

# 2014 Assisted Reproductive Technology

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## National Summary Report

National Center for Chronic Disease Prevention and Health Promotion  
Division of Reproductive Health



Updates to this report will be posted on the CDC website at the following address:

<http://www.cdc.gov/art/reports/>

For additional information, send an e-mail to [artinfo@cdc.gov](mailto:artinfo@cdc.gov)

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October 2016

# Acknowledgments

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greatly appreciated. Appendix B has current contact information for these national consumer organizations.

This publication was developed and produced by the National Center for Chronic Disease Prevention and Health Promotion of the Centers for Disease Control and Prevention in consultation with the American Society for Reproductive Medicine and the Society for Assisted Reproductive Technology.

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# 2014 National Report







# INTRODUCTION TO THE 2014 NATIONAL REPORT

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Data provided by United States clinics that use assisted reproductive technology (ART) to treat infertility are a rich source of information about the factors that contribute to a successful ART treatment—the delivery of a healthy live-born infant. Pooling the data from all reporting clinics provides a national picture that could not be obtained by examining data from an individual clinic.

A woman's chances of having a pregnancy and a live birth when using ART are influenced by many factors, some of which are patient-related and outside a clinic's control (for example, the woman's age or the cause of infertility). Because the national data include information on many of these factors, this can give potential ART patients an idea of the average chances of success. Average chances, however, do not necessarily apply to a particular individual or couple. People considering ART should consult their physician to discuss all the factors that apply in their particular case.

The data for this national report come from the 458 fertility clinics in operation in 2014 that provided and verified data on the outcomes of all ART cycles started in their clinics. Of the 208,604 ART cycles performed in 2014 at these reporting clinics, 173,198 cycles (83%) were started with the intent to transfer at least one embryo. These 173,198 cycles resulted in 57,323 live births (deliveries of one or more living infants) and 70,354 infants.

Of the 173,198 ART cycles started in 2014 with the intent to transfer at least one embryo, 3,596 cycles were reported with the intent to thaw a previously frozen egg, fertilize the egg, and then transfer the resulting embryo. However, because this cycle type (a frozen egg cycle) does not contribute to the calculation of any success rates for the 458 clinics included in the *2014 Assisted*

*Reproductive Technology Fertility Clinic Success Rates Report* (hereafter called the *2014 Fertility Clinic Success Rates Report*), the 3,596 frozen egg cycles are not included in the majority of this national report. The majority of the report includes the remaining 169,602 cycles.

Of the 208,604 ART cycles performed in 2014, 35,406 cycles (17%) were started with the intent of cryopreserving (freezing) and storing all resulting eggs or embryos for potential future use. However, because this cycle type (a banking cycle) cannot result in immediate pregnancy, the 35,406 banking cycles started in 2014 are not included in the majority of this national report.

The 208,604 total ART cycles performed in 2014 excludes 26 cycles started in which a new treatment procedure was being evaluated. The 26 new procedure cycles are not included in the majority of this national report because they do not contribute to the calculation of any success rates for the 458 clinics included in the *2014 Fertility Clinic Success Rates Report*.

The 2014 National Summary table on page 5 combines data from all 208,604 cycles reported by the 458 clinics. For an explanation of how to read this table, see pages 11–20 of the *2014 Fertility Clinic Success Rates Report* available at <http://www.cdc.gov/art/reports/>.

This national report consists of graphs and charts that use 2014 data to answer specific questions related to ART success rates. These figures are organized according to the type of ART procedure used. Some ART procedures use a woman's own eggs (nondonor cycles), and others use donated eggs or embryos (donor cycles). Although sperm used to create an embryo also may be either from a woman's partner or from a sperm donor, ART cycles in this report are classified according to the source of the egg.

In some procedures, the embryos that develop after fertilization are transferred back to the woman without having been frozen (fresh embryo transfer); in others, embryos that previously have been frozen (cryopreserved) for transfer at a later date are thawed and transferred to the woman (frozen embryo transfer).

The national report has five sections:

- Section 1 (Figures 1 through 5) presents overall information about the different types of ART cycles performed in 2014. Figure 2 is the only figure in this report that includes information about ART cycles in which a new treatment procedure was being evaluated (26 cycles that are not counted as part of the 208,604 total ART cycles performed in 2014). Figures 1 through 3 are the only figures in the report to include information about frozen egg cycles (3,596 cycles of the 208,604 total). Figures 1 through 3 (and Figure 44 in Section 5) are the only figures in the report to include information about egg/embryo banking cycles (35,406 cycles of the 208,604 total). Thus, data presented in Figures 4 and 5 in Section 1 and
- in other sections of the report are based on the total of 169,602 fresh nondonor, frozen nondonor, fresh donor, and frozen donor ART cycles performed in 2014 with the intent to transfer at least one egg or embryo.
- Section 2 (Figures 6 through 35) presents information on the ART cycles that used only fresh nondonor eggs or embryos or, in approximately 1% of cases, a mixture of fresh and frozen nondonor embryos (92,862 cycles resulting in 67,070 transfers).
- Section 3 (Figures 36 through 38) presents information on the ART cycles that used only frozen nondonor embryos (56,259 cycles resulting in 52,577 transfers).
- Section 4 (Figures 39 through 42) presents information on the ART cycles that used only donated eggs or embryos (20,481 cycles resulting in 18,411 transfers).
- Section 5 (Figures 43 through 53) presents trends in the number of ART procedures and measures of success over the past 10 years, from 2005 through 2014.

# 2014 NATIONAL SUMMARY

Technical terms are defined in the Glossary of Terms (Appendix A, pages 63–65). For more information on how to interpret the statistics in this table, see pages 11–20 in the 2014 Assisted Reproductive Technology Fertility Clinic Success Rates Report.

## 2014 ART CYCLE PROFILE

Type of ART and Procedural Factors <sup>a</sup>				Patient Diagnosis <sup>b</sup>				
IVF	>99%	With ICSI	69%	Tubal factor	13%	Uterine factor	6%	<i>Multiple Factors:</i> Female factors only 12% Female & male factors 17%
Unstimulated	2%	PGD/PGS	4%	Ovulatory dysfunction	15%	Male factor	33%	
Used gestational carrier	<1%			Diminished ovarian reserve	32%	Other factor	16%	
				Endometriosis	9%	Unknown factor	13%	

## 2014 ART SUCCESS RATES<sup>c</sup>

Total number of cycles<sup>d</sup>: 208,604 (includes 3,596 cycle[s] using frozen eggs)

Type of Cycle	Age of Woman					
	<35	35–37	38–40	41–42	43–44	>44
<b>Fresh Embryos from Nondonor Eggs</b>						
Number of cycles	39,573	19,376	17,617	9,114	5,131	2,051
Percentage of cancellations before retrieval (%)	6.1	9.7	13.4	17.4	19.4	25.1
Average number of embryos transferred	1.7	1.9	2.2	2.6	2.8	2.5
Percentage of embryos transferred resulting in implantation (%)	41.1	32.3	21.1	10.8	5.0	2.3
Percentage of elective single embryo transfers (eSET) (%)	28.5	16.7	6.9	2.1	1.2	0.4
<b>Outcomes per Cycle</b>						
Percentage of cycles resulting in term, normal weight & singleton live births <sup>e</sup> (%)	23.2	19.2	13.0	7.1	2.8	0.8
Percentage of cycles resulting in singleton live births (%)	27.4	22.8	15.6	8.3	3.4	1.0
Percentage of cycles resulting in twin live births (%)	9.4	6.8	3.7	1.3	0.3	0.2
Percentage of cycles resulting in live births (%)	37.1	30.0	19.5	9.7	3.8	1.2
Percentage of cycles resulting in pregnancies (%)	42.6	36.4	26.9	16.4	8.8	2.7
<b>Outcomes per Transfer</b>						
Number of transfers	30,902	14,654	12,257	5,629	2,807	821
Percentage of transfers resulting in term, normal weight & singleton live births <sup>e</sup> (%)	29.7	25.4	18.6	11.5	5.2	1.9
Percentage of transfers resulting in singleton live births (%)	35.0	30.1	22.4	13.5	6.3	2.4
Percentage of transfers resulting in twin live births (%)	12.1	9.1	5.3	2.0	0.5	0.5
Percentage of transfers resulting in live births (%)	47.5	39.6	28.0	15.7	6.9	3.0
Percentage of transfers resulting in pregnancies (%)	54.6	48.1	38.6	26.5	16.0	6.7
<b>Frozen Embryos from Nondonor Eggs</b>						
Number of cycles	26,182	13,539	10,078	3,792	1,811	857
Number of transfers	24,740	12,626	9,343	3,460	1,643	765
Estimated average number of transfers per retrieval	1.3	1.1	0.8	0.6	0.4	0.3
Average number of embryos transferred	1.6	1.5	1.6	1.7	1.8	1.9
Percentage of embryos transferred resulting in implantation (%)	43.7	40.8	35.2	28.4	19.9	12.9
Percentage of transfers resulting in term, normal weight & singleton live births <sup>e</sup> (%)	30.7	30.6	27.1	23.3	16.8	9.5
Percentage of transfers resulting in singleton live births (%)	36.5	36.1	32.9	28.4	20.1	12.0
Percentage of transfers resulting in twin live births (%)	9.9	7.7	5.3	3.7	2.9	2.1
Percentage of transfers resulting in live births (%)	46.6	44.0	38.3	32.1	23.1	14.2
Percentage of transfers resulting in pregnancies (%)	56.6	54.1	49.7	44.7	34.4	22.9
<b>Number of Egg/Embryo Banking Cycles</b>	9,395	7,340	8,582	4,830	3,149	2,110
<b>Donor Eggs</b>						
		<b>Fresh Embryos<sup>f</sup></b>		<b>Frozen Embryos<sup>f</sup></b>		
Number of cycles		8,507		11,974		
Number of transfers		7,256		11,155		
Average number of embryos transferred		1.7		1.6		
Percentage of embryos transferred resulting in implantation (%)		53.0		38.7		
Percentage of transfers resulting in term, normal weight & singleton live births <sup>e</sup> (%)		32.2		25.0		
Percentage of transfers resulting in singleton live births (%)		39.5		32.9		
Percentage of transfers resulting in twin live births (%)		17.1		8.4		
Percentage of transfers resulting in live births (%)		56.8		41.5		
Percentage of transfers resulting in pregnancies (%)		66.8		51.7		

## CURRENT SERVICES & PROFILE

Number of reporting clinics: 458

### Percentage of clinics that allow cycles involving:

Donor eggs	93%	Gestational carriers	87%
Donor embryos	72%	Embryo cryopreservation	>99%
Single women	97%		

### Clinic profile:

SART member	81%
Verified lab accreditation	
Yes	92%
No	6%
Pending	2%

<sup>a</sup> Reflects features of fresh nondonor cycles. If IVF is less than 100%, the remaining cycles are GIFT, ZIFT, or a combination of these procedures with IVF.

<sup>b</sup> Total patient diagnosis percentages may be greater than 100% because more than one diagnosis can be reported for each ART cycle.

<sup>c</sup> Multiple-infant births (for example, twins) with at least one live infant are counted as one live birth.

<sup>d</sup> Total cycle number includes those using frozen eggs. It excludes 26 cycle(s) evaluating new procedures. Both cycle types are excluded from ART success rates.

<sup>e</sup> In this report, births are defined as term if at least 37 full weeks gestation and normal birth weight if at least 2,500 grams (approximately 5 pounds, 8 ounces).

<sup>f</sup> All ages are reported together because previous data show that patient age does not materially affect success with donor eggs.



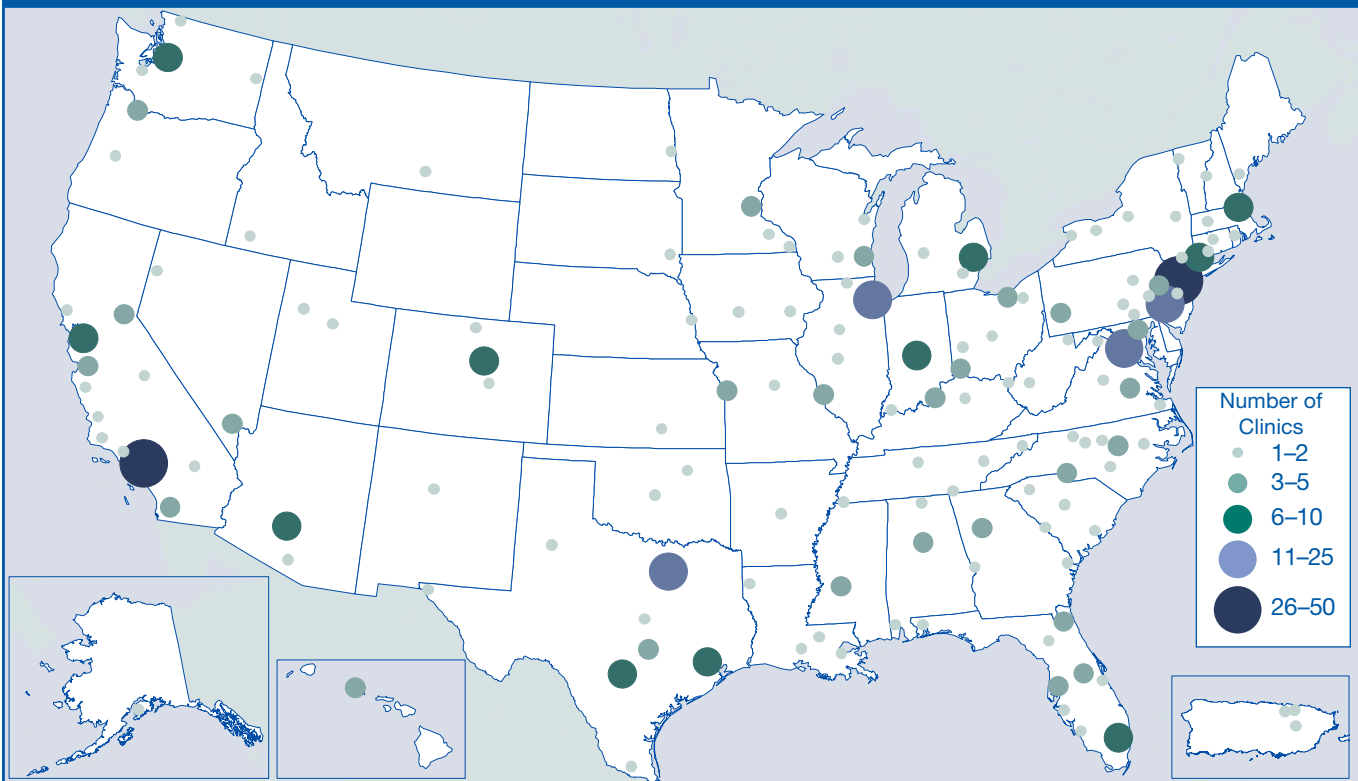
# SECTION 1: OVERVIEW

## Where are ART clinics located?

ART clinics are located throughout the United States. Figure 1 shows the locations of the 458 reporting clinics. Individual clinic tables with success rates and clinic profiles are published in the *2014 Fertility Clinic Success Rates Report*, arranged in alphabetical order by state, city, and clinic name. The number of clinics, cycles performed, live-birth deliveries, and infants born as a result of ART all have increased steadily

since CDC began collecting this information in 1995 (see Section 5, pages 49–59). Because in some cases more than one infant is born during a live-birth delivery (for example, twins), the total number of infants born is greater than the number of live-birth deliveries. CDC estimates that ART accounts for slightly less than 2% of total US births.

**Figure 1**  
Locations of ART Clinics in the United States and Puerto Rico, 2014



Number of ART clinics in the United States in 2014.....	498
Number of ART clinics that submitted data in 2014.....	458
Total number of ART cycles started in 2014 at clinics reporting data.....	208,604*
Number of live-birth deliveries resulting from ART cycles started in 2014.....	57,323
Number of infants born as a result of ART cycles started in 2014.....	70,354

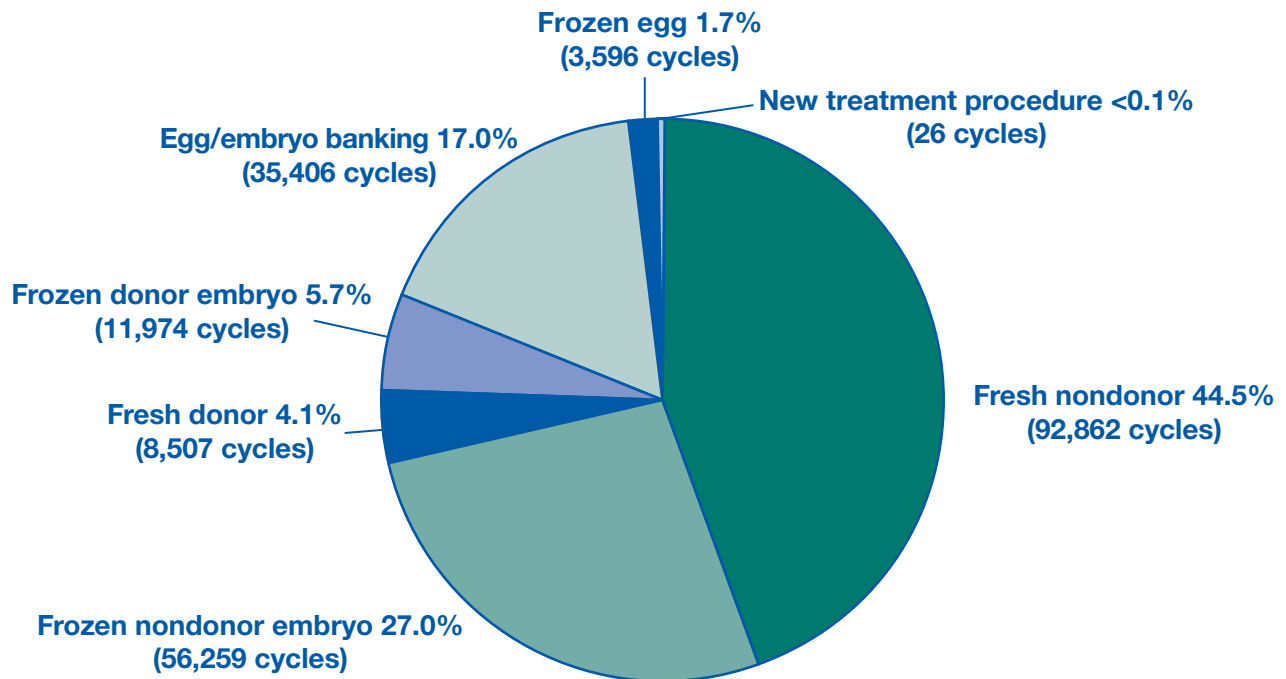
\* Total includes 35,406 cycles with the intent to freeze all eggs or embryos. Figure 1 live-birth deliveries and infants born are based on remaining 173,198 cycles with intent to transfer at least one egg or embryo. This includes 3,596 cycles with intent to fertilize previously frozen eggs and transfer resulting embryos. Figure 1 does not include 26 cycles evaluating a new treatment procedure. See the introduction on pages 3–4 for more details about the types of ART cycles performed and included in other figures.

## What types of ART cycles were performed?

For about 45% of ART cycles performed in the United States in 2014, fresh nondonor eggs or embryos were used (Figure 2). ART cycles that used frozen nondonor embryos were the next most common type, accounting for 27% of the total. In almost 10% of cycles, eggs or embryos were donated by another woman or couple. Slightly less than 2% of cycles were performed with the intent to fertilize previously

frozen eggs and transfer resulting embryos. There were 17% of cycles performed with the intent of freezing and storing (banking) all resulting eggs or embryos for potential future use. A very small number of cycles (less than 1%) involved the evaluation of a new treatment procedure. See the introduction on pages 3–4 for more details about the types of ART cycles performed and included in other figures.

**Figure 2**  
Types of ART Cycles—United States,\* 2014



\* Total does not equal 100% due to rounding.

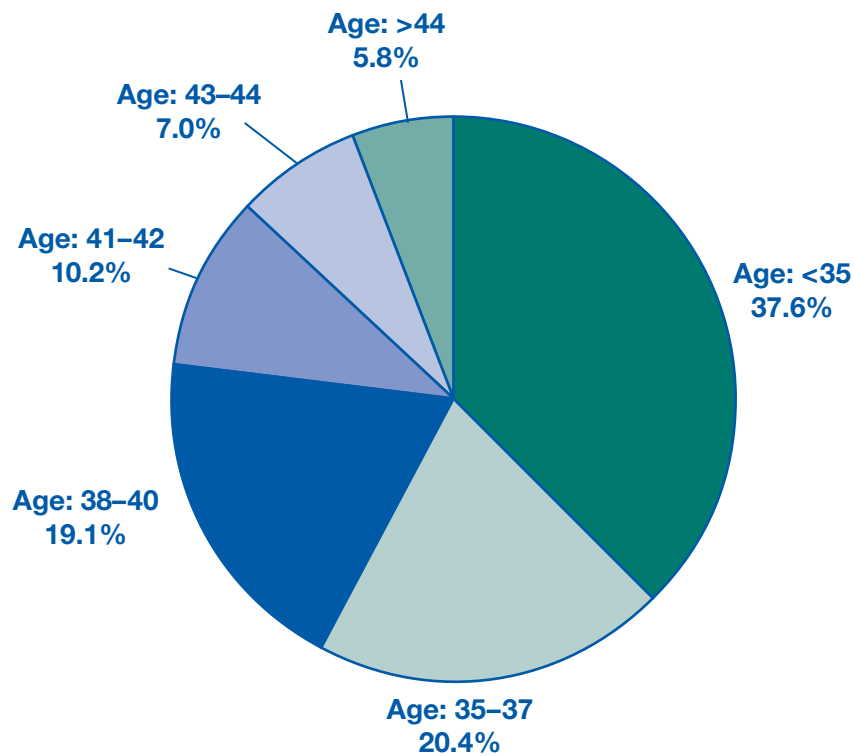


## How old were women who used ART?

As shown in Figure 3, which presents ART cycles performed in the United States in 2014 according to the age of the woman who had the procedure, the largest group of women using ART services were women younger than age 35. These women represented approximately 38% of all ART cycles performed in 2014. About 20% of ART cycles were performed among women aged 35–37, 19% among women aged 38–40, 10% among

women aged 41–42, 7% among women aged 43–44, and 6% among women older than age 44. The average age of women using ART services in 2014 was 36. Cycles using previously frozen eggs and cycles with the intent to bank all eggs or embryos are included in the data for this figure. See the introduction on pages 3–4 for more information about these cycle types.

**Figure 3**  
ART Use by Age Group—United States,\*† 2014



\* Based on 208,604 cycles.

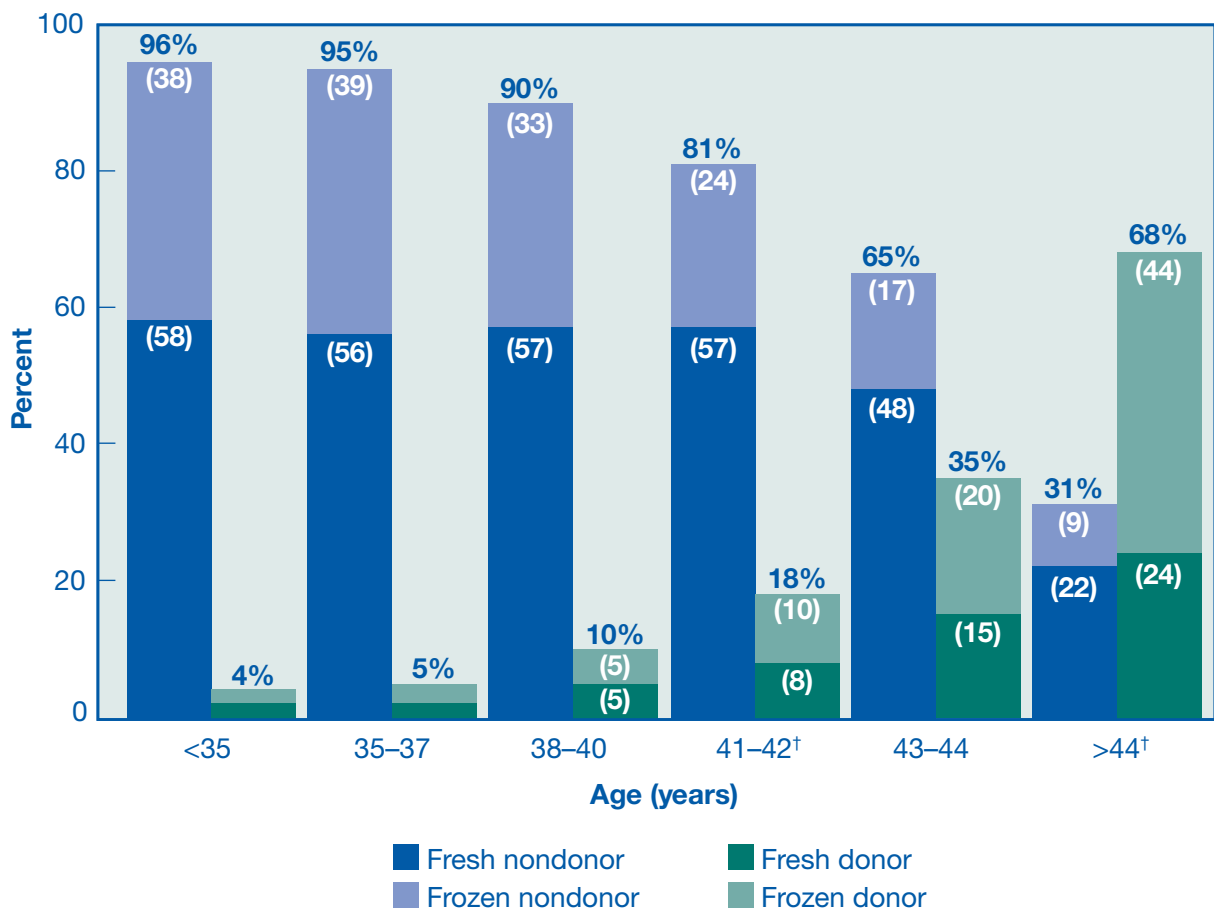
† Total does not equal 100% due to rounding.

## How did the types of ART cycles performed differ by a woman's age?

Figure 4 shows that, in 2014, the percentage of ART cycles in which a woman used her own eggs declined with age, while the percentage of ART cycles using a donor egg increased with age. The vast majority (96%) of women younger than age 35 used their own eggs (nondonor), and about 4% used donor eggs. In contrast, 35% of women aged 43–44 and 68% of women older than age 44

used donor eggs. Percentages of fresh nondonor cycles performed were greater than frozen nondonor cycles in all age groups. Percentages of fresh or frozen donor cycles were about the same in younger age groups. Percentages of frozen donor cycles were greater than fresh donor cycles in older age groups.

**Figure 4**  
Types of ART Cycles by Age Group—United States,\* 2014



\* Percentages of ART cycles that used fresh or frozen embryos from nondonor or donor eggs are in parentheses.

