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# Stillbirth Collaborative Research Network: Design, Methods and Recruitment Experience

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## SUMMARY

The Stillbirth Collaborative Research Network (SCRN) has conducted a multisite, population-based, case-control study, with prospective enrollment of stillbirths and live births at the time of delivery. This paper describes the general design, methods, and recruitment experience. The SCRN attempted to enroll all stillbirths and a representative sample of live births occurring to residents of pre-defined geographic catchment areas delivering at 59 hospitals associated with five clinical sites. Live births <32 weeks gestation and women of African descent were oversampled. The recruitment hospitals were chosen to ensure access to at least 90% of all stillbirths and live births to residents of the catchment areas. Participants underwent a standardized protocol including maternal interview, medical record abstraction, placental pathology, biospecimen testing, and, in stillbirths, postmortem examination. Recruitment began in March 2006 and was completed in September 2008 with 663 women with a stillbirth and 1932 women with a live birth enrolled, representing 69% and 63%, respectively, of the women identified. Additional surveillance for stillbirth continued through June 2009 and a follow-up of the case-control study participants was completed in December 2009.

Among consenting women, there were high consent rates for the various study components. For the women with stillbirth, 95% agreed to maternal interview, chart abstraction, and placental pathologic examination; 91% of the women with live birth agreed to all of these components.

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Additionally, 84% of the women with stillbirth agreed to a fetal postmortem examination. This comprehensive study is poised to systematically study a wide range of potential causes of, and risk factors for, stillbirth and to better understand the scope and incidence of the problem.

## INTRODUCTION

Stillbirth accounts for half of all perinatal mortality. In the US there are approximately 25,000 stillbirths per year, with a rate that is 52% higher than the Healthy People 2010 target goal of 4.1 fetal deaths per 1,000 births.[1] More than half of stillbirths are ≥28 weeks gestation and approximately 20% are term gestations. The causes of about half of all stillbirths remain undetermined. Despite the significant and persistent burden of stillbirths, they remain understudied.

In March 2001 the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD) convened a workshop of experts in the field to set a national agenda for stillbirth research.[2] Subsequently, in August 2003, the NICHD established the Stillbirth Collaborative Research Network (SCRN) to study the extent and causes of stillbirth in the United States. The specific aims of the SCRN were to: (i) determine the causes of stillbirth using a standardized stillbirth postmortem protocol, to include review of clinical history, protocols for postmortem and pathologic examinations of the fetus and placenta, as well as other postmortem tests to illuminate genetic, maternal, and other environmental influences; (ii) obtain a geographic population-based determination of the incidence of stillbirth, defined as fetal death at ≥20 weeks gestation; and (iii) elucidate risk factors for stillbirth.

The design and methods of the resulting study are described here.

## METHODS

### Overview of the SCRN

The SCRN consists of a multidisciplinary team of investigators and research coordinators from five clinical sites (listed in Table 1), a data coordinating and analysis center (RTI International) and the NICHD, in collaboration with local hospitals in geographic areas associated with the clinical sites.

**Hypotheses—**Within the specific aims, the SCRN specified research questions that guided protocol development. Examples include:

- The characteristics associated with the excess rate of stillbirth among specific racial/ethnic groups;
- The association of prenatal exposure to interpersonal and environmental stressors, and substances such as cigarettes, alcohol and drugs of abuse with stillbirth;
- The relationship of placental and/or umbilical cord abnormalities to stillbirth;
- The relationship of fetal growth restriction to stillbirth;
- The association of known maternal and fetal DNA mutations and polymorphisms, such as thrombophilia, and newly identified polymorphisms and copy number changes with stillbirth using current genomic technologies;
- The contribution of undiagnosed or untreated maternal disease, such as diabetes, thyroid disease and the presence of antiphospholipid antibodies to stillbirth; and
- The contribution of viral, bacterial and other infectious agents to stillbirth.

