

# Hopelessly Infertile: Are There Any Miracles?

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FERTILITY  
ASSOCIATES  
of MEMPHIS

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*When you absolutely cannot have children,  
it's called sterility.*

*When it seems to be taking an awfully long  
time, but you still hope, that's called  
infertility.*

*Infertility is worse.*

**Katherine Bouton**  
**Ms. Magazine**  
**April/97**

# LIFE

November 1982 \$2.00

## 'CATS' LEAPS ONTO BROADWAY

The hottest theater  
ticket in the country

## SAVING AFRICA'S BIG ANIMALS

A radical plan to  
butcher some of them  
and sell their meat

## TEST- TUBE BABY BOOM

Elizabeth Curo,  
America's first  
in vitro baby,  
at the lab  
where she  
was conceived



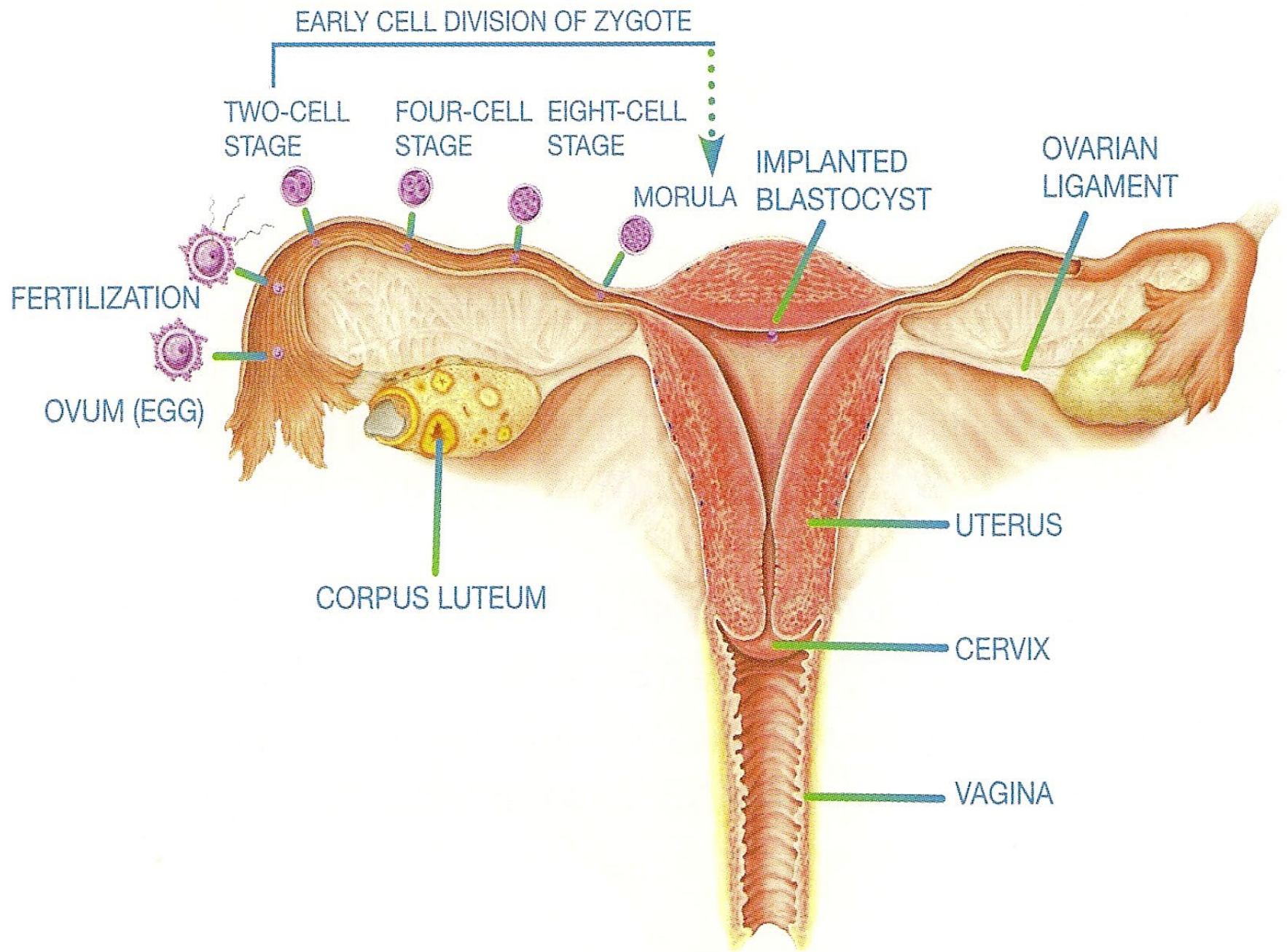
# Assisted Reproductive Technology (ART)