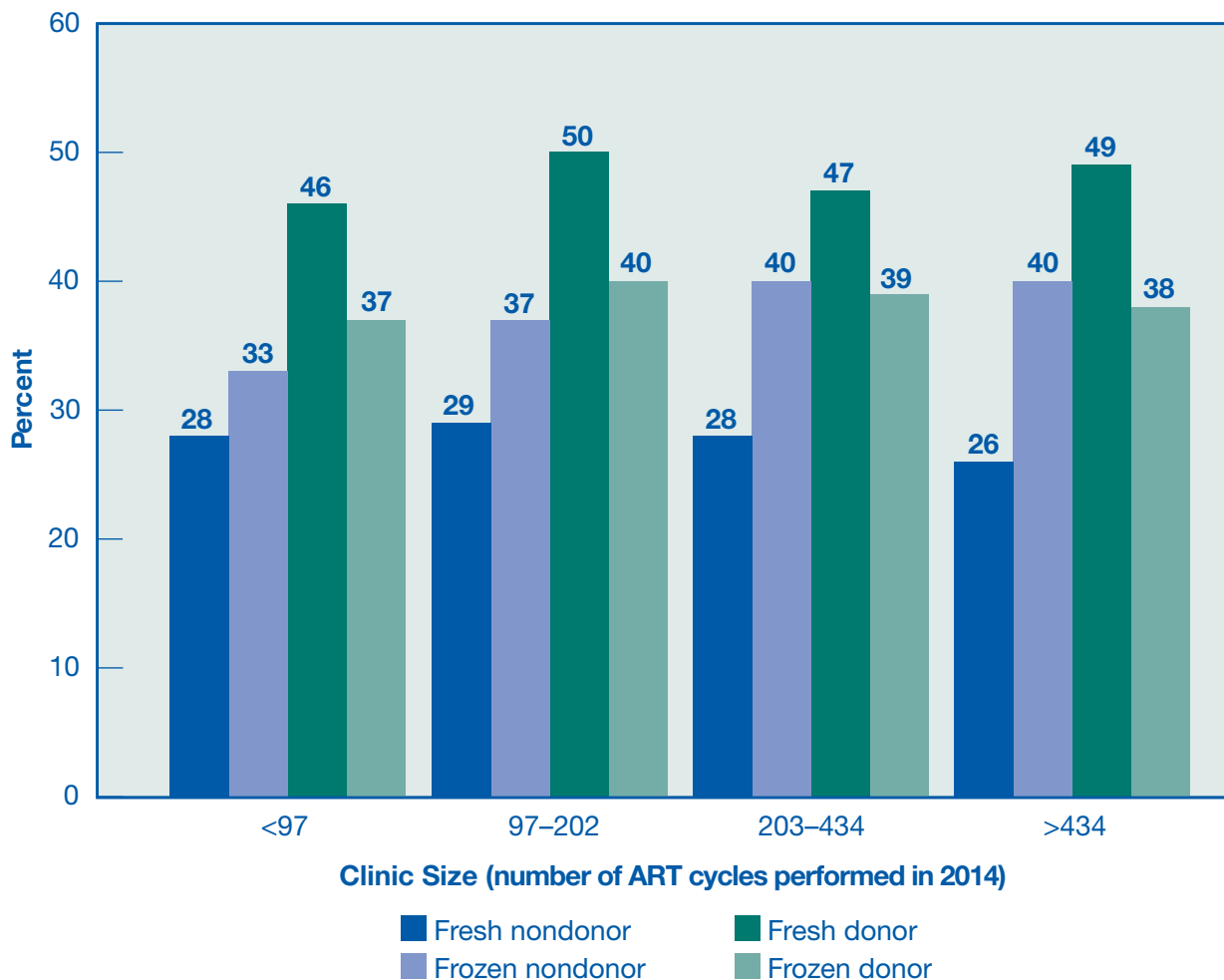
† Totals do not equal 100% due to rounding.

## What was the relationship between clinic size and the percentage of ART cycles that resulted in live births?

As shown in Figure 5, the number of ART procedures performed varied among fertility clinics in the United States. In 2014, the percentage of ART cycles that resulted in live births using frozen nondonor embryos generally increased as the clinic size increased. Less difference was observed in percentages of cycles resulting in live births by clinic size for fresh nondonor, or fresh or frozen donor cycles.

For Figure 5, clinics were divided equally into four groups from smallest to largest (called quartiles) based on the number of ART cycles they performed in 2014. The percentage for each group by type of ART shows the average percentage of ART cycles that resulted in live births for clinics in that group.

**Figure 5**  
Percentages of ART Cycles That Resulted in Live Births, by Type of ART and Clinic Size—United States, 2014



# SECTION 2: ART CYCLES USING FRESH NONDONOR EGGS OR EMBRYOS

## What are the steps for an ART cycle?

An ART **cycle is started** when a woman begins taking medication to stimulate the ovaries to develop eggs or, if no drugs are given, when the woman begins having her ovaries monitored (using ultrasound or blood tests) for natural egg production.

If eggs are produced, the cycle then progresses to **egg retrieval**, a surgical procedure in which eggs are collected from a woman's ovaries.

Once retrieved, eggs are combined with sperm in the laboratory. If fertilization is successful, one or more of the resulting embryos are selected for **transfer**, most often into a woman's uterus through the cervix (IVF), but sometimes into the fallopian tubes (GIFT or ZIFT).

If one or more of the transferred embryos implant within the woman's uterus, the cycle then may progress to clinical **pregnancy**.

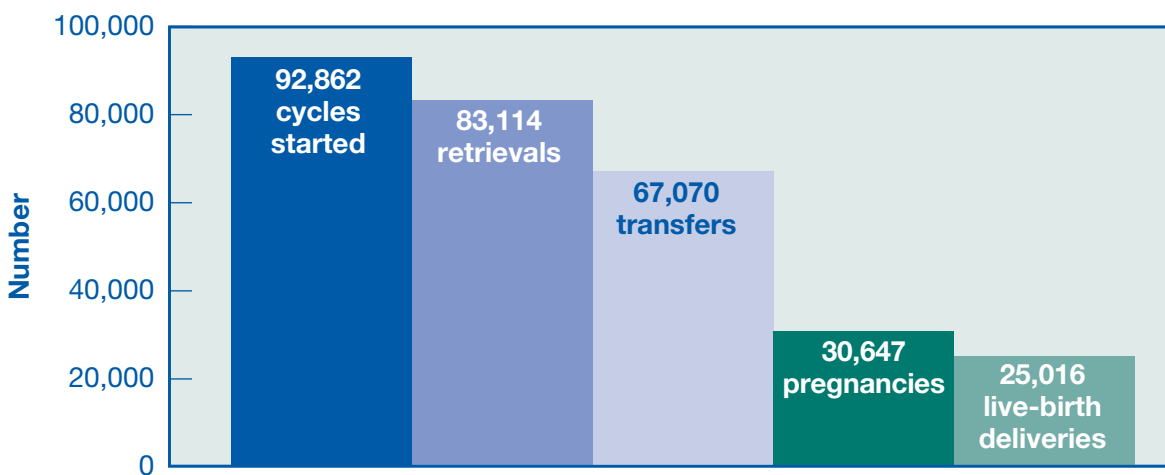
Finally, the pregnancy may progress to a **live birth**, the delivery of one or more live-born infants. (The birth of twins, triplets, or more is counted as one live birth.)

A cycle may be stopped at any step for specific medical reasons (for example, no eggs are produced or the embryo transfer was not successful) or by patient choice.

Figure 6 presents the steps for an ART cycle using fresh nondonor eggs or embryos and shows how ART patients in 2014 progressed through these stages toward pregnancy and live birth.

**Figure 6**

Outcomes of ART Cycles Using Fresh Nondonor Eggs or Embryos, by Stage, 2014

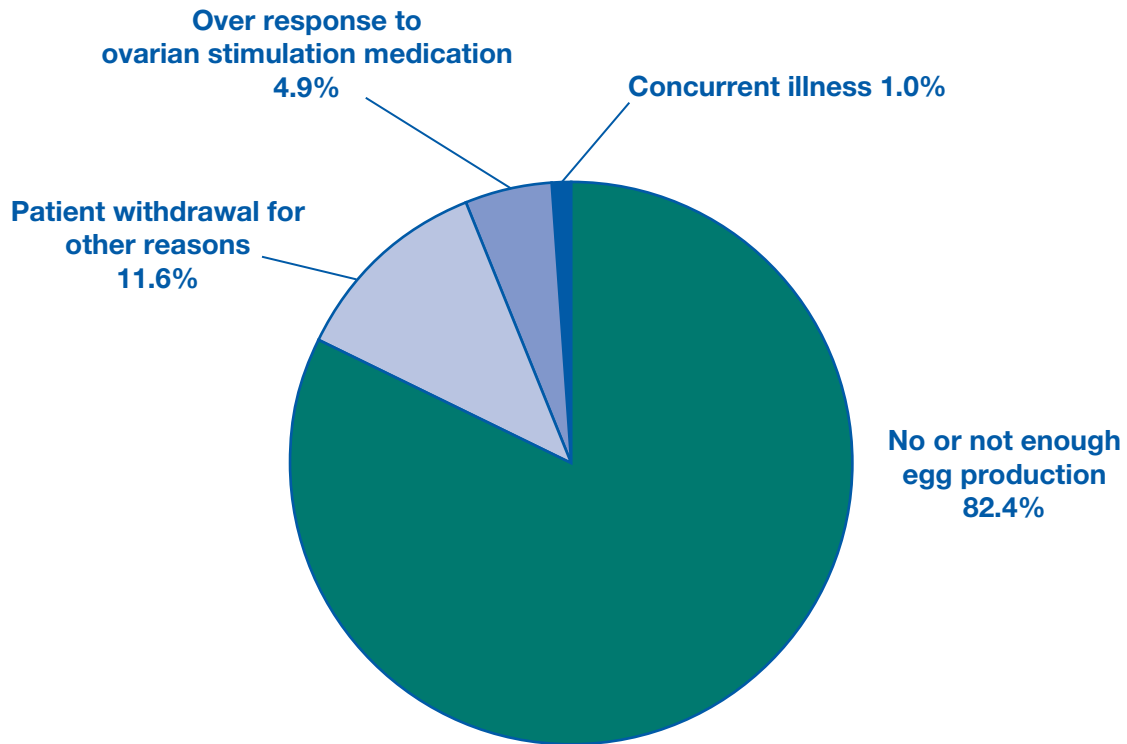


## Why were some ART cycles canceled?

In 2014, a total of 9,748 ART cycles (about 10% of all 92,862 cycles using fresh nondonor eggs or embryos) were canceled before the egg retrieval step (see Figure 6, page 12). Figure 7 shows the reasons that the cycles were canceled. For approximately 82% of these cycles, there was

no or not enough egg production. Other reasons included an over response to ovarian stimulation medications (that is, a potential for ovarian hyperstimulation syndrome), simultaneous illness, or patient withdrawal for other reasons.

**Figure 7**  
Reasons ART Cycles Using Fresh Nondonor Eggs or Embryos Were Canceled,\*† 2014



\* Based on 9,748 ART cycles.

† Total does not equal 100% due to rounding.

## How are success rates of ART measured?

Figure 8 shows success rates for ART cycles using fresh nondonor eggs or embryos in 2014. Most success measures have increased slightly since CDC began monitoring them in 1995 (see Section 5, pages 49–59).

**Percentage of cycles that resulted in a pregnancy.** This rate includes all cycles started, even if they were canceled before retrieval or stopped after retrieval but before transfer. Some cycles are canceled before retrieval for reasons shown in Figure 7 (page 13), or stopped after retrieval but before transfer for reasons such as embryos not surviving or poor quality embryos.

**Percentage of transfers that resulted in a pregnancy.** This rate is higher than the percentage of cycles that resulted in a pregnancy because cycles that did not move forward to a transfer are excluded.

**Percentage of cycles that resulted in a live birth (delivery of one or more live-born infants).** This rate includes all cycles started. This is referred to as the “basic live birth rate” in

the Fertility Clinic Success Rate and Certification Act of 1992. This is lower than the percentage of cycles that resulted in a pregnancy, because some pregnancies end in miscarriage, induced abortion, or stillbirth (see Figure 10, page 16).

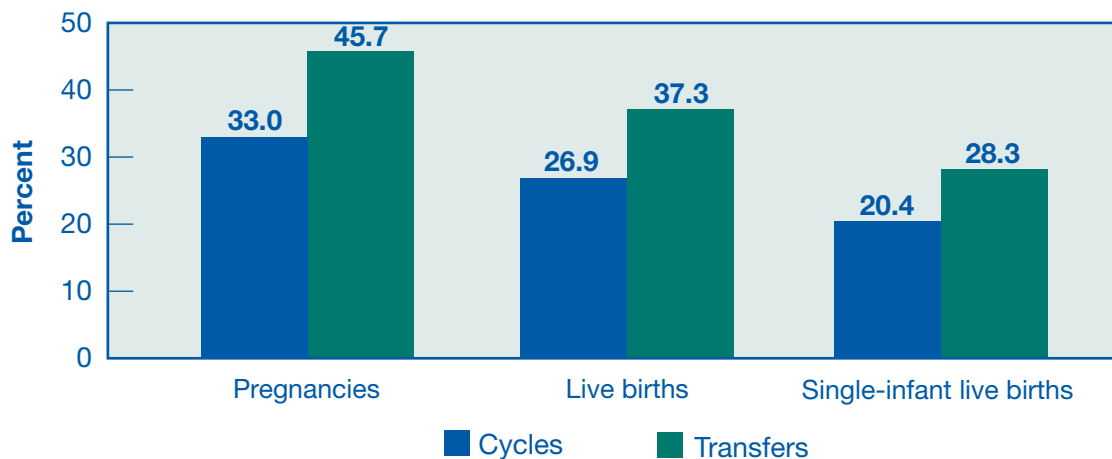
**Percentage of transfers that resulted in a live birth.** This rate is higher than the percentage of cycles that resulted in a live birth because cycles that did not move forward to a transfer are excluded.

**Percentage of cycles that resulted in a single-infant live birth.** This rate is important because single infants have a much lower risk than multiple infants of poor health outcomes, including prematurity, low birth weight, disability, and death.

**Percentage of transfers that resulted in a single-infant live birth.** This rate is higher than the percentage of cycles that resulted in a single-infant live birth because cycles that did not move forward to a transfer are excluded.

**Figure 8**

Percentages of ART Cycles and Transfers Using Fresh Nondonor Eggs or Embryos That Resulted in Pregnancies, Live Births, and Single-Infant Live Births, 2014



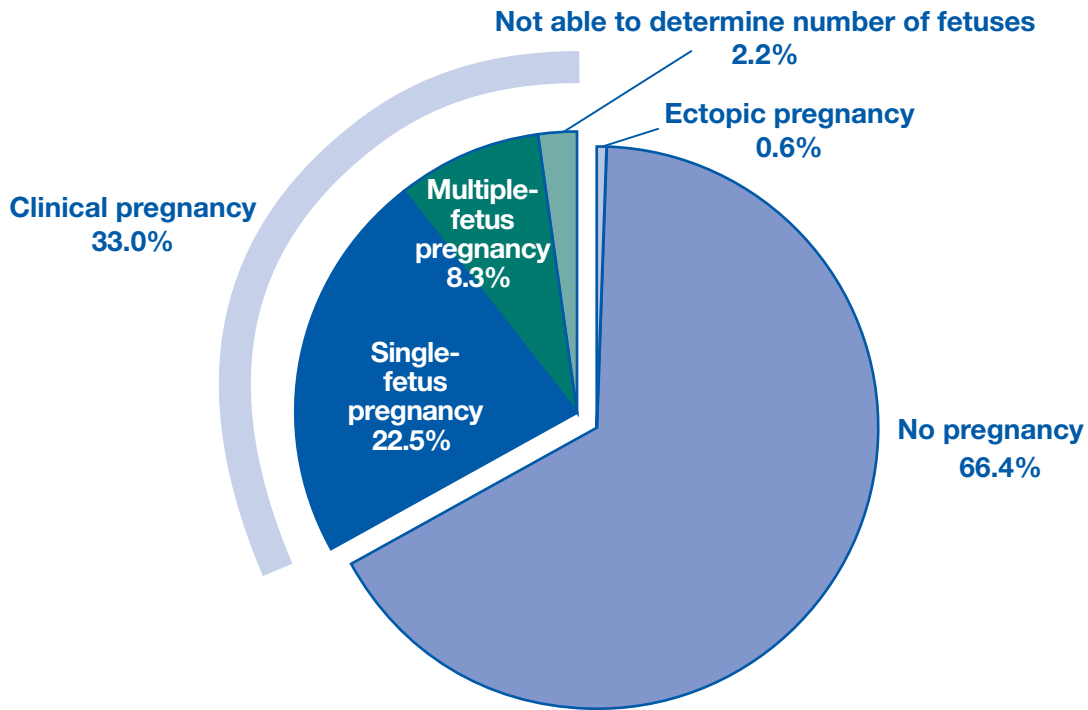


## What percentage of ART cycles resulted in a pregnancy?

In total, 33% of cycles using fresh nondonor eggs or embryos that were started in 2014 resulted in clinical pregnancy; about 23% resulted in a single-fetus pregnancy, 8% in a multiple-fetus pregnancy, and 2% in a pregnancy where the number of fetuses could not be

determined (Figure 9). However, most of these cycles (approximately 66%) did not produce a pregnancy while a very small proportion (less than 1%) resulted in an ectopic pregnancy with the embryo implanted outside the uterus.

**Figure 9**  
Outcomes of ART Cycles Using Fresh Nondonor Eggs or Embryos, 2014



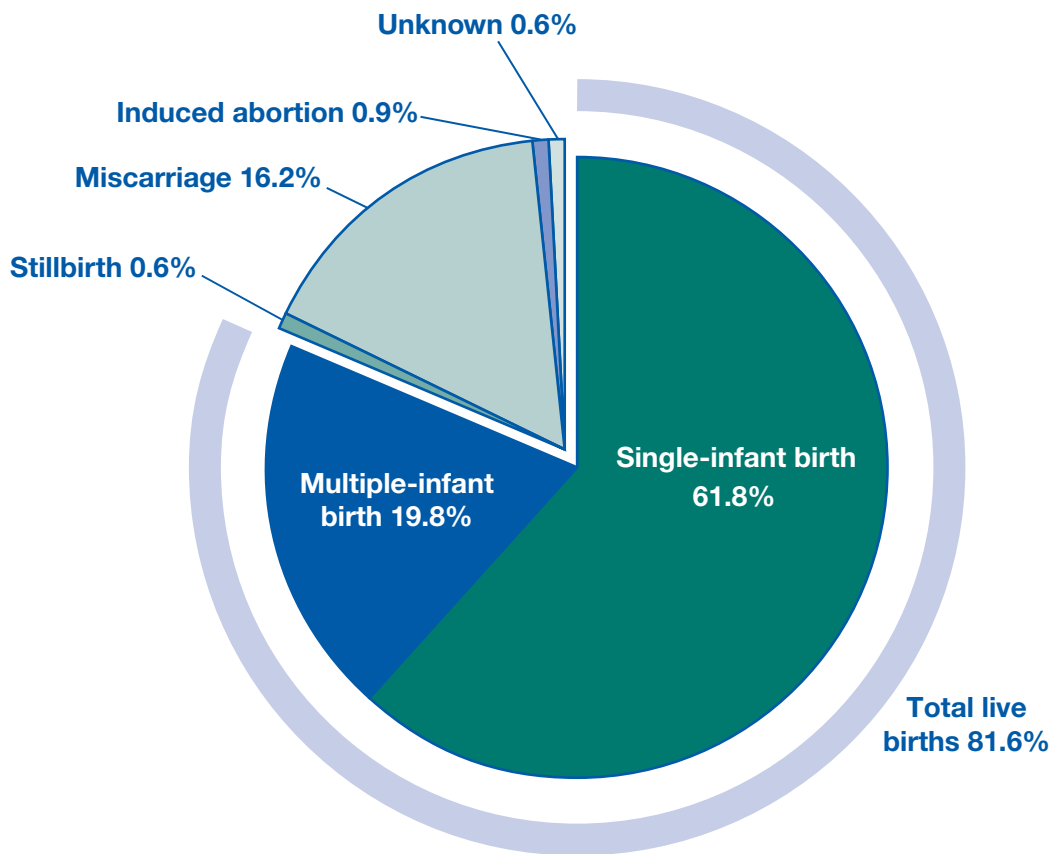
## What percentage of ART pregnancies resulted in a live birth?

Figure 10 shows that approximately 82% of the pregnancies resulting from ART cycles using fresh nondonor eggs or embryos in 2014 produced a live birth (about 62% were the birth of a single infant and 20% were the birth of multiple infants). About 18% of pregnancies resulted

in miscarriage, stillbirth, induced abortion, or maternal death prior to birth (maternal deaths are not shown in Figure 10 due to the small number). For less than 1% of pregnancies, the outcome was unknown.

**Figure 10**

Outcomes of Pregnancies That Resulted from ART Cycles Using Fresh Nondonor Eggs or Embryos,<sup>\*†</sup> 2014



\* Maternal deaths prior to birth are not displayed due to small number of cycles.

† Total does not equal 100% due to rounding.

## What percentage of ART cycles resulted in a multiple-fetus pregnancy or multiple-infant birth?

Part A of Figure 11 shows that among the 30,647 pregnancies that resulted from ART cycles using fresh nondonor eggs or embryos in 2014, about 68% were single-fetus pregnancies and 25% were multiple-fetus pregnancies. Approximately 7% of pregnancies ended before the number of fetuses could be accurately determined.

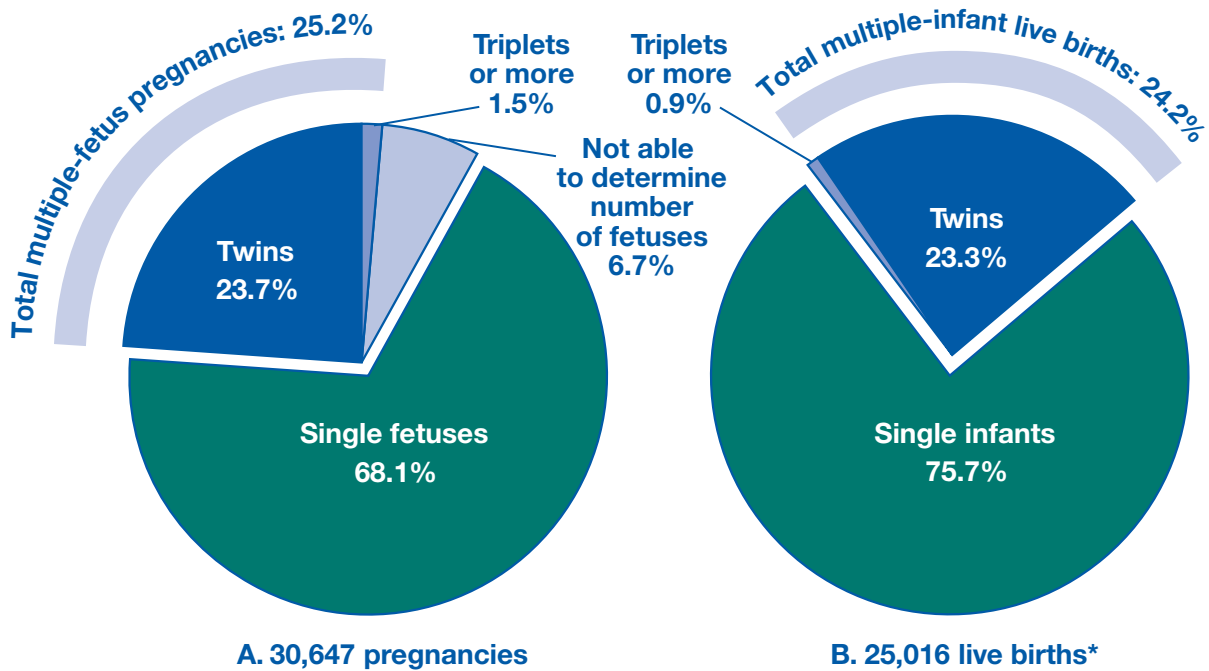
Of the 30,647 pregnancies that resulted from these ART cycles, 25,016 (82%) resulted in live

births. Part B of Figure 11 shows that about 24% of these live births resulted in more than one infant (23% twins and 1% triplets or more).

ART pregnancies are more likely to result in multiple-infant births (twins, triplets or more) than pregnancies resulting from natural conception because more than one embryo may be transferred.

**Figure 11**

Distribution of Multiple-Fetus Pregnancies and Multiple-Infant Live Births Among ART Cycles Using Fresh Nondonor Eggs or Embryos, 2014



\* Total does not equal 100% due to rounding.

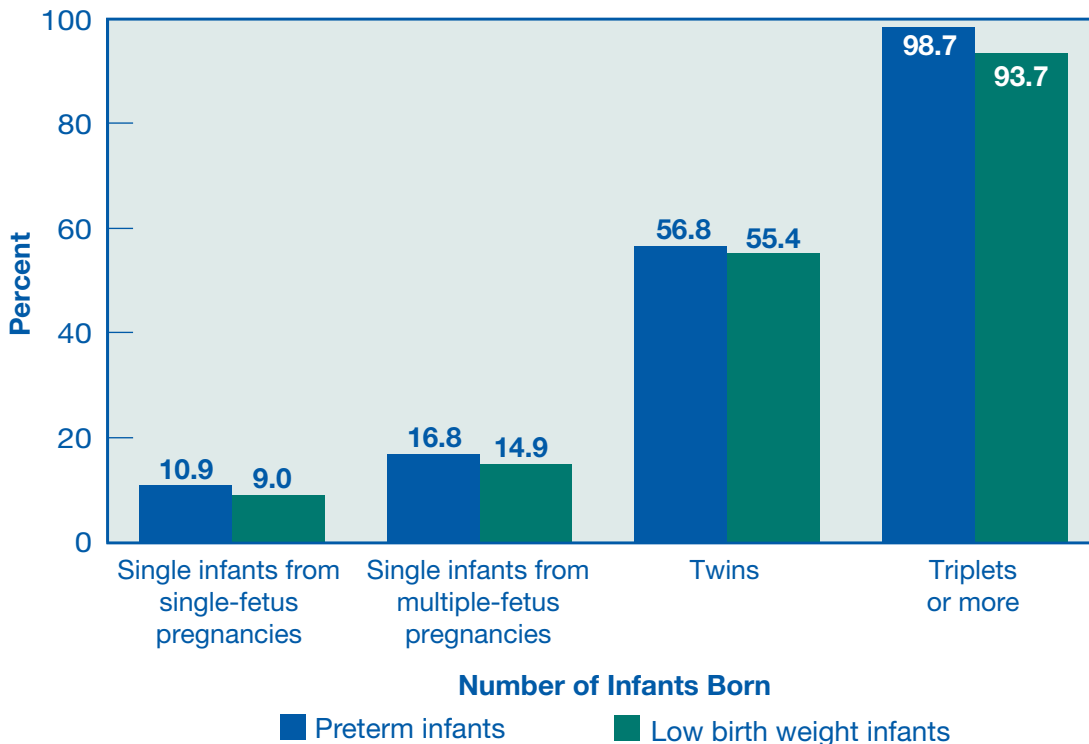
## What percentage of ART cycles resulted in a preterm or low birth weight infant?

Percentages of preterm and low birth weight infants resulting from ART cycles that used fresh nondonor eggs or embryos in 2014 increased as the number of infants born increased (Figure 12). Preterm infants are born to a woman giving birth before 37 full weeks of pregnancy and low birth weight infants are born weighing less than 2,500 grams (about 5 pounds, 8 ounces). Infants born preterm or with low birth weight are at greater risk of death in the first year of life, as well as other poor health outcomes, including visual and hearing problems, intellectual and learning disabilities, and behavioral and emotional problems throughout life. Preterm and low birth weight infants also can cause considerable emotional and economic burdens for families.

For births resulting in a single live-born infant, percentages of preterm infants and low birth weight infants are shown separately for single- and multiple-fetus pregnancies. Among single live-born infants, percentages of preterm and low birth weight infants were higher for those from multiple-fetus pregnancies. In the general US population, where the live birth of a single infant is almost always the result of a single-fetus pregnancy, 10% of single live-born infants were preterm and 6% of single infants had low birth weight (data not shown).