**Design—**The study was designed as a multi-site, population-based, case-control study, with prospective enrollment of stillbirths and live births at the time of delivery. Table 1 characterizes the *catchment areas*. To achieve the target number of stillbirths within a defined calendar period, clinical site investigators were required to establish catchment areas containing at least 6,000 births per year for urban areas. The one rural area (Brazoria and Galveston Counties in Texas) was required to contain at least 3,000 births per year. The boundaries selected were state and county lines and the areas included portions of 5 states - Rhode Island, Massachusetts, Georgia, Texas and Utah. The investigators selected 59 hospitals (detailed in the appendix) for enrollment to ensure access to at least 90% of all pregnancies ending in live birth or stillbirth to residents of their catchment areas.

The accrual period was to be of sufficient duration to enroll 500 stillbirths with adequate pathology assessment. Pre-study estimates of stillbirth rates across sites, derived from clinical databases, ranged from 5.3 to 11.8 per 1000 births, suggesting that the study would be able to identify approximately 1000 stillbirths in two years, providing an estimated 700 enrollments and 500 post-mortem examinations.

## Screening and Enrollment

**Inclusion / Exclusion Criteria—**Stillbirth is defined as a fetal death at 20 weeks gestation or greater. A woman was eligible for screening to the SCRN if she had experienced a fetal death (case) at ≥18 weeks of clinical gestational age, or delivered a live birth (control) at ≥20 weeks gestation at one of the participating site hospitals. She was subsequently excluded if there was evidence that clearly estimated the gestational age at $\leq 19^{6}$ weeks or if the delivery resulted from termination of a living fetus.

To be included in the case-control study, the woman was required to be at least 13 years of age, a physical resident at the time of delivery within one of the geographic catchment areas and identified for participation prior to hospital discharge. Women were excluded if incarcerated, or if informed consent (and assent if applicable) could not be administered due to mental status or a language barrier.

The local designation of fetal death versus live birth status was used for screening and enrollment. Subsequent to enrollment, each delivery was carefully reviewed; and an APGAR score greater than 0 at 1 and/or 5 minutes after delivery or signs of life by direct observation further distinguished live birth from stillbirth for the SCRN.

**Surveillance—**Coordinators actively monitored site hospitals and registered all potentially eligible fetal deaths ≥18 weeks gestation and live births 20–31 weeks gestation. All stillbirths and a sample of the live births 20–31 weeks gestation were selected to approach for consent. A separate mechanism was established to select a sample of live births 32+ weeks gestation for screening through hospital delivery logs. Sampling of live births is described in more detail below and in the appendix.

**Consent—**Once a woman was identified as a potential study participant (case or control), her physician was asked for permission to approach her. For women whose physicians agreed, a trained study coordinator administered informed consent and requested written consent (and written assent for minors).

## Sampling Controls

**Overview—**The procedure for sampling live births was designed to provide: (i) sufficient live birth controls at various gestational ages for gestation-specific analyses; (ii) at least as

many live births as stillbirths for whites, Hispanics, and African Americans; and (iii) real-time sampling of live births.

**Live Births 20–31 Weeks Gestation—**Oversampling live births 20–31 weeks gestation was required, given the large difference in gestational age distribution between stillbirths and live births. For example, projected from site specific data, 36% of stillbirths but only 0.3% of all live births would be 20 to 23 weeks. Study personnel screened for and registered all detected live births 20–31 weeks gestation, and either attempted to enroll all of them (births at 20–23 weeks) or a sample selected at random with selection probabilities that were pre-specified by week of gestation (births at 24–31 weeks). The selection probabilities were specified to provide numbers similar to those of enrolled stillbirths at each week of gestational age.

**Live Births at ≥32 Weeks Gestation—**Practical issues affecting the sampling design included the need to enroll the mother and collect samples within hours of the delivery; the very large number of live births in the cohort and the small sampling fraction; the variation in size of the hospitals, some with as few as 1 or 2 deliveries per day to residents of the catchment area; and limits on the personnel who could be engaged at participating hospitals, particularly hospitals that ordinarily did not do research. Thus, certain approaches were not feasible, such as using retrospective selection from vital statistics records; prospective screening and random selection applied to every live birth; and random pre-selection of a specified percentage of live births at each hospital.