**“ Techniques that combine egg and sperm outside the female reproductive tract to enhance the probability of pregnancy.”**

# **In Vitro Fertilization (IVF)**

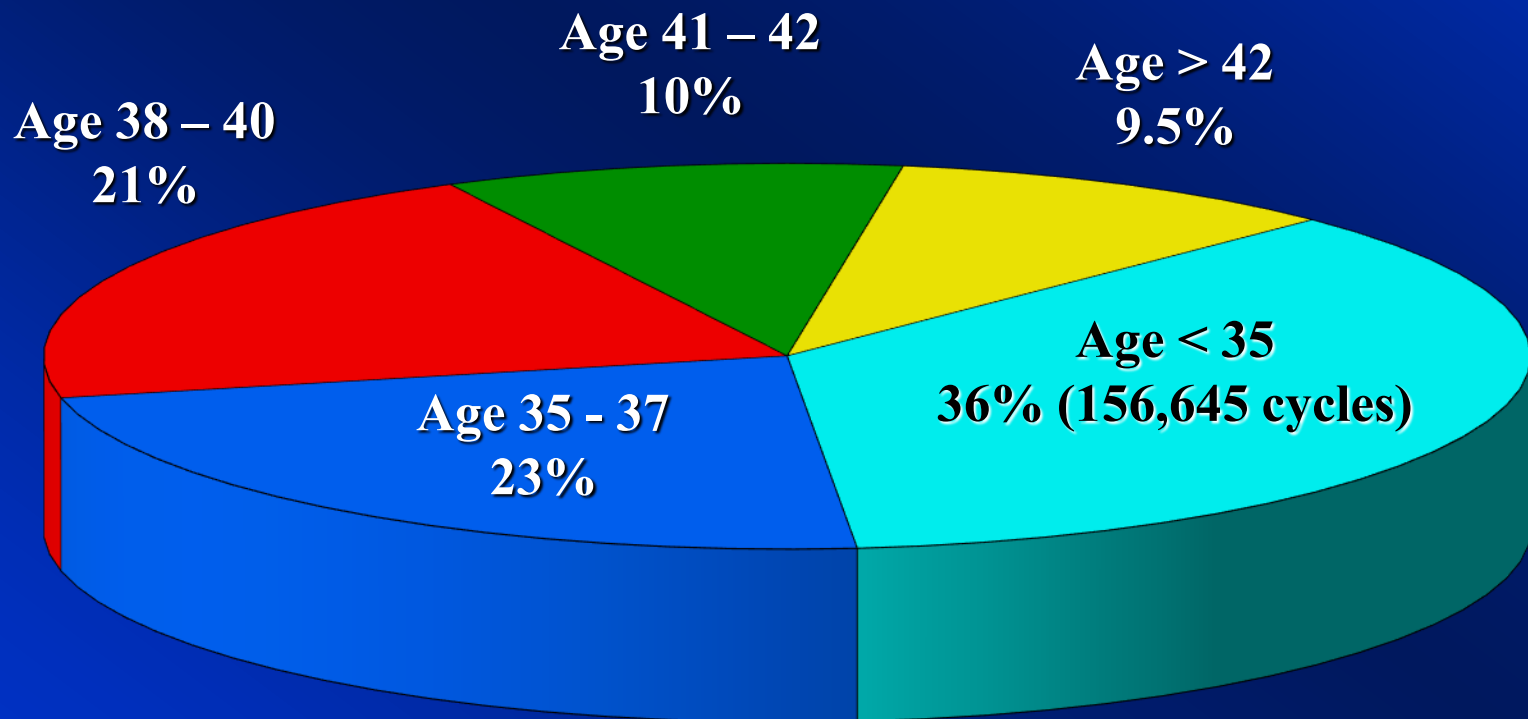
