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Assisted Reproductive Technology Surveillance — United States, 2011

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Assisted Reproductive Technology Surveillance — United States, 2011

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Abstract

Problem/Condition: Since the first U.S. infant conceived with Assisted Reproductive Technology (ART) was born in 1981, both the use of advanced technologies to overcome infertility and the number of fertility clinics providing ART services have increased steadily in the United States. ART includes fertility treatments in which both eggs and embryos are handled in the laboratory (i.e., in vitro fertilization [IVF] and related procedures). Women who undergo ART procedures are more likely to deliver multiple-birth infants than those who conceive naturally because more than one embryo might be transferred during a procedure. Multiple births pose substantial risks to both mothers and infants, including pregnancy complications, preterm delivery, and low birthweight infants. This report provides state-specific information on U.S. ART procedures performed in 2011 and compares infant outcomes that occurred in 2011 (resulting from procedures performed in 2010 and 2011) with outcomes for all infants born in the United States in 2011.

Reporting Period Covered: 2011.

Description of System: In 1996, CDC began collecting data on all ART procedures performed in fertility clinics in the United States as mandated by the Fertility Clinic Success Rate and Certification Act of 1992 (FCSRCA) (Public Law 102-493). Data are collected through the National ART Surveillance System (NASS), a web-based data collecting system developed by CDC.

Results: In 2011, a total of 151,923 ART procedures performed in 451 U.S. fertility clinics were reported to CDC. These procedures resulted in 47,818 live-birth deliveries and 61,610 infants. The largest numbers of ART procedures were performed among residents of six states: California (18,808), New York (excluding New York City) (14,576), Massachusetts (10,106), Illinois (9,886), Texas (9,576), and New Jersey (8,698). These six states also had the highest number of live-birth deliveries as a result of ART procedures and together accounted for 47.2% of all ART procedures performed, 45.3% of all infants born from ART, and 45.1% of all multiple live-birth deliveries, but only 34% of all infants born in the United States. Nationally, the average number of ART procedures performed per 1 million women of reproductive age (15–44 years), which is a proxy indicator of ART use, was 2,401. In 11 states (Connecticut, Delaware, Hawaii, Illinois, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Virginia), the District of Columbia, and New York City, this proxy measure was higher than the national rate, and of these, in three states (Massachusetts, New Jersey, and New York) and the District of Columbia, it exceeded twice the national rate. Nationally, among ART cycles with patients using fresh embryos from their own eggs in which at least one embryo was transferred, the average number of embryos transferred increased with increasing age (2.0 among women aged <35 years, 2.3 among women aged 35–40 years, and 2.9 among women aged >40 years). Elective single-embryo transfer (eSET) rates decreased with increasing age (12.2% among women aged <35 years, 4.7% among women aged 35–40 years, and 0.7% among women aged >40 years). Rates of eSET also varied substantially between states (range: 0.7% in Idaho to 53% in Delaware among women aged <35 years).

The number of ART births as a percentage of total infants born in the state is considered as another measure of ART use. Overall, ART contributed to 1.5% of U.S. births (range: 0.2% in Puerto Rico to 4.5% in Massachusetts) with the highest rates (≥3.5% of all infants born) observed in four states (Connecticut, Massachusetts, New Jersey, and New York state), and the District of Columbia. Infants conceived with ART comprised 20% of all multiple-birth infants (range: 4.7% in Puerto Rico to 41.3% in New York state), 19% of all twin infants (range: 4.1% in Mississippi to 39.7% in Massachusetts), and 32% of triplet or higher order

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infants (range: 0 in several states to 71.4% in Hawaii). Among infants conceived with ART, 45.6% were born in multiple-birth deliveries (range: 23.1% in Delaware to 61.3% in Wyoming), compared with only 3.4% of infants among all births in the general population (range: 1.9% in Puerto Rico to 4.8% in New Jersey). Approximately 43% of ART-conceived infants were twins, and 3% were triplets and higher order infants.

Nationally, infants conceived with ART comprised 5.7% of all low birthweight (<2,500 grams) infants (range: 0.6% in Puerto Rico to 15% in Massachusetts) and 5.9% of all very low birthweight (<1,500 grams) infants (range: 0.8% in Mississippi to 17.3% in Massachusetts). Overall, among ART-conceived infants, 31% were low birthweight (range: 18% in District of Columbia to 44.6% in Puerto Rico), compared with 8.1% among all infants (range: 6% in Alaska to 12.5% in Puerto Rico); 5.7% of ART infants were very low birthweight (range: 0 in North Dakota to 8.5% in Hawaii), compared with 1.4% among all infants (range: 0.9% in Alaska to 2.2% in Mississippi). Finally, ART-conceived infants comprised 4.6% of all infants born preterm (<37 weeks; range: 0.5% in Puerto Rico to 13% in Massachusetts) and 5.2% of all infants born very preterm (<32 weeks; range: 0 in Wyoming to 17.1% in Massachusetts). Overall, among infants conceived with ART, 36.2% were born preterm (range: 12.5% in Vermont to 56.9% in Puerto Rico), compared with 11.8% among all infants born in the general population (range: 8.8% in Vermont to 17.6% in Puerto Rico); 6.7% of ART infants were born very preterm (range: 0 in Wyoming to 12.5% in Alaska), compared with 1.9% among all infants born in the general population (range: 1.3% in Wyoming to 3.0% in Puerto Rico).

The percentage of infants conceived with ART who were low birthweight varied from 8.8% (range: 3.9% in the District of Columbia to 17.9% in Puerto Rico) among singletons, to 56.4% (range: 34.6% in Vermont to 70.4% in Mississippi) among twins, and 95.7% (range: 79.5% in North Carolina to 100% in several states) among triplets or higher-order multiples; comparable percentages for all infants were 6.4% (range: 4.5% in Idaho and Oregon to 11.3% in Puerto Rico), 56.3% (range: 47.7% in Vermont to 72.1% in Puerto Rico), and 93.9% (range: 50% in Wyoming to 100% in several states), respectively. The percentage of ART infants who were preterm varied from 13.2% (range: 7.3% in the District of Columbia to 28.6% in Puerto Rico) among singletons, to 61.8% (range: 46% in the District of Columbia to 82.7% in Oklahoma) among twins, and 97.1% (range: 76.9% in Iowa to 100% in several states) among triplets or higher-order multiples; comparable percentages for all infants were 10.1% (range:7.5% in Oregon to 16.6% in Puerto Rico), 57.3% (range: 46.8% in New Hampshire to 68.8% in Louisiana), and 93.4% (range: 73.3% in Rhode Island to 100% in several states), respectively. Only nonsuppressed values from reporting areas are provided to protect confidentiality.

Interpretation: The percentage of infants conceived with ART varied considerably by state (range: 0.2% to 4.5%). In most states, multiples from ART comprised a substantial proportion of all twin, triplet, and higher-order infants born in the state, and the rates of low birthweight and preterm infants were disproportionately higher among ART infants than in the birth population overall. Even among women aged <35 years, for whom elective single embryo transfers should be considered (particularly in patients with a favorable prognosis), on average, two embryos were transferred per cycle in ART procedures, influencing the overall multiple infant rates in the United States. Compared with ART singletons, ART twins were approximately 5 times more likely to be born preterm, and approximately six times more likely to be low birthweight. Singleton infants conceived with ART had slightly higher rates of preterm delivery and low birthweight than among all singleton infants born in the United States. However, all multiple-birth infants, regardless of whether they were ART-conceived or not, were more likely to be preterm and low birthweight compared with singletons. Further, ART use per population unit was distributed disproportionately in the United States, with 11 states showing ART use above the national rate. Of the four states (Illinois, Massachusetts, New Jersey, and Rhode Island) with comprehensive statewide-mandated health insurance coverage for ART procedures (e.g., coverage for at least four cycles of in vitro fertilization, three states (Illinois, Massachusetts, and New Jersey) also had rates of ART use >1.5 times the national level. This type of mandated insurance has been associated with greater use of ART and might account for the differences in per capita ART use observed among states.

Public Health Actions: Reducing the number of embryos transferred per ART procedure and promoting eSET procedures, when clinically appropriate, are needed to reduce multiple births and related adverse consequences of ART. Improved patient education and counseling on the health risks of having twins might be useful in reducing twin births given that twins account for the majority of ART-conceived multiple births. Although ART contributes to increasing rates of multiple births, it does not explain all of the increases, and therefore other explanations for multiple births not investigated in this report, such as the possible role of non-ART fertility treatments, warrants further study.

Introduction

Since the birth of the first U.S. infant conceived with Assisted Reproductive Technology (ART) in 1981, use of advanced technologies to overcome infertility has increased steadily, as has the number of fertility clinics providing ART services and procedures in the United States (*1*). In 1992, Congress passed the Fertility Clinic Success Rate and Certification Act (FCSRCA; Public Law 102-493), which requires that all U.S. fertility clinics performing ART procedures report data to CDC annually on every ART procedure performed. In 1997, CDC published the first annual ART Success Rates Report under FCSRCA, which reported on ART procedures performed in 1995 (*2*). CDC uses the data it receives to report pregnancy success rates for all ART programs and clinics in the annual ART Success Rates Report (*1*). Several measures of success for ART are presented in the annual report including the percentage of ART cycles that result in a pregnancy, live-birth deliveries, and singleton live births. Since 2010, ART Fertility Clinic Success Rates Reports are published in two separate reports: a Fertility Clinic Success Rates Report and a National Summary Report (*1,3*).

ART is associated with potential risks to the mother and fetus. Because multiple embryos are transferred in the majority of ART procedures, ART has been associated with a substantial risk for multiple-gestation pregnancy and multiple births (*4–11*). Multiple births are associated with greater health problems for mothers and infants, including higher rates of caesarean deliveries, prematurity, low birthweight, infant death, elevated risk for birth defects, and disability (*4–15*). Further, even singleton infants conceived with ART have a higher risk of low birthweight (*16,17*).

This report is based on ART surveillance data reported to CDC's Division of Reproductive Health for procedures performed in 2011. Data are presented regarding the use of ART in each U.S. state, the District of Columbia, and the Commonwealth of Puerto Rico as well as infant outcomes in 2011 resulting from procedures performed in 2010 and 2011. Additionally, the report examines the contribution of ART to selected adverse outcomes (e.g., multiple birth, low birthweight, and preterm delivery) and compares 2011 ART infant outcomes to outcomes among all infants born in the United States in 2011.

Methods

National ART Surveillance System

In 1996, CDC initiated data collection of ART procedures performed in the United States. ART data for 1995–2003 were obtained from the Society of Assisted Reproductive Technology (SART). Since 2004, CDC has contracted with Westat, Inc., a statistical survey research organization, to obtain data from fertility clinics in the United States through the National ART Surveillance System (NASS), a web-based data collection system developed by CDC (http://www.cdc.gov/art/NASS.htm). Clinics enter their data into NASS and verify the data's accuracy before sending the data to Westat. The data then are compiled by Westat and reviewed by both CDC and Westat. A few clinics (6.0%) did not report their data to CDC and are listed as nonreporting programs in the Fertility Clinic Success Rates Report, as required by FCSRCA. Because nonreporting clinics tend to be smaller than reporting clinics, NASS is estimated to contain information on >97.0% of all ART cycles in the United States (*1*).

Data collected include patient demographics, medical history, and infertility diagnoses; clinical information pertaining to the ART procedure type; and information regarding resultant pregnancies and births. The data file is organized with one record per ART procedure (or cycle of treatment) performed. Multiple procedures from individual patients are not linked. Because ART providers typically do not provide continued prenatal care after a pregnancy is established, information on live births for all procedures is collected by ART clinics either directly from their patients (83.0%) or from their patients' obstetric providers (17.0%).

ART Procedures

ART includes fertility treatments in which both eggs or embryos are handled in the laboratory (i.e., in vitro fertilization [IVF] and related procedures). ART does not include treatments in which only sperm are handled (i.e., intrauterine insemination) or procedures in which a woman takes drugs only to stimulate egg production without the intention of having eggs retrieved. Because an ART procedure consists of several steps over an interval of approximately 2 weeks, a procedure often is referred to as a cycle of treatment. An ART cycle generally begins with drug-induced ovarian stimulation. If eggs are produced, the cycle progresses to the egg-retrieval stage. After the eggs are retrieved, they are combined with sperm in the laboratory through IVF. If this is successful, the most viable embryos (i.e., those that are morphologically most likely to develop and implant) are selected for transfer by clinicians. If an embryo implants in the uterus, a clinical pregnancy is diagnosed by the presence of a gestational sac detectable by ultrasound. Most pregnancy losses occur within the first 12 weeks. Beyond 12 weeks of gestation, the pregnancy usually progresses to a live-birth delivery (with survival probabilities ranging from 95.0% at 16 weeks to 98.0% at 20 weeks), which is defined as the delivery of one or more live-born infants (*18*).

ART procedures are classified into four types on the basis of the source of the egg (patient or donor) and the status of the embryos (fresh or thawed). Both fresh and thawed embryos can result from either the patient's eggs or from the donor's eggs. ART procedures involving fresh embryos include an egg-retrieval stage. ART procedures that use thawed embryos do not include egg retrieval because the eggs were fertilized during a previous procedure, and the resulting embryos were frozen until the current procedure. An ART procedure can be discontinued at any step for medical reasons or by patient choice.

Variables and Definitions

ART data and outcomes from ART procedures are presented by the patient's state of residence at the time of treatment. If this information was missing, the state of residence was assigned as the state in which the procedure was performed. Cycles among non-U.S. residents are included in NASS data but might be excluded from some calculations for which the exact denominators were not known. To protect confidentiality in the presentation of data in tables, cells with values between 1 and 4 are suppressed, as are data that can be used to derive cell values of 1–4.* These values are included in totals. ART data for territories (with the exception of Puerto Rico) are not included in this report to protect data confidentiality.

This report presents data on all cycles initiated; however, outcomes are determined on the basis of cycles that involved embryo transfer. The number of ART procedures performed per 1 million women of reproductive age (15–44 years) was calculated, and the resulting ratio approximates the proportion of women of reproductive age who used ART in each state. However, this proxy measure of ART use is only an approximation because some women who used ART might fall outside the age range of 15–44 years, and some women might have had more than one procedure during the reporting period.

Live-birth delivery was defined as birth of one or more live-born infants, with delivery of multiple infants counted as one live-birth delivery. A singleton live-birth was defined as a birth of one live-born infant from a single gestation pregnancy. A multiple birth was defined as a birth of two or more infants, at least one of whom was live-born.