For live births ≥32 weeks gestation, random hospital-date-times (RHDTs) were pre-selected for each clinical site. For each RHDT, the mother of the next eligible delivery of a live baby at ≥32 weeks gestation to a resident of the catchment area was invited to join the study. If there was no eligible delivery within 24 hours, then no woman was enrolled for that RHDT (see appendix for further details). Enough RHDTs were generated to result in an approximate 2:1 ratio of live births ≥32 weeks gestation to stillbirths enrolled to the study.

**Additional Enrollment for Women of African Descent—**The original design resulted in at least 2:1 live births ≥32 weeks gestation relative to stillbirths for white, non-Hispanic women and for Hispanic women. However, the ratio for African Americans was closer to 1:1. The increased burden of stillbirth in African Americans, coupled with the potential interaction or effect modifying role of race with several hypothesized risk factors for stillbirth, led the investigators to develop an addendum to the protocol to increase the number of women of African descent in the sample of live births 32+ weeks gestation to approximately twice the expected number of women of African descent in the sample of stillbirths (an additional 175 women). This over-sampling was limited to the geographic catchment area defined by Emory – DeKalb County, Georgia, where approximately 58% of the residents were African American. See the appendix for further details.

## Data and Sample Collection

**Maternal interview—**A two-part maternal interview was conducted. The first component, administered during in-hospital stays, addressed the following topics: social (e.g., Medicaid status, marital status, living situation, income sources), demographics (race/ethnicity, country of origin, and details regarding the father of the baby); reproductive history (including infertility treatment and outcome of all previous pregnancies); complications of the index pregnancy (including specific conditions, medications, and infectious symptoms); and early indications of problems with the pregnancy such as abdominal pain or bleeding. The woman was asked to identify health care providers whom she saw during pregnancy so that her prenatal charts could be requested and abstracted.

The emphasis of the second component of the maternal interview was psychosocial data (such as recent history of depression, anxiety and anger traits, and sources of material and social support) and medical history of the mother. Also, limited medical history about her relatives and the relatives of the baby's father, including information about birth defects and genetic diseases was collected. This component of the interview included validated instruments used in many studies, such as Spielberger's trait anxiety subscale and trait anger subscale[3–9] and a 13-item significant life events inventory developed for the Pregnancy Risk Assessment Monitoring System Phase 5 core questionnaire.[10] Information on over-the-counter drugs, herbal remedies and illicit drug exposure was obtained. The mother was asked about how she and the father of the baby felt about this pregnancy (i.e., whether it was planned, mistimed, or unwanted). While this second component of the maternal interview could be completed by phone 2–4 weeks after delivery, most interviews were completed in-hospital.

Total interview time averaged 45–60 minutes and was often conducted in segments to accommodate hospital procedures and visitors. Interview materials were available in English and Spanish and a hospital interpreter was engaged for other languages.

**Chart abstraction—**Records from the participant's prenatal care providers and from hospitals and emergency rooms attended during the current pregnancy were abstracted. Data abstraction included demographics, social history, prenatal exposures and medications, family genetic history, reproductive history, routine prenatal care and labs, ultrasound diagnoses, invasive diagnostic procedures, antenatal surveillance, hospital visits, delivery hospitalization, stillborn assessment and diagnostic labs, neonatal outcome for live births, and placental cultures.

**Pathology examinations and biospecimens—**The postmortem and placental examinations were performed by SCRN pathologists at each clinical site using standard protocols. The pathologists met to ensure a common approach to the data fields, definitions of pathologic lesions, review of the gross examinations of the fetus and placenta and common assessment of histologic images. Data from the pathologic exams were collected prospectively on forms designed specifically for the study. Biologic specimens that were collected and stored for later analysis included maternal blood, umbilical cord section, placental sections, and cord blood from stillborn and live born deliveries; fetal tissue, heart blood and meconium from stillbirths; and extracted DNA from blood and placenta samples.