**Figure 12**

Percentages of Preterm Infants or Infants with Low Birth Weight from ART Cycles Using Fresh Nondonor Eggs or Embryos, by Number of Infants Born, 2014



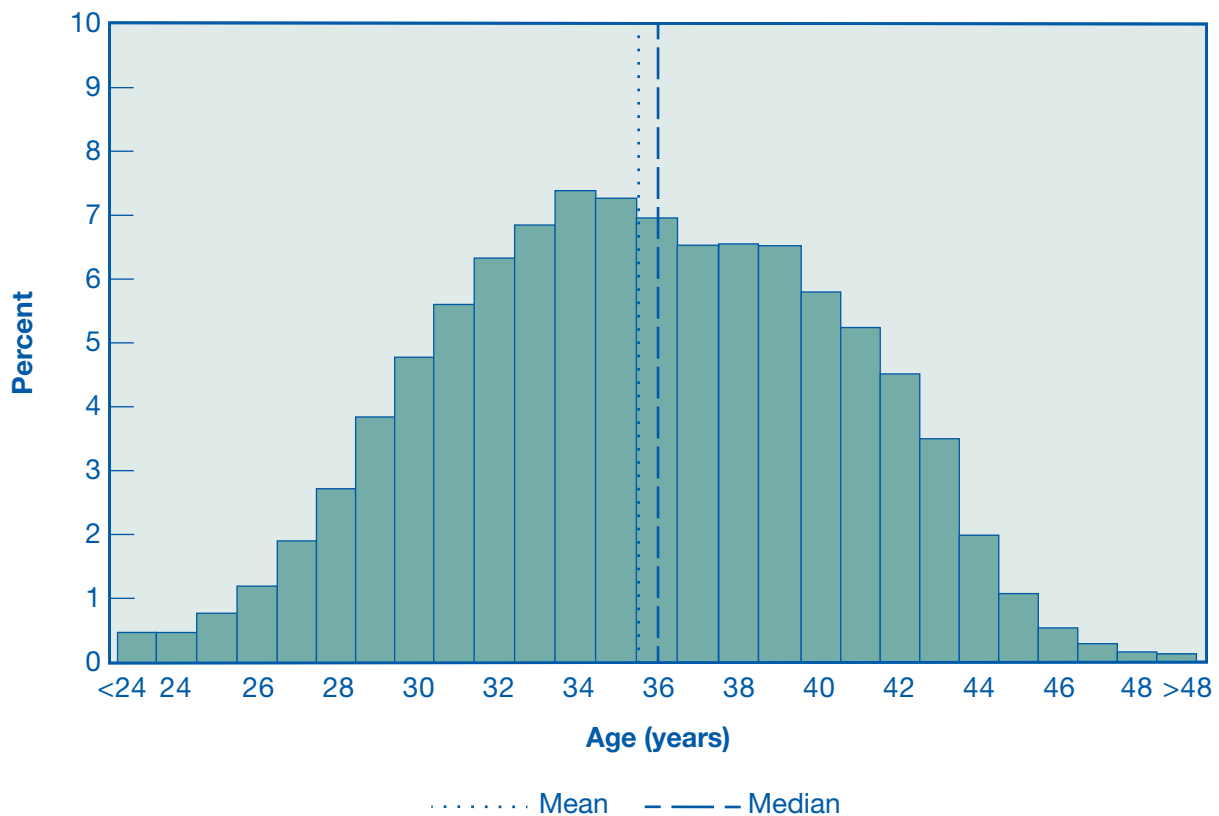
## What were the ages of women who used ART?

The average (mean) age of women who had ART cycles using fresh nondonor eggs or embryos in 2014 was slightly more than 35 and the median age was 36 (Figure 13). About 12% of these

cycles were among women younger than age 30, 65% were among women aged 30–39, and 23% were among women aged 40 or older.

**Figure 13**

Age Distribution of Women Who Had ART Cycles Using Fresh Nondonor Eggs or Embryos, 2014



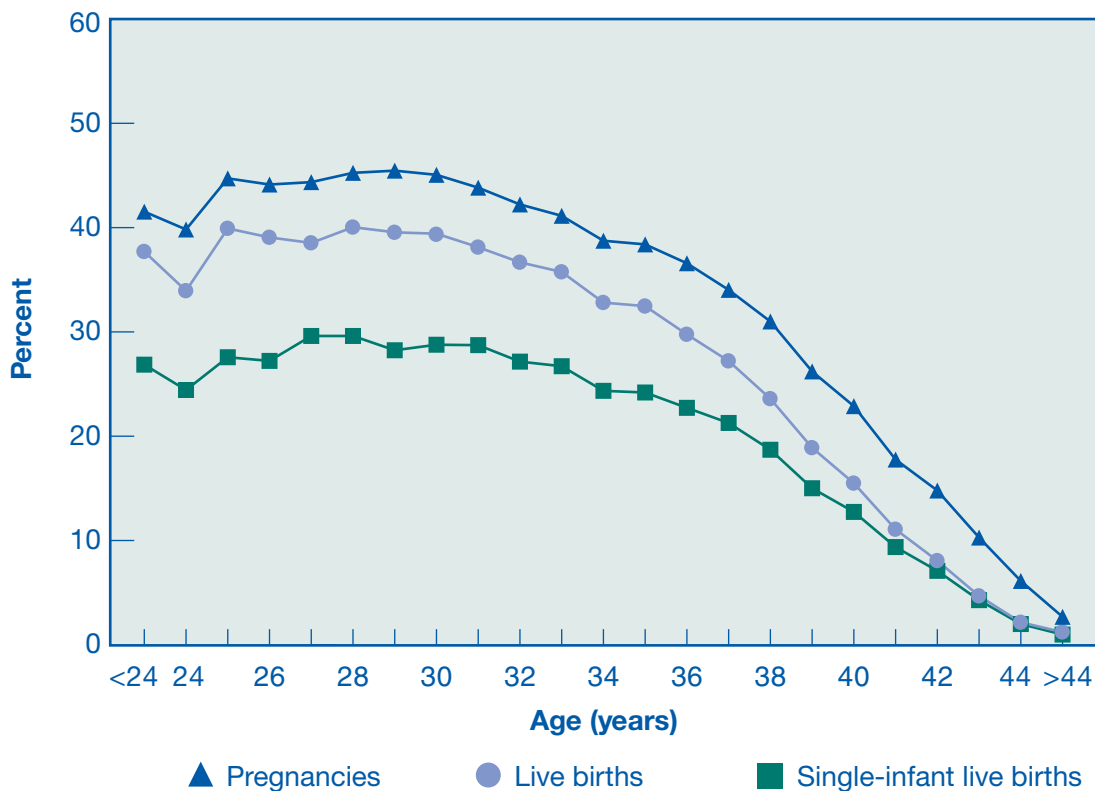
## Did the percentage of pregnancies, live births, and births of a single live infant differ by a woman's age?

Among women in their 20s, percentages of ART cycles using fresh nondonor eggs or embryos in 2014 that resulted in pregnancies, live births, and single-infant live births were relatively stable; however, percentages declined among women in their 30s onward (Figure 14). A woman's age is the most important factor for having a live birth when her own eggs are used. Percentages of ART cycles resulting in total live births and births of a

single live infant are different because multiple-infant deliveries count towards the total live births. The percentage of multiple-infant births is particularly high among women younger than age 35 (see Figure 29, page 35). For additional detail on percentages of ART cycles that resulted in pregnancies, live births, and single-infant live births among women aged 40 or older, see Figure 15 on page 21.

**Figure 14**

Percentages of ART Cycles Using Fresh Nondonor Eggs or Embryos That Resulted in Pregnancies, Live Births, and Single-Infant Live Births, by Age of Woman,\* 2014



\* For consistency, all percentages are based on cycles started.



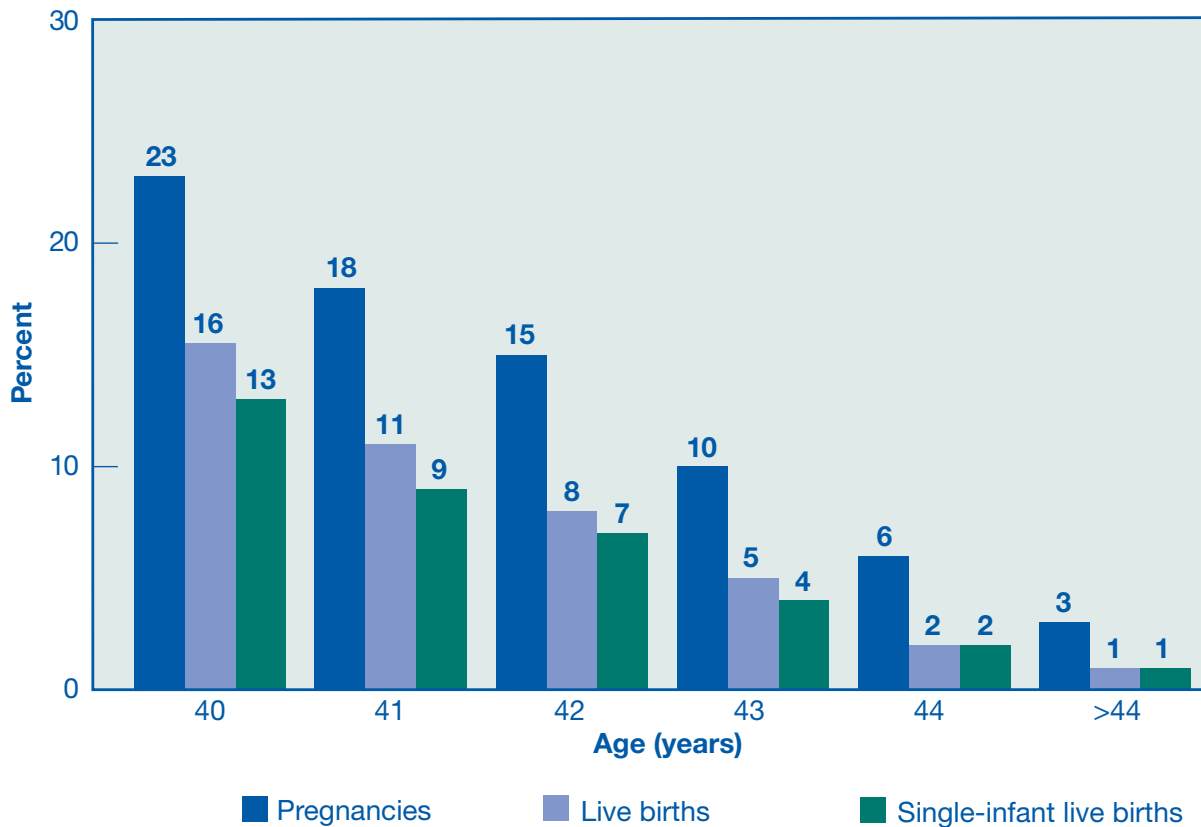
## How did the percentage of ART cycles that resulted in pregnancies, live births, and births of single live infants differ among women aged 40 or older?

For women aged 40 or older, percentages of ART cycles using fresh nondonor eggs or embryos in 2014 that resulted in pregnancies, live births, and single-infant live births declined as a woman's age increased (Figure 15). Among women age 40, the percentage of ART cycles resulting in pregnancy was 23%, the percentage of ART cycles resulting in live births was about 16%, and

the percentage of ART cycles resulting in single-infant live births was 13%. Percentages dropped steadily with each 1-year increase in age. Among women older than age 44, percentages of live births and single-infant live births were 1%. Women aged 40 or older generally have much higher percentages of live births using donor eggs (see Figure 40, page 46).

**Figure 15**

Percentages of ART Cycles Using Fresh Nondonor Eggs or Embryos That Resulted in Pregnancies, Live Births, and Single-Infant Live Births Among Women Aged 40 or Older,\* 2014



\* For consistency, all percentages are based on cycles started.

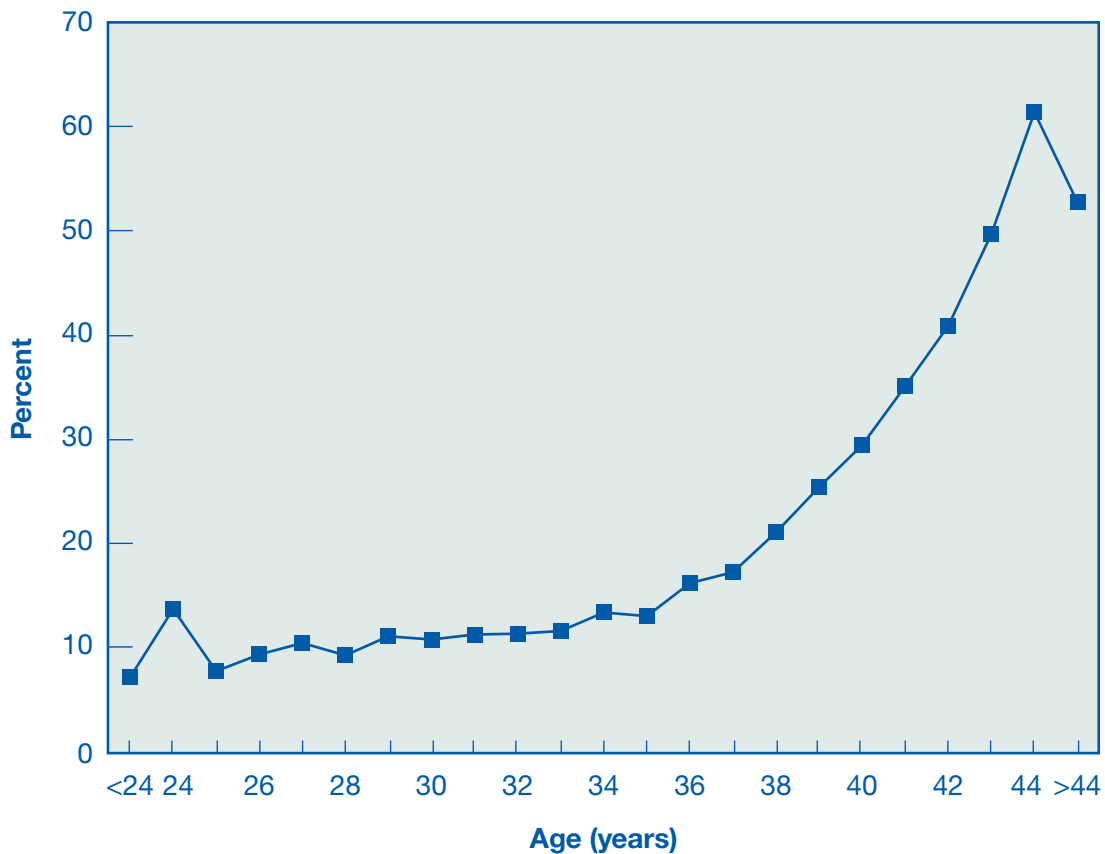
## How did the percentage of cycles that resulted in miscarriage differ by a woman's age?

Percentages of ART cycles using fresh nondonor eggs or embryos in 2014 that resulted in miscarriage were below 14% among women aged 35 or younger (Figure 16). The percentage of ART cycles that resulted in miscarriage began to increase rapidly among women in their late 30s and continued to increase through age 44, reaching more than 29% at age 40 and over 60% among women age 44.

A woman's age not only affects the percentage of cycles resulting in pregnancy when her own eggs are used, but also her risk of miscarriage. Previous data show that most miscarriages occur before week 14 (during the first trimester) among women of all ages undergoing ART. The risk of miscarriage among women undergoing ART procedures using fresh nondonor eggs or embryos appears to be similar to those reported in various studies of other pregnant women in the United States.

**Figure 16**

Percentages of ART Cycles Using Fresh Nondonor Eggs or Embryos That Resulted in Miscarriage, by Age of Woman, 2014



## How did a woman’s age affect ART cycle progress and outcomes?

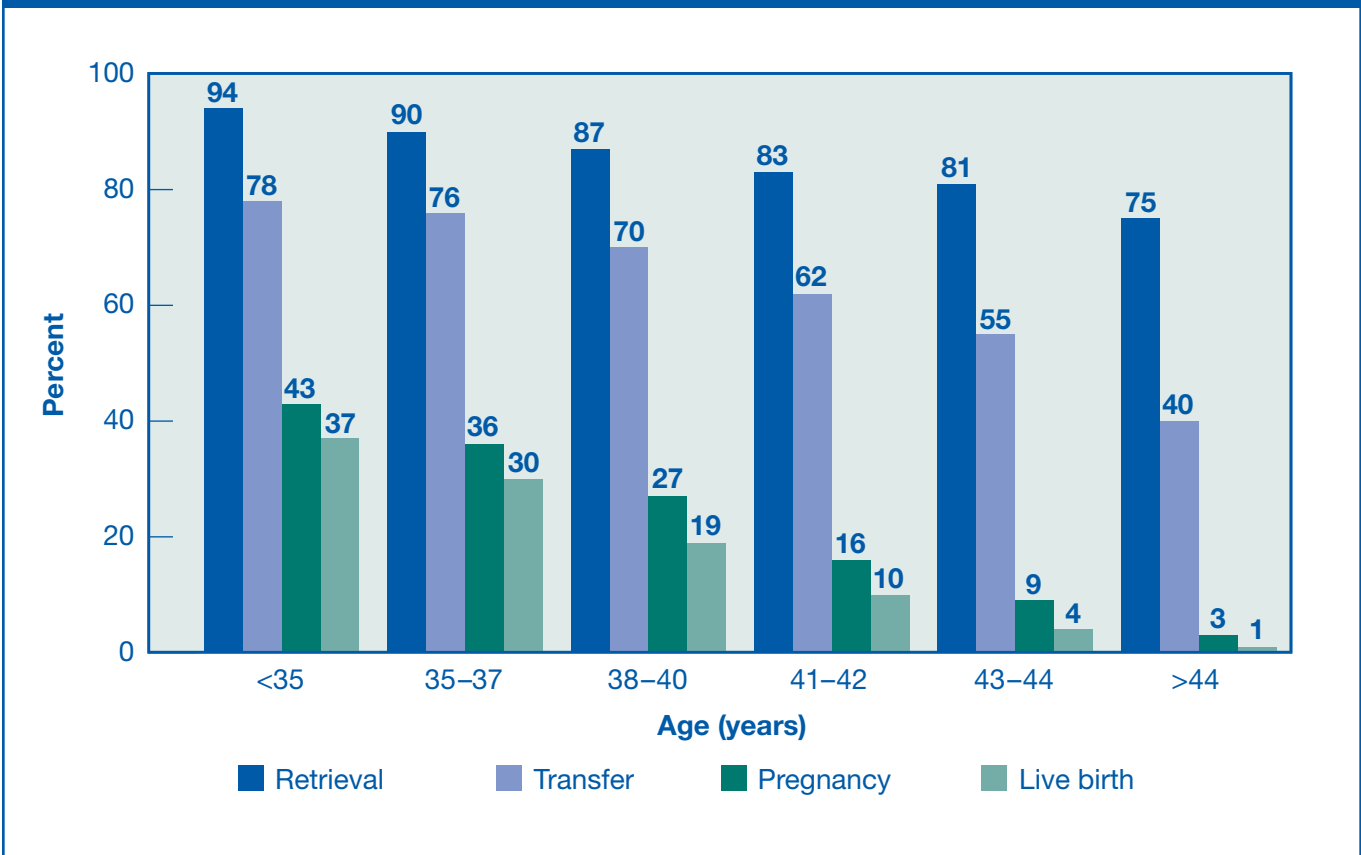
Figure 17 shows that the percentage of cycles progressing from the beginning of ART to pregnancy and live birth using a woman’s own eggs decreases at every stage of ART as her age increases. Overall, 37% of cycles started in 2014 among women younger than age 35 resulted in live births. This percentage decreased to 30% among women aged 35–37, 19% among women aged 38–40, 10% among women aged 41–42, 4% among women aged 43–44, and 1% among women older than age 44.

As women get older:

- The likelihood of a successful response to ovarian stimulation and progression to **egg retrieval** decreases.
- Cycles that progress to egg retrieval are less likely to reach **transfer**.
- Cycles that progress to transfer are less likely to reach **pregnancy**.
- Cycles that progress to pregnancy are less likely to result in a **live birth** because the percentage of cycles ending in miscarriage increases (see Figure 16, page 22).

**Figure 17**

Outcomes of ART Cycles Using Fresh Nondonor Eggs or Embryos, by Stage and Age Group, 2014



## What were the causes of infertility among ART patients?

Causes of infertility among ART patients include:

**Tubal factor.** Fallopian tubes are blocked or damaged, making it difficult for the egg to be fertilized or for an embryo to travel to the uterus.

**Ovulatory dysfunction.** Ovaries are not producing eggs normally. Reasons include polycystic ovary syndrome and multiple ovarian cysts.

**Diminished ovarian reserve.** The ability of the ovary to produce eggs is reduced. Reasons include congenital, medical, or surgical causes or advanced age.

**Endometriosis.** The presence of tissue similar to the uterine lining in abnormal locations. This condition can affect both fertilization of the egg and embryo implantation.

**Uterine factor.** A structural or functional disorder of the uterus that results in reduced fertility.

**Male factor.** A low sperm count or problems with sperm function that make it difficult for a sperm to fertilize an egg under normal conditions.

**Other factor.** Includes immunological problems, chromosomal abnormalities, chemotherapy, and serious illnesses.

**Unknown factor.** No clear cause of infertility is found in either partner.

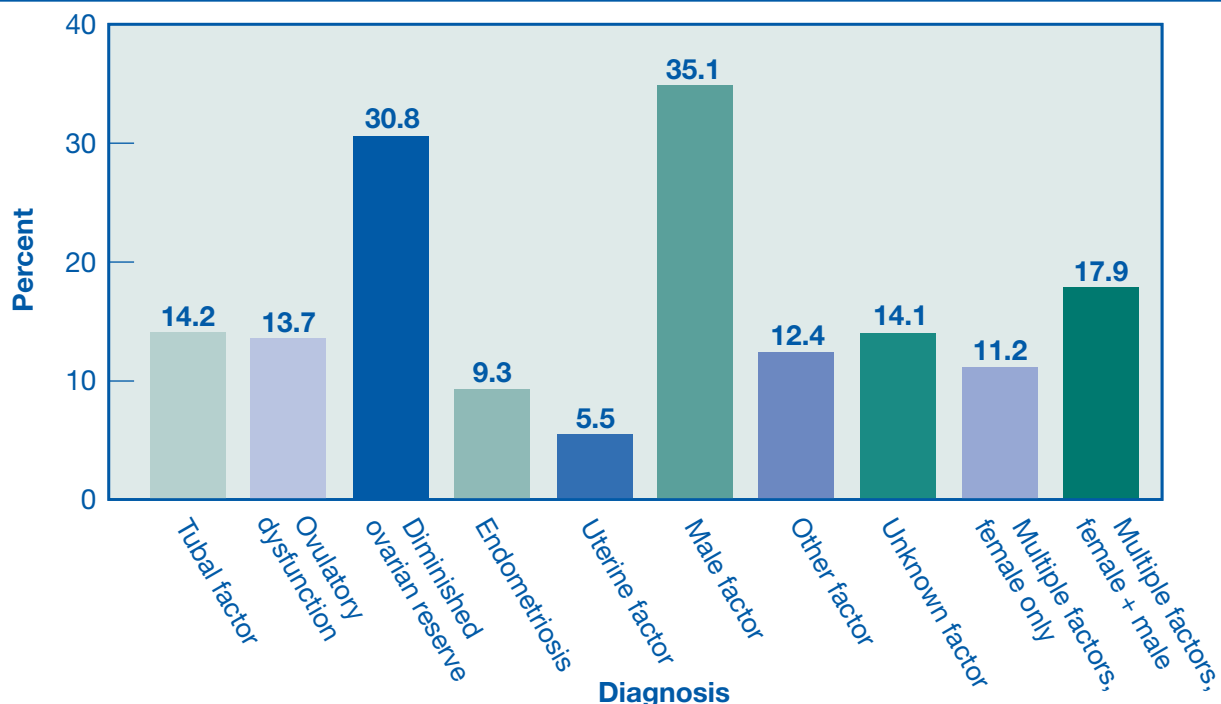
**Multiple factors, female only.** More than one female cause of infertility, and no male factor infertility.

**Multiple factors, female and male.** One or more female causes in addition to male factor infertility.

Figure 18 shows infertility diagnoses reported for each ART cycle using fresh nondonor eggs or embryos performed in 2014. Diagnoses ranged from one infertility factor in the patient or partner to multiple infertility factors in either one or both. However, diagnostic procedures may vary among clinics, so the categorizations also may vary.

**Figure 18**

Percentages of ART Cycles Using Fresh Nondonor Eggs or Embryos, by Type of Infertility Diagnosis,\* 2014



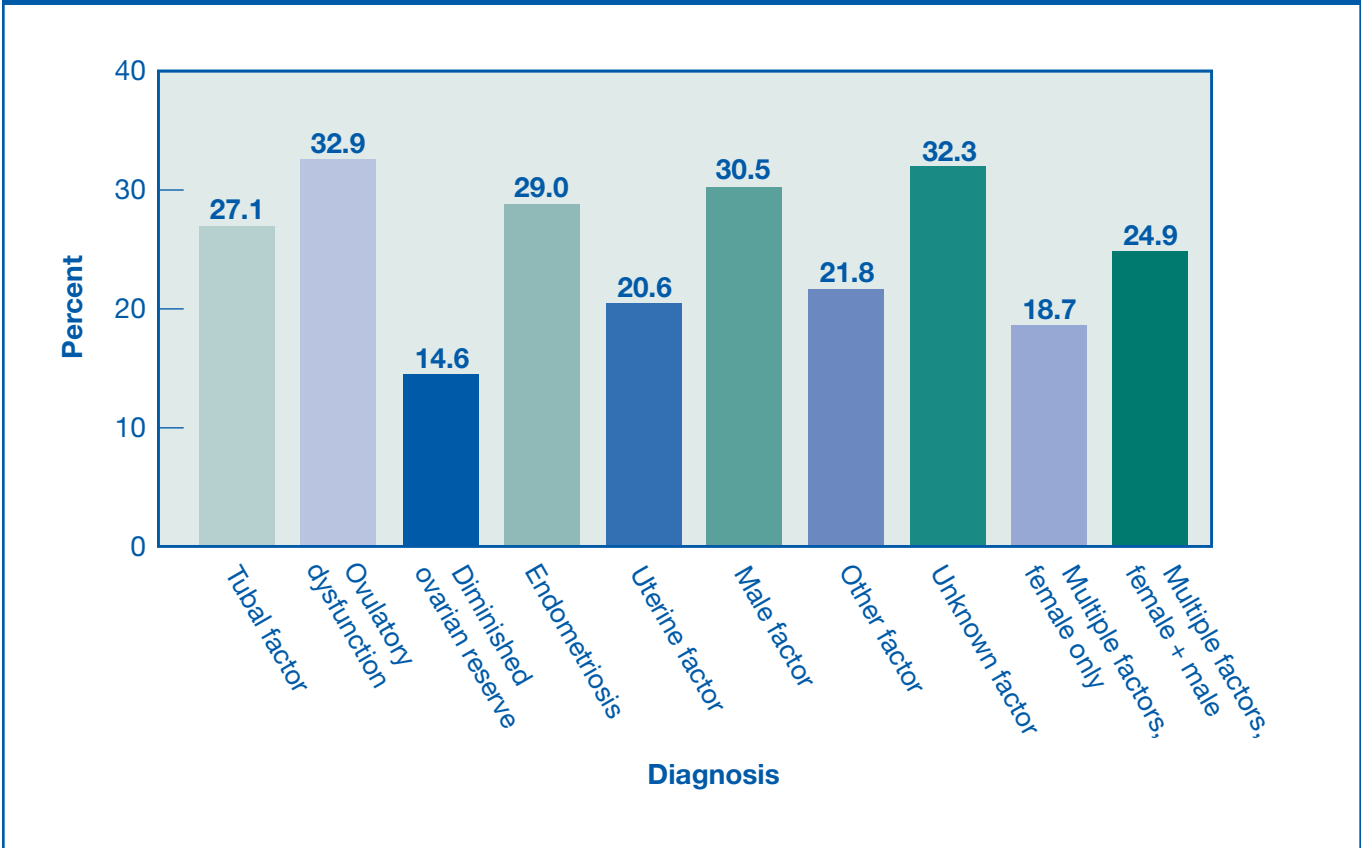
\* Total percentages are greater than 100% because more than one diagnosis can be reported for each cycle.

# How did the type of infertility diagnosis affect the percentage of ART cycles that resulted in live births?

The percentage of fresh nondonor ART cycles resulting in live births was 27% nationally in 2014 (see Figure 8, page 14). However, this percentage varied depending on the patient’s diagnosis. In 2014, the percentage of ART cycles using fresh nondonor eggs or embryos that resulted in live

births was *higher* than the national percentage for patients with tubal factor, ovulatory dysfunction, endometriosis, male factor, or unknown factor infertility; it was *lower* for patients with diminished ovarian reserve, uterine factor, “other” factor, or multiple infertility factors (Figure 19).