Elective single-embryo transfer (eSET) is a procedure in which one embryo, selected from a larger number of available embryos, is placed in the uterus, with extra embryos cryopreserved. This procedure does not include cycles in which only one embryo is available. Transfer procedures in which only one embryo was transferred but no embryos were cryopreserved also are excluded from this definition. The embryo selected for eSET might be from a previous IVF cycle (e.g., cryopreserved [frozen] embryos) or from the current fresh IVF cycle that yielded more than one embryo. The remaining embryos might be set aside for future use through cryopreservation. In this report, both eSET procedures and the average number of embryos transferred were calculated for fresh, nondonor cycles in which at least one embryo was transferred.

The average number of embryos transferred for three age groups (<35 years, 35–40 years, and >40 years) was calculated by dividing the total number of embryos transferred by the total number of embryo-transfer procedures performed in that age group. The percentage of eSET was calculated by dividing the total number of transfer procedures in which only one embryo was transferred and one or more embryos were cryopreserved, by the sum of this numerator (total number of single embryo transfer procedures where extra embryos were available for cryopreservation) and the total number of transfer procedures in which more than one embryo were transferred.

The contribution of ART to an outcome was calculated by dividing the total number of outcomes among ART-conceived pregnancies by the total number of overall outcomes. The contribution of ART to all infants born was calculated by plurality (singleton, multiples, twins, and triplets or higher order births) and by adverse perinatal outcomes (low birthweight and prematurity). The contribution of ART to total infants born in the state was used as a second measure of ART use. The number and percentage of infants (ART-conceived and all infants) born in the state were calculated for singleton, multiple, twin, and triplet or higher order births and for different categories of birthweight and gestational age. Additionally, the percentages of infants with low birthweight and preterm delivery were calculated for each group of plurality (singleton, twins, and triplets and higher order births) for both ART-conceived infants and all infants, by dividing the number of low birthweight or preterm infants in each group of plurality by the total number of infants in that group.

Low birthweight was defined as <2,500 grams, very low birthweight as <1,500 grams, and extremely low birthweight as <1,000 grams. For comparability with births to women who did not undergo ART, for which gestational age is determined on the basis of the date of the last menstrual period (LMP), gestational age was calculated for fresh ART cycles by subtracting the date of egg retrieval from the birth date and adding 14 days. For frozen embryo cycles, and for fresh ART cycles for which the date of retrieval was not available, gestational age was calculated by subtracting the date of embryo transfer from the birth date and adding 17 days (to account for an average of 3 days in embryo culture). Preterm delivery was defined as gestational age <37 weeks, very preterm delivery as gestational age <32 weeks, and extremely preterm delivery as gestational age <28 weeks (*19*).

*Only nonsuppressed values from reporting areas are provided to protect confidentiality.

Content of This Report

This report provides information on U.S. ART procedures performed in 2011 and compares infant outcomes that occurred in 2011 (resulting from procedures performed in 2010 and 2011) with outcomes for all infants born in the United States in 2011. Specifically, this report provides data on the number and outcomes of all ART procedures performed in the 50 states, the District of Columbia, and the Commonwealth of Puerto Rico in 2011. Live-birth delivery rates, the number of live-born infants, live singleton and multiple birth deliveries, and data regarding the number of ART procedures in relation to the number of women in the reproductive age group (15–44 years) are reported (*20*).† Data also are presented on the number of embryo-transfer procedures performed, the average number of embryos transferred, and the percentage of eSET procedures performed among women who used fresh embryos from their own eggs, by age group, for each state.

For each state, the proportions of singleton, multiple, twin, and triplet or higher order infants resulting from ART are compared with their respective ratios among all infants born in that state in 2011. Infants born in the state during that year include those that were conceived naturally as well as those resulting from ART and other infertility treatments. To accurately assess the proportion of ART births among overall U.S. births in 2011, ART births were aggregated from 2 reporting years: 1) infants conceived from ART procedures performed in 2010 and born in 2011 (approximately 69% of the live-birth deliveries reported to the ART surveillance system for 2011), and 2) infants conceived from ART procedures performed in 2011 and born in 2011 (approximately 31% of the live-birth deliveries reported to the ART surveillance system for 2011). Data on the total number of live-birth and multiple birth infants in each state in 2011 were obtained from U.S. natality files (*21*). The report presents the number and percentage of select adverse perinatal outcomes (low birthweight, very low birthweight, preterm delivery, and very preterm delivery) among ART-conceived infants and all infants, as well as the contribution of ART to these outcomes. Additionally, the percentages of adverse perinatal outcomes are reported for singleton, twin, and triplet and higher order infants for ART-conceived infants and all infants. Finally, results for New York City are presented separately from the rest of the state because New York City is an independent vital registration reporting area (*21*). Therefore, unless otherwise specified, references in this report to New York include only New York State and exclude New York City.

† Data regarding population size are determined on the basis of July 1, 2011 estimates from the U.S. Census Bureau.

Results

Overview of Fertility Clinics

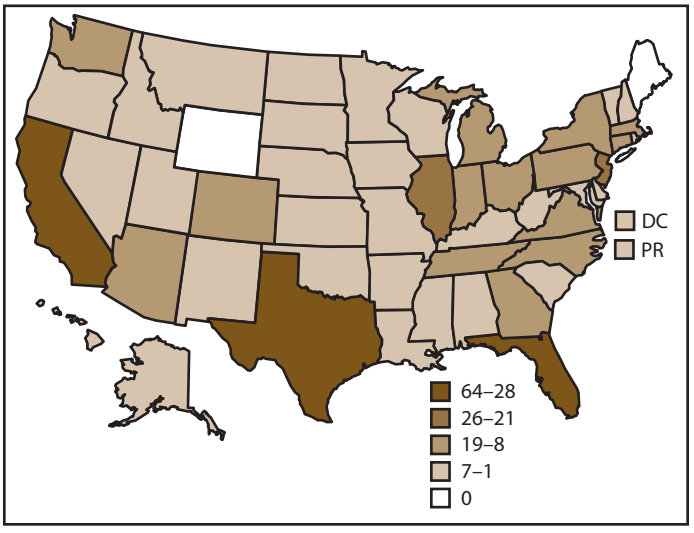
Of 481 fertility clinics in the United States that performed ART procedures in 2011, a total of 451 (94.0%) provided data to CDC (Figure 1) with the majority located in or near major cities in the eastern United States. The number of fertility clinics performing ART procedures varied by state. States with the largest number of fertility clinics reporting data for 2011 were California (64), Texas (39), New York (including New York City) (38), Florida (28), Illinois (26), and New Jersey (21).

Number and Type of ART Procedures

The number, type, and outcome of ART procedures performed in 2011 are provided for the 50 states, the District of Columbia, New York City, and Puerto Rico (Table 1). State residency data were missing for approximately 3.8% of procedures performed and 4.1% of live-birth deliveries but are included in the total. Approximately 16.0% of ART cycles were conducted among out-of-state residents. Non-U.S. residents accounted for approximately 2.0% of ART procedures, live-birth deliveries, and infants born.

Nationally, a total of 151,923 ART procedures performed in 2011 were reported to CDC (Table 1). Of the 151,923 procedures performed, 129,355 (85.2%) progressed to embryo transfer (Table 1). Overall, 45.7% (59,132 of 129,355) of ART procedures that progressed to the transfer stage resulted in a pregnancy, 37.0% (47,818 of 129,355) resulted in a live-birth delivery, 26.6% (34,464 of 129,355) resulted in a singleton

FIGURE 1. Location of clinics* that perform assisted reproductive technology procedures — United States, 2011



Abbreviations: DC = District of Columbia; PR = Puerto Rico.
* In 2011, of the 481 ART clinics in the United States, 451 (94%) submitted data.

live-birth delivery, and 10.3% (13,354 of 129,355) resulted in a multiple live-birth delivery. The 47,818 live-birth deliveries from ART procedures performed in 2011 resulted in 61,610 infants (34,464 singleton live-birth deliveries and 13,354 multiple live-birth deliveries) (Table 1; Figure 2).

Six states (California, Illinois, Massachusetts, New Jersey, New York (excluding New York City), and Texas) accounted for 47.2% (71,650 of 151,923) of ART procedures performed, 47.3% (61,202 of 129,355) of all embryo transfer procedures, 45.3% (27,936 of 61,610) of all infants born from ART in the United States, and 45.1% (6,024/13,354) of all ART multiple live-birth deliveries; however, these six states only accounted for 34% of all U.S. births (*21*) (Table 1).

The number of ART procedures per million women of reproductive age varied from 313 in Puerto Rico to 7,502 in Massachusetts, with an overall national ratio of 2,401 procedures per 1 million women of reproductive age. Eleven states (Connecticut, Delaware, Hawaii, Illinois, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Virginia), New York City, and the District of Columbia had ratios higher than the national ratio. Three states (Massachusetts (7,502), New York (excluding New York City) (6,860), and New Jersey (5,038)) and the District of Columbia (6,563) had ratios exceeding twice the national level, and three states (Connecticut, Illinois, and Maryland) had ratios exceeding one and half times the national level (4,708, 3,769, and 4,729, respectively) (Figure 3).

Embryo Transfer and Patient's Age

The number of embryo-transfer procedures performed, the average number of embryos transferred per procedure, and the percentage of eSET procedures performed among women who used fresh embryos from their own eggs are provided by age group (Table 2). Overall, the highest number of embryo-transfer procedures performed was among women aged <35 years and lowest among women aged >40 years. Nationally, the average number of embryos transferred per procedure varied from 2.0 among women aged <35 years (range: 1.5 to 2.2) to 2.3 among women aged 35–40 years (range: 1.8 to 2.8), and 2.9 among women aged >40 years (range: 2.1 to 4.0). In 10 states (California, Connecticut, Hawaii, Maine, Maryland, Massachusetts, New Hampshire, New York, Vermont, and Virginia), the District of Columbia, New York City, and Puerto Rico, more embryo-transfer procedures were performed among women aged 35–40 years than among younger women. Nationally, rates of eSET ranged from 12.2% among women aged <35 years (range: 0.7% in Idaho to 52.9% in Delaware) to 4.7% among women aged 35–40 years (range: 0 in several states to 37.0% in Delaware) and 0.7% among women aged

FIGURE 2. Number of outcomes of assisted reproductive technology cycles, by stage — United States, 2011

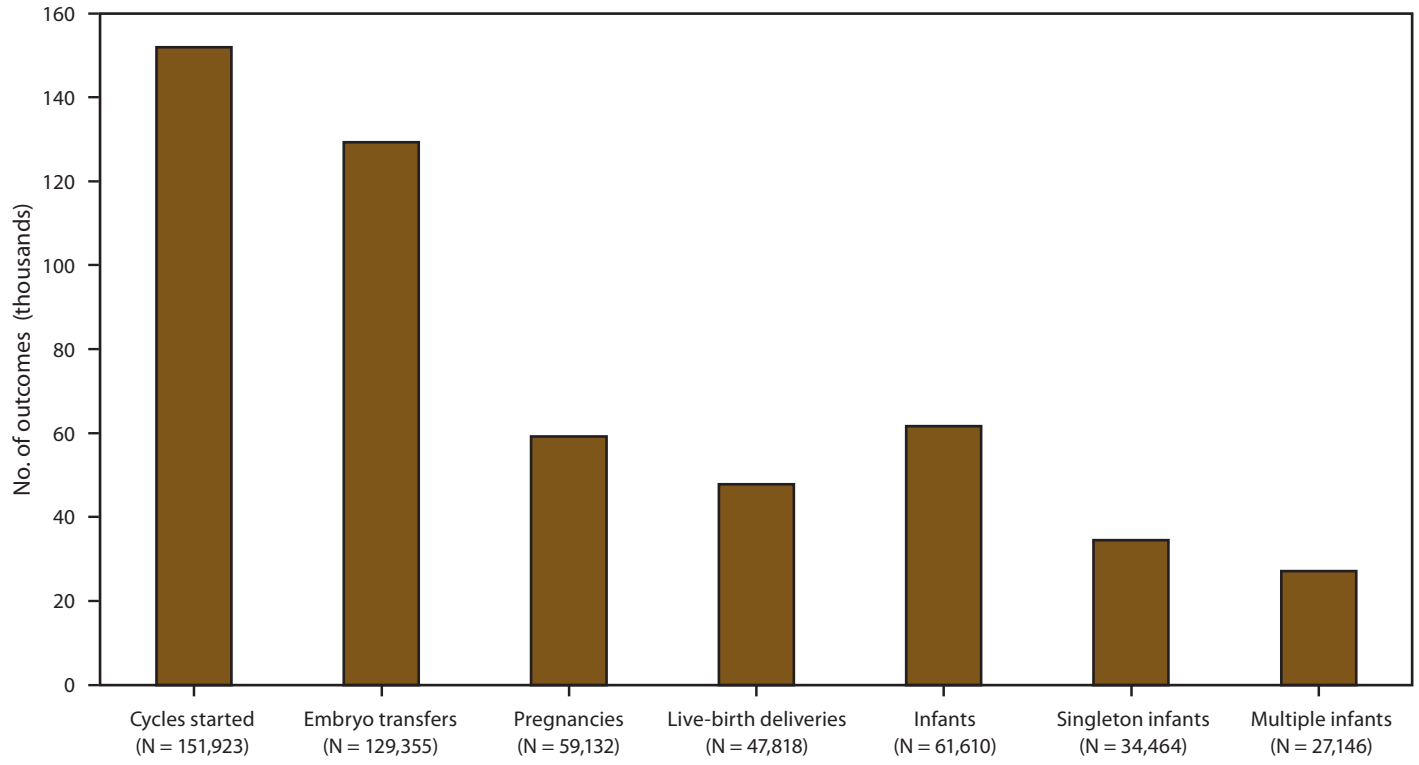
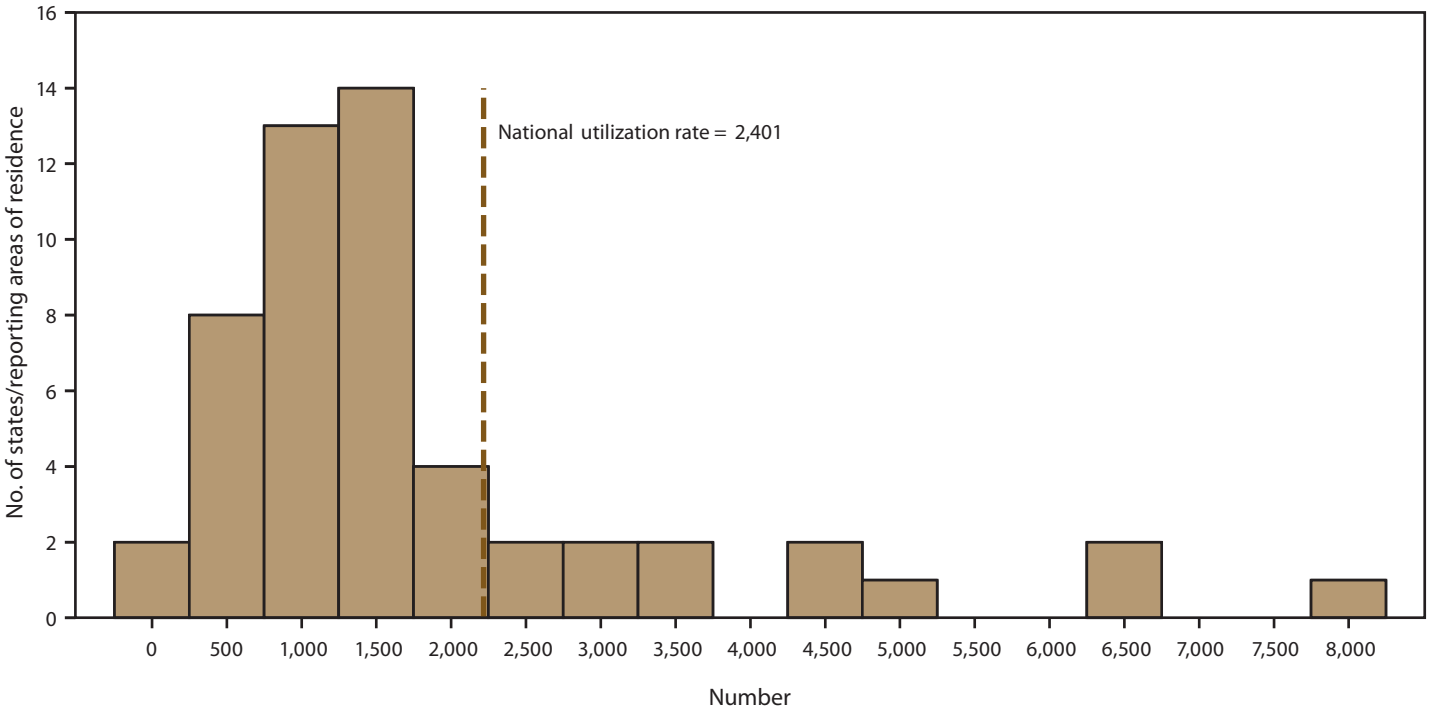