## Training and Quality Assurance

Prior to initiating the full study, a preliminary assessment of recruitment procedures, chart abstraction and the maternal interview were conducted with three cases and three controls from each site. In addition, a series of questions were asked of the interviewers, chart abstractors and participants to identify problems on the instruments and to record participant reactions to the interview and their overall experience of participation in the study. Results from the pilot were used to improve the final instruments and protocol.

Central training was held for study coordinators from each clinical site. This included separate instruction, observation and practice in bereavement counseling; interviewing; chart abstraction; consent for autopsy; data entry; specimen collection, processing, labeling and shipment; and use of the manual of operations. After certification by a standardized, computer-based system, they conducted similar training and certification for their site staff members.

### Construction of Analysis Weights

With completion of data collection, basic sets of analysis weights were developed to account for key elements of the sampling design and differential participation rates. Generally, the weights were computed in steps, and separately for three subgroups: live births <32 weeks gestation; live births 32+ weeks gestation; and stillbirths.

Base weights were first constructed to take into account the sampling design. For all three subgroups, the base weights accounted for staggered starts to enrollment across the 59 site hospitals. Additionally, live births were weighted to account for the different sampling probabilities by gestational age and race (see appendix for details).

After accounting for the study design at the screening level, weight adjustments were constructed to take into account differential participation rates. Some women who were eligible were not approached because their health care providers did not assent. Others were approached but did not consent. We used the generalized exponential model (GEM)[11,12] of the propensity to participate. Weight adjustments were computed separately for the two steps towards the enrollment of a woman to the study within the three subgroups. Candidate variables for the modeling were first assessed using logistic regression. Any variable that was found to be a significant predictor for `approached among those eligible' or `consented among those approached' in any of the three subgroups was included. The candidate variables, which were limited to data available at screening, are described in the appendix.

Analysis weights were then constructed as the product of all of the weighting factors. The resulting weighted sample of live births is intended to approximate a random selection of live births in the five catchment areas over the enrollment period.

Additional analysis weights are under development for various components of the study not available for all participants (e.g., the placental exam).

### Continued Surveillance for Stillbirth

Recruitment to the case-control study began March 2006 with staggered start dates and ended in September 2008, after enrolling 500 stillbirths with complete data ascertainment. Coordinators continued surveillance following the original protocol, to collect basic descriptive information on all stillbirths through June 2009. The purpose of this surveillance was to obtain data on incident stillbirths for 30 months at all site hospitals starting in January 2007.

## RESULTS

Among the 1,158 women with stillbirth who were screened for inclusion, 17% were ineligible for study participation (Table 2). Of the 958 eligible women, 126 (13%) were not approached, 167 (17%) were approached but refused to participate, and 665 (69%) consented. Of those consenting, 95% agreed to maternal interview, chart abstraction, and placental examination (97% agreed to a maternal interview, almost 100% to chart abstraction, and 99% to a placental exam). Additionally, 561 women with stillbirth (84%) consented to fetal postmortem examination.

A total of 3,083 women with live-birth were identified and selected for the case-control study. Among these women, 394 (13%) were not approached, 759 (25%) were approached but refused to participate, and 1930 (63%) consented. Of those consenting, 91% agreed to maternal interview, chart abstraction, and placental examination (98% agreed to a maternal interview, 98% to chart abstraction, and 93% to a placental exam). For more detail, see the appendix.

Figure 1 depicts consent rates for women with stillbirths and live births by maternal race/ethnicity, gestational age and maternal age. There were significant differences in the consent rates among white, non-Hispanic women with stillbirth versus live birth (71% vs 60%, p=0.0006). For women with live births, we found that Hispanic women were more likely to consent than white, non-Hispanic and black, non-Hispanic women (70% for Hispanic versus: 60% for white, non-Hispanic, p<0.0001; and 57% for black, non-Hispanic, p<0.0001). Among women delivering stillbirths at <32 weeks, consent rates increased with gestational age from 67% at 20–23 weeks to 79% at 28–31 weeks (p=0.0134). Consent rates increased with gestational age of live births from 54% for women delivering 20–23 weeks to 64% for women delivering at ≥37 weeks (p=0.0001). Differences were found in the consent rates for women with stillbirth versus live birth in the 20–35 year maternal age group (71% versus 63%, p=0.0003), but not the other age groups.