**Figure 19**  
Percentages of ART Cycles Using Fresh Nondonor Eggs or Embryos That Resulted in Live Births, by Type of Infertility Diagnosis, 2014



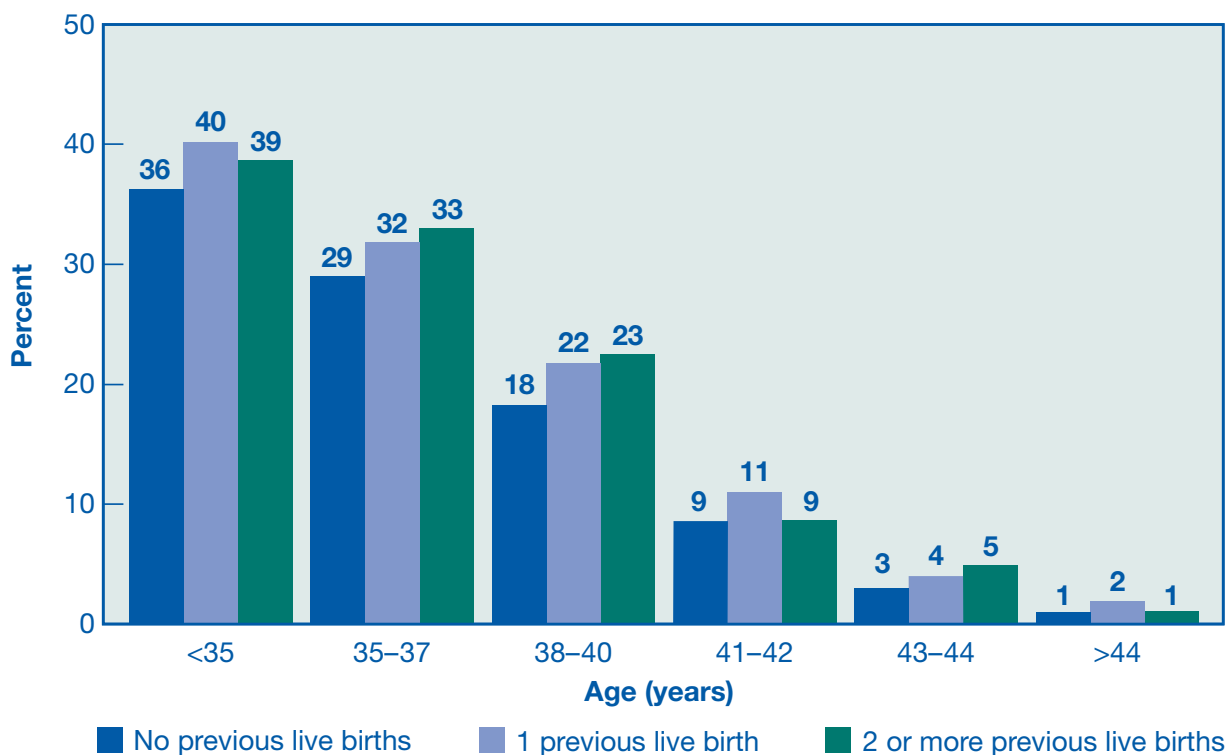
## How did previous birth impact ART live-birth outcomes?

Overall, the percentage of ART cycles using fresh nondonor eggs or embryos in 2014 that resulted in live births decreased with age, regardless of number of previous live births (Figure 20). Previous live-born infants could have been conceived naturally or through ART. In all age groups, the percentage of ART cycles that resulted in live births was higher among women who had one previous live birth compared with women who had no previous live births. In

most age groups, the percentage of ART cycles resulting in live births also was higher with two or more previous live births compared with no previous live births. Almost 73% of ART cycles performed in 2014 using fresh nondonor eggs or embryos were among women who had no previous live births, although they may have had a previous pregnancy that resulted in miscarriage or an induced abortion.

**Figure 20**

Percentages of ART Cycles Using Fresh Nondonor Eggs or Embryos That Resulted in Live Births, by Age Group and Number of Previous Live Births, 2014



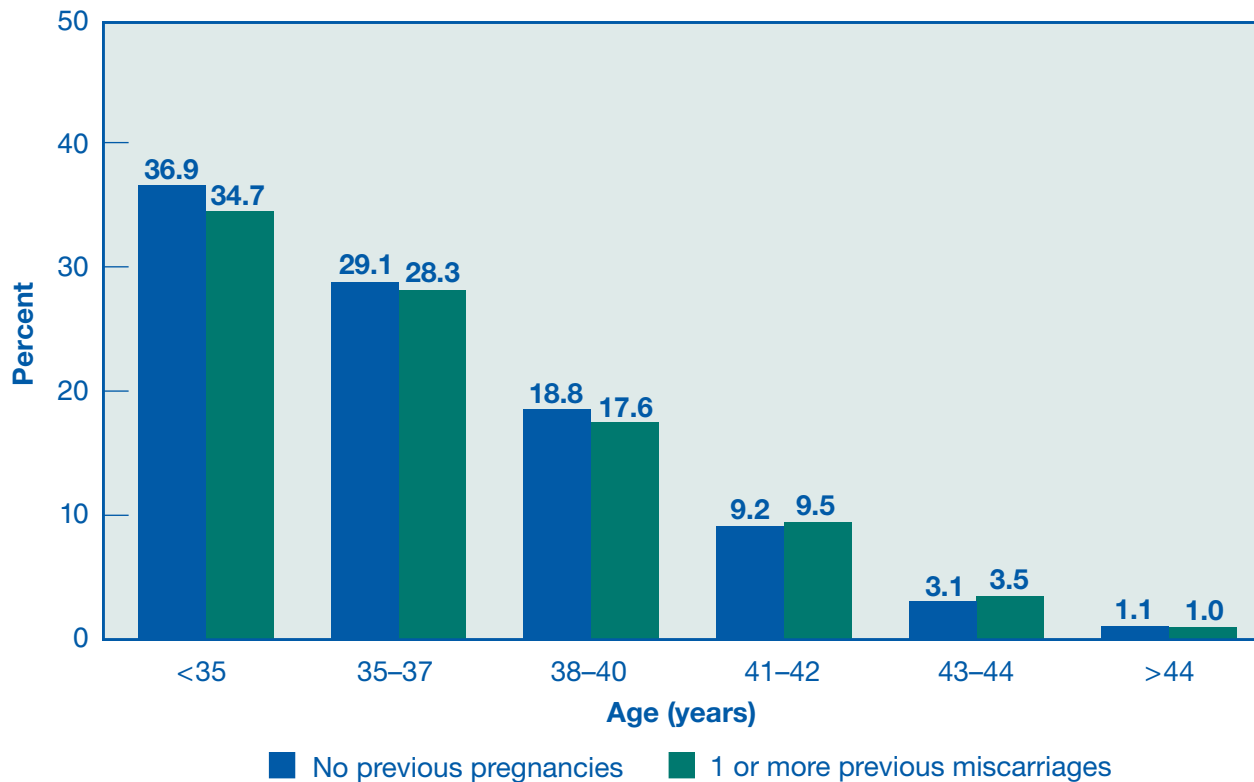
## How did previous miscarriage impact ART live-birth outcomes among women with no previous births?

In younger age groups, the percentage of ART cycles using fresh nondonor eggs or embryos that resulted in live births was lower among women who had one or more previous miscarriages compared with women who never were pregnant (Figure 21). Previous pregnancies ending in miscarriage could have been conceived naturally or through ART. In older age groups, the percentage of ART cycles that resulted in live

births was higher or about the same with one or more previous miscarriage compared with never pregnant. In 2014, a total of 67,529 ART cycles using fresh nondonor eggs or embryos were performed among women who had not previously given birth. However, about 24% of those cycles were reported by women with one or more previous pregnancies that resulted in miscarriage.

**Figure 21**

Percentages of ART Cycles Using Fresh Nondonor Eggs or Embryos That Resulted in Live Births, by Age Group and History of Miscarriage, Among Women with No Previous Births,\* 2014



\* Women reporting only previous ectopic pregnancies or pregnancies that ended in induced abortion are not included.

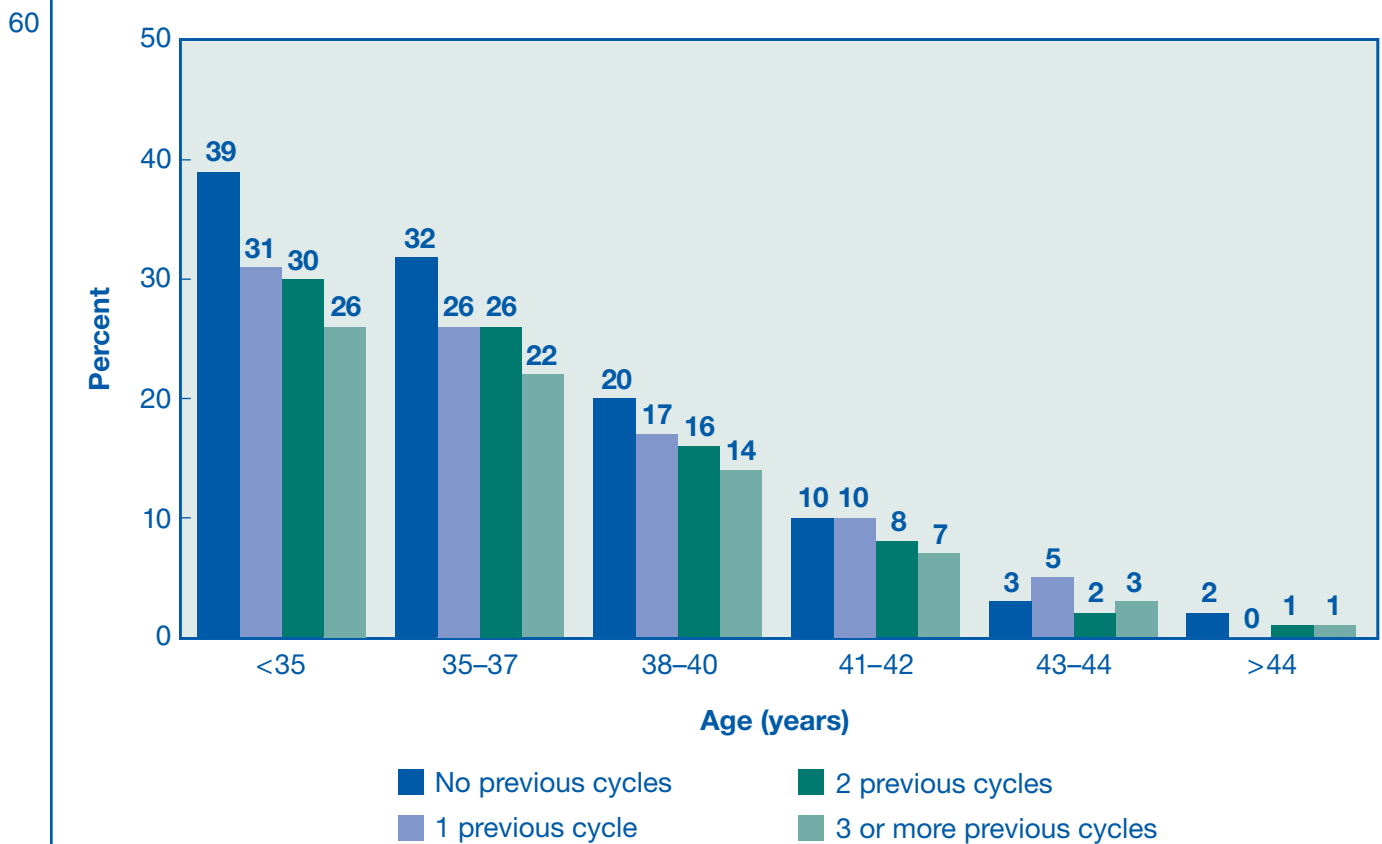
## How did previous unsuccessful ART use impact ART live-birth outcomes among women with no previous births?

In most age groups, the percentage of ART cycles using fresh nondonor eggs or embryos that resulted in live births was lower among women who previously had one or more unsuccessful ART cycles compared with women who had no previous ART cycles and no previous births (Figure 22). Generally, in younger age groups,

the percentage of ART cycles resulting in live births decreased as the number of previous unsuccessful ART cycles increased. For about 42% of fresh nondonor ART cycles performed in 2014, one or more previous ART cycles were reported (this percentage includes previous ART cycles using either fresh or frozen embryos).

**Figure 22**

Percentages of ART Cycles Using Fresh Nondonor Eggs or Embryos That Resulted in Live Births, by Age Group and Number of Previous ART Cycles, Among Women with No Previous Live Births, 2014



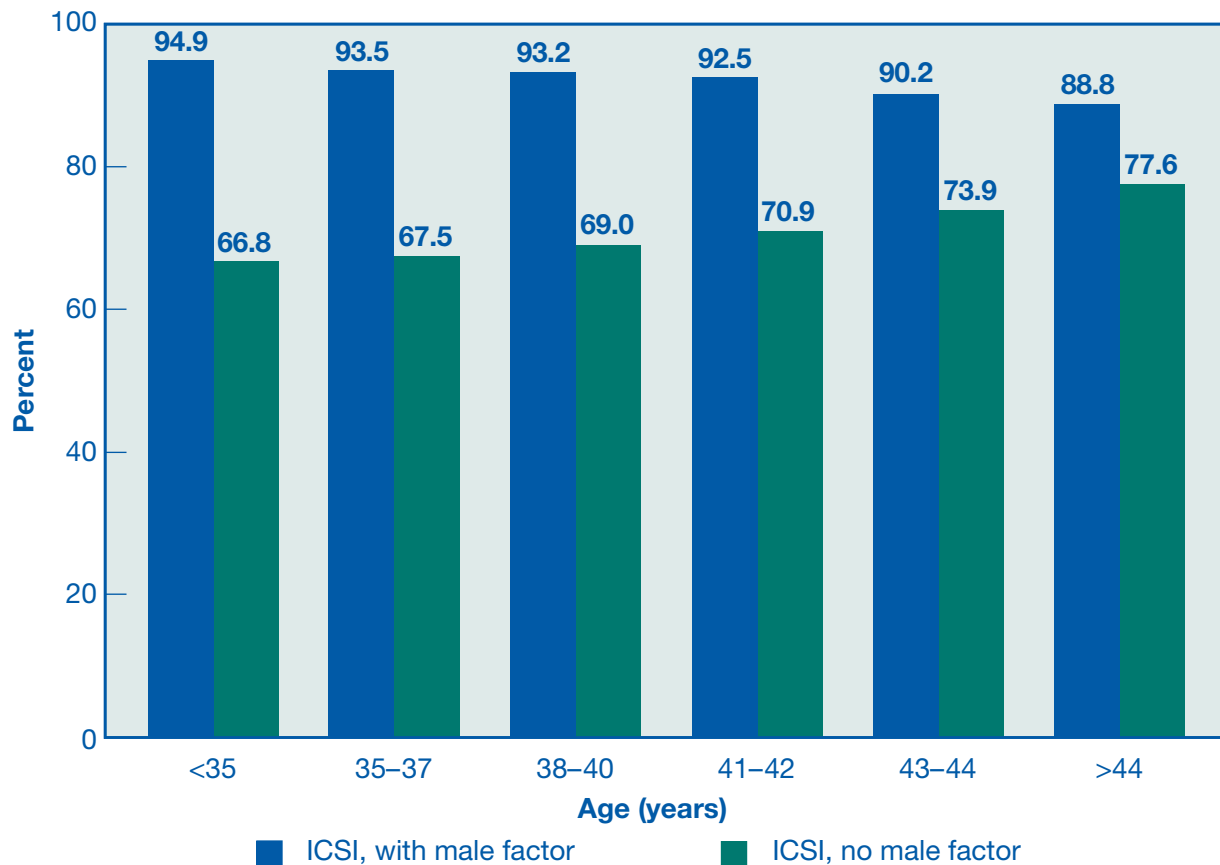


## Did the use of ICSI differ by age group or by male factor infertility diagnosis?

The use of intracytoplasmic sperm injection (ICSI) was more common among patients with male factor infertility (Figure 23). ICSI was developed to overcome problems with fertilization that sometimes occur with a diagnosis of male factor infertility. The use of ICSI among patients with a diagnosis of male factor infertility was high among all female patient age groups, ranging from 89% in patients older than age 44 to 95% in patients younger than age 35. In all age groups, the

percentage of fresh nondonor retrievals that used ICSI was lower for patients with no diagnosis of male factor infertility than among patients with a male factor diagnosis. The percentage of retrievals using ICSI in the group without male factor infertility ranged from 67% among patients younger than age 35 to 78% among those older than age 44.

**Figure 23**  
Percentages of Retrievals Using Fresh Nondonor Eggs or Embryos That Used ICSI, 2014



## How did ICSI use and male factor infertility impact live-birth outcomes?

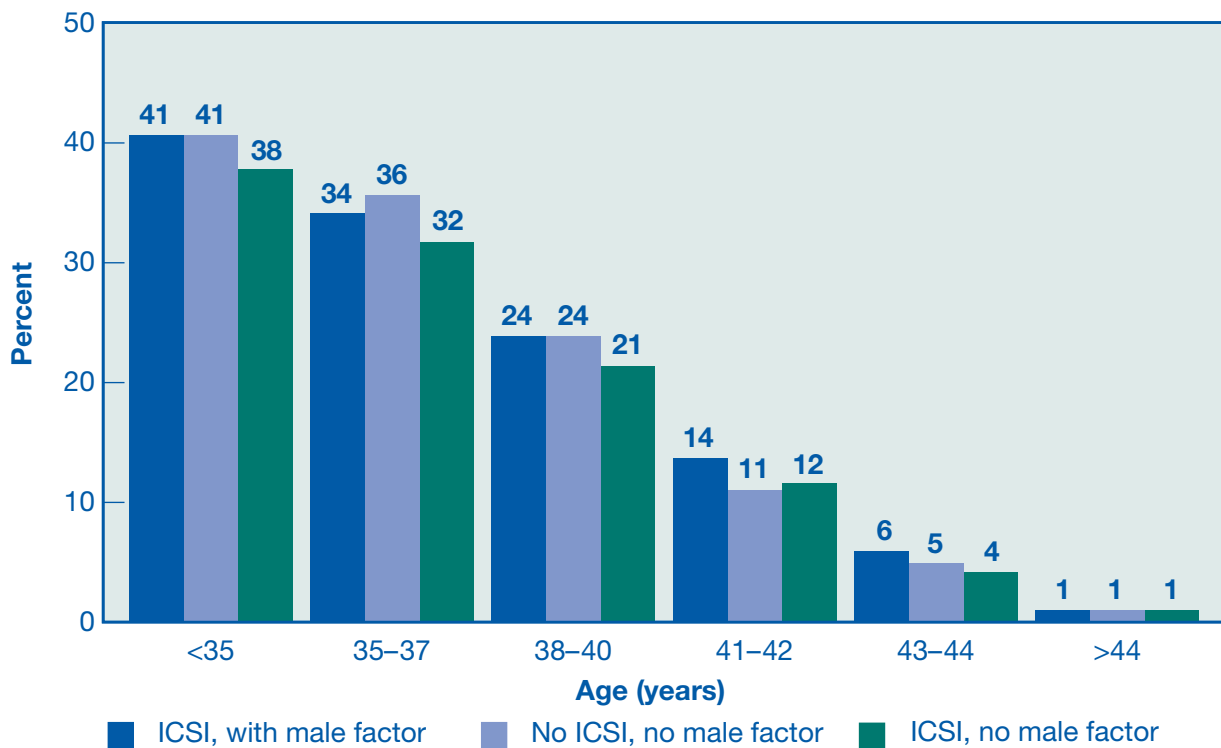
When ICSI was used for patients with male factor infertility, percentages of retrievals that resulted in live births were higher in all female patient age groups except greater than 44 compared with those using ICSI without a diagnosis of male factor infertility (Figure 24). In most age groups, for patients without male factor infertility, percentages of retrievals resulting in live births were lower or the same for those using ICSI compared with those not using ICSI. In 2014, 86% of cycles with a diagnosis of male factor infertility used IVF with ICSI, but slightly more

than half (56%) of all ICSI procedures were performed in cycles without a diagnosis of male factor infertility.

Note that definitions of infertility diagnoses may vary among clinics, and no information was available to determine whether this finding was a direct effect of using ICSI or differences in patient characteristics among those who used ICSI compared with those who did not use ICSI. Therefore, differences in live-birth outcomes should be interpreted with caution.

**Figure 24**

Percentages of Fresh Nondonor Retrievals That Resulted in Live Births Among Patients with or Without Diagnosed Male Factor Infertility, by Age Group and Use of ICSI,\* 2014



\* Cycles using donor sperm and cycles using GIFT or ZIFT are excluded.

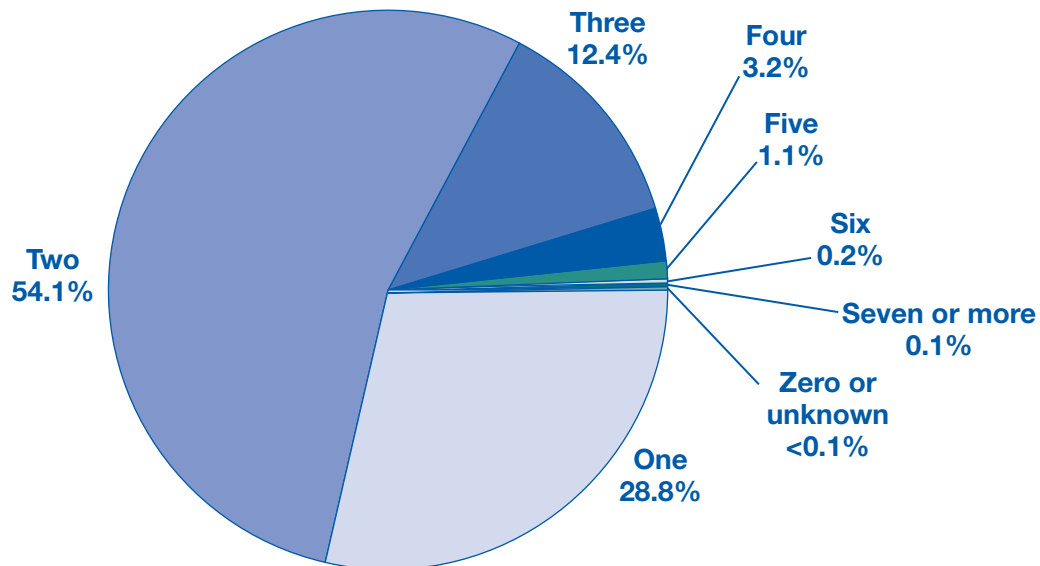
## How many embryos were typically transferred in an ART procedure?

Figure 25 shows that in 2014, the majority (83%) of ART cycles that used fresh nondonor eggs or embryos and progressed to the embryo transfer stage involved the transfer of one or

two embryos, 12% involved the transfer of three embryos, 3% involved the transfer of four embryos, and 1% involved the transfer of five or more embryos.

**Figure 25**

Numbers of Embryos Transferred Among All Transfers Using Fresh Nondonor Eggs or Embryos,\* 2014



\* Total does not equal 100% due to rounding.

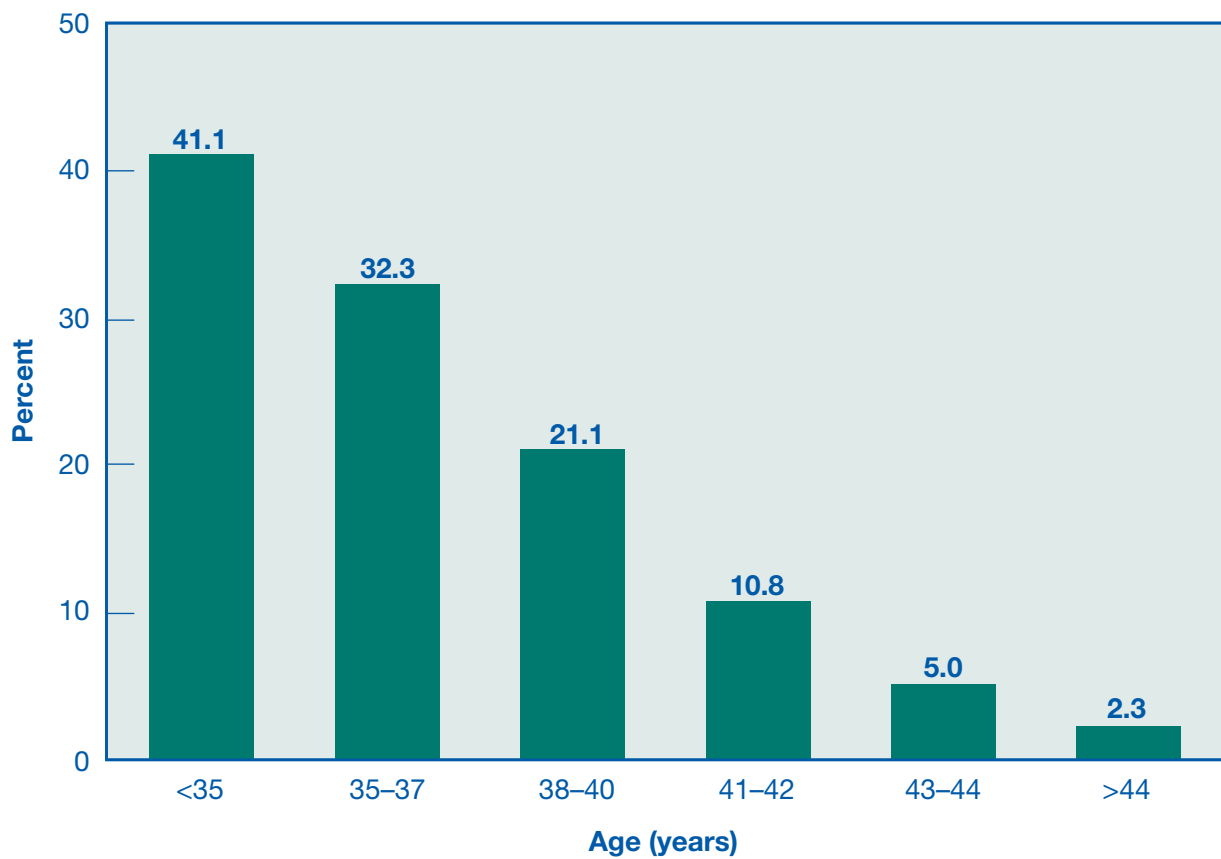
## Did the implantation rate differ by a woman's age?

The implantation percentage for transfers of fresh nondonor eggs or embryos decreased as the age of the woman increased (Figure 26). In 2014, the percentage of transfers that resulted

in implantation was highest (approximately 41%) among women younger than age 35. The implantation percentage was lowest (about 2%) among women older than age 44.

**Figure 26**

Percentages of Embryos Transferred That Implanted Using Fresh Nondonor Eggs or Embryos, by Age Group, 2014



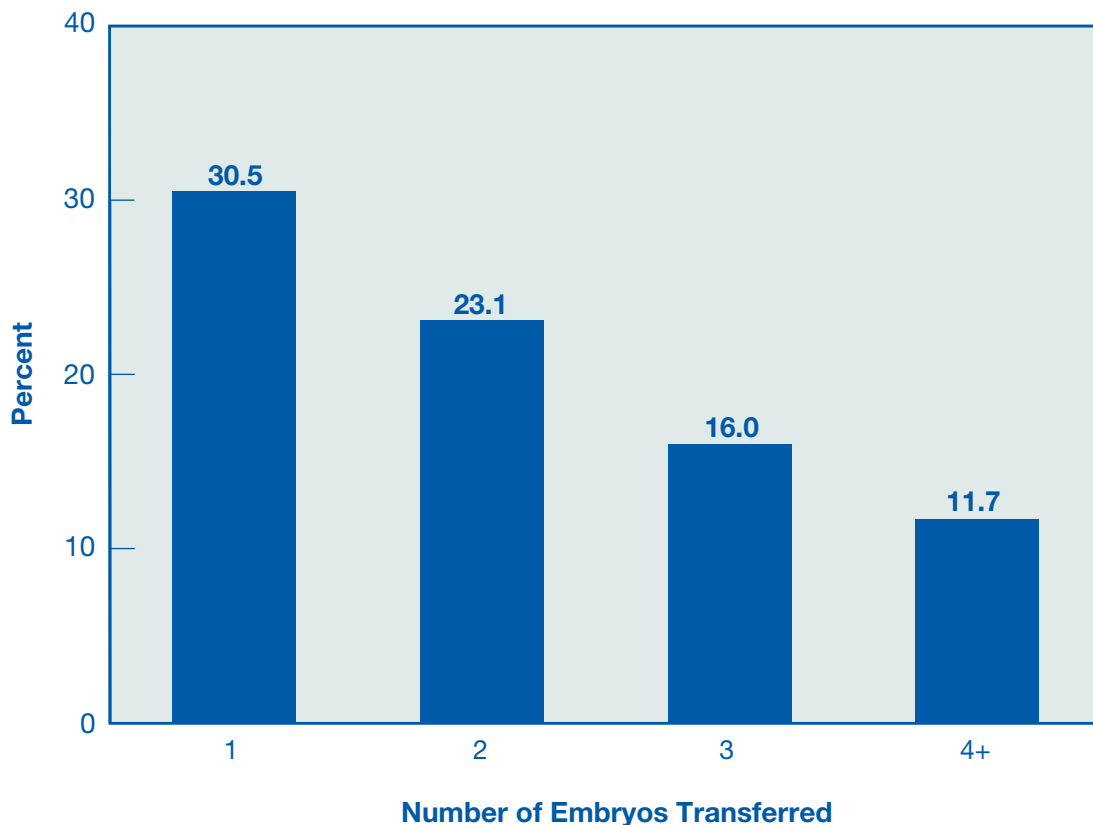
## Did the number of embryos transferred impact the percentage of single, term, and normal birth weight infants born?