FIGURE 3. Number of procedures performed using assisted reproductive technology among women* of reproductive age (ages 15–44 years) — United States 2011



* Per 1 million women aged 15–44 years.

>40 years (range: 0 in most states to 16.7% in Mississippi). Among women aged <35 years, eSET rates exceeded the national rate in 18 states (Arkansas, California, Connecticut, Delaware, Georgia, Iowa, Maine, Maryland, Massachusetts, Montana, New Hampshire, South Dakota, Vermont, Virginia, Washington, West Virginia, Wisconsin and Wyoming), and the District of Columbia.

Singleton and Multiple Births

Among 3,994,670 infants born in the United States and Puerto Rico in 2011 (*21*), a total of 59,631 (1.5%) were conceived with ART procedures performed in 2010 and 2011 (Tables 3 and 4). California, Texas, and Florida ranked among the three highest states in total number of U.S. births. ART-conceived births were highest in California, followed by New York (excluding New York City), and Texas. Approximately 0.2% (in Puerto Rico) to 4.5% (in Massachusetts) of infants were born as a result of ART. The contribution of ART to all infants born in the state was highest in Massachusetts, followed by New York (excluding New York City) (4%), New Jersey (3.6%), Connecticut (3.5%), and the District of Columbia (3.7%) (Table 3). Although singletons accounted for 96.6% of total infants born in 2011 (range: 95.2% in New Jersey to 97.4% in New Mexico), singletons accounted for only 54.4% of all ART infants (range: 38.7% in Wyoming to 76.9% in Delaware). Nationwide, 45.6% (range: 23.1% in Delaware to 61.3% in Wyoming) of ART infants were multiples compared with only 3.4% (range: 1.9% in Puerto Rico to 4.8% in New Jersey) of all infants (Table 4). ART multiple-birth infants represent 19.8% (range: 4.9% in Mississippi to 41.3% in New York (excluding New York City)) of total multiple-birth infants. Approximately 42.7% (range: 31.6% in Rhode Island to 61.3% in Wyoming) of all ART-conceived infants were twins compared with only 3.3% (range: 1.9% in Puerto Rico to 4.6% in New Jersey) of all infants. ART-conceived twin infants accounted for 19.3% (range: 4.1% in Mississippi to 39.7% in Massachusetts) of all twins born in 2011. Finally, 2.9% of ART-conceived infants were triplets or higher order multiples (range: 0 in several states to 8.7% in Mississippi) compared with 0.1% (with very little variation by state) of all infants. ART triplet or higher order multiple infants contributed to 32.2% (range: 0 in several states to 71.4% in Hawaii) of all triplet or higher order infants born in 2011.

Adverse Perinatal Outcomes

Nationally, ART infants represented approximately 5.7% of all low birthweight and 5.9% of very low birthweight infants (Table 5). The contribution of ART to low birthweight infants ranged from 0.6% in Puerto Rico to 15% in Massachusetts.

The contribution of ART to very low birthweight infants ranged from 0.8% in Mississippi to 17.3% in Massachusetts. In three states (Connecticut, Massachusetts, and New Jersey) >10% of all low birthweight infants born were conceived with ART. In four states (Connecticut, Hawaii, Massachusetts, and New Jersey) >10% of all very low birthweight infants were conceived with ART.

In all states, rates of low birthweight and very low birthweight infants were higher among infants conceived with ART than among all infants (Table 5). Among ART infants, 31% were low birthweight infants (range: 18% in the District of Columbia to 44.6% in Puerto Rico), compared with 8.1% among all infants (range: 6% in Alaska to 12.5% in Puerto Rico). Approximately 5.7% of ART infants were very low birthweight infants (range: 0 in North Dakota to 8.5% in Hawaii), compared with 1.4% among all infants (range: 0.9% in Alaska to 2.2% in Mississippi) (Table 5). Additional analyses show that among very low birthweight (<1,500 g) ART-conceived infants, 40.5% were born with extremely low birthweight of <1,000g. Nationally, infants conceived with ART contributed approximately 4.6% and 5.2%, respectively, to all preterm and very preterm infants (Table 6). The contribution of ART to preterm infants ranged from 0.5% in Puerto Rico to 13% in Massachusetts. The contribution of ART to very preterm infants ranged from 0 in Wyoming to 17.1% in Massachusetts. In three states (Connecticut, Massachusetts, and New Jersey), >10% of all preterm and very preterm infants in the state were conceived with ART.

As with low birthweight, rates of preterm and very preterm infants were higher among ART infants than in the general birth population (Table 6). Among ART infants, 36.2% were born preterm (range: 12.5% in Vermont to 56.9% in Puerto Rico), compared with 11.8% among all infants (range: 8.8% in Vermont to 17.6% in Puerto Rico). Approximately 6.7% of ART infants were very preterm (range: 0 in Wyoming to 12.5% in Alaska), compared with 2% among all infants (range: 1.3% in Wyoming to 3% in Puerto Rico) Table 6). Additional analyses show that among all ART-conceived infants born very preterm (<32 weeks), 45.7% were born extremely preterm (<28 weeks of gestation).

The percentage of ART infants who were low birthweight varied from 8.8% (range: 3.9% in District of Columbia to 17.9% in Puerto Rico) among singletons, to 56.4% (range: 34.6% in Vermont to 70.4% in Mississippi) among twins, and 95.7% (range: 79.5% in North Carolina to 100% in several states) among triplets or higher-order multiples; comparable percentages among all infants born were 6.4% (range: 4.5% in Idaho to 11.3% in Puerto Rico), 56.3% (range: 47.7% in Vermont to 72.1% in Puerto Rico), and 93.9% (range: 50% in Wyoming to 100% in several states), respectively (Table 7).

The percentage of ART infants who were very low birthweight varied from 1.7% (range: 0 in several states to 3.5% in North Carolina) among singletons, to 8.9% (range: 0 in several states to 16.4% in Kansas) among twins, and 36.9% (range: 0 in several states to 60% in Hawaii) among triplets or higher-order multiples; comparable percentages among all infants were 1.2% (range: 0.7% in several states to 1.8% in District of Columbia), 9.8% (range: 6.5% in Maine to 14.4% in Vermont), and 36.9% (range: 9.5% in Hawaii to 100% in Vermont), respectively. The percentage of ART infants who were preterm varied from 13.2% (range: 7.3% in the District of Columbia to 28.6% in Puerto Rico) among singletons, to 61.8% (range: 46% in the District of Columbia to 82.7% in Oklahoma) among twins, and 97.1% (range: 76.9% in Iowa to 100% in several states) for triplets or higher-order multiples; comparable percentages among all infants were 10.1% (range:7.5% in Oregon to 16.6% in Puerto Rico), 57.3% (range: 46.8% in New Hampshire to 68.8% in Louisiana), and 93.4% (range: 73.3% in Rhode Island to 100% in several states), respectively (Table 8). The percentage of ART infants who were very preterm varied from 2.2% (range: 0 in several states to 3.8% in Louisiana, North Carolina, and South Carolina) among singletons, to 10.5% (range: 0 in Vermont and Wyoming to 23.8% in Nebraska) among twins, and 38.2% (range: 0 in several states to 75% in Idaho and Tennessee) among triplets or higher-order multiples; comparable percentages among all infants were 1.6% (range: 1% in Idaho and Oregon to 2.8% in Puerto Rico), 11.3% (range: 6.3% in Maine to 17.1% in Louisiana), and 38% (range: 0 in Alaska and Vermont to 77.8% in District of Columbia), respectively.

Discussion

Overview

The use of ART has increased substantially in the United States since the beginning of ART surveillance. In 1996 (the first full year for which ART data were reported to CDC), 20,597 infants were born from 64,036 ART cycles (*22*). Since then, the number of cycles reported to CDC has more than doubled and the number of infants born from ART procedures has approximately tripled. The impact of ART on rates of multiple-birth infants and poor birth outcomes is substantial because almost half of ART infants (46%) were born in multiple births (compared with only 3% of infants among the general birth population). On average, two embryos were transferred among women aged <35 years. National rates of eSET procedures were low, even among women aged <35 years. Rates of low birthweight and preterm births were substantially higher among ART infants (31%

and 36%, respectively) than among all infants (8% and 12%, respectively). Compared with ART singletons, ART twins and triplet or higher order infants were five and seven times more likely to be preterm. Although infants conceived with ART accounted for approximately 1.5% of total births in the United States in 2011, the proportion of twin and triplet or higher order infants attributed to ART were 19% and 32%, respectively, which is similar to the rates for previous years.

Variations by State

ART use varied widely by state, especially after controlling for the size of the population of women of reproductive age. Residents of California, Illinois, Massachusetts, New York (excluding New York City), New Jersey, and Texas had 45.0% of all ART infants but accounted for only 34.0% of all infants born in the United States. Rates of ART use were not correspondingly high in all six states. ART use exceeded twice the national average in only three of these six states (Massachusetts, New Jersey, and New York, excluding New York City) (as measured by the number of ART procedures performed per 1 million women of reproductive age). By this measure, Massachusetts ranked highest in ART use whereas California, despite having the highest overall number of ART procedures and the highest number of ART infants, ranked 15th nationally, with a rate of ART use that was lower than the national rate. Furthermore, the contribution of ART to all infants born in the state was 4.5% in Massachusetts compared with 1.5% in California, which also indicates higher ART use in Massachusetts. Similarly, residents of Connecticut, Delaware, District of Columbia, Hawaii, Illinois, Maryland, New Hampshire, New Jersey, New York, and New York City, Rhode Island, and Virginia had higher rates of ART use than the national average as reflected by the high number of ART procedures performed per 1 million women of reproductive age in those states.

This divergence might be explained in part by variations in state health insurance coverage. Currently, 15 states (Arkansas, California, Connecticut, Hawaii, Illinois, Louisiana, Maryland, Massachusetts, Montana, New Jersey, New York, Ohio, Rhode Island, Texas, and West Virginia) have passed legislation mandating insurance coverage for infertility treatments; four of these states (Illinois, Massachusetts, New Jersey, and Rhode Island) also have mandated comprehensive insurance coverage that must cover at least four cycles of IVF.[§] Three out of the four states with mandates (Illinois, Massachusetts, and New Jersey) also had rates of ART use >1.5 times the national level. This type of mandated insurance has been associated with greater use of ART (*23–25*).

[§] Nine states (Arkansas, Connecticut, Hawaii, Louisiana, Maryland, Montana, New York, Ohio, and West Virginia) have restricted mandates. Two states (California and Texas) have other insurance regulations on ART or other infertility treatments but do not require coverage of ART.

Elective Single-Embryo Transfer Rates

Typically, younger women are better candidates for eSET procedures because they might have more than one embryo available for transfer and better prognosis. Data on eSET rates varied by age group and by state. Rates of eSET procedures were higher among women aged <35 years than other age groups but varied widely among states (range: 0.7% to 53%). Although many factors (e.g., patient's age and diagnostic factors) influence eSET rates, research shows that broad insurance mandates for IVF might result not only in large increases in access to ART services but also in substantially fewer aggressive treatments, with fewer embryos transferred within a procedure (*24,26*). In the four states with mandatory insurance for ART, among women aged <35 years, eSET rates were higher than the national average of 12.2% only in Massachusetts (22.9%) but lower in Illinois (11.5%), New Jersey (9.9%) and Rhode Island (8.6%). Because ART procedures are expensive, attempts to reduce out-of-pocket costs might result in higher number of embryo transfers per attempt for patients who do not have insurance coverage for ART (*24,26*). In the United States, approximately 20.0% of all ART costs are covered by state mandate of private insurers and/or by private insurers. Even where mandated, coverage for infertility treatment often varies in scope (*23*). The higher use of eSET in Massachusetts is consistent with previous research linking insurance with embryo transfer practices that might promote eSET. Such a pattern is not evident in Illinois, New Jersey and Rhode Island, all of which had state-mandated insurance for ART but lower-than-national rates of eSET procedures performed. ESET rates also exceeded the national rate in a number of states that do not have mandated insurance coverage for ART, especially among women aged <35 years, suggesting provider compliance with American Society for Reproductive Medicine (ASRM)/SART recommendations on eSET even in the absence of mandated insurance (*27*).