The unweighted and weighted gestational age distributions are shown at the top of Table 3, followed by weighted analyses for a few maternal demographic characteristics of the participants. Two women labeled as having stillbirths by the local designation were subsequently classified as live births by the SCRN, resulting in 663 women with stillbirth and 1932 women with live birth to be used in the case-control study. Details are provided in the appendix on the breakdown of the stillbirths and live births, both pregnancies and babies, according to local and SCRN designations.

Because of oversampling, 18% of enrolled live births were <32 weeks. The weighted distribution reflects the general population of births during the time of the study with approximately 2% of live births delivering at <32 weeks.

## DISCUSSION

Stillbirth statistics for vital registration reporting areas of the US were first published in 1918.[13] Stillbirths were substantially underreported during the first half of the 20th century, mainly because of unregistered out-of-hospital deliveries and variations in states' requirements for reporting fetal deaths.[14] The US adopted the World Health Organization definition of fetal death in 1950 and recommended reporting of stillbirths as fetal deaths of ≥20 completed weeks gestation.[15] By 1990 stillbirth rates were 60% lower than in 1950 (annual average drop of 1.5%). Between 1990 and 2005, however ,improvement in stillbirth rates had slowed to an annual average of 1.2%.[15–20]

Despite data limitations, analysts have utilized vital statistics data in selected states to add to the list of known maternal risk factors or high-risk groups: obesity, smoking, short interpregnancy intervals, prior stillbirth, lower maternal education, and medical complications.[21–26] Other potential risk factors such as caffeine, occupation, and acute or chronic maternal stress have been identified in selected studies, but these factors are not included in vital records and have not been thoroughly explored in US populations.[27]

The SCRN study was designed to address some of these information gaps. The SCRN study is the only large study of stillbirth that simultaneously includes: 1) prospective population-based surveillance of stillbirths and enrollment at delivery; 2) population-based controls for true estimates of scope and risks of stillbirth in comparison to live birth; 3) live births oversampled for preterm births; 4) uniform, highly detailed fetal postmortem and placental pathology in stillbirths and placental pathology in live births, 5) review of prenatal and peri-partum records; 6) a maternal interview conducted immediately after the delivery; and 7) biospecimens including maternal blood, placenta, cord blood, and, in stillbirths, fetal tissue.

The study has the limitation that much of the information is retrospective and derived from maternal interview at the time of delivery. While prenatal records were abstracted, the extent

and quality of data in prenatal records required substantial reliance on the retrospective data collected from the mother. Also, while biomarkers of smoking, alcohol, and illicit drugs were collected, the measurements are only for the time around delivery and may not reflect exposure at earlier vulnerable periods during gestation.

Traditional hospital-based case-control studies may be biased because women with complicated deliveries may be more likely than women with uncomplicated deliveries to deliver at tertiary care hospitals. In an effort to avoid this bias, the SCRN selected 59 hospitals across 5 catchment areas with access to an estimated 90%+ of all pregnancies ending in live birth or stillbirth to residents of the catchment areas. All stillbirths and a sample of live births were targeted for enrollment with the live births sampled in proportion to the number of live births to catchment residents that occurred in each hospital.

Based on past experience of recruiting for case-control studies, we set recruitment goals of 70% for cases and 50% for controls, who are generally less likely to agree to volunteer. These goals were nearly met for stillbirths (69% of eligible women) and exceeded for live births (63% of eligible women).

In addition to providing the opportunity to obtain population-based estimates of incidence and risk, the population-based surveillance and enrollment across 5 disparate geographic areas is a major strength of this study because, while not representing the US population, the cohort reflects a range of populations and obstetrical and delivery services. With high participation rates, high ascertainment of stillbirths, a weighted sample of controls designed to approximate a random selection, and high consent to autopsy among consenting women with stillbirth (84%), the study results should adequately represent the population from those sites.