The percentage of transfers of fresh nondonor eggs or embryos in 2014 resulting in the live birth of a single, term, and normal birth weight infant decreased as the number of embryos transferred increased (Figure 27). An infant is defined as term if born at 37 or more full weeks of pregnancy and as normal birth weight if at least 2,500 grams (about 5 pounds, 8 ounces). The percentage of transfers resulting in the live birth of a single, term, and normal birth weight

infant decreased from approximately 31% among cycles that involved the transfer of one embryo to 12% among cycles that involved the transfer of four or more embryos. Transferring more embryos increases the percentage of multiple-fetus pregnancies. Multiple-fetus pregnancies are associated with increased risk of poor outcomes for mothers and infants, including higher rates of prematurity, low birth weight, and pregnancy complications.

**Figure 27**

Percentages of Transfers Using Fresh Nondonor Eggs or Embryos That Resulted in Live Births of Single, Term, and Normal Birth Weight Infants, by Number of Embryos Transferred, 2014



# Was the percentage of multiple-infant births higher if more embryos were transferred?

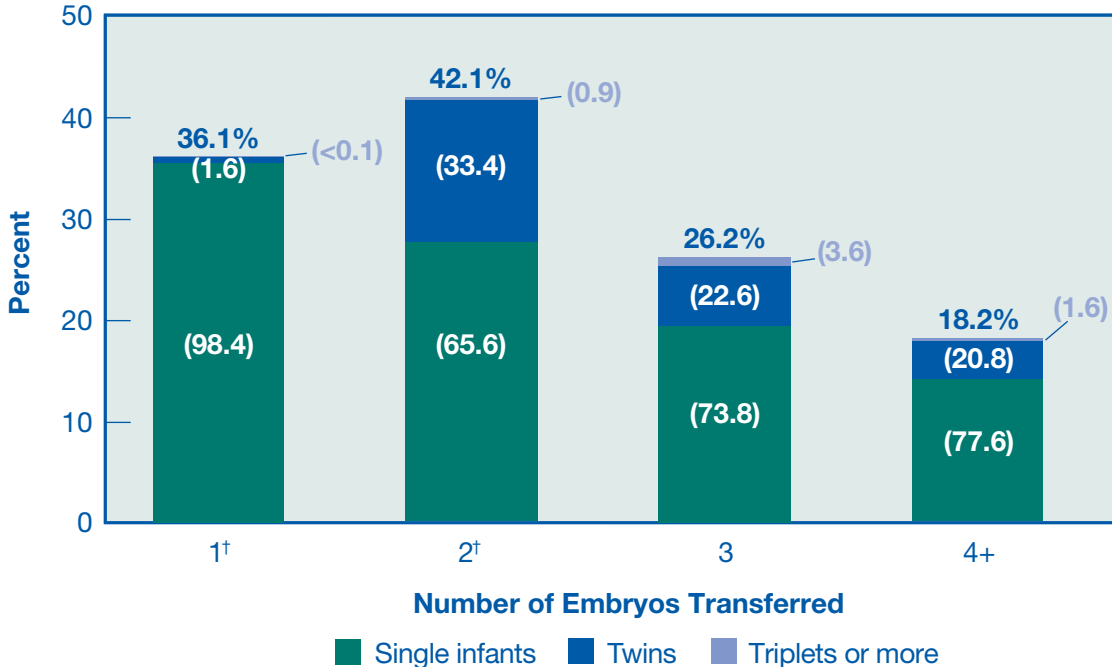
Among transfers of fresh eggs or embryos for cycles performed among women who used their own eggs, the percentage of multiple-infant births was lowest if one embryo was transferred, highest if two embryos were transferred, and otherwise decreased as more embryos were transferred (Figure 28). In 2014, the percentage of transfers that resulted in live births was highest (42%) when two embryos were transferred; however, the percentage of multiple-infant births also was highest (34%). Note that in rare cases a single embryo may divide and thus produce multiple-infant births. For this reason, small percentages

of twins and triplets or more resulted from a single embryo transfer, and a small percentage of triplets or more resulted when two embryos were transferred.

The relationship between the number of embryos transferred, the percentage of transfers resulting in live births, and the percentage of multiple-infant births is influenced by several factors, such as the woman's age and embryo quality. See Figures 29 and 33 (pages 35 and 39) for more details on cycles with a higher percentage of transfers resulting in multiple-infant births.

**Figure 28**

Percentages of Transfers Using Fresh Nondonor Eggs or Embryos That Resulted in Live Births and Distribution of Number of Infants Born, by Number of Embryos Transferred,\* 2014



\* Percentages of transfers resulting in live births are shown on top of each bar graph. Percentages of live births that were single infants, twins, and triplets or more are in parentheses.

† Totals do not equal 100% due to rounding.

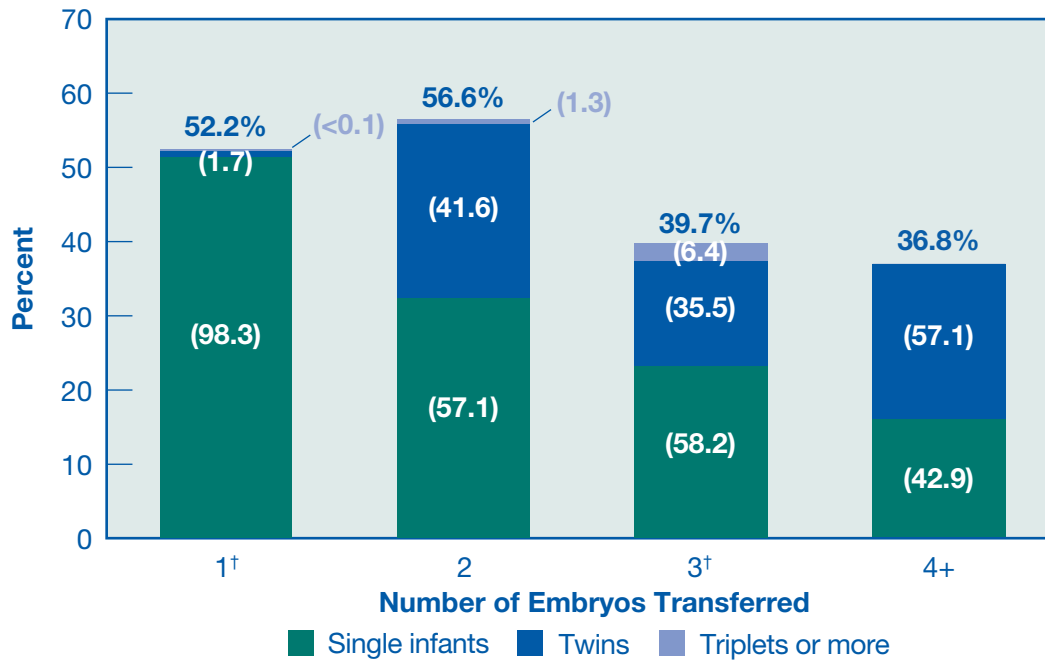
# Was the percentage of live births higher if more embryos were transferred for good-prognosis women?

In 2014, among good-prognosis women, the percentage of transfers of fresh nondonor eggs or embryos that resulted in live births was highest (57%) when two embryos were transferred; however, among transfers that resulted in live births, the percentage of single-infant live births was highest with the transfer of one embryo (98%) (Figure 29). Good-prognosis women are defined here as younger than age 35 with extra embryos available to set aside by choice for future cycles.

Note that in rare cases a single embryo may divide and thus produce multiple-infant births. For this reason, small percentages of twins and triplets or more resulted from a single embryo transfer, and a small percentage of triplets or more resulted when two embryos were transferred.

**Figure 29**

Percentages of Transfers Using Fresh Nondonor Eggs or Embryos That Resulted in Live Births and Distribution of Number of Infants Born Among Good-Prognosis Women, by Number of Embryos Transferred,\* 2014



\* Percentages of transfers resulting in live births are shown on top of each bar graph. Percentages of live births that were single infants, twins, and triplets or more are in parentheses.

† Totals do not equal 100% due to rounding.

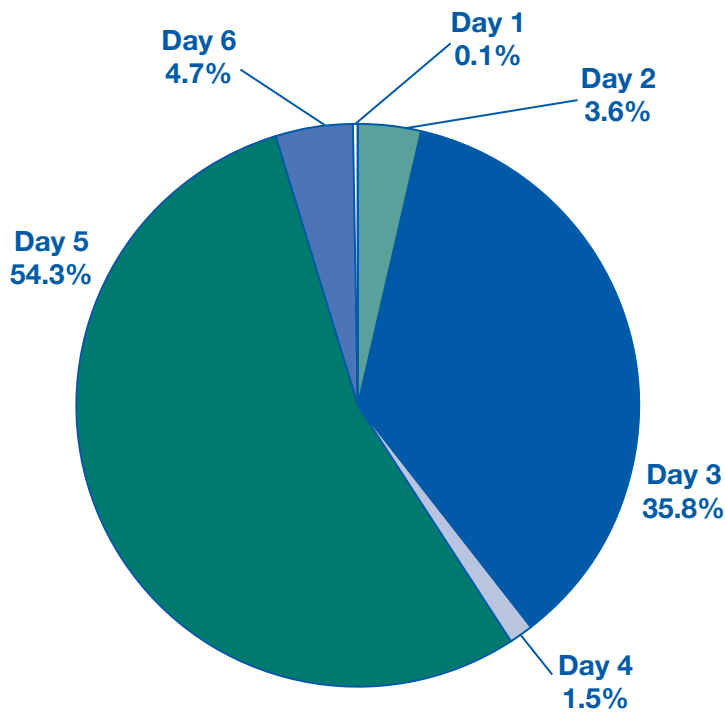
## How long after egg retrieval did embryo transfer occur?

Once an ART cycle has progressed from egg retrieval to fertilization, the embryo(s) can be transferred into the woman's uterus anytime in the next 1 to 6 days. As seen in Figure 30, transfers 3 days after retrieval (a day 3 transfer) and transfers

5 days after retrieval (a day 5 transfer) were the most common (36% and 54%, respectively) among those embryos that progressed to the embryo transfer stage.

**Figure 30**

Day of Embryo Transfer\* Among All ART Transfers Using Fresh Nondonor Eggs or Embryos,† 2014



\* Number of days following egg retrieval.

† Cycles using GIFT or ZIFT are excluded. Missing or implausible values for day of embryo transfer (that is, 0 or greater than 6) are not included.



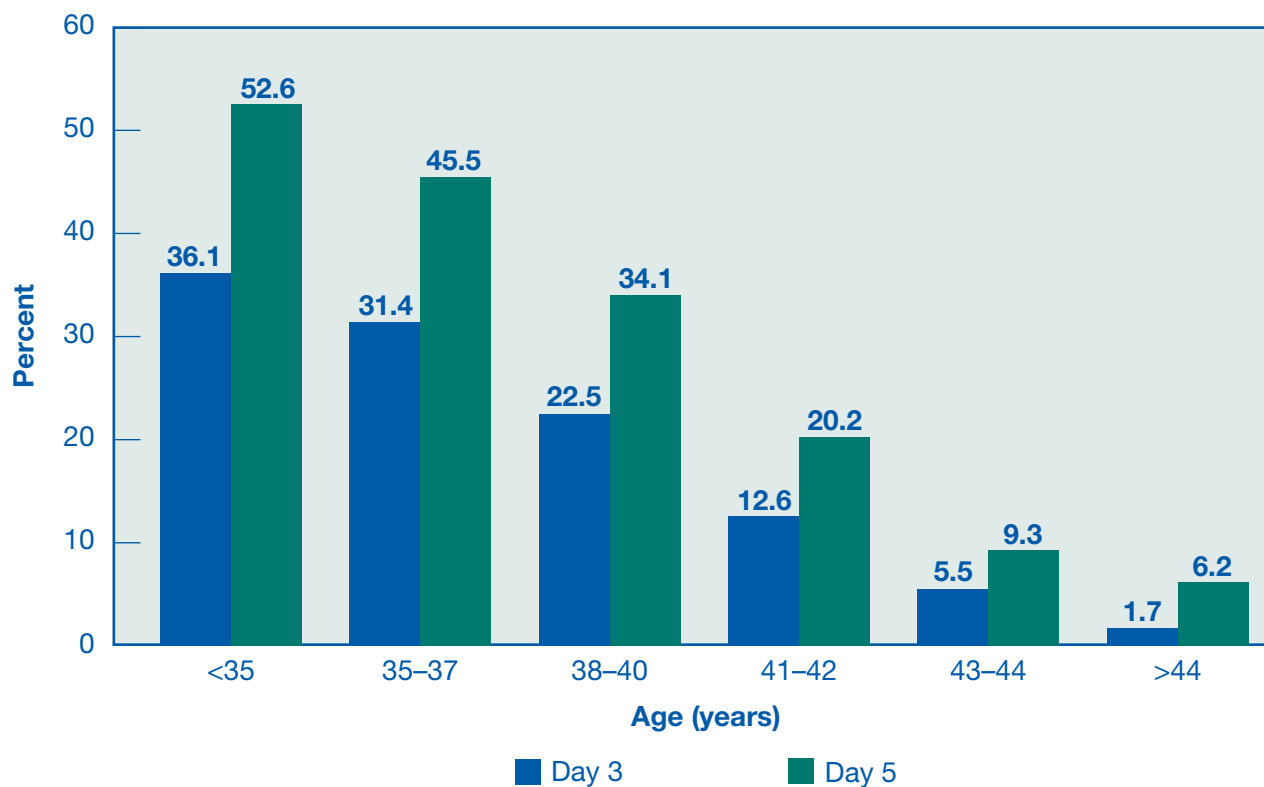
## Was the percentage of live births higher for day 3 or day 5 transfers?

In 2014, for all age groups, live-birth percentages were higher for day 5 embryo transfers using fresh nondonor eggs or embryos than for day 3 transfers, although percentages resulting in live births decreased in all age groups for both day 3 and day 5 transfers (Figure 31). As shown in Figure 30 (page 36), the vast majority (more than

90%) of ART fresh nondonor embryo transfers were performed on day 3 or day 5. While day 5 transfers have higher live-birth percentages, not all embryos survive to transfer. Some embryos do not survive to day 3, and some that survive to day 3 do not survive to day 5.

**Figure 31**

Percentages of Day 3 and Day 5 Embryo Transfers Using Fresh Nondonor Eggs or Embryos That Resulted in Live Births, by Age Group,\* 2014



\* Cycles using GIFT or ZIFT are excluded. Embryo transfers performed on days 1, 2, 4, and 6 are not included because each of these accounted for a small proportion of procedures.

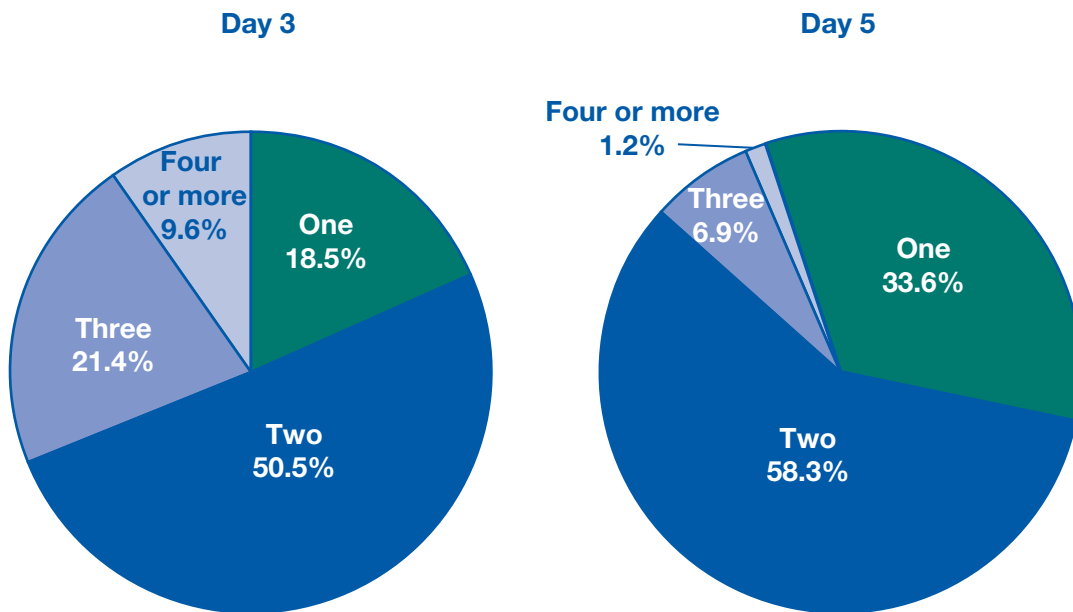
## Did the number of embryos transferred differ for day 3 and day 5 transfers?

The percentage of transfers using fresh nondonor eggs or embryos that involved one and two embryos was higher on day 5 than on day 3 (Figure 32). About 8% of day 5 transfers and 31% of day 3 transfers involved three or more embryos. Transferring fewer numbers of

embryos on day 5, however, did not translate into a lower percentage of multiple-infant births. See Figure 33 (page 39) for more details on the relationship between the day of transfer and multiple-infant births.

**Figure 32**

Numbers of Embryos Transferred on Day 3 and Day 5 Among All Transfers Using Fresh Nondonor Eggs or Embryos,\* 2014



\* Cycles using GIFT or ZIFT are excluded. Embryo transfers performed on days 1, 2, 4, and 6 are not included because each of these accounted for a small proportion of procedures.

## Did the percentage of multiple-infant births differ for day 3 and day 5 transfers?

The percentage of multiple-infant births was higher for day 5 transfers using fresh nondonor eggs or embryos than for day 3 transfers (Figure 33). Part A of Figure 33 shows that among the 6,242 live births that occurred following the transfer of day 3 fresh nondonor embryos, about 78% were single infants, and approximately 22% involved the birth of more than one infant (21% twins, and 1% triplets or more).

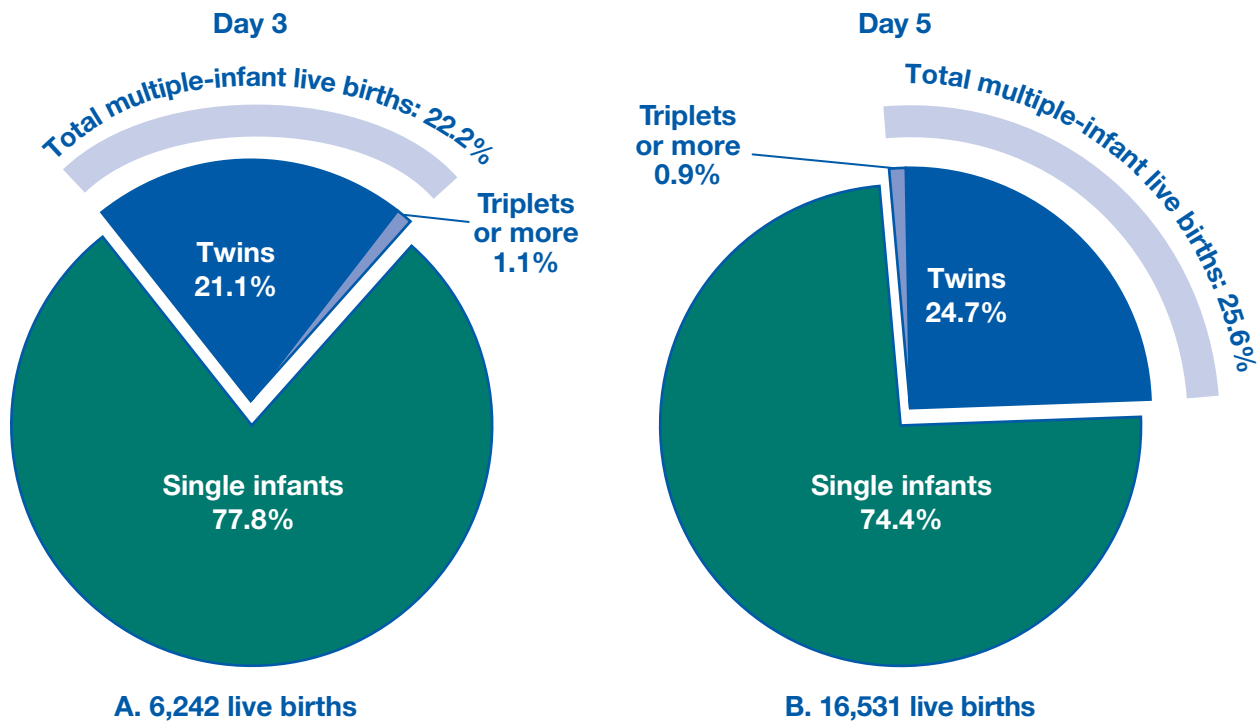
In 2014, a total of 16,531 live births occurred following the transfer of day 5 fresh nondonor embryos. Part B of Figure 33 shows that

approximately 26% of these live births involved the birth of more than one infant (25% twins and 1% triplets or more).

As shown in Figure 32 (page 38), fewer embryos were transferred on day 5 than on day 3, although the majority of day 5 transfers still involved the transfer of more than one embryo. The proportion of live births resulting in twins was higher among transfers performed on day 5 than on day 3. Thus, having a multiple-infant birth was more likely for day 5 embryo transfers.

**Figure 33**

Distribution of Number of Infants Born Among Day 3 and Day 5 Embryo Transfers Using Fresh Nondonor Eggs or Embryos That Resulted in Live Births,\* 2014



\* Cycles using GIFT or ZIFT are excluded. Embryo transfers performed on days 1, 2, 4, and 6 are not included because each of these accounted for a small proportion of procedures.

## Was the percentage of day 5 transfers that resulted in live births affected by the number of embryos transferred for good-prognosis women?

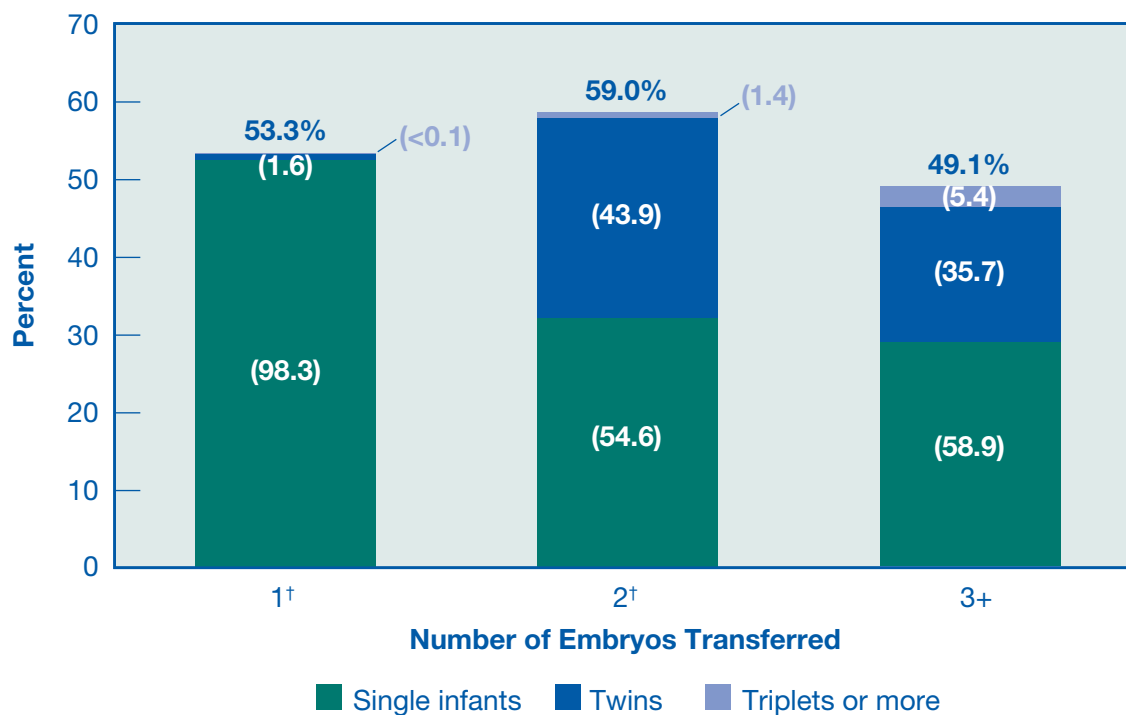
The percentage of day 5 transfers using fresh nondonor eggs or embryos resulting in live births was highest when two embryos were transferred among good-prognosis women (Figure 34). Good-prognosis women are defined here as women younger than age 35 with extra embryos set aside for future cycles. As shown in Figure 33 (page 39), fresh nondonor embryos transferred on day 5 resulted in a higher percentage of multiple-infant births than embryos transferred on day 3.

In 2014, the percentage of day 5 transfers resulting in live births when two embryos were

transferred was 59%; however, the proportion of live births that were multiples (twins or more) was about 45%. The highest percentage of live births of a single infant (98%) resulted from the day 5 transfer of a single embryo. Note that in rare cases a single embryo may divide and thus produce multiple-infant births. For this reason, small percentages of twins and triplets or more resulted from a single embryo transfer, and a small percentage of triplets or more resulted when two embryos were transferred.

**Figure 34**

Percentages of Day 5 Transfers Using Fresh Nondonor Eggs or Embryos That Resulted in Live Births and Distribution of Number of Infants Born Among Good-Prognosis Women, by Number of Embryos Transferred,\* 2014



\* Percentages of transfers resulting in live births are shown on top for each bar graph. Percentages of live births that were single infants, twins, and triplets or more are in parentheses. Cycles using GIFT or ZIFT are excluded.

† Totals do not equal 100% due to rounding.