ART Multiple Births

A comparison of findings from this report to the 2000 ART Surveillance Summary report (*28*) shows that since 2000, the percentage of ART-conceived multiple infants in the United States declined by 13% (from 53% in 2000 to 46% in 2011). A sharp decline was noted in the rate of ART-conceived triplets and higher order infants of 67% (from 9% in 2000 to 3% in 2011) and a lesser decline in ART-conceived twin infant rates of 2% (from 44% in 2000 to 43% in 2011).

Despite the decline, multiple birth rates remain high in the United States. On average, two embryos were transferred per cycle among all age groups, even among younger women, in 2011. To control costs, patients and providers might be willing to transfer multiple embryos to maximize the chance of live-birth delivery in a single procedure (*25*). The expected association between fewer average number of embryos transferred and availability of mandated insurance coverage for ART is not wholly supported by these data. The average percentage of embryos transferred among women aged <35 years in the four states with universal mandated coverage (Illinois, 2.0%; Massachusetts, 1.8%; New Jersey, 2.0%; Rhode Island, 2.1%) was similar to the national rate (2.0%). However, in three (Illinois: 44.3%; Massachusetts: 39.4%; and Rhode Island: 31.6%) of the four states with mandated insurance, the rate of ART-conceived multiple infants was lower than the national rate of ART multiple infants (45.6%). This rate was higher than the national rate in New Jersey (48.8%), which also had mandated insurance. Thus, rates of ART-conceived multiple infants varied between the four states with mandated insurance, suggesting that the link between insurance and embryo transfer practices (e.g., the number of embryos transferred per procedure) and multiple births is complex.

Evidence suggests that infertile couples might prefer multiple births, especially twins, in their desire to achieve parenthood, and might underestimate the risks for such pregnancies or might consider the potential benefits to outweigh the risks. Infertile women might be more receptive to the idea of a multiple birth than fertile women (*29,30*). Therefore, understanding the viewpoint of couples undergoing infertility treatments about multiple births is an important consideration. ART providers also can vary widely in their clinical practices, which can affect the outcomes in each state; the extent that clinic practices affect the overall state results shown in this report depends on various factors including patient age and diagnostics, the number of cycles performed, as well as the number and size of the other clinics in the state.

In 2011, approximately half of all ART infants were born in multiple births, most of which were twin infants. During 1980–2009, the overall twin birth rates in the United States, which also comprise the majority of multiple births, increased by 76.2%, from 18.9 to 33.3 per 1,000 births (*31*). In 2009, one in every 30 babies born in the United States was a twin, compared with one in every 53 babies in 1980 (*31*). The increased use of infertility treatments, both ART and non-ART fertility treatments (ovulation stimulation medications without ART), likely is associated with this sharp increase (*32*). Because of the risks associated with multiple-gestation pregnancies, medical experts believe that the best outcome of IVF treatment is a singleton pregnancy followed by a singleton birth (*33*). Singleton live-birth deliveries have much lower risks than multiple births for adverse birth outcomes such as prematurity, low birthweight, disability, and death. ART twins and higher order multiples were five to seven times more likely to be born preterm than were ART singletons. Similar higher rates of preterm and low birthweight were observed among twins and higher order infants born in the general population, compared with singletons. Because most multiple birth infants in the United States are twins, strategies to reduce multiple births should include efforts to reduce the frequency of IVF-related twin pregnancies.

The economic costs of multiple births also are much higher compared with singleton births. The mean medical cost of delivering a singleton baby was estimated to be $9,329, whereas a set of twins costs $20,318, and triplets costs $153,335 (*34*). Transferring two embryos is associated with a more than threefold increase in the birth rate and a more than 16-fold increase in the twin birth rate as compared with singletons (*35*). In 2011, the transfer of two embryos was still a common practice, even among younger patients. To improve the likelihood of optimal birth outcomes, the transfer of fewer numbers of embryos should be encouraged among patients and providers, taking into consideration patient age and prognosis (*36*). The guidelines on the number of embryos transferred were revised in 2004, 2006, 2008, 2009, and 2012 (*37–41*). Currently, the guidelines suggest a maximum of 1–2 embryos to be transferred for women aged <35 years who have good prognosis, if the transfer is done on day 2 or 3, and a maximum of one embryo to be transferred for that age group if the transfer is done on day 5. When the female is aged >35 years, the maximum number of embryos allowed increases. At its 2011 annual meeting, the American Society for Reproductive Medicine Practice Committee noted that the most direct way to limit the risk for multiple gestations from ART is to transfer single embryos (*27*).

ART Low Birthweight Infants and Preterm Births

The rates of low birthweight and very low birthweight infants were disproportionately higher among ART infants than among infants in the general birth population. Three states (Connecticut, Massachusetts, and New Jersey) with high number of ART cycles and births also had high ART contributions (>10%) to both categories of low birthweight and preterm births. The contribution of ART to preterm births in the United States, most of which are also low birthweight, is a key concern. Since 1981, the rate of preterm births in the United States has increased >24% (*42*). Fertility treatments, both ART and controlled ovarian stimulations, contribute substantially to preterm births among both multiple and singleton pregnancies (*42*). Preterm births are a leading cause of infant mortality and morbidity, and preterm

infants are at increased risk for death and have more health and developmental problems than full-term infants (*42–45*). Among ART infants, a substantial proportion of very preterm and very low birthweight infants were born extremely preterm at <28 weeks of gestation and with extremely low birthweight at <1,000 grams. The health risks associated with preterm births have contributed to increasing health-care costs. In 2005, the estimated economic cost associated with preterm births in the United States was $26 billion ($51,600 per infant born preterm) (*42*).

In addition to the known multiple-birth risks associated with ART, singleton infants conceived from ART procedures are at increased risk for low birthweight and preterm delivery. In 2011, of all singleton infants conceived with ART, 8.8% were low birthweight, compared with 7.3% in the general U.S. population. Approximately 2% of singleton infants conceived from ART were very low birthweight, compared with approximately 1% of singletons conceived in the general U.S. population. The percentage of ART singletons born preterm was 13% in comparison to 10% for the general U.S. population. Therefore, adverse infant health outcomes among singletons (e.g. low birthweight and preterm delivery) also should be considered when assessing the effects of ART.

Limitations

The findings in this report are subject to at least five limitations. First, ART surveillance data were reported for each ART procedure performed rather than for each patient who used ART. Linking procedures among patients who underwent more than one ART procedure, even within a given year, is difficult. Second, because patients can achieve a successful pregnancy after undergoing multiple procedures, the cycle-specific success rates reported here might underestimate the true per-patient success rates. Third, prematurity and low birthweight could be associated with factors contributing to underlying infertility and not entirely to ART procedures. Fourth, a small percentage of fertility clinics that performed ART in 2011 did not report their data to CDC and might have had results different from clinics that reported their data. Finally, five states had a substantial percentage of residency information missing for procedures performed in 2011 (Maryland [6.8%], Georgia [9.0%], Pennsylvania [9.0%], Hawaii [9.6%], and Massachusetts [33.1%]). Overall, residency data were missing for approximately 4.0% of procedures performed and 3.0% of all live-birth deliveries resulting from ART procedures performed in 2011.

Conclusion

During 1996–2011, the number of ART procedures performed in the United States doubled, and the number of infants born as a result of these procedures nearly tripled. With this increasing use, ART-conceived infants now represent 1.5% of infants born in the United States and had a noticeable impact on the prevalence of low birthweight and preterm deliveries in many states, as nearly half of these infants were born in multiple-gestation pregnancies that resulted in multiple births. Furthermore, among ART-conceived infants, although rates of triplet or higher order infants have declined during the last decade, twin infant rates have remained persistently high. Therefore, the impact of ART on poor birth outcomes remains substantial despite the overall decline in multiple infant rates. This could be attributed to the persistently high rates of ART-conceived twin infants, which have declined very little in the last decade. This report documents the rates and contribution of ART to multiple births, low birthweight, and preterm infants by each state. It also highlights the differences in rates of low birthweight and prematurity between ART-conceived singleton, twin, and triplet and higher order infants compared with infants born in the general population. This allows state health departments to monitor the extent of ART-related adverse perinatal outcomes in their individual states.

Comprehensive insurance coverage of ART might increase access to fertility treatments. The findings in this report indicate that ART use was higher than the national rate in all four states with mandated comprehensive insurance coverage. Three of these four states had utilization rates exceeding 1.5 times national levels. However, embryo transfer practices were similar to the national rates in all four states providing comprehensive insurance coverage. The use of elective single-embryo transfers was higher only in Massachusetts, which had a correspondingly lower rate of ART multiple infants. Further research is needed to ascertain the influence of state insurance mandates on ART use, embryo transfer practices, and infant outcomes, as well as the economic costs of multiple births (*23–26*), including out-of-pocket costs to patients. Addressing the risk for multiple births also requires understanding the perspectives of couples undergoing infertility treatments who might view a multiple birth, especially twins, as an acceptable or even desired outcome and who might not be aware of the increased risks associated with multiple birth to mother and infants. Clinicians need to be aware of ongoing efforts to limit the number of embryos transferred to single embryo to reduce twin rates, which have remained high, and encourage wider implementation of elective single-embryo transfers, when clinically appropriate, as mechanisms of promoting singleton infant births among ART-conceived pregnancies (*27*).

CDC is working to extend the use of NASS by linking to data collected by states (i.e., birth certificate, infant deaths, hospital discharge, birth defect registries, and cancer registries) to conduct state-based surveillance of ART, infertility, and related issues. This initiative, the States Monitoring ART (SMART) Collaborative,¶ has been determined to be feasible and useful, especially for monitoring long-term outcomes of ART (*46*). Data from NASS have been linked with vital records from three states (Florida, Massachusetts, and Michigan). The overarching purpose of the SMART Collaborative is to strengthen the capacity of states to evaluate maternal and perinatal outcomes and programs through state-based public health surveillance systems (*47*).

Further efforts also are needed to monitor the use of non-ART fertility treatments and their role in the rising number of multiple births (*32,42*). Despite its substantial impact on adverse birth outcomes, ART only partially explains the overall prevalence of these adverse outcomes in the United States. Preterm births resulting from controlled ovarian stimulation (superovulation-intrauterine insemination and conventional ovulation induction) also might contribute to multiple gestations (*42*). More research is needed to identify the causes and consequences of preterm births that occur because of infertility treatments and to institute guidelines to reduce the number of multiple gestations (*42*). The risk for multiple gestations associated with non-ART fertility treatments is less well documented, as clinics are not mandated to report data on their use. Recent studies have demonstrated that singleton infants conceived with ovulation stimulation are more likely than naturally conceived infants to be small for gestational age (*48*). CDC is monitoring the prevalence of non-ART fertility treatment use among women who had live births and their resultant outcomes in several states through the Pregnancy Risk Assessment Monitoring System (*49*). The most recent ART Surveillance Summary was published by CDC in 2013 (*50*). CDC will continue to provide updates of ART use in the United States as data become available.

¶ SMART is a collaboration between CDC and state health departments in Connecticut, Florida, Massachusetts, and Michigan (information available at http://www.cdc.gov/art/smart.htm).

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TABLE 1. Number and outcomes of assisted reproductive technology procedures, by female patient's state/reporting area of residence* at time of treatment — United States, 2011

Patient's state/ reporting area of residence	No. of ART clinics	No. procedures performed	No. embryo transfer procedures†	No. pregnancies	No. live-birth deliveries	No. singleton live-birth deliveries	No. multiple live-birth deliveries	No. live-born infants	Procedures started/ women aged 15–44 yrs. (per million)§
Alabama	6	853	738	348	292	205	87	382	888.4
Alaska	1	229	198	71	57	41	16	75	1,569.9
Arizona	10	2,038	1,769	806	633	474	159	795	1,603.2
Arkansas	1	450	391	175	143	103	40	183	788.4
California	64	18,808	16,177	7,454	5,894	4,344	1,550	7,504	2,375.7
Colorado	8	1,768	1,620	1,012	854	572	282	1,136	1,702.8
Connecticut	9	3,233	2,676	1,173	945	707	238	1,188	4,708.4
Delaware	2	556	415	193	153	132	21	175	3,107.9
District of Columbia	3	1,090	887	343	270	220	50	319	6,563.1
Florida	28	6,720	5,633	2,456	1,952	1,384	568	2,550	1,877.9
Georgia**	9	3,146	2,821	1,361	1,124	800	324	1,464	1,515.3
Hawaii**,††	5	928	755	355	276	180	96	374	3,520.5
Idaho	1	437	408	190	158	98	60	220	1,415.7
Illinois	26	9,886	8,208	3,573	2,871	2,068	803	3,698	3,769.4
Indiana	10	1,681	1,345	622	525	355	170	704	1,305.8
Iowa	2	1,132	953	524	441	328	113	561	1,957.6
Kansas	5	734	620	282	229	151	78	311	1,318.8
Kentucky	4	1,046	937	431	357	227	130	489	1,222.7
Louisiana	4	988	824	356	298	184	114	417	1,060.0
Maine	0	100	82	42	36	25	11	48	418.1
Maryland**	7	5,640	4,618	2,194	1,752	1,372	380	2,143	4,728.9
Massachusetts**	9	10,106	8,759	3,506	2,794	2,162	632	3,437	7,502.3
Michigan	12	3,402	2,964	1,375	1,105	785	320	1,440	1,786.0
Minnesota	5	2,097	1,823	946	791	529	262	1,058	2,008.2
Mississippi	2	347	303	131	116	75	41	159	574.9
Missouri	7	1,587	1,373	655	543	383	160	709	1,350.8
Montana	1	208	190	93	78	58	20	98	1,149.6
Nebraska	2	611	474	223	188	142	46	236	1,710.3
Nevada	3	942	759	385	320	228	92	418	1,714.7
New Hampshire	1	696	585	251	200	154	46	247	2,813.1
New Jersey	21	8,698	7,388	3,603	2,865	1,978	887	3,767	5,038.0
New Mexico	1	318	287	155	139	86	53	193	795.0
New York§§	19	14,576	12,268	4,736	3,715	2,757	958	4,720	6,859.7
New York City	19	5,041	4,118	1,693	1,326	1,017	309	1,639	2,642.8

See table footnotes on page 15.