The large number of preterm births in this cohort is valuable to: (i) analyze risk factors and biological mechanisms in stillbirths at preterm gestations that are related to prematurity and those that are unique to demise; and, (ii) to conduct case-control analyses of preterm versus term live birth.

The SCRN is poised to study the heterogeneous nature of stillbirth by considering a variety of potential causes and risk factors and to better understand the scope and incidence. We anticipate that the knowledge garnered from the SCRN will set the agenda for future research aimed at improving preventive and therapeutic interventions.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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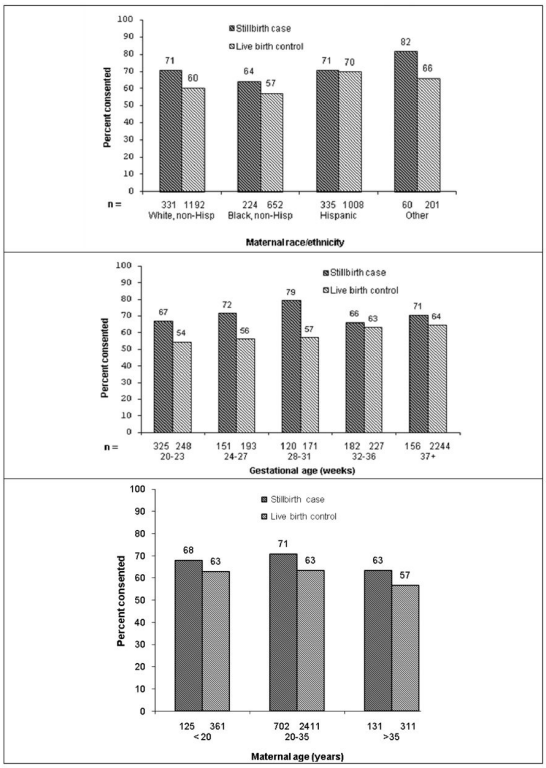


**Figure 1. Consent Rates Among Selected Subgroups by Local Case-Control Status**[a]

[a] The figure shows consent rates as unweighted percents. The stillbirth / live birth categorization is according to the local hospital designation of the birth.

## Table 1

Characterization of the Catchment Areas[a] for the Clinical Sites at the Outset of the Study

| Clinical Site | Catchment Area | Residence | # Site Hospitals[b] | Catchment Area Resident Deliveries at Site Hospitals | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Stillbirths (SBs) | | | Live births (LBs) | |
| | | | | % of total | # / year | Rate | % of total | # / year |
| Brown | State of Rhode Island & Bristol County, MA | Urban & Rural | 14 | 98 | 110 | 5.3 | 100 | 20,834 |
| Emory | DeKalb County, GA | Urban Only | 7 | 93 | 126 | 11.8 | 96 | 10,520 |
| UTMB - Galveston | Galveston & Brazoria Counties, TX | Urban & Rural | 12 | 91 | 43 | 6.0 | 90 | 6,757 |
| UTHSC - San Antonio | Bexar County, TX | Primarily Urban | 11 | 93 | 120 | 5.0 | 97 | 23,600 |
| Utah | Salt Lake County, UT | Urban Only | 15 | 97 | 110 | 5.7 | 96 | 18,954 |
| Total | | | 59 | 95 | 509 | 6.2 | 97 | 80,665 |

[a]Data were provided from vital statistics and hospital medical records for the following years: Brown: 2001, Emory: 2001–2002, Galveston: 1998–2001, San Antonio: 2001–2002, Utah: 1998–2002.

[b]Due to the small number of catchment area residents delivering live births in four of the UTMB-Galveston and six of the Utah clinical site hospitals, live birth controls were not recruited from these facilities. The live births reported above pertain to the hospitals involved in recruitment only.