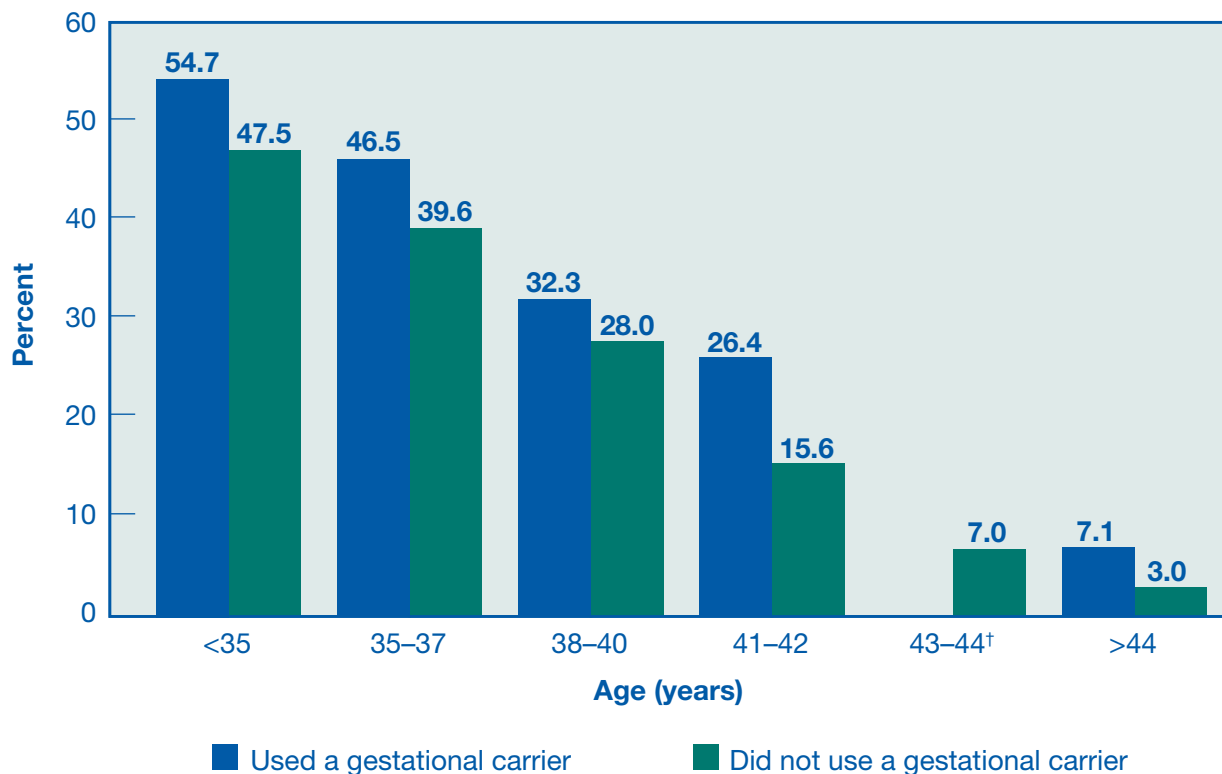
## Did the percentage of transfers that resulted in live births differ by gestational carrier use?

Among all age groups except those aged 43–44, the percentage of transfers using fresh nondonor eggs or embryos that resulted in live births was higher for those using gestational carriers than for those that did not use a gestational carrier (Figure 35). A gestational carrier or gestational surrogate is a woman who agrees to carry a developing embryo created from another woman’s egg for others. In 2014, gestational

carriers were used in about 1% of fresh nondonor cycles. While the percentage of live births generally decreased with the patient’s age with or without using gestational carrier, percentages of live births when using a gestational carrier were about 4% to 7% higher among younger patient age groups and patients older than age 44, and almost 11% higher among patients aged 41–42.

**Figure 35**

Percentages of Transfers Using Fresh Nondonor Eggs or Embryos That Resulted in Live Births Among ART Cycles That Used Gestational Carriers and Those That Did Not, by Age Group,\* 2014



\* Age groups reflect the age of the ART patient, not the age of the gestational carrier.

<sup>†</sup> There were no transfers resulting in live births among patients aged 43–44 who used gestational carriers.

# SECTION 3: ART CYCLES USING FROZEN NONDONOR EMBRYOS

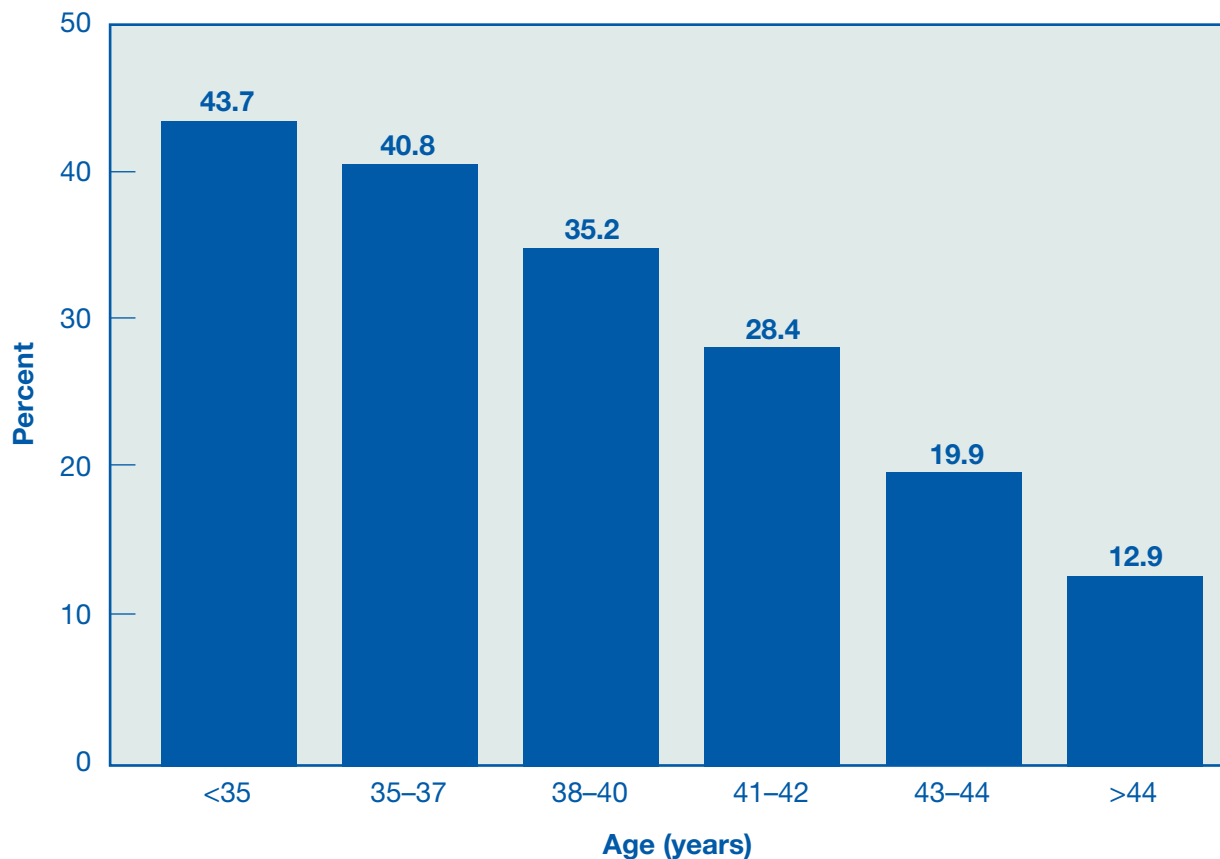
## Did the implantation rate differ by a woman's age?

The implantation percentage for transfers of frozen nondonor embryos decreased as the age of the woman increased from about 44% among women younger than age 35 to 13% among women older than age 44 (Figure 36). Note that

for frozen cycles, although not shown, the age of the woman at the time of retrieval has a larger effect on implantation rates than the age of the woman at the time of transfer.

**Figure 36**

Percentages of Embryos Transferred That Implanted Using Frozen Nondonor Embryos, by Age Group, 2014



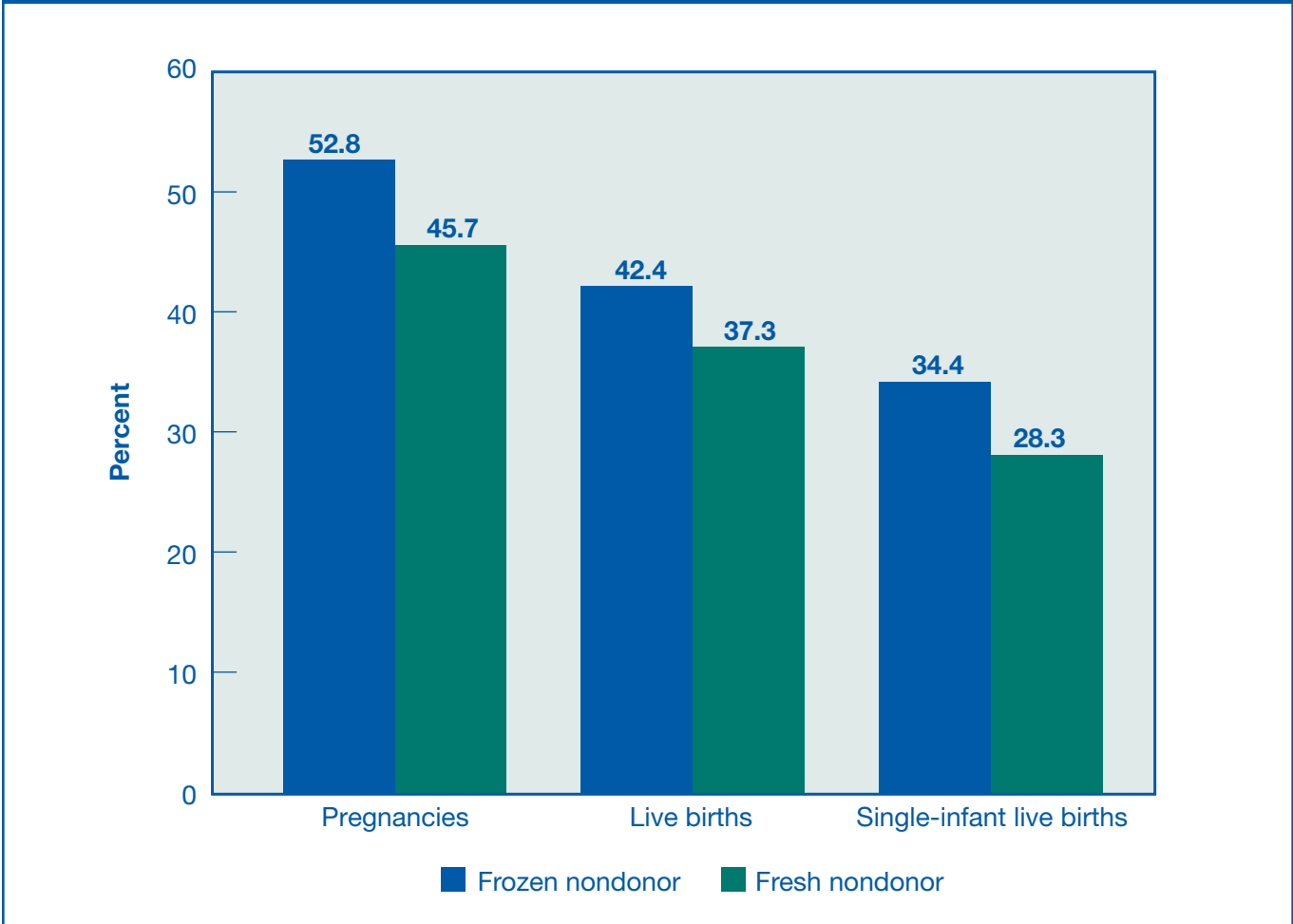
# Was the percentage of transfers that resulted in pregnancies, live births, and single-infant live births higher for fresh or frozen nondonor embryos?

Figure 37 shows that percentages of transfers resulting in pregnancies, live births, and single-infant live births were higher for frozen nondonor embryos than for fresh nondonor embryos in 2014.

Frozen nondonor embryos were used in 56,259 ART cycles performed in 2014. Cycles using

frozen nondonor embryos are both less expensive and less invasive than those using fresh nondonor embryos because the woman does not have to go through the fertility drug stimulation and egg retrieval steps again.

**Figure 37**  
Percentages of Transfers Using Frozen or Fresh Nondonor Embryos That Resulted in Pregnancies, Live Births, and Single-Infant Live Births, 2014



## What percentage of ART cycles resulted in a multiple-fetus pregnancy or multiple-infant birth?

Part A of Figure 38 shows that among the 27,757 pregnancies that resulted from ART cycles using frozen nondonor embryos in 2014, about 72% were single-fetus pregnancies and 19% were multiple-fetus pregnancies. Approximately 8% of pregnancies ended before the number of fetuses could be accurately determined.

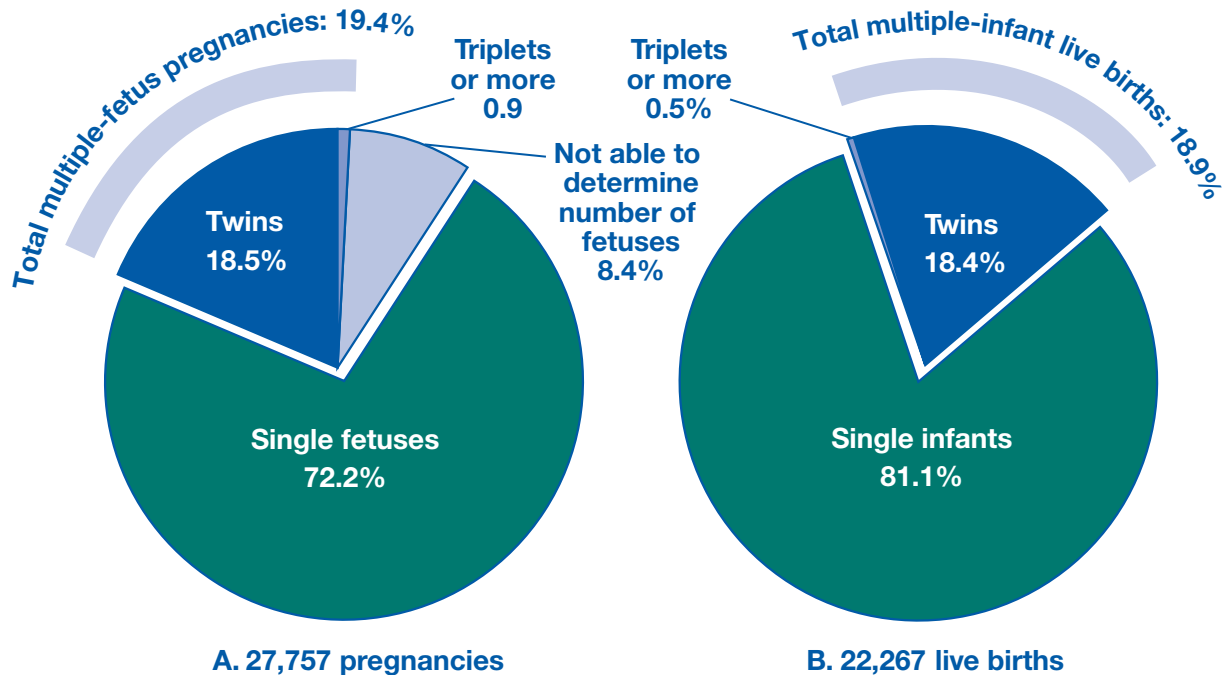
Of the 27,757 pregnancies that resulted from these ART cycles, 22,267 (80%) resulted in live births. Part B of Figure 38 shows that about 19%

of these live births resulted in more than one infant (18% twins and 1% triplets or more).

ART pregnancies are more likely to result in multiple-infant births (twins, triplets or more) than pregnancies resulting from natural conception because more than one embryo may be transferred. Multiple-infant births are associated with greater problems for both mothers and infants, including higher rates of caesarean section, prematurity, low birth weight, and infant disability or death.

**Figure 38**

Distribution of Multiple-Fetus Pregnancies and Multiple-Infant Live Births Among ART Cycles Using Frozen Nondonor Embryos, 2014





# SECTION 4: ART CYCLES USING DONOR EGGS

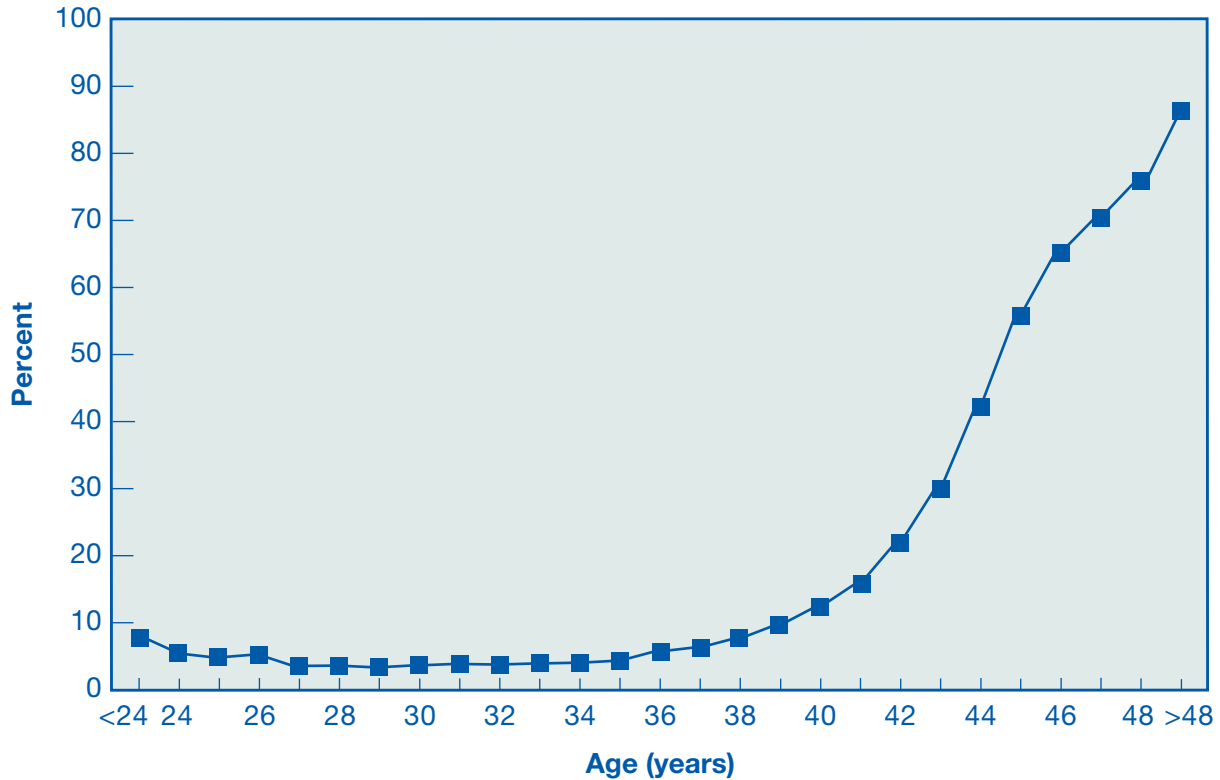
## Was the use of donor eggs or embryos higher among older women undergoing ART?

ART using donor eggs is much more common among older women than among younger women (Figure 39). Donor eggs or embryos were used in 20,481 ART cycles performed in 2014. The percentage of cycles performed with donor eggs increased sharply after age 40. Among women older than age 48, for example, approximately

86% of all ART cycles used donor eggs. As shown in Figures 16 and 36 (pages 22 and 42), eggs produced by women in older age groups form embryos that are less likely to implant and more likely to result in miscarriage if they do implant.

**Figure 39**

Percentages of ART Cycles Using Donor Eggs, by Age of Woman, 2014



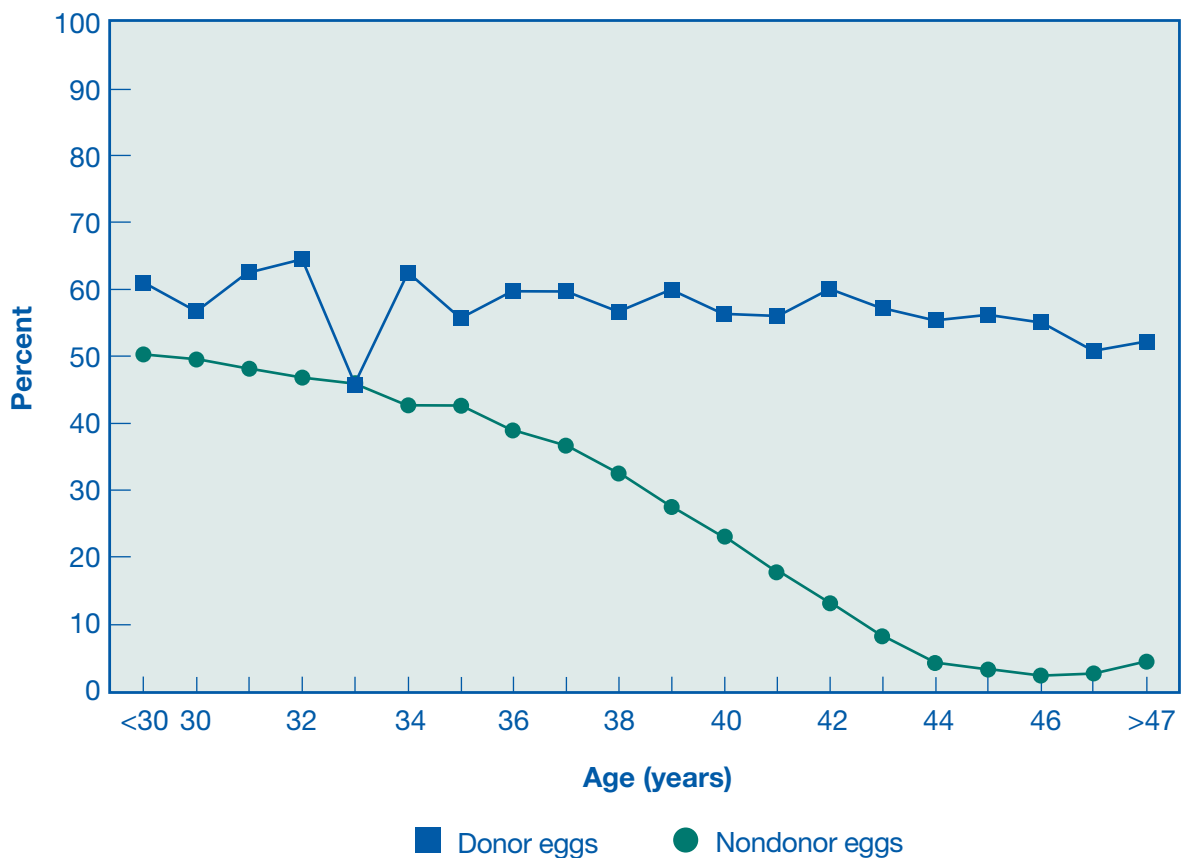
## Did the percentage of ART transfers that resulted in live births differ for fresh donor and fresh nondonor eggs?

The percentage of transfers using fresh nondonor eggs or embryos resulting in live births decreased as the age of the woman increased (Figure 40). In contrast, since egg donors are typically in their 20s or early 30s, the percentage of transfers using

embryos from donor eggs that resulted in live births remained consistently above 50% among women of almost all ages. The likelihood of a fertilized egg implanting is related to the age of the woman who produced the egg.

**Figure 40**

Percentages of Transfers Using Fresh Embryos from Donor or Nondonor Eggs That Resulted in Live Births, by Age of Woman, 2014



## What percentage of ART cycles resulted in a multiple-fetus pregnancy or multiple-infant birth?

Part A of Figure 41 shows that among the 4,849 pregnancies that resulted from ART cycles using fresh donor eggs or embryos in 2014, about 63% were single-fetus pregnancies and 31% were multiple-fetus pregnancies. Approximately 6% of pregnancies ended before the number of fetuses could be accurately determined.

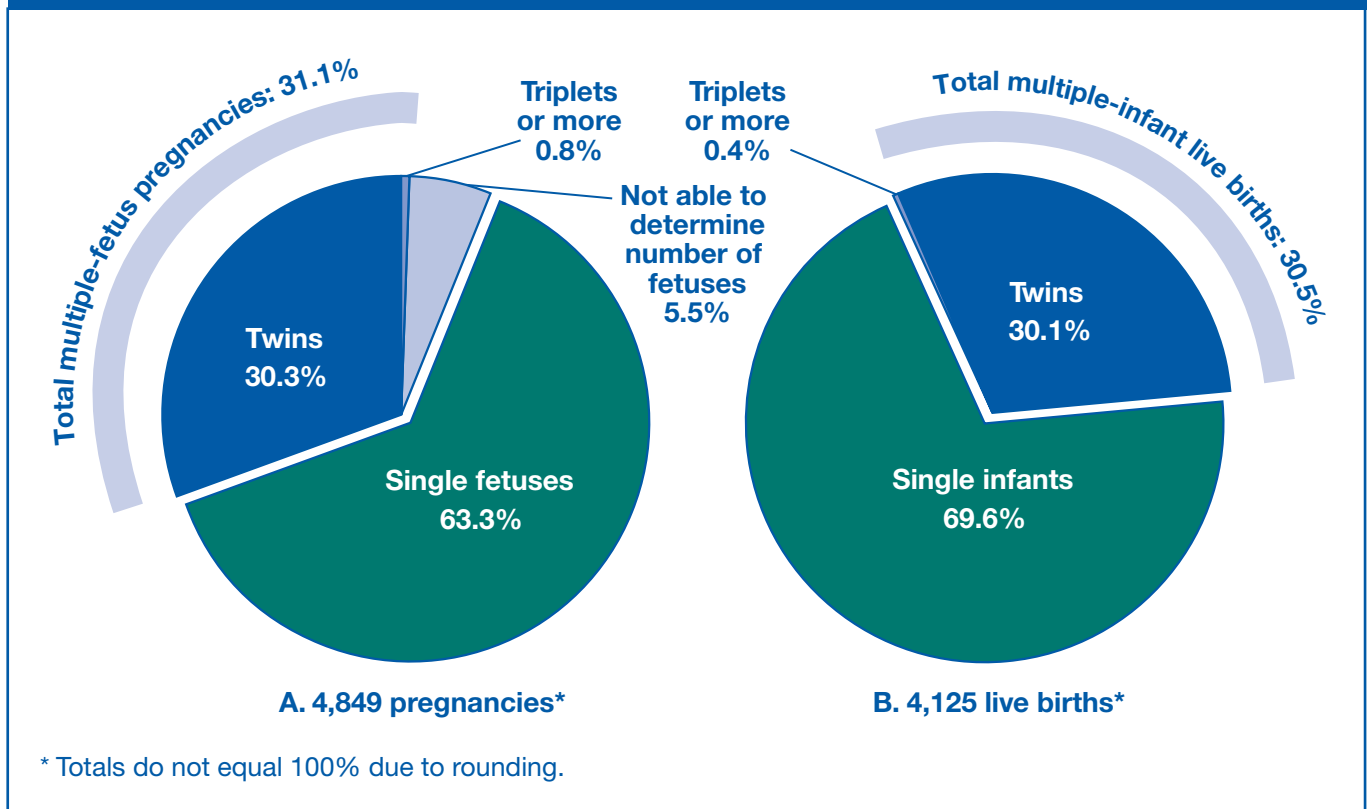
Of the 4,849 pregnancies that resulted from these ART cycles, 4,125 (85%) resulted in live births. Part B of Figure 41 shows that approximately

30% of these live births resulted in twins and less than 1% resulted in triplets or more.

ART pregnancies are more likely to result in multiple-infant births (twins, triplets or more) than pregnancies resulting from natural conception because more than one embryo may be transferred. Multiple-infant births are associated with greater problems for both mothers and infants, including higher rates of caesarean section, prematurity, low birth weight, and infant disability or death.

**Figure 41**

Distribution of Multiple-Fetus Pregnancies and Multiple-Infant Live Births Among ART Cycles Using Fresh Embryos from Donor Eggs, 2014



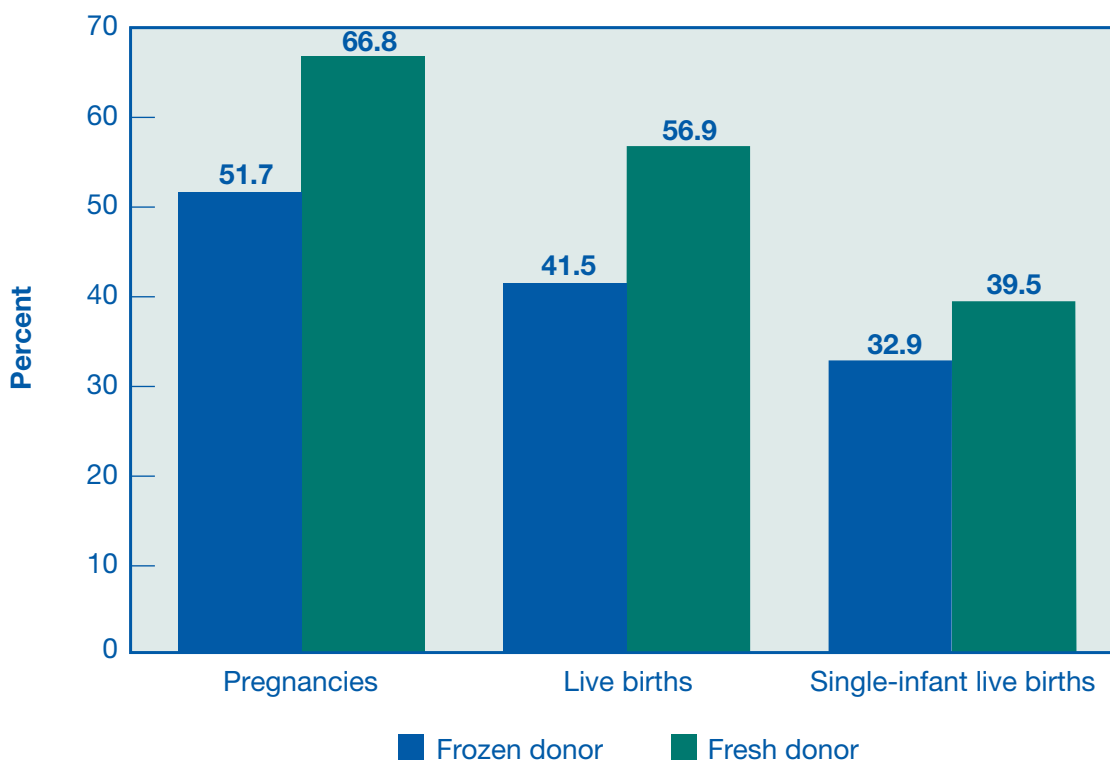
## Was the percentage of transfers that resulted in pregnancies, live births, and single-infant live births higher for fresh or frozen donor embryos?