TABLE 1. (*Continued*) Number and outcomes of assisted reproductive technology procedures, by female patient's state/reporting area of residence* at time of treatment — United States, 2011

Patient's state/ reporting area of residence	No. of ART clinics	No. procedures performed	No. embryo transfer procedures†	No. pregnancies	No. live-birth deliveries	No. singleton live-birth deliveries	No. multiple live-birth deliveries	No. live-born infants	Procedures started/ women aged 15–44 yrs. (per million)§
North Carolina	11	3,124	2,702	1,418	1,163	825	338	1,507	1,595.3
North Dakota	1	219	187	101	92	60	32	125	1,663.5
Ohio	11	3,234	2,781	1,281	1,092	757	335	1,435	1,456.2
Oklahoma	4	752	668	352	289	182	107	406	1,012.4
Oregon	4	1,114	989	526	459	328	131	593	1,466.4
Pennsylvania**	19	5,818	4,791	2,104	1,677	1,265	412	2,104	2,391.0
Puerto Rico	3	240	210	99	73	49	24	100	313.3
Rhode Island	1	758	656	219	175	126	49	224	3,564.6
South Carolina	4	1,244	1,091	548	457	320	137	599	1,339.9
South Dakota	1	221	198	95	73	56	17	90	1,438.4
Tennessee	8	1,174	1,019	444	370	266	104	479	919.2
Texas	39	9,576	8,402	4,295	3,568	2,374	1,194	4,810	1,771.1
Utah	4	1,154	1,003	518	439	277	162	607	1,883.6
Vermont	1	215	173	70	59	43	16	76	1,832.1
Virginia	13	5,311	4,406	1,994	1,573	1,205	368	1,949	3,201.3
Washington	10	2,923	2,552	1,259	1,056	783	273	1,336	2,139.1
West Virginia	3	217	179	90	76	51	25	101	635.9
Wisconsin	7	1,558	1,364	656	551	383	168	721	1,424.7
Wyoming	0	83	72	45	38	27	11	49	775.0
Non-Resident		2,873	2,528	1,296	1,090	757	333	1,432	—¶¶
Total	**451**	**151,923**	**129,355**	**59,132**	**47,818**	**34,464**	**13,354**	**61,610**	**2,401**

Abbreviation: ART = assisted reproductive technology.

* In cases of missing residency data (~ 4%), the patient's state of residence was assigned as the state in which the ART procedure was performed.

† Embryo transfer procedures include all procedures that are not cancelled and a transfer was attempted (even if no embryos were transferred, n = 36).

§ Annual Estimates of the Population for the United States, Regions, States, and Puerto Rico: April1, 2010 to July 1, 2011 (NST-EST2012-01). Source: U.S. Census Bureau, Population Division. Release date: December 2012.

** A substantial percentage (7%–33%) of residency information was missing for procedures performed in these five states. Overall, residency information was missing for 5,791 (4%) procedures performed and 1,954 (4%) of live-birth deliveries.

†† Of all ART procedures, 0.5% were reported from military medical centers located in Hawaii, Maryland, North Carolina, Texas, and Washington. In each of these areas, ≥1% of ART procedures among residents were performed in a military medical center.

§§ Outcomes for New York state do not include New York City.

¶¶ Non-U.S. residents excluded from ratio because the appropriate denominators were unknown.

TABLE 2. Number of embryo transfer procedures* among patients who used fresh embryos from their own eggs, by female patient's age group and state/reporting area of residence† at time of treatment — United States, 2011

Patient's state/ reporting area of residence	Age group (years)								
	<35 years			35–40 years			>40 years		
	No. embryo transfer procedures	Average no. embryos transferred (mean)	eSET§ (%)	No. embryo transfer procedures	Average no. embryos transferred (mean)	eSET (%)	No. embryo transfer procedures	Average no. embryos transferred (mean)	eSET (%)
Alabama	331	2.1	2.9	146	2.4	2.2	20	3.1	0
Alaska	70	2.2	4.8	48	2.3	4.7	9	2.6	0
Arizona	434	2	11.9	378	2.5	5	101	3	0
Arkansas	156	1.9	14.5	75	2.2	4.5	19	2.4	0
California	3,203	2	13.9	4,401	2.5	5	2,040	3.1	1
Colorado	351	1.9	11.5	276	2.3	3.1	60	3	0
Connecticut	798	1.9	13.8	808	2.3	4.5	337	2.9	0.7
Delaware	119	1.5	52.9	57	1.8	37	15	2.1	0
District of Columbia	151	1.7	32.1	327	1.9	19.5	156	2.7	1.6
Florida	1,693	2	10.9	1,681	2.3	2.2	465	2.6	1.1
Georgia¶	776	1.9	16.9	670	2.5	5	160	3	0
Hawaii¶	145	2.2	3.6	241	2.8	0	124	3.1	0
Idaho	147	2.1	0.7	59	2.4	0	15	3.1	0
Illinois	2,356	2	11.5	2,109	2.3	4.3	695	2.7	2.6
Indiana	520	2	4.1	323	2.3	2	56	2.6	0
Iowa	395	1.8	19.2	188	2.1	8.2	24	2.5	0
Kansas	239	1.9	10.9	121	2.2	4.7	13	2.9	0
Kentucky	368	2.1	2.8	199	2.4	2.2	47	3	0
Louisiana	336	2.1	2.2	210	2.4	1.1	62	2.6	1.9
Maine	23	1.8	15	28	2.3	3.7	7	3.1	0
Maryland¶	1,221	1.7	30.2	1,307	2.1	11.1	477	2.8	0.2
Massachusetts¶	2,611	1.8	22.9	2,905	2.3	6.2	1,018	3.3	0.1
Michigan	948	2.1	4.9	612	2.4	3.4	141	2.7	0.8
Minnesota	682	1.9	9.8	429	2.2	3.3	109	2.7	0
Mississippi	118	2.1	5.1	73	2.2	0	7	2.3	16.7
Missouri	531	2	4	251	2.4	2.6	34	2.9	0
Montana	50	1.8	20.8	43	2.3	5	—**	2.5	0
Nebraska	207	2	3.6	93	2.4	2.4	10	3.9	0
Nevada	157	2	11.2	132	2.2	5.3	47	2.4	0
New Hampshire	190	1.7	21	192	2.1	7.6	44	2.9	0
New Jersey	2,151	2	9.9	1,967	2.3	5.1	790	2.7	1.1
New Mexico	93	1.9	9.3	67	2.3	0	12	3.1	0
New York††	3,019	2.1	9.4	3,556	2.5	3.5	1,760	2.9	0.6
New York City	660	2	9.2	1,217	2.5	3.3	888	3	1

See table footnotes on page 17.

TABLE 2. (*Continued*) Number of embryo transfer procedures* among patients who used fresh embryos from their own eggs, by female patient's age group and state/reporting area of residence† at time of treatment — United States, 2011

Patient's state/ reporting area of residence	Age group (years)								
	<35 years			35–40 years			>40 years		
	No. embryo transfer procedures	Average no. embryos transferred (mean)	eSET§ (%)	No. embryo transfer procedures	Average no. embryos transferred (mean)	eSET (%)	No. embryo transfer procedures	Average no. embryos transferred (mean)	eSET (%)
North Carolina	864	2	9.4	711	2.4	3.3	113	3	1.1
North Dakota	74	2.1	4.1	29	2.2	3.4	—	4	0
Ohio	1,044	2.1	4.8	647	2.5	0.8	146	2.9	0
Oklahoma	290	1.9	4	143	2.2	2.3	17	2.8	0
Oregon	248	2	5.8	210	2.3	5.5	67	3.1	0
Pennsylvania¶	1,464	2	9.5	1,233	2.4	4	351	2.8	0.7
Puerto Rico	70	2.2	1.5	81	2.4	1.4	26	2.8	0
Rhode Island	234	2.1	8.6	201	2.3	2.2	75	3.3	1.5
South Carolina	380	2	6	234	2.3	1.4	45	2.9	0
South Dakota	89	1.8	23.3	33	2.4	3.6	6	2.8	0
Tennessee	331	2	12.1	231	2.3	2.8	33	2.9	3.1
Texas	2,799	2	8.1	2,132	2.3	3.1	538	2.8	0.2
Utah	461	2.1	4.5	196	2.3	1.6	23	2.6	0
Vermont	53	1.8	13	56	2.4	1.9	15	3.3	0
Virginia	1,203	1.7	22.2	1,307	2.1	7.4	399	2.6	0.6
Washington	673	1.7	25.9	627	2.2	10.4	183	3	0
West Virginia	63	2.1	13.3	36	2.4	6.1	8	3.1	0
Wisconsin	476	1.9	14	296	2.2	3.4	61	2.9	0
Wyoming	24	1.9	12.5	13	2.3	0	—	3	0
Non-Resident	389	2.1	8.4	418	2.4	3.2	151	2.8	2.6
Total	**36,486**	**2.0**	**12.2**	**34,024**	**2.3**	**4.7**	**12,030**	**2.9**	**0.7**

Abbreviation: eSET = elective Single Embryo Transfer.

* Includes all procedures in which at least one embryo was transferred.

† In cases of missing residency data (~ 4%), the patient's state of residence was assigned as the state in which the ART procedure was performed.

§ A procedure in which one embryo, selected from a larger number of available embryos, is placed in the uterus. A cycle in which only one embryo is available is not defined as eSET.

¶ A substantial percentage (7%–33%) of residency information was missing for procedures performed in these five states.

** To protect confidentiality, cells with values between 1–4 are suppressed, as are data that can be used to derive cell values of 1–4. These values are included in totals.

†† Outcomes for New York state do not include New York City.

TABLE 3. Number, proportion, and percentage of infants born with the use of assisted reproductive technology, by female patient's state/reporting area of residence* at time of treatment — United States, 2011†

Patient's state/reporting area of residence	Total no. infants born§	No. ART infants born	Proportion of ART infants among all infants (%)	Singleton infants among ART infants		Singleton infants among all infants§		Proportion of ART singleton infants among all singleton infants (%)
				No.	%	No.	%	
Alabama	59,354	368	0.6	196	53.3	57,369	96.7	0.3
Alaska	11,456	80	0.7	39	48.8	11,122	97.1	0.4
Arizona	85,543	884	1.0	492	55.7	83,123	97.2	0.6
Arkansas	38,715	208	0.5	115	55.3	37,474	96.8	0.3
California	502,120	7,552	1.5	4,083	54.1	486,067	96.8	0.8
Colorado	65,055	1,047	1.6	516	49.3	62,998	96.8	0.8
Connecticut	37,281	1,307	3.5	757	57.9	35,700	95.8	2.1
Delaware	11,257	169	1.5	130	76.9	10,880	96.7	1.2
District of Columbia	9,295	339	3.7	234	69.0	8,951	96.3	2.6
Florida	213,414	2,569	1.2	1,370	53.3	206,294	96.7	0.7
Georgia¶	132,409	1,384	1.0	755	54.6	127,834	96.5	0.6
Hawaii¶	18,956	305	1.6	132	43.3	18,349	96.8	0.7
Idaho	22,305	193	0.9	97	50.3	21,625	97.0	0.4
Illinois	161,312	3,583	2.2	1,995	55.7	155,080	96.1	1.3
Indiana	83,701	725	0.9	353	48.7	80,868	96.6	0.4
Iowa	38,214	530	1.4	313	59.1	36,912	96.6	0.8
Kansas	39,642	336	0.8	175	52.1	38,342	96.7	0.5
Kentucky	55,370	483	0.9	243	50.3	53,519	96.7	0.5
Louisiana	61,888	426	0.7	186	43.7	59,792	96.6	0.3
Maine	12,704	52	0.4	29	55.8	12,294	96.8	0.2
Maryland¶	73,093	2,032	2.8	1,231	60.6	70,212	96.1	1.8
Massachusetts¶	73,166	3,326	4.5	2,016	60.6	69,926	95.6	2.9
Michigan	114,008	1,366	1.2	713	52.2	109,889	96.4	0.6
Minnesota	68,409	1,070	1.6	591	55.2	65,970	96.4	0.9
Mississippi	39,860	138	0.3	70	50.7	38,464	96.5	0.2
Missouri	76,117	703	0.9	334	47.5	73,432	96.5	0.5
Montana	12,069	88	0.7	44	50.0	11,702	97.0	0.4
Nebraska	25,720	228	0.9	133	58.3	24,882	96.7	0.5
Nevada	35,296	538	1.5	291	54.1	34,197	96.9	0.9
New Hampshire	12,851	295	2.3	164	55.6	12,333	96.0	1.3
New Jersey	105,883	3,822	3.6	1,957	51.2	100,818	95.2	1.9
New Mexico	27,289	210	0.8	95	45.2	26,572	97.4	0.4
New York **	121,917	4,819	4.0	2,709	56.2	116,813	95.8	2.3
New York City	119,395	1,519	1.3	909	59.8	114,977	96.3	0.8
North Carolina	120,389	1,478	1.2	746	50.5	116,205	96.5	0.6
North Dakota	9,527	96	1.0	48	50.0	9,206	96.6	0.5
Ohio	137,918	1,382	1.0	782	56.6	133,026	96.5	0.6
Oklahoma	52,272	385	0.7	188	48.8	50,670	97.0	0.4
Oregon	45,155	627	1.4	315	50.2	43,679	96.7	0.7
Pennsylvania¶	143,178	2,186	1.5	1,285	58.8	138,034	96.4	0.9
Puerto Rico	41,080	65	0.2	28	43.1	40,301	98.1	0.1
Rhode Island	10,960	225	2.1	154	68.4	10,588	96.6	1.5
South Carolina	57,393	594	1.0	292	49.2	55,396	96.5	0.5
South Dakota	11,846	98	0.8	62	63.3	11,500	97.1	0.5
Tennessee	79,588	489	0.6	259	53.0	77,043	96.8	0.3
Texas	377,445	4,539	1.2	2,190	48.2	365,360	96.8	0.6
Utah	51,223	544	1.1	243	44.7	49,563	96.8	0.5
Vermont	6,078	64	1.1	38	59.4	5,901	97.1	0.6
Virginia	102,652	1,984	1.9	1,133	57.1	98,936	96.2	1.1
Washington	86,976	1,341	1.5	773	57.6	84,224	96.8	0.9
West Virginia	20,717	126	0.6	58	46.0	20,032	96.7	0.3
Wisconsin	67,810	652	1.0	361	55.4	65,565	96.7	0.6
Wyoming	7,399	62	0.8	24	38.7	7,196	96.4	0.3
Total	**3,994,670**	**59,631**	**1.5**	**32,455**	**54.4**	**3,857,205**	**96.6**	**0.8**

Abbreviation: ART = assisted reproductive technology.

* In cases of missing residency data (~4%), the patient's state of residency was assigned as the state in which the ART procedure was performed.

† Includes infants conceived from ART procedures performed in 2010 and born in 2011, and infants conceived from ART procedures performed in 2011 and born in 2011. Total ART births exclude nonresidents.

§ **Source:** U.S. natality file, CDC, National Center for Health Statistics. U.S. births include nonresidents.

¶ A substantial percentage (7%–33%) of residency information was missing for procedures performed in these five states.