## Table 2

Screening and Enrollment by Clinical Site[a]

| Characteristic- n (%) | Clinical Sites | | | | | Total |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| ***Stillbirths by Local Designation*** | | | | | | |
| Screened for SB eligibility | 330 | 260 | 250 | 215 | 103 | 1,158 |
| Exclusions from Case-Control Study | 54 (16) | 36 (14) | 63 (25) | 32 (15) | 15 (15) | 200 (17) |
| Case-Control Study Pop'n - Cases | 276 | 224 | 187 | 183 | 88 | 958 |
| Not approached for consent | 41 (15) | 29 (13) | 31 (17) | 17 (9) | 8 (9) | 126 (13) |
| Refused consent | 59 (21) | 25 (11) | 28 (15) | 39 (21) | 16 (18) | 167 (17) |
| Consented | 176 (64) | 170 (76) | 128 (68) | 127 (69) | 64 (73) | 665 (69) |
| Maternal interview | 171 (97) | 166 (98) | 128 (100) | 118 (93) | 59 (92) | 642 (97) |
| Chart abstraction | 174 (99) | 170 (100) | 128 (100) | 127 (100) | 64 (100) | 663 (100) |
| Placental exam | 172 (98) | 169 (99) | 128 (100) | 124 (98) | 63 (98) | 656 (99) |
| Genetic studies on mom and/or baby | 173 (98) | 170 (100) | 125 (98) | 125 (98) | 60 (94) | 653 (98) |
| Fetal postmortem exam | 143 (81) | 154 (91) | 103 (80) | 104 (82) | 57 (89) | 561 (84) |
| ***Live Birth by Local Designation*** | | | | | | |
| Case-Control Study Pop'n - Controls | | | | | | |
| Live births < 32 weeks | 179 | 114 | 110 | 159 | 50 | 612 |
| Live births ≥ 32 weeks | 633 | 565 | 568 | 534 | 171 | 2,471 |
| *(Additional African descent live births ≥ 32 weeks)* | | | | | | *(283)* |
| Total live births | 812 | 679 | 678 | 693 | 221 | 3,083 |
| Not approached for consent | 125 (15) | 72 (11) | 124 (18) | 64 (9) | 9 (4) | 394 (13) |
| Refused consent | 120 (15) | 185 (27) | 153 (23) | 241 (35) | 60 (27) | 759 (25) |
| Consented | 567 (70) | 422 (62) | 401 (59) | 388 (56) | 152 (69) | 1930 (63) |
| Maternal interview | 558 (98) | 414 (98) | 398 (99) | 376 (97) | 144 (95) | 1890 (98) |
| Chart abstraction | 559 (99) | 420 (100) | 380 (95) | 386 (99) | 151 (99) | 1896 (98) |
| Placental exam | 520 (92) | 407 (96) | 358 (89) | 371 (96) | 146 (96) | 1802 (93) |
| Genetic studies on mom and/or baby | 551 (97) | 417 (99) | 352 (88) | 382 (98) | 150 (99) | 1852 (96) |

[a]The table shows the screening and enrollment experience with unweighted counts and percents. The stillbirth / live birth categorization is according to the local hospital designation of the birth.

## Table 3

Maternal Demographics by SCRN Designation of Case-Control Status[a]