Figure 42 shows that percentages of transfers resulting in pregnancies, live births, and single-infant live births were lower for frozen donor embryos than for fresh donor embryos in 2014.

The average number of embryos transferred was the same for transfers in 2014 using frozen donor embryos and those using fresh donor embryos.

**Figure 42**

Percentages of Transfers Using Frozen or Fresh Donor Embryos That Resulted in Pregnancies, Live Births, and Single-Infant Live Births, 2014



## SECTION 5: ART TRENDS, 2005–2014

This report marks the twentieth consecutive year that CDC has published an annual report detailing the success rates for ART clinics in the United States. Having many years of data provides us with the opportunity to examine trends in ART use and success rates over time. This report

features an examination of trends for the most recent 10-year period, 2005–2014. Statistics for earlier years are available in CDC's previous annual publications of ART success rates and national summaries.

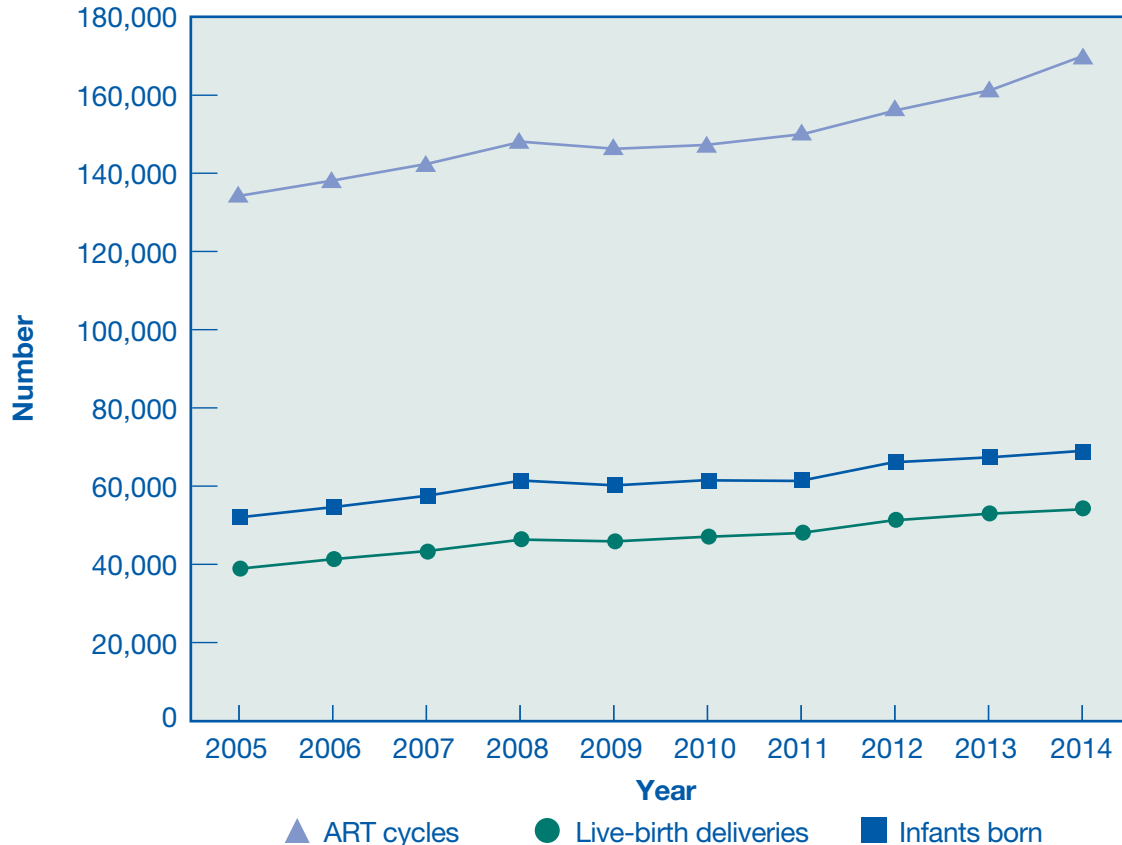
### Has the use of ART increased?

Figure 43 shows that the number of ART cycles performed in the United States has increased 26%, from 134,260 cycles in 2005 to 169,602 in 2014. The number of live-birth deliveries in 2014 (56,037) was almost one and a half times higher than in 2005 (38,910). The number of infants born

who were conceived using ART increased from 52,041 in 2005 to 68,791 in 2014. Because more than one infant can be born during a live-birth delivery (for example, twins), the total number of infants born is greater than the number of live-birth deliveries.

**Figure 43**

Numbers of ART Cycles Performed, Live-Birth Deliveries, and Infants Born Using ART, 2005–2014



## What are egg/embryo banking cycles and have they increased?

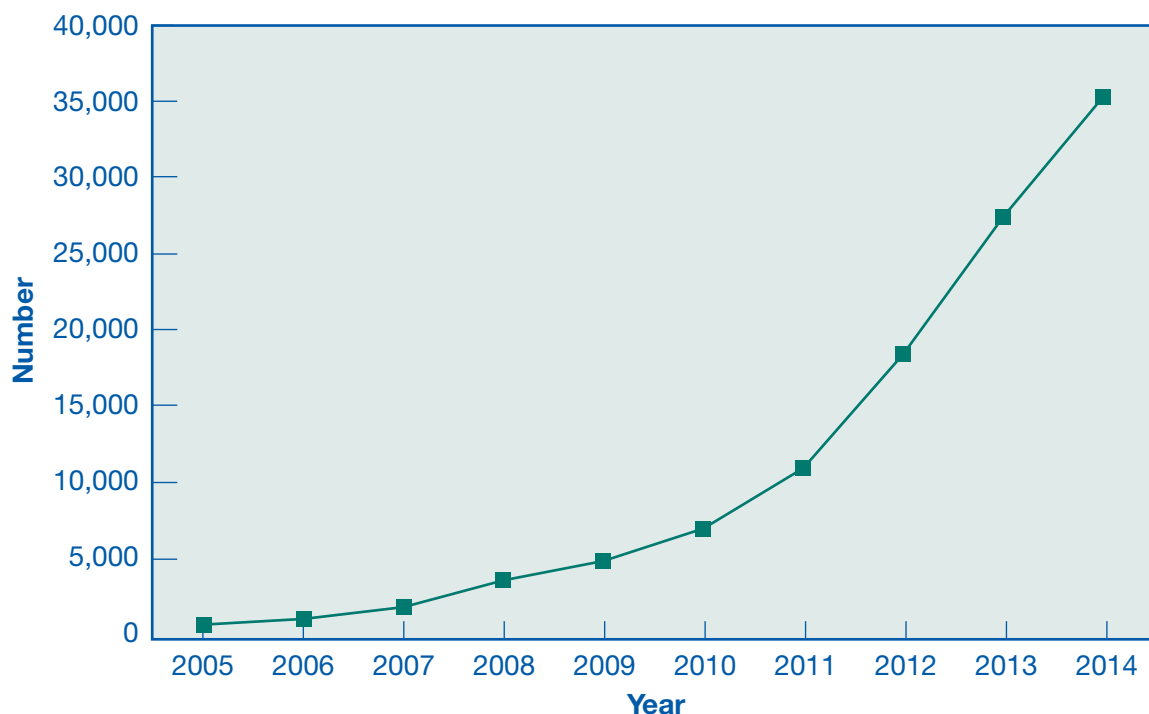
Figure 44 shows that the number of cycles performed for banking all fresh nondonor eggs or embryos increased dramatically from 2005 through 2014.

An egg/embryo banking cycle is an ART cycle started with the intention of freezing (cryopreserving) all resulting eggs or embryos for potential future use, when they may be thawed, fertilized (if eggs), and transferred. Banking cycles may be performed to avoid potentially negative effects of stimulation, or when it is necessary to

wait for results of genetic testing. Egg/embryo banking also may be used when only a small number of eggs or embryos develop during one cycle. In this case, women may undergo several banking cycles to improve availability of good-quality eggs or embryos for later transfer. In other situations, patients may choose to freeze eggs or embryos because the patient or partner needs to undergo medical treatment that may harm their future reproduction capabilities or to delay childbearing for other reasons.

**Figure 44**

Numbers of ART Cycles Performed for Banking All Fresh Nondonor Eggs or Embryos, 2005–2014



## Has the number of cycles using donor eggs or embryos increased?

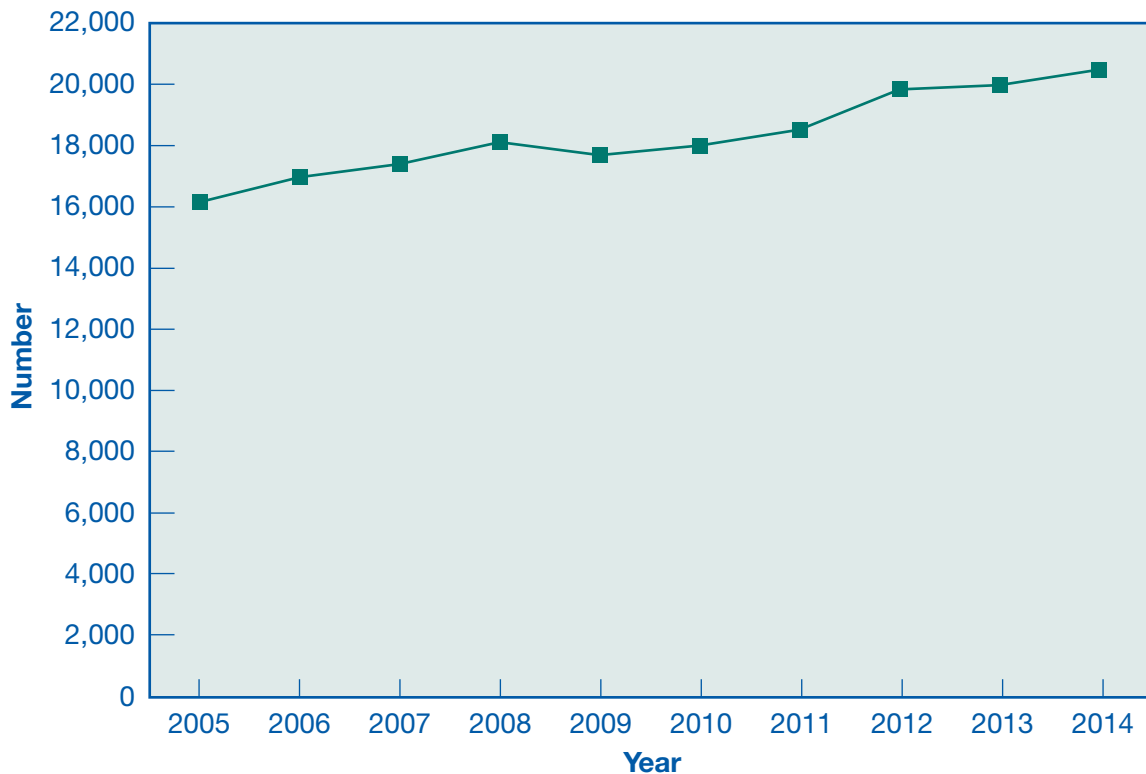
Figure 45 shows that the number of cycles performed using donor eggs or embryos increased almost 27%, from 16,161 in 2005 to 20,481 in 2014.

A donor egg cycle is a cycle in which an embryo is formed from the egg of one woman (the donor) and the sperm from her partner or a donor and then transferred to another woman (the recipient). A donor embryo cycle is a cycle in which an

embryo is donated by a patient who previously underwent ART treatment; neither the sperm nor egg is genetically related to the parent(s) who will raise the child. Donor cycles are most commonly used by women with diminished ovarian reserve, usually as a result of advanced maternal age or premature ovarian insufficiency. Donors are usually younger women, which results in higher pregnancy and lower miscarriage rates among recipients.

**Figure 45**

Numbers of ART Cycles Using Donor Eggs or Embryos, 2005–2014



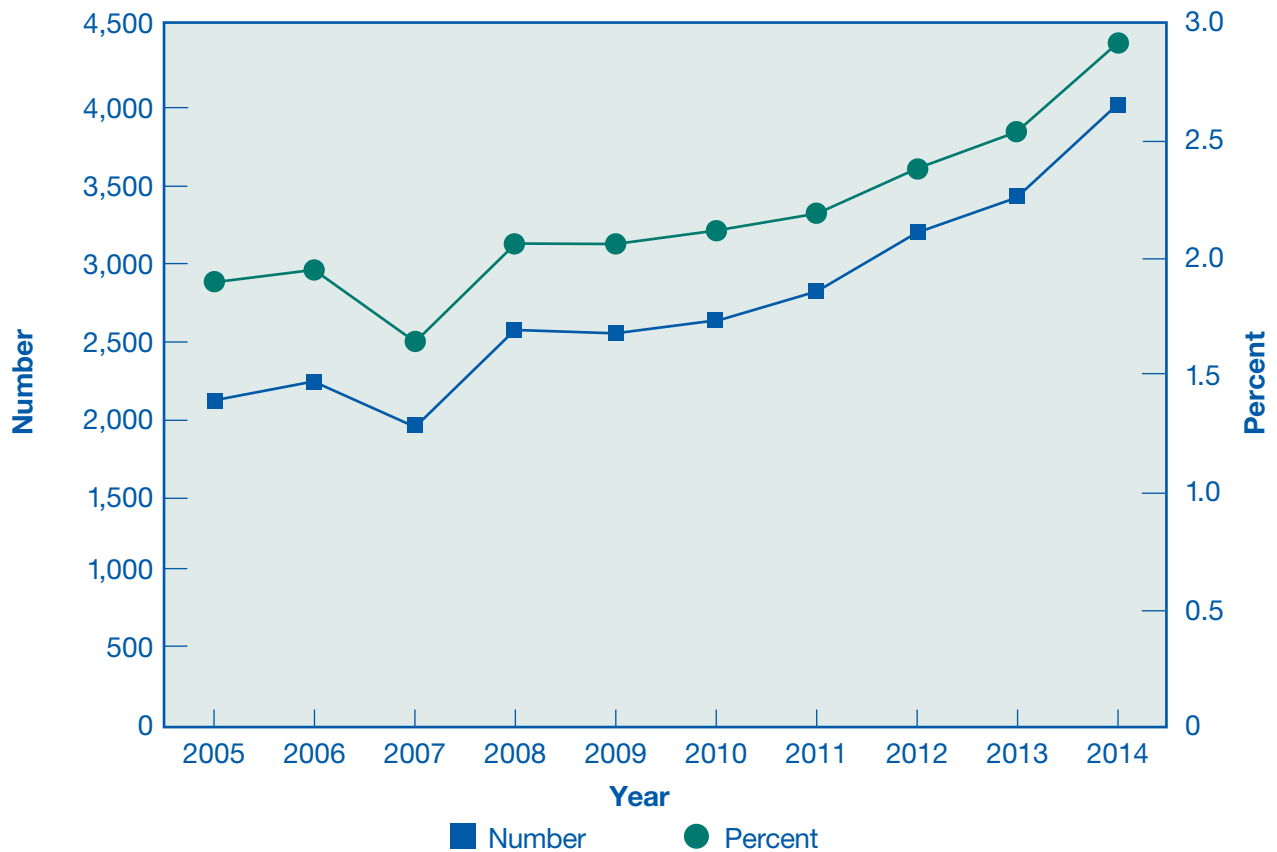
## Has the number and percentage of transfers using gestational carriers increased?

Figure 46 shows that the number of transfers for ART cycles using gestational carriers almost doubled, from 2,133 in 2005 to 4,030 in 2014. The percentage of transfers using a gestational carrier among all transfers also increased, from about 2% in 2005 to about 3% in 2014.

A gestational carrier (also called a gestational surrogate) is a woman who agrees to carry a developing embryo created from another woman's egg for others.

**Figure 46**

Numbers and Percentages of Transfers Using Gestational Carriers, 2005–2014





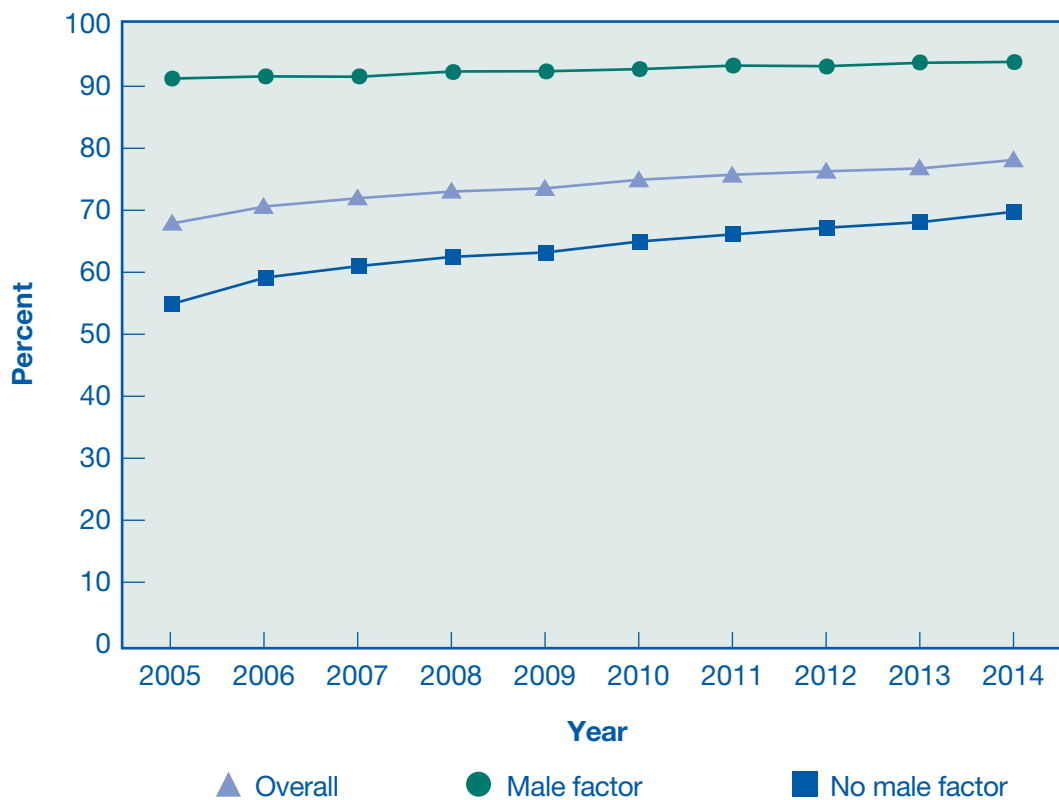
## Has ICSI use changed over time?

Figure 47 shows that the percentage of retrievals using ICSI increased over time from 68% in 2005 to 78% in 2014. The increase in use was larger for patients with no diagnosis of male factor infertility

than for those patients with a diagnosis of male factor infertility, where ICSI use has remained consistently high over the last ten years.

**Figure 47**

Percentages of Retrievals Using Fresh Nondonor or Donor Eggs or Embryos That Used ICSI, 2005–2014



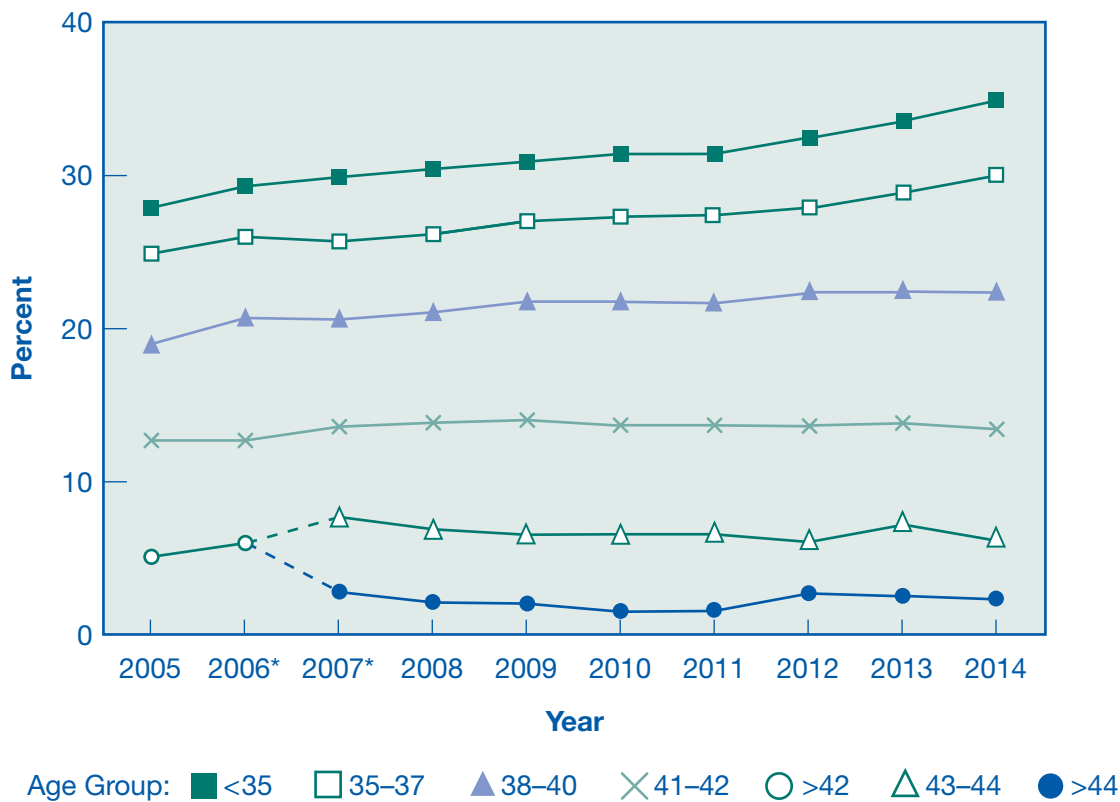
## Has the percentage of transfers that resulted in single-infant live births changed?

From 2005 through 2014, the percentage of transfers using fresh nondonor eggs or embryos that resulted in single-infant live births increased from 28% in 2005 to 35% in 2014 for women younger than age 35, from 25% to 30% for women aged 35–37, and from 19% to 22% for women aged 38–40 (Figure 48).

Single-infant births have a lower risk than multiple-infant births for poor infant health outcomes, including prematurity, low birth weight, disability, and death.

**Figure 48**

Percentages of Transfers Using Fresh Nondonor Eggs or Embryos That Resulted in Single-Infant Live Births, by Age Group, 2005–2014



\* Through 2006, data for women older than age 42 were combined. Starting in 2007, data for women older than age 42 were reported as women aged 43–44 and women older than age 44.

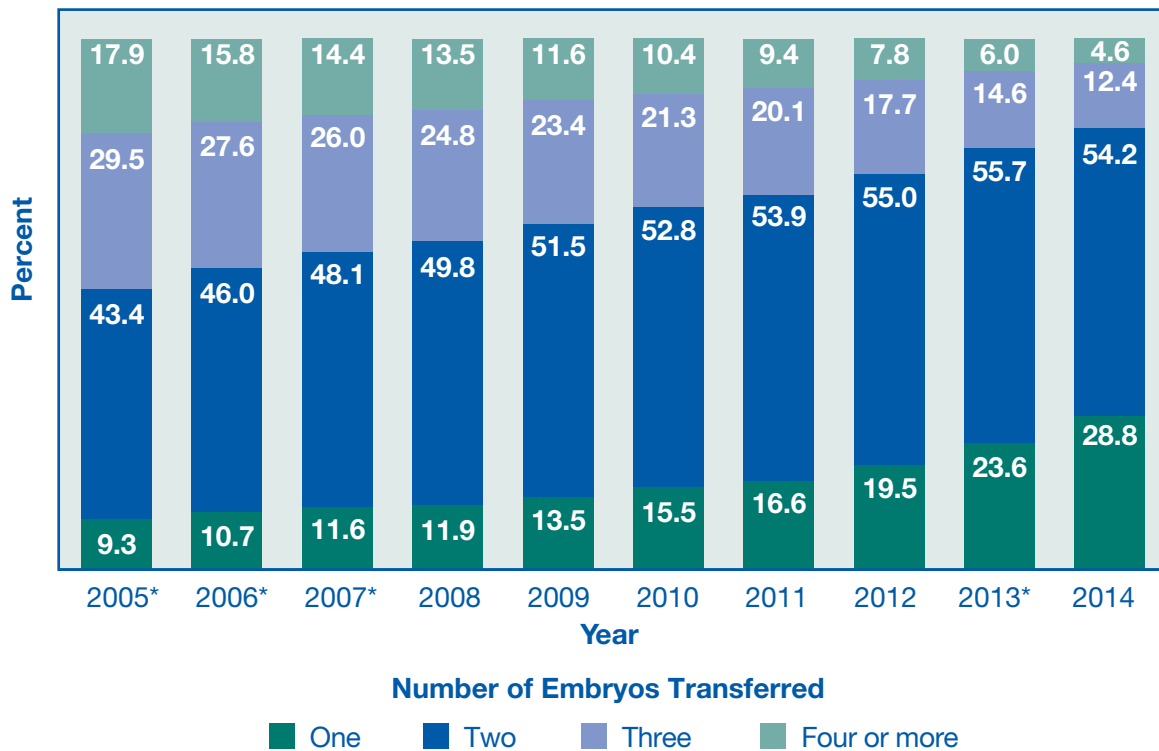
## Has the number of embryos transferred changed?

From 2005 through 2014, transfers of one embryo more than tripled from 9% to almost 29%, and transfers of two embryos increased from 43% to approximately 54% for all fresh nondonor cycles that resulted in transfer (Figure 49). During the

same time period, transfers of three embryos decreased from about 30% to 12%, and transfers of four or more embryos decreased by more than three times from approximately 18% to 5%.

**Figure 49**

Percentages of Fresh Nondonor Transfers of One, Two, Three, or Four or More Embryos, 2005–2014



\* Totals do not equal 100% due to rounding.