** Outcomes for New York state do not include New York City.

TABLE 4. Number, percentage, and proportion of multiple-birth, twins, and triplets and higher order infants born with the use of assisted reproductive technology procedure, by female patient's state/reporting area of residence* at time of treatment — United States, 2011†

Patient's state/ reporting area of residence	Multiple-birth infants among ART infants§		Multiple-birth infants among all infants¶		Proportion of ART multiple-birth infants among all multiple-birth infants (%)	Twin infants among ART infants§		Twin infants among all infants¶		Proportion of ART twin infants among all twin infants (%)	Triplet (plus) infants among ART infants§		Triplet (plus) infants among all infants¶		Proportion of ART triplet (plus) infants among all triplet (plus) infants (%)
	No.	%	No.	%	%	No.	%	No.	%	%	No.	%	No.	%	%
Alabama	172	46.7	1,985	3.3	8.7	148	40.2	1,888	3.2	7.8	24	6.5	97	0.2	24.7
Alaska	41	51.3	334	2.9	12.3	—**	—	327	2.9	—	—	—	7	0.1	—
Arizona	392	44.3	2,420	2.8	16.2	362	41.0	2,335	2.7	15.5	30	3.4	85	0.1	35.3
Arkansas	93	44.7	1,241	3.2	7.5	87	41.8	1,209	3.1	7.2	6	2.9	32	0.1	18.8
California	3,469	45.9	16,053	3.2	21.6	3,247	43.0	15,435	3.1	21.0	222	2.9	618	0.1	35.9
Colorado	531	50.7	2,057	3.2	25.8	501	47.9	2,002	3.1	25.0	30	2.9	55	0.1	54.5
Connecticut	550	42.1	1,581	4.2	34.8	502	38.4	1,506	4.0	33.3	48	3.7	75	0.2	64.0
Delaware	39	23.1	377	3.4	10.3	—	—	368	3.3	—	—	—	9	0.1	—
District of Columbia	105	31.0	344	3.7	30.5	—	—	335	3.6	—	—	—	9	0.1	—
Florida	1,199	46.7	7,120	3.3	16.8	1,083	42.2	6,819	3.2	15.9	116	4.5	301	0.1	38.5
Georgia††	629	45.4	4,575	3.5	13.7	578	41.8	4,395	3.3	13.2	51	3.7	180	0.1	28.3
Hawaii††	173	56.7	607	3.2	28.5	158	51.8	586	3.1	27.0	15	4.9	21	0.1	71.4
Idaho	96	49.7	680	3.1	14.1	84	43.5	642	2.9	13.1	12	6.2	38	0.2	31.6
Illinois	1,588	44.3	6,232	3.9	25.5	1,490	41.6	5,951	3.7	25.0	98	2.7	281	0.2	34.9
Indiana	372	51.3	2,833	3.4	13.1	339	46.8	2,692	3.2	12.6	33	4.6	141	0.2	23.4
Iowa	217	40.9	1,302	3.4	16.7	204	38.5	1,254	3.3	16.3	13	2.5	48	0.1	27.1
Kansas	161	47.9	1,300	3.3	12.4	156	46.4	1,272	3.2	12.3	5	1.5	28	0.1	17.9
Kentucky	240	49.7	1,851	3.3	13.0	223	46.2	1,780	3.2	12.5	17	3.5	71	0.1	23.9
Louisiana	240	56.3	2,096	3.4	11.5	217	50.9	2,001	3.2	10.8	23	5.4	95	0.2	24.2
Maine	23	44.2	410	3.2	5.6	—	—	398	3.1	—	—	—	12	0.1	—
Maryland††	801	39.4	2,881	3.9	27.8	777	38.2	2,790	3.8	27.8	24	1.2	91	0.1	26.4
Massachusetts††	1,310	39.4	3,240	4.4	40.4	1,247	37.5	3,140	4.3	39.7	63	1.9	100	0.1	63.0
Michigan	653	47.8	4,119	3.6	15.9	607	44.4	3,942	3.5	15.4	46	3.4	177	0.2	26.0
Minnesota	479	44.8	2,439	3.6	19.6	463	43.3	2,336	3.4	19.8	16	1.5	103	0.2	15.5
Mississippi	68	49.3	1,396	3.5	4.9	56	40.6	1,350	3.4	4.1	12	8.7	46	0.1	26.1
Missouri	369	52.5	2,685	3.5	13.7	346	49.2	2,579	3.4	13.4	23	3.3	106	0.1	21.7
Montana	44	50.0	367	3.0	12.0	44	50.0	357	3.0	12.3	0	0.0	10	0.1	0.0
Nebraska	95	41.7	838	3.3	11.3	84	36.8	795	3.1	10.6	11	4.8	43	0.2	25.6
Nevada	247	45.9	1,099	3.1	22.5	222	41.3	1,044	3.0	21.3	25	4.6	55	0.2	45.5
New Hampshire	131	44.4	518	4.0	25.3	125	42.4	506	3.9	24.7	6	2.0	12	0.1	50.0
New Jersey	1,865	48.8	5,065	4.8	36.8	1,777	46.5	4,817	4.6	36.9	88	2.3	248	0.2	35.5
New Mexico	115	54.8	717	2.6	16.0	106	50.5	699	2.6	15.2	9	4.3	18	0.1	50.0
New York§§	2,110	43.8	5,104	4.2	41.3	1,933	40.1	9,071	3.8	21.3	177	3.7	451	0.2	39.2
New York City¶¶	610	40.2	4,418	3.7	13.8	589	38.8				21	1.4			

See table footnotes on page 20.

TABLE 4. (*Continued*) Number, percentage, and proportion of multiple-birth, twins, and triplets and higher order infants born with the use of assisted reproductive technology procedure, by female patient's state/reporting area of residence* at time of treatment — United States, 2011†

Patient's state/ reporting area of residence	Multiple-birth infants among ART infants§		Multiple-birth infants among all infants¶		Proportion of ART multiple-birth infants among all multiple-birth infants (%)	Twin infants among ART infants§		Twin infants among all infants¶		Proportion of ART twin infants among all twin infants (%)	Triplet (plus) infants among ART infants§		Triplet (plus) infants among all infants¶		Proportion of ART triplet (plus) infants among all triplet (plus) infants (%)
	No.	%	No.	%	%	No.	%	No.	%	%	No.	%	No.	%	%
North Carolina	732	49.5	4,184	3.5	17.5	688	46.5	3,994	3.3	17.2	44	3.0	190	0.2	23.2
North Dakota	48	50.0	321	3.4	15.0	—	—	303	3.2	—	—	—	18	0.2	—
Ohio	600	43.4	4,892	3.6	12.3	558	40.4	4,671	3.4	11.9	42	3.0	221	0.2	19.0
Oklahoma	197	51.2	1,602	3.1	12.3	173	44.9	1,538	2.9	11.2	24	6.2	64	0.1	37.5
Oregon	312	49.8	1,476	3.3	21.1	297	47.4	1,432	3.2	20.7	15	2.4	44	0.1	34.1
Pennsylvania††	901	41.2	5,144	3.6	17.5	847	38.7	4,932	3.4	17.2	54	2.5	212	0.2	25.5
Puerto Rico	37	56.9	779	1.9	4.7	—	—	764	1.9	—	—	—	15	0.0	—
Rhode Island	71	31.6	372	3.4	19.1	71	31.6	357	3.3	19.9	0	0.0	15	0.1	0.0
South Carolina	302	50.8	1,997	3.5	15.1	278	46.8	1,917	3.3	14.5	24	4.0	80	0.1	30.0
South Dakota	36	36.7	346	2.9	10.4	36	36.7	340	2.9	10.6	0	0.0	6	0.1	0.0
Tennessee	230	47.0	2,545	3.2	9.0	218	44.6	2,476	3.1	8.8	12	2.5	69	0.1	17.4
Texas	2,349	51.8	12,085	3.2	19.4	2,184	48.1	11,602	3.1	18.8	165	3.6	483	0.1	34.2
Utah	301	55.3	1,660	3.2	18.1	282	51.8	1,590	3.1	17.7	19	3.5	70	0.1	27.1
Vermont	26	40.6	177	2.9	14.7	26	40.6	174	2.9	14.9	0	0.0	3	0.1	0.0
Virginia	851	42.9	3,716	3.6	22.9	811	40.9	3,607	3.5	22.5	40	2.0	109	0.1	36.7
Washington	568	42.4	2,752	3.2	20.6	556	41.5	2,690	3.1	20.7	12	0.9	62	0.1	19.4
West Virginia	68	54.0	685	3.3	9.9	68	54.0	670	3.2	10.1	0	0.0	15	0.1	0.0
Wisconsin	291	44.6	2,245	3.3	13.0	273	41.9	2,158	3.2	12.7	18	2.8	87	0.1	20.7
Wyoming	38	61.3	203	2.7	18.7	38	61.3	197	2.7	19.3	0	0.0	6	0.1	0.0
Total	**27,185**	**45.6**	**137,465**	**3.4**	**19.8**	**25,434**	**42.7**	**132,033**	**3.3**	**19.3**	**1,751**	**2.9**	**5,432**	**0.1**	**32.2**

Abbreviation: ART = assisted reproductive technology.

* In cases of missing residency data (~ 4%), the patient's state of residency was assigned as the state in which the ART procedure was performed.

† ART totals include infants conceived from ART procedures performed in 2010 and born in 2011, and infants conceived from ART procedures performed in 2011 and born in 2011. Total ART births exclude nonresidents.

§ Includes only the number of infants live-born in a multiple-birth delivery. For example, if three infants were born in a live-birth delivery and one of the three infants was stillborn, the total number of live born infants would be two. However, the two infants still would be counted as triplets.

¶ **Source:** U.S. natality file, CDC, National Center for Health Statistics. U.S. totals include nonresidents.

** To protect confidentiality, cells with values between 1–4 are suppressed, as are data that can be used to derive cell values of 1–4. These values are included in totals.

†† A substantial percentage (7%–33%) of residency information was missing for procedures performed in these five states.

§§ Outcomes for New York state do not include New York City.

¶¶ The total number of multiple birth infants in New York City cannot be separated into twins and triplets (plus); the number is reported as an aggregate that includes twins and higher-order multiple birth infants.

TABLE 5. Number, percentage, and proportion of infants born with the use of assisted reproductive technology, by low birth weight category and by female patient's state/reporting area of residence* at time of treatment — United States, 2011†

Patient's state/ reporting area of residence	<2,500g (LBW)					<1,500g (VLBW)				
	ART infants		All infants§		Proportion of ART LBW infants among all LBW infants (%)	ART infants		All infants§		Proportion of ART VLBW infants among all VLBW infants (%)
	No.	%	No.	%		No.	%	No.	%	
Alabama	134	36.4	5,896	9.9	2.3	24	6.5	1,138	1.9	2.1
Alaska	26	32.5	690	6.0	3.8	5	6.3	108	0.9	4.6
Arizona	258	29.2	5,988	7.0	4.3	58	6.6	994	1.2	5.8
Arkansas	67	32.2	3,516	9.1	1.9	10	4.8	632	1.6	1.6
California	2,287	30.3	33,946	6.8	6.7	393	5.2	5,717	1.1	6.9
Colorado	364	34.8	5,640	8.7	6.5	59	5.6	810	1.2	7.3
Connecticut	368	28.2	2,883	7.7	12.8	80	6.1	573	1.5	14.0
Delaware	35	20.7	942	8.4	3.7	6	3.6	206	1.8	2.9
District of Columbia	61	18.0	970	10.4	6.3	8	2.4	199	2.1	4.0
Florida	885	34.4	18,527	8.7	4.8	152	5.9	3,388	1.6	4.5
Georgia¶	464	33.5	12,333	9.3	3.8	99	7.2	2,338	1.8	4.2
Hawaii¶	125	41.0	1,557	8.2	8.0	26	8.5	232	1.2	11.2
Idaho	73	37.8	1,352	6.1	5.4	16	8.3	215	1.0	7.4
Illinois	1,069	29.8	13,232	8.2	8.1	217	6.1	2,498	1.5	8.7
Indiana	256	35.3	6,786	8.1	3.8	42	5.8	1,227	1.5	3.4
Iowa	150	28.3	2,495	6.5	6.0	21	4.0	428	1.1	4.9
Kansas	108	32.1	2,854	7.2	3.8	28	8.3	509	1.3	5.5
Kentucky	161	33.3	5,040	9.1	3.2	34	7.0	861	1.6	3.9
Louisiana	182	42.7	6,773	10.9	2.7	31	7.3	1,272	2.1	2.4
Maine	17	32.7	846	6.7	2.0	—**	—	136	1.1	—
Maryland¶	545	26.8	6,466	8.8	8.4	127	6.3	1,280	1.8	9.9
Massachusetts¶	824	24.8	5,481	7.5	15.0	166	5.0	960	1.3	17.3
Michigan	458	33.5	9,508	8.3	4.8	100	7.3	1,764	1.5	5.7
Minnesota	305	28.5	4,384	6.4	7.0	49	4.6	712	1.0	6.9
Mississippi	56	40.6	4,710	11.8	1.2	7	5.1	872	2.2	0.8
Missouri	210	29.9	5,995	7.9	3.5	35	5.0	1,026	1.3	3.4
Montana	25	28.4	867	7.2	2.9	—	—	118	1.0	—
Nebraska	66	28.9	1,702	6.6	3.9	14	6.1	279	1.1	5.0
Nevada	196	36.4	2,906	8.2	6.7	36	6.7	471	1.3	7.6
New Hampshire	72	24.4	911	7.1	7.9	10	3.4	160	1.2	6.3
New Jersey	1,240	32.4	9,005	8.5	13.8	237	6.2	1,686	1.6	14.1
New Mexico	79	37.6	2,385	8.7	3.3	—	—	359	1.3	—
New York††	1,457	30.2	19,557	8.1	7.5	264	5.5	3,533	1.5	7.5
New York City	383	25.2				35	2.3			

See table footnotes on page 22.