| Maternal Demographics | SCRN Case/Control Status | | OR [95% CI] | p-value |
|---|---|---|---|---|
| | SB | LB | | |
| **Consented - N** | 663 | 1932 | | |
| **Gestational age in weeks – n (%)** | | | | |
| 18–19 | 15 (2.3) | 0 (0.0) | | |
| 20–23 | 216 (32.6) | 136 (7.0) | | |
| 24–27 | 108 (16.3) | 108 (5.6) | | |
| 28–31 | 95 (14.3) | 97 (5.0) | | |
| 32–36 | 119 (17.9) | 144 (7.5) | | |
| 37+ | 110 (16.6) | 1,447 (74.9) | | |
| Total | 663 | 1,932 | | |
| **Weighted Results** | | | | |
| **Gestational age in weeks – $n_w$ (%)** | | | | |
| 18–19 | 17 (2.5) | 0 (0.0) | | |
| 20–23 | 224 (33.8) | 5 (0.4) | | |
| 24–27 | 105 (15.8) | 10 (0.7) | | |
| 28–31 | 84 (12.7) | 15 (1.1) | | |
| 32–36 | 125 (18.8) | 124 (8.6) | | |
| 37+ | 108 (16.3) | 1285 (89.3) | | |
| $Total_w$ | 663 | 1439 | | |
| **Race / Ethnicity – $n_w$ (%)** | | | | |
| White, Non-Hispanic | 221 (33.4) | 659 (45.8) | *reference* | <.0001 |
| Black, Non-Hispanic | 154 (23.3) | 169 (11.7) | 2.72 (2.09, 3.54) | |
| Hispanic | 240 (36.3) | 501 (34.8) | 1.43 (1.14, 1.78) | |
| Other | 46 (6.9) | 110 (7.6) | 1.25 (0.85, 1.84) | |
| Missing | 1 (0.1) | 0 (0.0) | -- | |
| $Total_w$ | 663 | 1439 | | |
| **Age in years** | | | | |
| < 20 | 88 (13.2) | 148 (10.3) | 1.39 (1.05, 1.85) | 0.0030 |
| 20–34 | 462 (69.7) | 1089 (75.7) | *reference* | |
| 35–39 | 82 (12.4) | 172 (11.9) | 1.13 (0.84, 1.52) | |
| 40+ | 31 (4.7) | 30 (2.1) | 2.44 (1.39, 4.27) | |
| $Total_w$ | 663 | 1439 | | |
| **Education in years – $n_w$ (%)** | | | | |
| 0–11 (none/primary/some secondary) | 145 (23.7) | 250 (18.3) | 1.55 (1.21, 1.98) | 0.0007 |
| 12 (completed secondary) | 181 (29.6) | 352 (25.8) | 1.37 (1.09, 1.73) | |

| Maternal Demographics | SCRN Case/Control Status | | OR [95% CI] | p-value |
|---|---|---|---|---|
| | SB | LB | | |
| 13+ (college) | 286 (46.7) | 760 (55.8) | *reference* | |
| $Total_w$ | 612 | 1361 | | |
| **Total pregnancies – $n_w$ (%)** | | | | |
| One | 195 (29.5) | 394 (27.5) | 1.33 (1.03, 1.72) | 0.0282 |
| Two | 159 (24.0) | 427 (29.8) | *reference* | |
| Three or more | 308 (46.5) | 610 (42.6) | 1.36 (1.07, 1.71) | |
| $Total_w$ | 662 | 1431 | | |
| **Parity – $n_w$ (%)** | | | | |
| Nulliparous | 297 (45.0) | 506 (35.3) | 1.50 (1.23, 1.82) | <.0001 |
| Multiparous | 363 (55.0) | 926 (64.7) | *reference* | |
| $Total_w$ | 661 | 1431 | | |
| **Previous stillbirth among women with previous pregnancy – $n_w$ (%)** | | | | |
| Yes | 44 (9.4) | 23 (2.2) | 4.63 (2.81, 7.64) | <.0001 |
| No | 421 (90.6) | 1010 (97.8) | *reference* | |
| $Total_w$ | 465 | 1033 | | |
| **Multiplicity of pregnancy – $n_w$ (%)** | | | | |
| Singleton | 622 (93.8) | 1412 (98.1) | *reference* | 0.0001 |
| Twin | 40 (6.1) | 27 (1.9) | 3.41 (1.90, 6.12) | |
| Triplet | 1 (0.1) | 0 (0.0) | 4.26 (0.44,41.15) | |
| $Total_w$ | 663 | 1439 | | |
| **Multiples among stillbirths – $n_w$ (%)** | | | | |
| All stillborn | 11 (26.5) | -- | | |
| Still- and live-born | 30 (73.5) | -- | | |
| $Total_w$ | 41 | -- | | |

[a]The table gives various characteristics of the participants after applying analysis weights to the data to account for unequal selection probabilities, staggered enrollment, the *24-hour rule* for RHDTs and differences in consent rates. A woman is classified as a case (SB) if she delivered at least one stillbirth and a control (LB) if she delivered all live births. The designation is according to the SCRN definition of a stillbirth. Weighted counts, denoted $n_W$ and $Total_W$, are rounded to whole numbers and do not necessarily add across a classification to the total on this scale.