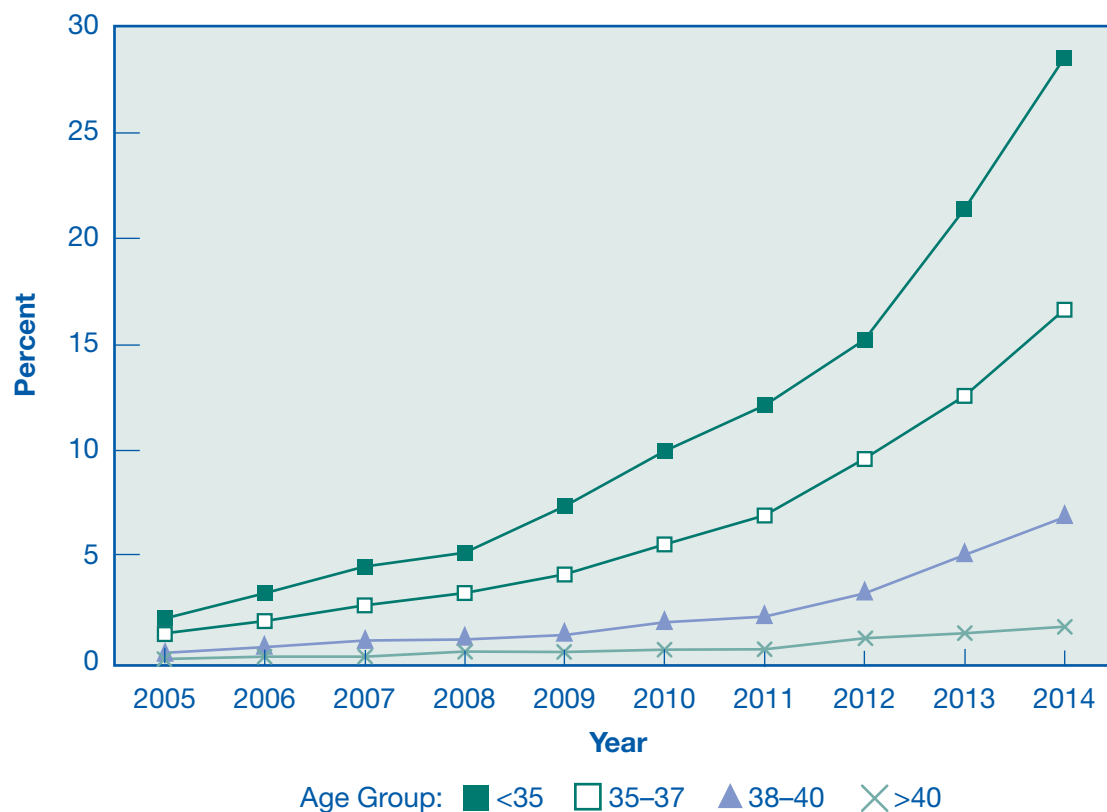
## Has the percentage of elective single embryo transfers increased?

From 2005 through 2014, the percentage of transfers using elective single embryo transfer (eSET) increased dramatically from about 2% to 29% for women younger than age 35 and from approximately 1% to almost 17% for women aged 35–37 (Figure 50).

An eSET cycle is one in which at least two embryos are available for transfer but only one embryo is transferred. It does not include cycles in which only one embryo is available. The use of eSET is the most effective way to avoid a multiple-fetus pregnancy and to reduce the risk for poor infant health outcomes such as prematurity and low birth weight.

**Figure 50**

Percentages of Elective Single Embryo Transfer (eSET) Among All Transfers Using Fresh Nondonor Eggs or Embryos, by Age Group,\* 2005–2014



\* All ages older than 40 years are reported together due to the small number of transfers performed with eSET.

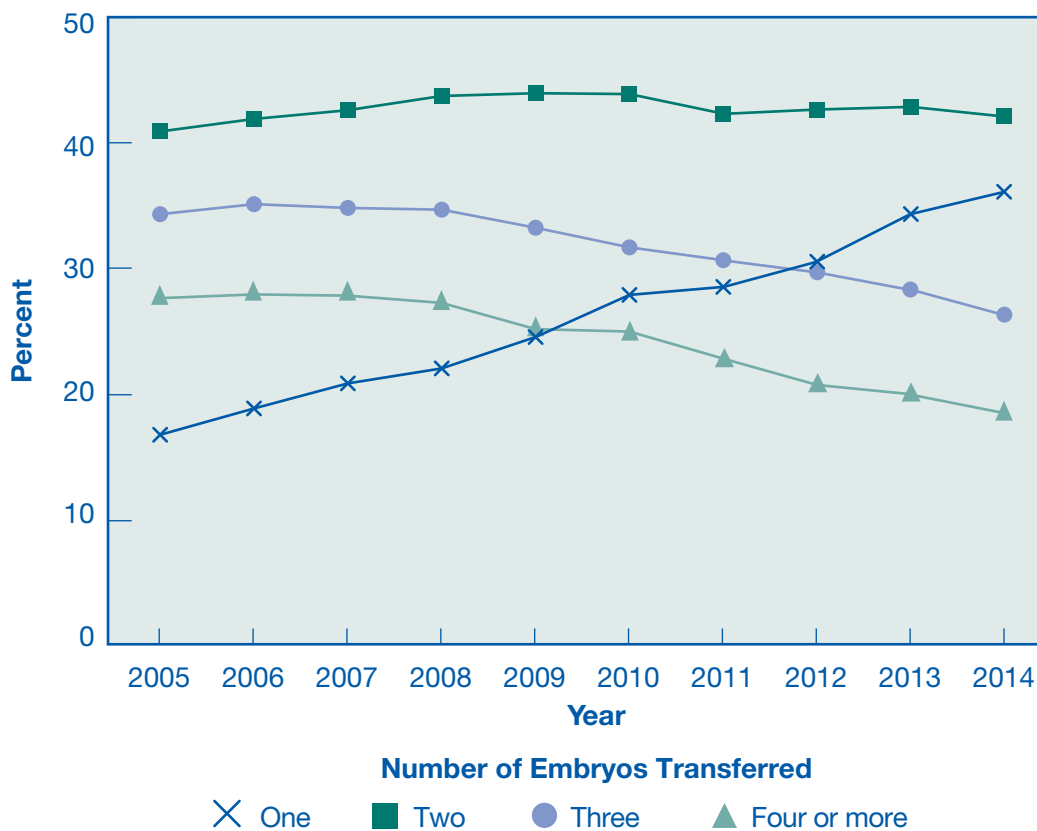
## Has the relationship between number of embryos transferred and the percentage of transfers that resulted in live births changed?

The percentage of transfers using fresh nondonor eggs or embryos that resulted in live births more than doubled from 17% in 2005 to 36% in 2014 for the transfer of one embryo, and increased slightly overall from 41% to 42% for the transfer of two embryos (Figure 51). During the same period, the percentage of transfers that resulted in live births decreased from 34% to 26% for the transfer of three embryos and from 28% to 18% for the transfer of four or more embryos.

Interpretation of the relationship between the number of embryos transferred and the percentage of live births over time is complicated by several factors, such as the woman's age and embryo quality. The increase in the percentage of live births among transfers of one embryo is likely due in part to a shift toward eSET among good-prognosis patients and overall improvements in ART practice.

**Figure 51**

Percentages of Transfers Using Fresh Nondonor Eggs or Embryos That Resulted in Live Births, by Number of Embryos Transferred, 2005–2014



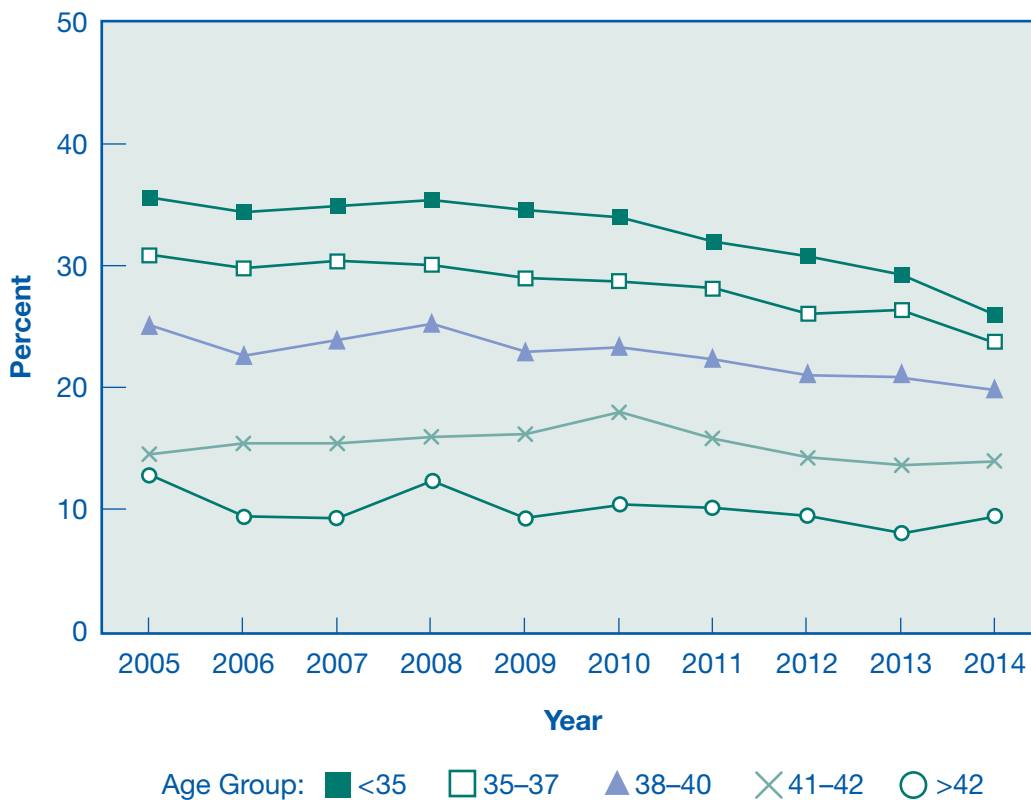
## Has the percentage of multiple-infant live births changed?

Figure 52 shows that the percentage of live births that resulted in multiple infants born decreased over time in each age group among cycles using fresh nondonor eggs or embryos. From 2005 through 2014, the percentage of multiple-infant live births decreased from 36% to 26% for women younger than age 35, from 31% to

24% for women aged 35–37, and from 25% to 20% for women aged 38–40. During the same time period, the percentage of multiple-infant live births decreased overall from approximately 15% to 14% for women aged 41–42 and from 13% to 10% for women older than age 42.

**Figure 52**

Percentages of Live Births Using Fresh Nondonor Eggs or Embryos That Resulted in Multiple Infants Born, by Age Group, 2005–2014



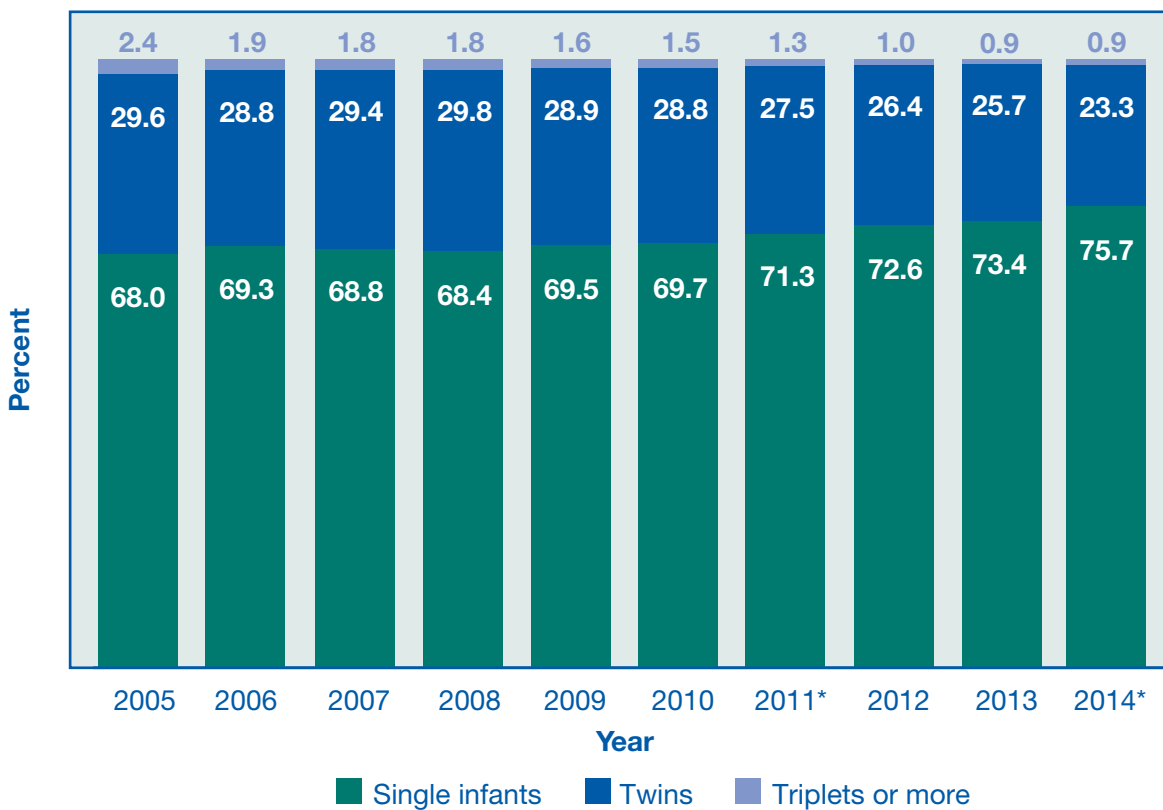
## Has the percentage of single infants, twins, and triplets or more changed for transfers that resulted in live births?

During the past 10 years, the percentage of transfers using fresh nondonor eggs or embryos that resulted in single-infant live births increased from 68% to almost 76%; twin births decreased from approximately 30% to 23%; and triplets or more births decreased from about 2%

to less than 1% (Figure 53). Infants born from multiple-infant births, including twins, are at greater risk of poor outcomes, including low birth weight, preterm birth, neurological impairments such as cerebral palsy, and death, compared with infants born from single-infant births.

**Figure 53**

Percentages of Single Infants, Twins, and Triplets or More Among ART Transfers Using Fresh Nondonor Eggs or Embryos That Resulted in Live Births, 2005–2014



\* Totals do not equal 100% due to rounding.





# 2014

## Appendix A

### Glossary of Terms





## APPENDIX A: GLOSSARY OF TERMS

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**American Society for Reproductive Medicine (ASRM).** Professional society whose affiliate organization, the Society for Assisted Reproductive Technology (SART), is composed of clinics and programs that provide ART.

**ART (assisted reproductive technology).** All treatments or procedures that include the handling of human eggs or embryos to help a woman become pregnant. ART includes but is not limited to in vitro fertilization (IVF), gamete intrafallopian transfer (GIFT), zygote intrafallopian transfer (ZIFT), tubal embryo transfer, egg and embryo cryopreservation, egg and embryo donation, and gestational surrogacy.

**ART cycle.** An ART cycle starts when a woman begins taking fertility drugs or having her ovaries monitored for follicle production. If eggs are produced, the cycle progresses to egg retrieval. Retrieved eggs are combined with sperm to create embryos. If fertilization is successful, at least one embryo is selected for transfer. If implantation occurs, the cycle may progress to clinical pregnancy and possibly live birth. ART cycles include any process in which (1) an ART procedure is performed, (2) a woman has undergone ovarian stimulation or monitoring with the intent of having an ART procedure, or (3) frozen embryos have been thawed with the intent of transferring them to a woman.

**Canceled cycle.** An ART cycle in which ovarian stimulation was performed but the cycle was stopped before eggs were retrieved or, in the case of frozen embryo cycles, before embryos were transferred. Cycles are canceled for many reasons: eggs may not develop, the patient may become ill, or the patient may choose to stop treatment.

**Cryopreservation.** The practice of freezing eggs or embryos from a patient's ART cycle for potential future use.

**Diminished ovarian reserve.** This diagnosis means that the ability of the ovary to produce eggs is reduced. Reasons include congenital, medical, or surgical causes or advanced age.

**Donor egg cycle.** An embryo is formed from the egg of one woman (the donor) and then transferred to another woman (the recipient).

**Donor embryo.** An embryo that is donated by a patient or couple who previously underwent ART treatment and had extra embryos available.

**Ectopic pregnancy.** A pregnancy in which the fertilized egg implants in a location outside of the uterus—usually in the fallopian tube, the ovary, or the abdominal cavity. Ectopic pregnancy is a dangerous condition that must receive prompt medical treatment.

**Egg.** A female reproductive cell, also called an oocyte or ovum.

**Egg/Embryo banking cycle.** An ART cycle started with the intention of freezing (cryopreserving) all resulting eggs or embryos for potential future use.

**Egg retrieval (also called oocyte retrieval).** A procedure to collect the eggs contained in the ovarian follicles.

**Egg transfer (also called oocyte transfer).** The transfer of retrieved eggs into a woman's fallopian tubes through laparoscopy. This procedure is used only in GIFT.

**Embryo.** An egg that has been fertilized by a sperm and has then undergone one or more cell divisions.

**Embryo transfer.** Placement of embryos into a woman's uterus through the cervix after IVF: in ZIFT, zygotes are placed in a woman's fallopian tube.

**Endometriosis.** A medical condition that involves the presence of tissue similar to the uterine lining in abnormal locations.

**eSET (elective single embryo transfer).** Elective single embryo transfer is a procedure in which one embryo, selected from a larger number of available embryos, is placed in the uterus or fallopian tube. The embryo selected for eSET might be a frozen (cryopreserved) embryo from a previous IVF cycle or a fresh embryo selected from a larger number of fresh embryos yielded during the current fresh IVF cycle.

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**Female factor infertility.** Infertility due to ovulatory disturbances, diminished ovarian reserve, pelvic abnormalities affecting the reproductive tract, or other abnormalities of the reproductive system.

**Fertility Clinic Success Rate and Certification Act of 1992 (FCSRCA).** Law passed by the United States Congress in 1992 requiring all clinics performing ART in the United States to annually report their success rate data to the Centers for Disease Control and Prevention.

**Fertilization.** The penetration of the egg by the sperm and the resulting combining of genetic material that develops into an embryo.

**Fetus.** The unborn offspring from the eighth week after conception to the moment of birth.

**Follicle.** A structure in the ovaries that contains a developing egg.

**Fresh eggs, sperm, or embryos.** Eggs, sperm, or embryos that have not been frozen. Fresh embryos, however, may have been conceived using either fresh or frozen sperm.

**Frozen embryo cycle.** An ART cycle in which frozen (cryopreserved) embryos are thawed and transferred to the woman.

**Gamete.** A reproductive cell, either a sperm or an egg.

**Gestational age.** The deviation of time from estimated last menstrual period (LMP) to birth. LMP is estimated using the date of retrieval or transfer.

**Gestational carrier (also called a gestational surrogate).** A woman who gestates, or carries, an embryo that was formed from the egg of another woman with the expectation of returning the infant to its intended parents.

**Gestational sac.** A fluid-filled structure that develops within the uterus early in pregnancy. In a normal pregnancy, a gestational sac contains a developing fetus.

**GIFT (gamete intrafallopian transfer).** An ART procedure that involves removing eggs from the woman's ovary and using a laparoscope to place the unfertilized eggs and sperm into the woman's fallopian tube through small incisions in her abdomen.

**ICSI (intracytoplasmic sperm injection).** A procedure in which a single sperm is injected directly into an egg; this procedure is commonly used to overcome male infertility problems.

**Implantation rate.** A measurement of ART success when the ART cycle results in an intrauterine clinical pregnancy, defined as the larger of either the number of maximum fetal hearts by ultrasound or maximum infants born, including live births and stillbirths, out of the total number of embryos transferred.

**Induced or therapeutic abortion.** A procedure used to end a pregnancy.

**Infertility.** In general, infertility refers to the inability to conceive after 12 months of unprotected intercourse. Women aged 35 and older unable to conceive after 6 months of unprotected intercourse generally are considered infertile for the purpose of initiating medical treatment.

**IUI (intrauterine insemination).** A medical procedure that involves placing sperm into a woman's uterus to facilitate fertilization. IUI is not considered an ART procedure because it does not involve the manipulation of eggs.

**IVF (in vitro fertilization).** An ART procedure that involves removing eggs from a woman's ovaries and fertilizing them outside her body. The resulting embryos are then transferred into a woman's uterus through the cervix.

**Live birth.** The delivery of one or more infants with any signs of life.

**Male factor infertility.** Any cause of infertility due to low sperm count or problems with sperm function that makes it difficult for a sperm to fertilize an egg under normal conditions.

**Miscarriage (also called spontaneous abortion).** A pregnancy ending in the spontaneous loss of the embryo or fetus before 20 weeks of gestation.

**Multifetal pregnancy reduction.** A procedure used to decrease the number of fetuses a woman carries and improve the chances that the remaining fetuses will develop into healthy infants. Multifetal reductions that occur naturally are referred to as spontaneous reductions.

**Multiple factor infertility, female and male.** A diagnostic category used when one or more female cause of infertility and male factor infertility are diagnosed.

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**Multiple factor infertility, female only.** A diagnostic category used when more than one female cause of infertility but no male factor infertility is diagnosed.

**Multiple-fetus pregnancy.** A pregnancy with two or more fetuses, determined by the number of fetal hearts observed on an ultrasound.

**Multiple-infant birth.** A pregnancy that results in the birth of more than one infant.

**NASS (National ART Surveillance System).** Web-based data collection system used by all ART clinics to report data for each ART procedure to CDC.

**Oocyte.** The female reproductive cell, also called an egg.

**Other causes of infertility.** These include immunological problems, chromosomal abnormalities, cancer chemotherapy, and serious illnesses.

**Ovarian hyperstimulation syndrome.** A possible complication of ovarian stimulation or ovulation induction that can cause enlarged ovaries, a distended abdomen, nausea, vomiting or diarrhea, fluid in the abdominal cavity or chest, breathing difficulties, changes in blood volume or viscosity, and diminished kidney perfusion and function.

**Ovarian monitoring.** The use of ultrasound, or blood or urine tests to monitor follicle development and hormone production.

**Ovarian stimulation.** The use of drugs (oral or injected) to stimulate the ovaries to develop follicles and eggs.

**Ovulatory dysfunction.** A diagnostic category used when a woman's ovaries are not producing eggs normally. It is usually characterized by irregular menstrual cycles reflective of ovaries that are not producing one mature egg each month. It includes polycystic ovary syndrome and multiple ovarian cysts.

**PGD/PGS (preimplantation genetic diagnosis or screening).** Techniques performed on embryos prior to transfer. PGD is for detecting specific genetic conditions to reduce the risk of passing inherited diseases to children. PGS screens embryos for an abnormal number of chromosomes, which is of special value for women with advanced age, recurrent miscarriages, or failed IVF.

**Pregnancy (clinical).** A pregnancy documented by ultrasound that shows a gestational sac in the uterus. For ART data reporting purposes, pregnancy is defined as a clinical pregnancy rather than a chemical pregnancy (that is, a positive pregnancy test).

**Singleton.** A single infant.

**Society for Assisted Reproductive Technology (SART).** An affiliate of ASRM composed of clinics and programs that provide ART.

**Sperm.** The male reproductive cell.

**Spontaneous abortion.** See Miscarriage.

**Stillbirth.** The birth of an infant that shows no sign of life after 20 or more weeks of gestation.

**Stimulated cycle.** An ART cycle in which a woman receives oral or injected fertility drugs to stimulate her ovaries to develop follicles that contain mature eggs.

**Thawed embryo cycle.** Same as frozen embryo cycle.

**Tubal factor infertility.** A diagnostic category used when the woman's fallopian tubes are blocked or damaged, making it difficult for the egg to be fertilized or for an embryo to travel to the uterus.

**Ultrasound.** A technique used in ART for visualizing the follicles in the ovaries, the gestational sac, or the fetus.

**Unknown cause of infertility.** A diagnostic category used when no cause of infertility is found in either the woman or the man.

**Unstimulated cycle.** An ART cycle in which the woman does not receive drugs to stimulate her ovaries to produce more follicles and eggs. Instead, follicles and eggs develop naturally.

**Uterine factor infertility.** A structural or functional disorder of the uterus that results in reduced fertility.

**ZIFT (zygote intrafallopian transfer).** An ART procedure in which eggs are collected from a woman's ovary and fertilized outside her body. A laparoscope is then used to place the resulting zygote into the woman's fallopian tube through a small incision in her abdomen.

**Zygote.** A fertilized egg before it begins to divide.





# 2014

## Appendix B

### National Consumer Organizations







## **APPENDIX B: NATIONAL CONSUMER ORGANIZATIONS**

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The following national consumer organizations offer support to people experiencing infertility:

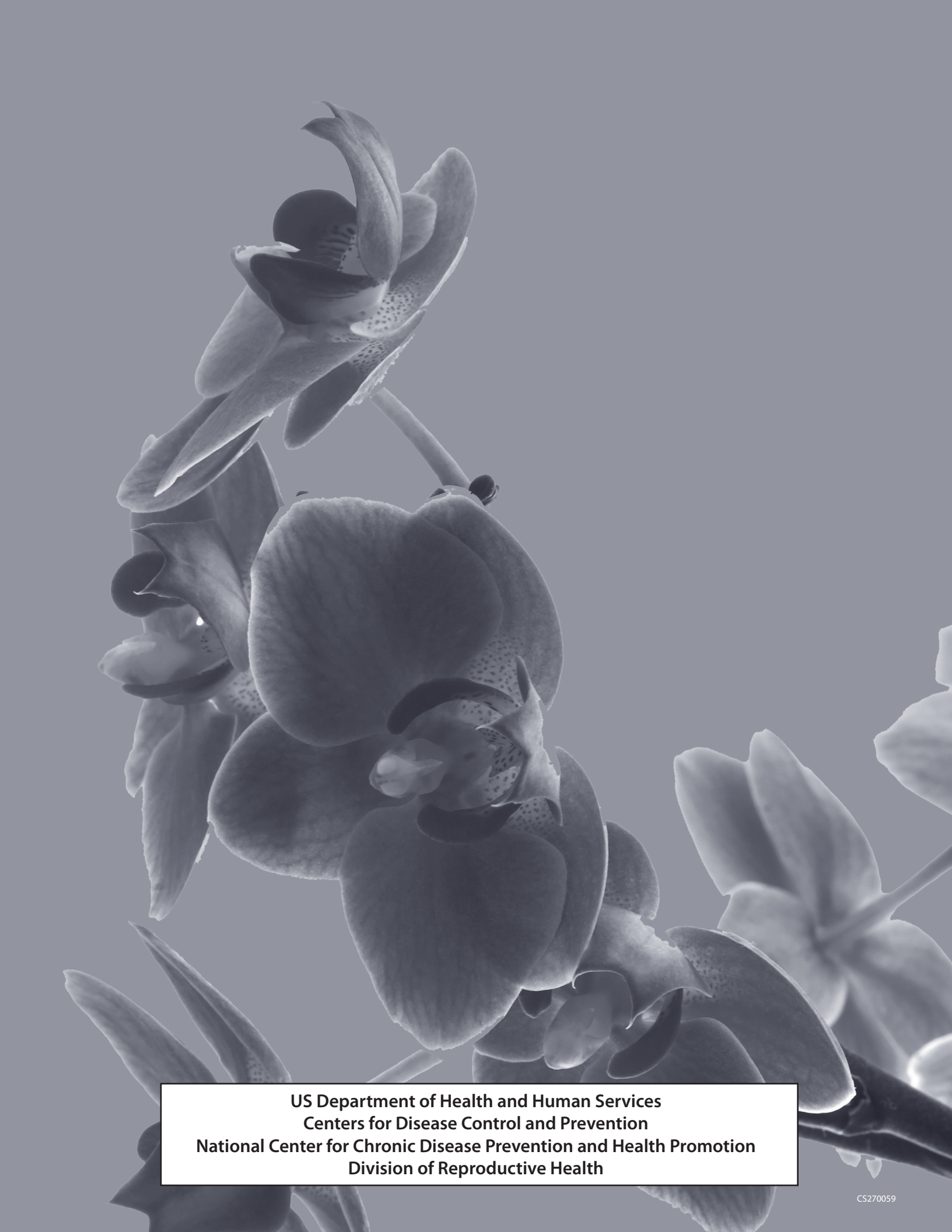
Path2Parenthood  
315 Madison Ave, Suite 901  
New York NY 10017  
Telephone: (888) 917-3777  
info@path2parenthood.org  
<http://www.path2parenthood.org>

RESOLVE: The National Infertility Association  
7918 Jones Branch Dr, Suite 300  
McLean VA 22102  
Telephone: (703) 556-7172; Fax: (703) 506-3266  
info@resolve.org  
<http://www.resolve.org>

Womenshealth.gov  
Office on Women's Health  
US Department of Health and Human Services  
200 Independence Ave S.W., Room 712E  
Washington DC 20201  
Telephone: (202) 690-7650; Fax: (202) 205-2631  
<http://www.womenshealth.gov>







**US Department of Health and Human Services  
Centers for Disease Control and Prevention  
National Center for Chronic Disease Prevention and Health Promotion  
Division of Reproductive Health**