TABLE 5: (*Continued*) Number, percentage, and proportion of infants born with the use of assisted reproductive technology, by low birth weight category and by female patient's state/reporting area of residence* at time of treatment — United States, 2011†

Patient's state/ reporting area of residence	<2,500g (LBW)					<1,500g (VLBW)				
	ART infants		All infants§		Proportion of ART LBW infants among all LBW infants (%)	ART infants		All infants§		Proportion of ART VLBW infants among all VLBW infants (%)
	No.	%	No.	%		No.	%	No.	%	
North Carolina	492	33.3	10,839	9.0	4.5	78	5.3	2,084	1.7	3.7
North Dakota	29	30.2	637	6.7	4.6	0	0.0	105	1.1	0.0
Ohio	407	29.5	11,901	8.6	3.4	86	6.2	2,298	1.7	3.7
Oklahoma	142	36.9	4,431	8.5	3.2	21	5.5	750	1.4	2.8
Oregon	211	33.7	2,764	6.1	7.6	26	4.1	443	1.0	5.9
Pennsylvania¶	583	26.7	11,662	8.1	5.0	101	4.6	2,151	1.5	4.7
Puerto Rico	29	44.6	5,119	12.5	0.6	5	7.7	572	1.4	0.9
Rhode Island	56	24.9	813	7.4	6.9	10	4.4	155	1.4	6.5
South Carolina	212	35.7	5,650	9.8	3.8	39	6.6	1,054	1.8	3.7
South Dakota	25	25.5	744	6.3	3.4	—	—	127	1.1	—
Tennessee	147	30.1	7,176	9.0	2.0	25	5.1	1,187	1.5	2.1
Texas	1,727	38.0	32,018	8.5	5.4	331	7.3	5,340	1.4	6.2
Utah	208	38.2	3,544	6.9	5.9	41	7.5	548	1.1	7.5
Vermont	13	20.3	404	6.6	3.2	—	—	74	1.2	—
Virginia	585	29.5	8,184	8.0	7.1	102	5.1	1,597	1.6	6.4
Washington	373	27.8	5,340	6.1	7.0	57	4.3	841	1.0	6.8
West Virginia	46	36.5	1,985	9.6	2.3	8	6.3	333	1.6	2.4
Wisconsin	192	29.4	4,876	7.2	3.9	43	6.6	885	1.3	4.9
Wyoming	25	40.3	600	8.1	4.2	—	—	81	1.1	—
Total	**18,508**	**31.0**	**324,830**	**8.1**	**5.7**	**3,377**	**5.7**	**57,326**	**1.4**	**5.9**

Abbreviations: ART = assisted reproductive technology; LBW = low birth weight; VLBW = very low birth weight.

* In cases of missing residency data (~ 4%), the patient's state of residency was assigned as the state in which the ART procedure was performed.

† ART totals include infants conceived from ART procedures performed in 2010 and born in 2011, and infants conceived from ART procedures performed in 2011 and born in 2011. Total ART infants exclude nonresidents.

§ **Source:** US natality file, CDC, National Center for Health Statistics. U.S. totals include nonresidents.

¶ A substantial percentage (7%–33%) of residency information was missing for procedures performed in these five states.

** To protect confidentiality, cells with values between 1–4 are suppressed, as are data that can be used to derive cell values of 1–4. These values are included in totals.

†† Outcomes for New York state do not include New York City.

TABLE 6. Number, percentage, and proportion of infants born with the use of assisted reproductive technology, by low gestational age category, and female patient's state/reporting area of residence* at time of treatment — United States, 2011†

Patient's state/ reporting area of residence	<37 weeks (PTB)					<32 weeks (VPTB)				
	ART infants		All infants§		Proportion of ART PTB infants among all PTB infants (%)	ART infants		All infants§		Proportion of ART VPTB infants among all VPTB infants (%)
	No.	%	No.	%		No.	%	No.	%	
Alabama	171	46.5	8,817	11.7	1.9	25	6.8	1,590	2.7	1.6
Alaska	35	43.8	1,188	14.9	2.9	10	12.5	160	1.4	6.3
Arizona	321	36.3	10,356	10.4	3.1	69	7.8	1,420	1.7	4.9
Arkansas	78	37.5	5,096	12.1	1.5	9	4.3	780	2.0	1.2
California	2,626	34.8	48,942	13.2	5.4	466	6.2	7,325	1.5	6.4
Colorado	415	39.6	6,712	9.7	6.2	71	6.8	1,046	1.6	6.8
Connecticut	424	32.4	3,760	10.3	11.3	100	7.7	676	1.8	14.8
Delaware	27	16.0	1,264	10.1	2.1	8	4.7	275	2.4	2.9
District of Columbia	66	19.5	1,270	11.2	5.2	12	3.5	269	2.9	4.5
Florida	966	37.6	27,829	13.7	3.5	161	6.3	4,653	2.2	3.5
Georgia¶	501	36.2	17,492	13.0	2.9	95	6.9	3,097	2.3	3.1
Hawaii¶	137	44.9	2,338	13.2	5.9	28	9.2	359	1.9	7.8
Idaho	80	41.5	2,264	12.3	3.5	24	12.4	298	1.3	8.1
Illinois	1,290	36.0	19,580	10.2	6.6	261	7.3	3,511	2.2	7.4
Indiana	314	43.3	9,664	12.1	3.2	49	6.8	1,599	1.9	3.1
Iowa	191	36.0	4,226	11.5	4.5	26	4.9	633	1.7	4.1
Kansas	130	38.7	4,455	11.1	2.9	33	9.8	664	1.7	5.0
Kentucky	210	43.5	7,413	11.2	2.8	36	7.5	1,154	2.1	3.1
Louisiana	214	50.2	9,673	13.4	2.2	34	8.0	1,751	2.8	1.9
Maine	18	34.6	1,220	15.6	1.5	—**	—	189	1.5	—
Maryland¶	636	31.3	9,160	9.6	6.9	135	6.6	1,659	2.3	8.1
Massachusetts¶	986	29.6	7,564	12.5	13.0	211	6.3	1,236	1.7	17.1
Michigan	550	40.3	13,710	10.3	4.0	114	8.3	2,437	2.1	4.7
Minnesota	390	36.4	6,779	12.0	5.8	68	6.4	1,025	1.5	6.6
Mississippi	68	49.3	6,730	9.9	1.0	9	6.5	1,141	2.9	0.8
Missouri	260	37.0	8,834	16.9	2.9	42	6.0	1,445	1.9	2.9
Montana	26	29.5	1,301	11.6	2.0	—	—	181	1.5	—
Nebraska	75	32.9	2,722	10.8	2.8	24	10.5	406	1.6	5.9
Nevada	224	41.6	4,654	10.6	4.8	35	6.5	648	1.8	5.4
New Hampshire	82	27.8	1,222	13.2	6.7	13	4.4	196	1.5	6.6
New Jersey	1,403	36.7	12,340	9.5	11.4	283	7.4	2,280	2.2	12.4
New Mexico	91	43.3	3,214	11.7	2.8	11	5.2	446	1.6	2.5
New York††	1,657	34.4	26,302	11.8	6.3	333	6.9	4,365	1.8	7.6
New York City	454	29.9				55	3.6			

See table footnotes on page 24.

TABLE 6. (*Continued*) Number, percentage, and proportion of infants born with the use of assisted reproductive technology, by low gestational age category, and female patient's state/reporting area of residence* at time of treatment — United States, 2011†

Patient's state/ reporting area of residence	<37 weeks (PTB)					<32 weeks (VPTB)				
	ART infants		All infants§		Proportion of ART PTB infants among all PTB infants (%)	ART infants		All infants§		Proportion of ART VPTB infants among all VPTB infants (%)
	No.	%	No.	%		No.	%	No.	%	
North Carolina	539	36.5	15,111	12.6	3.6	93	6.3	2,974	2.5	3.1
North Dakota	38	39.6	946	9.9	4.0	10	10.4	174	1.8	5.7
Ohio	474	34.3	16,689	12.1	2.8	95	6.9	3,177	2.3	3.0
Oklahoma	201	52.2	6,878	13.2	2.9	34	8.8	1,070	2.0	3.2
Oregon	217	34.6	4,093	9.1	5.3	33	5.3	582	1.3	5.7
Pennsylvania¶	656	30.0	15,778	11.0	4.2	114	5.2	2,692	1.9	4.2
Puerto Rico	37	56.9	7,220	17.6	0.5	5	7.7	1,227	3	0.4
Rhode Island	65	28.9	1,135	10.4	5.7	13	5.8	204	1.9	6.4
South Carolina	262	44.1	8,066	14.1	3.2	54	9.1	1,473	2.6	3.7
South Dakota	32	32.7	1,323	11.2	2.4	—	—	205	1.7	—
Tennessee	195	39.9	10,141	12.7	1.9	33	6.7	1,556	2.0	2.1
Texas	2,073	45.7	48,336	12.8	4.3	380	8.4	7,409	2.0	5.1
Utah	256	47.1	5,580	10.9	4.6	38	7.0	715	1.4	5.3
Vermont	8	12.5	533	8.8	1.5	—	—	6,108	1.6	—
Virginia	664	33.5	11,484	11.2	5.8	130	6.6	2,054	2.0	6.3
Washington	442	33.0	8,524	9.8	5.2	71	5.3	1,230	1.4	5.8
West Virginia	58	46.0	2,640	12.7	2.2	10	7.9	437	2.1	2.3
Wisconsin	224	34.4	7,060	10.4	3.2	51	7.8	1,136	1.7	4.5
Wyoming	28	45.2	755	10.2	3.7	0	0.0	98	1.3	0.0
Total	**21,586**	**36.2**	**470,383**	**11.8**	**4.6**	**4,025**	**6.7**	**77,426**	**1.9**	**5.2**

Abbreviations: ART = assisted reproductive technology; PTB = preterm birth; VPTB = very preterm birth.

* In cases of missing residency data (~ 4%), the patient's state of residency was assigned as the state in which the ART procedure was performed.

† ART totals include infants conceived from ART procedures performed in 2010 and born in 2011, and infants conceived from ART procedures performed in 2011 and born in 2011. Total ART births exclude nonresidents.

§ **Source**: U.S. natality file, CDC, National Center for Health Statistics. U.S. totals include nonresidents.

¶ A substantial percentage (7%–33%) of residency information was missing for procedures performed in these five states.

** To protect confidentiality, cells with values between 1–4 are suppressed, as are data that can be used to derive cell values of 1–4. These values are included in totals.

†† Outcomes for New York state do not include New York City.

TABLE 7. Percentages* of low birthweight infants among infants born with assisted reproductive technology and all U.S. infants, by plurality, by female patient's state/reporting area of residence† at time of treatment — United States, 2011§

Patient's state/reporting area of residence	ART Singletons		All Singletons¶		ART Twins**		All Twins¶		ART Triplets (Plus)**		All Triplets (Plus)¶	
	<2,500 g (LBW) (%)	<1,500 g (VLBW) (%)	<2,500 g (LBW) (%)	<1,500 g (VLBW) (%)	<2,500 g (LBW) (%)	<1,500 g (VLBW) (%)	<2,500 g (LBW) (%)	<1,500 g (VLBW) (%)	<2,500 g (LBW) (%)	<1,500 g (VLBW) (%)	<2,500 g (LBW) (%)	<1,500 g (VLBW) (%)
Alabama	9.2	—††	8.1	1.5	65.1	11.6	61.8	12.2	87.5	—	93.8	47.4
Alaska	14.7	—	4.7	0.8	47.4	—	50.8	7.0	—	—	85.7	
Arizona	7.1	1.2	5.6	0.9	53.9	10.6	55.2	9.2	100.0	46.7	97.6	38.8
Arkansas	7.9	—	7.4	1.3	59.8	6.9	58.6	10.9	100.0	—	96.9	43.8
California	9.0	1.5	5.2	0.9	55.5	8.2	53.0	8.0	94.9	37.7	94.2	37.5
Colorado	8.6	—	6.9	0.9	59.4	9.8	61.1	10.1	100.0	34.5	94.5	34.5
Connecticut	8.4	2.3	5.6	1.1	53.0	8.1	54.7	10.5	95.6	51.1	97.3	45.3
Delaware	11.5	—	6.7	1.4	52.8	—	55.2	12.8	—	0.0	77.8	55.6
District of Columbia	3.9	—	8.6	1.8	48.0	5.9	56.7	10.1	—	0.0	100.0	66.7
Florida	9.6	2.0	6.9	1.3	59.7	8.3	59.5	10.2	97.3	31.0	93.7	35.5
Georgia§§	8.9	1.2	7.5	1.4	60.8	11.1	58.4	11.1	100.0	52.9	93.3	42.8
Hawaii§§	10.7	—	6.5	0.9	60.8	8.9	57.7	10.9	100.0	60.0	90.5	9.5
Idaho	8.2	—	4.5	0.7	63.1	10.7	53.0	7.8	100.0	50.0	92.1	34.2
Illinois	8.0	1.7	6.2	1.2	55.2	9.1	55.4	9.9	94.9	50.0	95.0	34.2
Indiana	7.2	1.4	6.4	1.2	59.4	9.3	56.1	8.7	97.0	18.2	94.3	38.3
Iowa	6.1	—	4.7	0.8	58.3	7.4	55.8	8.3	92.3	—	91.7	39.6
Kansas	7.6	—	5.6	0.9	60.5	16.4	54.4	10.9	—	0.0	75.0	21.4
Kentucky	11.6	3.0	7.3	1.2	55.3	11.1	58.9	10.9	100.0	—	100.0	29.6
Louisiana	10.3	3.2	8.9	1.6	66.5	8.4	67.6	13.7	87.0	30.4	90.5	34.7
Maine	—	—	5.1	0.9	55.0	0.0	50.8	6.5	—	—	100.0	16.7
Maryland§§	9.0	2.4	6.8	1.3	52.9	11.5	56.5	10.8	95.8	33.3	93.4	38.5
Massachusetts§§	8.4	1.6	5.5	0.9	49.6	8.9	49.5	9.3	98.3	45.0	99.0	44.0
Michigan	9.6	2.1	6.5	1.1	57.5	10.5	56.5	11.2	100.0	50.0	95.5	40.1
Minnesota	5.3	1.0	4.7	0.8	56.8	7.9	51.1	7.3	93.8	43.8	94.2	33.0
Mississippi	8.7	0.0	9.7	1.7	70.4	11.1	69.2	14.3	100.0	—	100.0	32.6
Missouri	7.9	—	6.2	1.0	48.5	6.5	53.3	8.2	91.3	43.5	88.7	55.7
Montana	—	—	5.6	0.7	52.3	—	55.7	7.6	0.0	0.0	90.0	70.0
Nebraska	6.8	—	5.1	0.8	60.0	12.5	50.6	9.2	81.8	—	76.7	27.9
Nevada	13.1	—	6.5	1.0	61.5	10.6	60.9	10.4	96.0	40.0	94.5	41.8
New Hampshire	5.5	—	5.3	0.9	47.2	7.2	49.2	9.5	—	0.0	75.0	16.7
New Jersey	8.9	2.3	6.1	1.1	56.0	8.8	55.2	9.1	94.3	43.2	91.1	38.3
New Mexico	10.6	0.0	7.3	1.1	61.8	—	61.1	8.9	100.0	—	100.0	33.3
New York¶¶	8.8	1.3	6.1	1.1	57.4	9.2	54.4	9.2	96.5	34.1	95.6	31.9
New York City	7.9	—			53.9	4.9			100.0	27.8		

See table footnotes on page 26.