## **Technique**

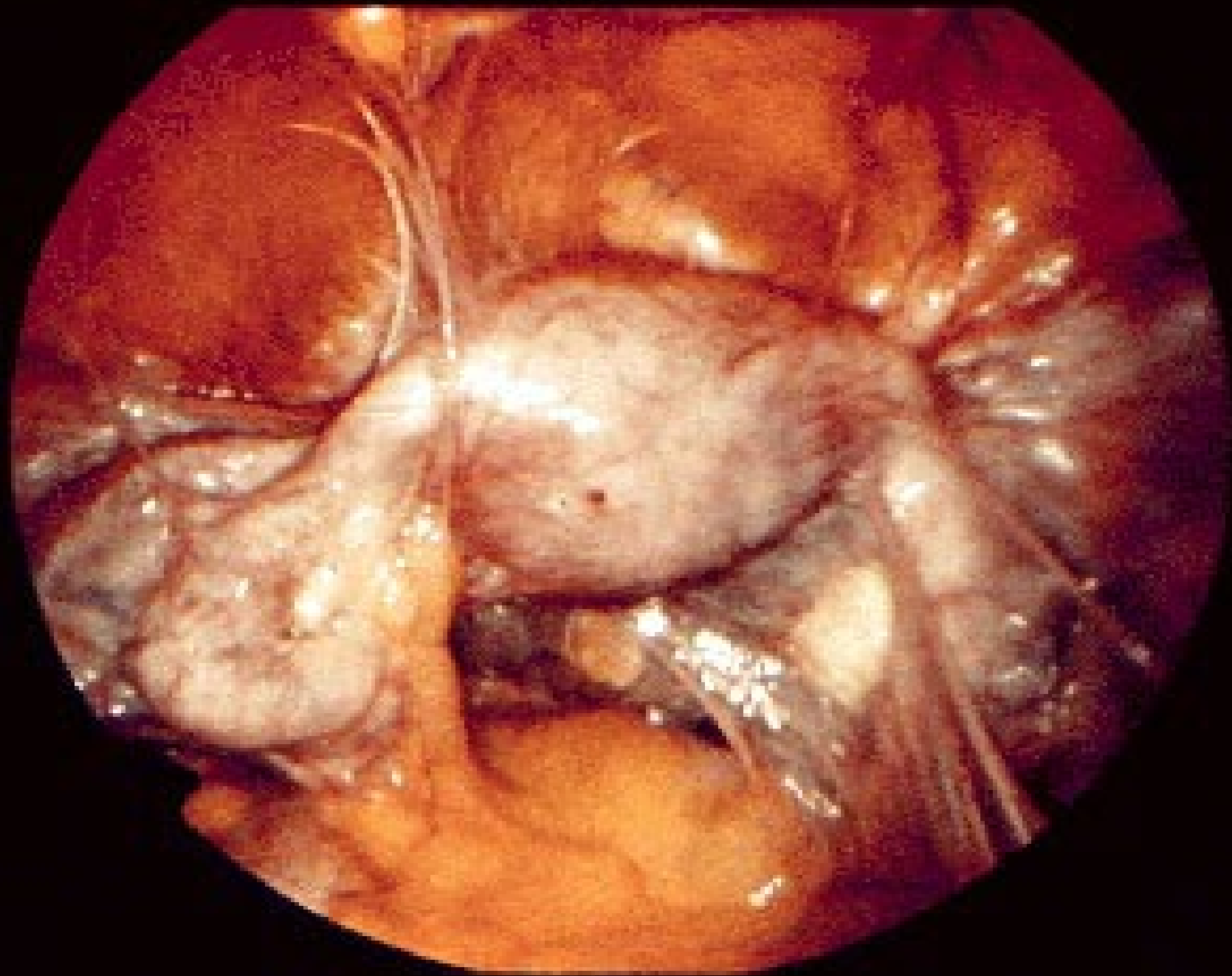
- **Controlled ovarian hyperstimulation (superovulation)**
- **Oocyte retrieval**
- **In vitro fertilization**
- **Embryo culture**
- **Transcervical embryo transfer**