TABLE 7. (*Continued*) Percentages* of low birthweight infants among infants born with assisted reproductive technology and all U.S. infants, by plurality, by female patient's state/reporting area of residence† at time of treatment — United States, 2011§

Patient's state/reporting area of residence	ART Singletons		All Singletons¶		ART Twins**		All Twins¶		ART Triplets (Plus)**		All Triplets (Plus)¶	
	<2,500 g (LBW) (%)	<1,500 g (VLBW) (%)	<2,500 g (LBW) (%)	<1,500 g (VLBW) (%)	<2,500 g (LBW) (%)	<1,500 g (VLBW) (%)	<2,500 g (LBW) (%)	<1,500 g (VLBW) (%)	<2,500 g (LBW) (%)	<1,500 g (VLBW) (%)	<2,500 g (LBW) (%)	<1,500 g (VLBW) (%)
North Carolina	10.6	3.5	7.3	1.4	55.3	6.3	55.3	10.3	79.5	20.5	93.2	32.1
North Dakota	—	0.0	4.9	0.8	56.8	0.0	56.4	10.6	—	0.0	88.9	11.1
Ohio	8.8	1.0	6.8	1.3	55.0	10.3	55.6	11.7	100.0	52.4	91.0	35.3
Oklahoma	11.2	—	6.8	1.1	58.0	10.1	60.1	11.8	100.0	—	93.8	28.1
Oregon	12.2	2.0	4.5	0.7	56.5	6.4	51.7	9.1	100.0	—	95.5	15.9
Pennsylvania§§	7.5	1.1	6.4	1.1	52.7	8.5	53.3	10.8	86.3	31.4	93.4	38.7
Puerto Rico	17.9	—	11.3	1.2	61.8	—	72.1	12.2	—	—	100	26.7
Rhode Island	11.7	—	5.8	1.1	55.1	8.7	52.7	8.7	0.0	0.0	86.7	33.3
South Carolina	10.8	2.8	8.0	1.5	59.0	9.0	59.9	11.6	100.0	29.2	98.8	27.5
South Dakota	—	0.0	4.9	0.8	61.1	—	50.9	9.1	0	0	83.3	50.0
Tennessee	9.7	—	7.3	1.2	50.5	6.4	58.8	8.6	100.0	58.3	89.9	27.5
Texas	10.4	2.4	6.7	1.1	61.9	10.3	60.4	9.9	98.2	35.2	95.2	41.2
Utah	11.1	2.9	5.2	0.8	57.8	9.2	56.3	9.1	100.0	44.4	94.3	38.6
Vermont	—	—	5.4	0.8	34.6	0.0	47.7	14.4	0.0	0.0	100.0	100.0
Virginia	9.1	1.6	6.2	1.2	55.6	8.0	55.0	9.7	97.5	50.0	97.2	44.0
Washington	8.2	0.9	4.7	0.7	55.2	8.9	50.1	8.1	100.0	—	88.7	16.1
West Virginia	8.6	0.0	7.6	1.2	62.1	12.1	66.4	13.7	0.0	0.0	100.0	53.3
Wisconsin	7.3	3.4	5.6	1.0	55.5	10.3	53.3	9.4	100.0	—	98.9	46.0
Wyoming	—	0.0	6.4	0.9	63.2	—	67.5	7.6	0.0	0.0	50.0	50.0
Total	**8.8**	**1.7**	**6.4**	**1.2**	**56.4**	**8.9**	**56.3**	**9.8**	**95.7**	**36.9**	**93.9**	**36.9**

Abbreviations: ART = assisted reproductive technology; LBW= low birth weight; VLBW = very low birth weight.

* Data do not include records with missing birth weight.

† In cases of missing residency data (~ 4%), the patient's state of residency was assigned as the state in which the ART procedure was performed.

§ ART totals include infants conceived from ART procedures performed in 2010 and born in 2011, and infants conceived from ART procedures performed in 2011 and born in 2011. Total ART births exclude nonresidents.

¶ **Source:** U.S. natality file, CDC, National Center for Health Statistics. U.S. totals include nonresidents. Includes only the number of infants live-born in a multiple-birth delivery. For example, if three infants were born in a live-birth delivery and one of the three infants was stillborn, the total number of liveborn infants would be two. However, the two infants still would be counted as triplets. To protect confidentiality, cells with values between 1–4 are suppressed, as are data that can be used to derive cell values of 1–4. These values are included in totals.

** Includes only the number of infants live-born in a multiple-birth delivery. For example, if three infants would be two. However, the two infants still would be counted as triplets.

†† To protect confidentiality, cells with values between 1–4 are suppressed, as are data that can be used to derive cell values of 1–4. These values are included in totals.

§§ A substantial percentage (7%–33%) of residency information was missing for procedures performed in these five states.

¶¶ Outcomes for New York state do not include New York City for ART.

TABLE 8. Percentages* of preterm infants among infants born with the use of assisted reproductive technology and all U.S. infants, by plurality, by female patient's state/reporting area of residence† at time of treatment — United States, 2011§

Patient's state/reporting area of residence	ART Singletons		All Singletons¶		ART Twins**		All Twins¶		ART Triplets (Plus)**		All Triplets (Plus)¶	
	<37 weeks (PTB) (%)	<32weeks (VPTB) (%)	<37 weeks (PTB) (%)	<32weeks (VPTB) (%)	<37 weeks (PTB) (%)	<32weeks (VPTB) (%)	<37 weeks (PTB) (%)	<32weeks (VPTB) (%)	<37 weeks (PTB) (%)	<32weeks (VPTB) (%)	<37 weeks (PTB) (%)	<32weeks (VPTB) (%)
Alabama	14.8	—††	13.3	2.2	79.7	13.5	59.1	14.1	100.0	—	93.8	46.4
Alaska	20.5	—	8.9	1.1	63.2	—	57.5	11.0	—	—	85.7	0.0
Arizona	14.8	2.3	10.7	1.4	60.5	11.9	57.6	10.2	100.0	50.0	91.8	32.9
Arkansas	13.0	—	11.7	1.6	65.5	6.9	57.6	12.9	100.0	0.0	84.4	46.9
California	12.4	2.0	8.2	1.2	59.1	9.1	54.6	9.3	98.6	41.9	95.6	38.8
Colorado	12.5	—	8.7	1.3	64.3	11.4	57.7	10.8	100.0	40.0	98.2	32.7
Connecticut	12.9	2.8	8.1	1.3	56.6	11.6	54.1	11.7	87.5	43.8	90.7	40.0
Delaware	10.5	—	9.9	2.0	50.0	—	49.2	13.6	0.0	0.0	100.0	33.3
District of Columbia	7.3	—	12.0	2.5	46.0	10.0	56.7	11.3	—	0.0	100.0	77.8
Florida	13.4	1.8	11.5	1.8	62.0	9.6	57.7	11.7	97.4	28.4	87.7	36.2
Georgia§§	11.8	1.5	11.5	1.9	63.1	11.5	58.4	12.6	100.0	35.3	94.4	50.0
Hawaii§§	18.2	—	10.8	1.6	62.0	11.4	56.3	11.3	100.0	40.0	85.7	14.3
Idaho	10.3	—	8.5	1.0	69.0	14.3	60.1	10.4	100.0	75.0	100.0	42.1
Illinois	13.5	2.4	10.3	1.7	62.2	11.2	57.0	11.8	100.0	48.0	94.0	37.4
Indiana	13.7	2.0	9.8	1.6	68.7	10.6	59.9	10.6	100.0	18.2	95.7	39.0
Iowa	12.5	—	9.1	1.3	69.6	8.8	65.6	10.0	76.9	—	93.8	31.3
Kansas	10.9	—	9.6	1.3	67.9	19.2	60.6	12.3	100.0	0.0	75.0	21.4
Kentucky	16.9	2.5	11.7	1.7	70.1	12.7	60.2	12.2	82.4	—	88.7	21.1
Louisiana	15.1	3.8	13.7	2.3	75.1	11.1	68.8	17.1	100.0	—	96.8	31.6
Maine	—	0.0	8.2	1.3	66.7	—	50.0	6.3	—	0.0	100.0	25.0
Maryland§§	12.4	2.8	10.6	1.8	60.0	12.3	57.3	12.3	100.0	25.0	93.4	37.4
Massachusetts§§	11.8	2.2	8.3	1.2	55.0	11.0	52.5	10.8	100.0	47.6	97.0	51.0
Michigan	13.0	2.5	10.2	1.7	69.5	12.4	58.1	12.9	93.5	47.8	93.8	44.1
Minnesota	12.1	1.4	8.1	1.2	65.4	11.4	57.1	9.2	100.0	43.8	99.0	34.0
Mississippi	17.1	0.0	15.1	2.4	78.6	10.7	64.9	14.7	100.0	—	100.0	41.3
Missouri	14.8	3.0	10.0	1.5	54.7	5.8	55.1	10.7	100.0	52.2	96.2	59.4
Montana	—	—	9.2	1.2	50.0	—	61.6	7.8	0.0	0.0	100.0	70.0
Nebraska	10.5	—	9.0	1.2	59.5	23.8	56.2	10.9	100.0	—	88.4	25.6
Nevada	16.4	—	11.5	1.5	69.1	10.0	62.8	11.1	100.0	40.0	89.1	45.5
New Hampshire	10.4	—	7.9	1.1	47.2	9.6	46.8	10.5	100.0	0.0	100.0	25.0
New Jersey	13.2	2.8	9.5	1.7	60.0	10.0	52.8	10.6	94.3	58.0	88.3	38.3
New Mexico	16.8	0.0	10.5	1.4	62.3	7.5	57.9	8.4	100.0	—	100.0	33.3
New York¶¶	13.7	2.3	9.1	1.4	58.4	11.0	52.4	10.4	94.9	33.9	91.8	31.5
New York City	11.5	1.1			55.9	6.6			100.0	28.6		

See table footnotes on page 28.

TABLE 8. (*Continued*) Percentages* of preterm infants among infants born with the use of assisted reproductive technology and all U.S. infants, by plurality, by female patient's state/reporting area of residence† at time of treatment — United States, 2011§

Patient's state/territory of residence	ART Singletons		All Singletons¶		ART Twins**		All Twins¶		ART Triplets (Plus)**		All Triplets (Plus)¶	
	<37 weeks (PTB) (%)	<32weeks (VPTB) (%)	<37 weeks (PTB) (%)	<32weeks (VPTB) (%)	<37 weeks (PTB) (%)	<32weeks (VPTB) (%)	<37 weeks (PTB) (%)	<32weeks (VPTB) (%)	<37 weeks (PTB) (%)	<32weeks (VPTB) (%)	<37 weeks (PTB) (%)	<32weeks (VPTB) (%)
North Carolina	12.5	3.8	11.0	2.1	58.8	7.6	54.4	11.7	100.0	29.5	93.2	37.4
North Dakota	—	0.0	8.0	1.4	68.9	15.6	65.0	14.5	—	—	83.3	27.8
Ohio	14.5	2.4	10.4	1.9	57.8	10.4	56.3	13.5	92.9	42.9	93.7	37.6
Oklahoma	18.1	2.7	11.5	1.7	82.7	13.3	65.9	13.7	100.0	25.0	90.6	28.1
Oregon	11.8	2.5	7.5	1.0	55.6	7.4	55.2	10.7	100.0	—	100.0	25.0
Pennsylvania§§	11.2	1.5	9.3	1.5	55.2	9.8	55.0	12.0	94.1	23.5	94.3	34.4
Puerto Rico	28.6	—	16.6	2.8	76.5	—	68.7	14.8	—	0.0	93.3	20.0
Rhode Island	13.1	—	9.0	1.5	63.4	12.7	49.3	9.8	100.0	0.0	73.3	33.3
South Carolina	18.1	3.8	12.3	2.1	67.4	13.4	60.7	14.3	100.0	25.0	96.3	31.3
South Dakota	9.7	0.0	9.6	1.4	72.2	—	63.2	12.4	94.5	0.0	100.0	50.0
Tennessee	14.3	—	11.1	1.6	67.0	10.1	62.6	11.8	100.0	75.0	100.0	34.8
Texas	16.7	3.1	11.1	1.6	71.3	11.4	61.8	11.4	100.0	40.0	92.8	41.4
Utah	15.2	2.9	9.1	1.1	70.9	7.8	62.8	10.3	100.0	47.4	98.6	37.1
Vermont	—	—	9.5	0.0	—	0.0	49.4	16.1	0.0	0.0	100.0	0.0
Virginia	12.7	1.9	8.3	1.6	59.5	10.0	54.1	10.5	100.0	70.0	93.6	53.2
Washington	12.5	1.6	10.9	1.2	60.3	10.1	54.1	8.5	100.0	—	85.5	22.6
West Virginia	17.5	0.0	8.8	1.6	70.6	14.7	64.6	14.6	0.0	0.0	100.0	60.0
Wisconsin	12.0	3.1	8.8	1.3	59.7	13.6	57.3	12.0	100.0	—	96.6	37.9
Wyoming	—	0.0	8.3	1.1	68.4	0.0	59.9	9.6	0.0	0.0	100.0	50.0
Total	**13.2**	**2.2**	**10.1**	**1.6**	**61.8**	**10.5**	**57.3**	**11.3**	**97.1**	**38.2**	**93.4**	**38.0**

Abbreviations: ART = assisted reproductive technologies; PTB = preterm birth; VPTB = very preterm birth.

* Data do not include records with missing gestational age.

† In cases of missing residency data (~ 4%), the patient's state of residency was assigned as the state in which the ART procedure was performed.

§ ART totals include infants conceived from ART procedures performed in 2010 and born in 2011, and infants conceived from ART procedures performed in 2011 and born in 2011. Total ART births exclude nonresidents.

¶ **Source:** U.S. natality file, CDC, National Center for Health Statistics. U.S. totals include nonresidents.

** Includes only the number of infants live-born in a multiple-birth delivery. For example, if three infants were born in a live-birth delivery and one of the three infants was stillborn, the total number of liveborn infants would be two. However, the two infants still would be counted as triplets.

†† To protect confidentiality, cells with values between 1–4 are suppressed, as are data that can be used to derive cell values of 1–4. These values are included in totals.

§§ A substantial percentage (7%–33%) of residency information was missing for procedures performed in these five states.

¶¶ Outcomes for New York state do not include New York City for ART.

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