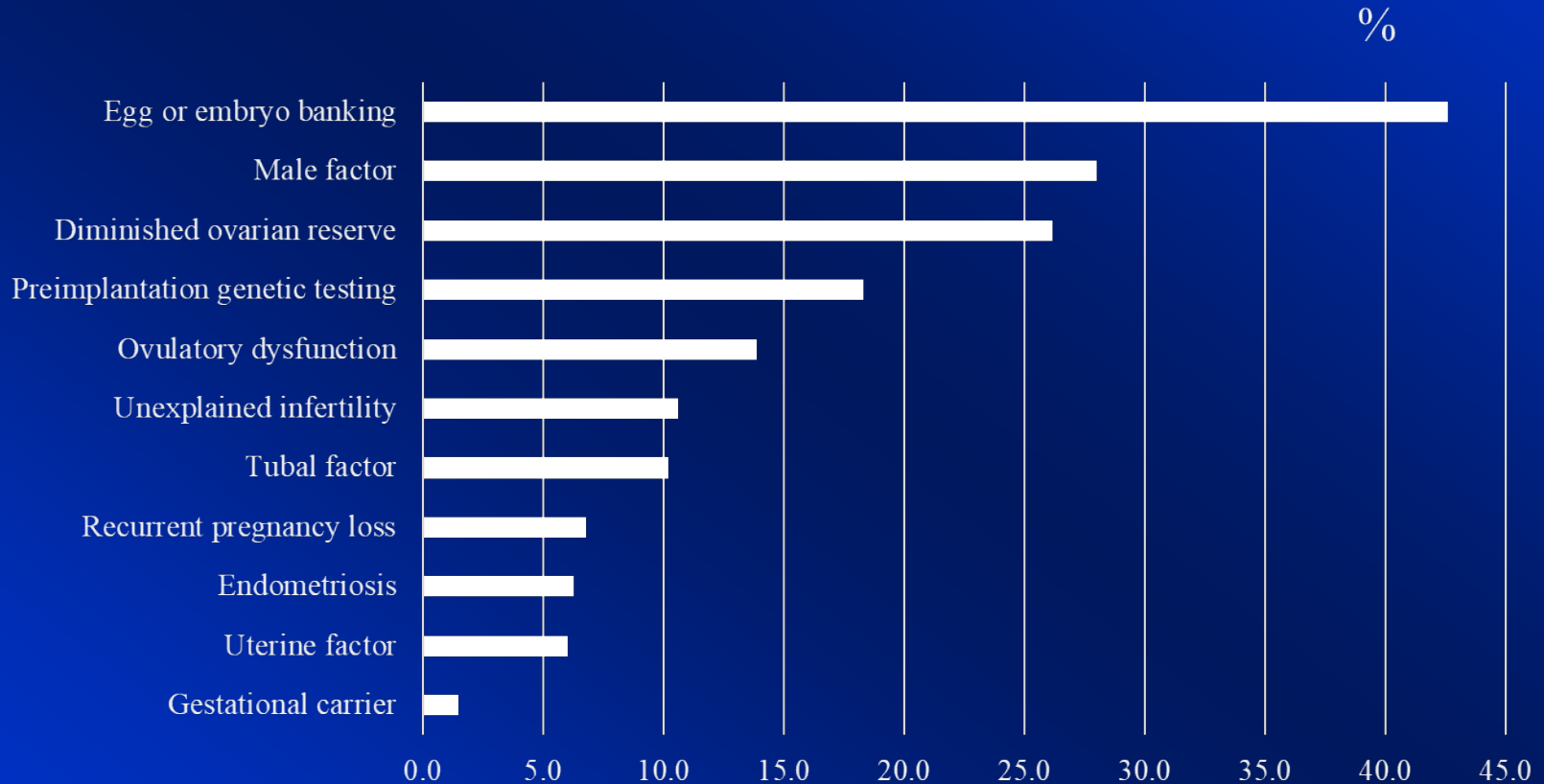
# ART Use By Age Group - United States, 2022





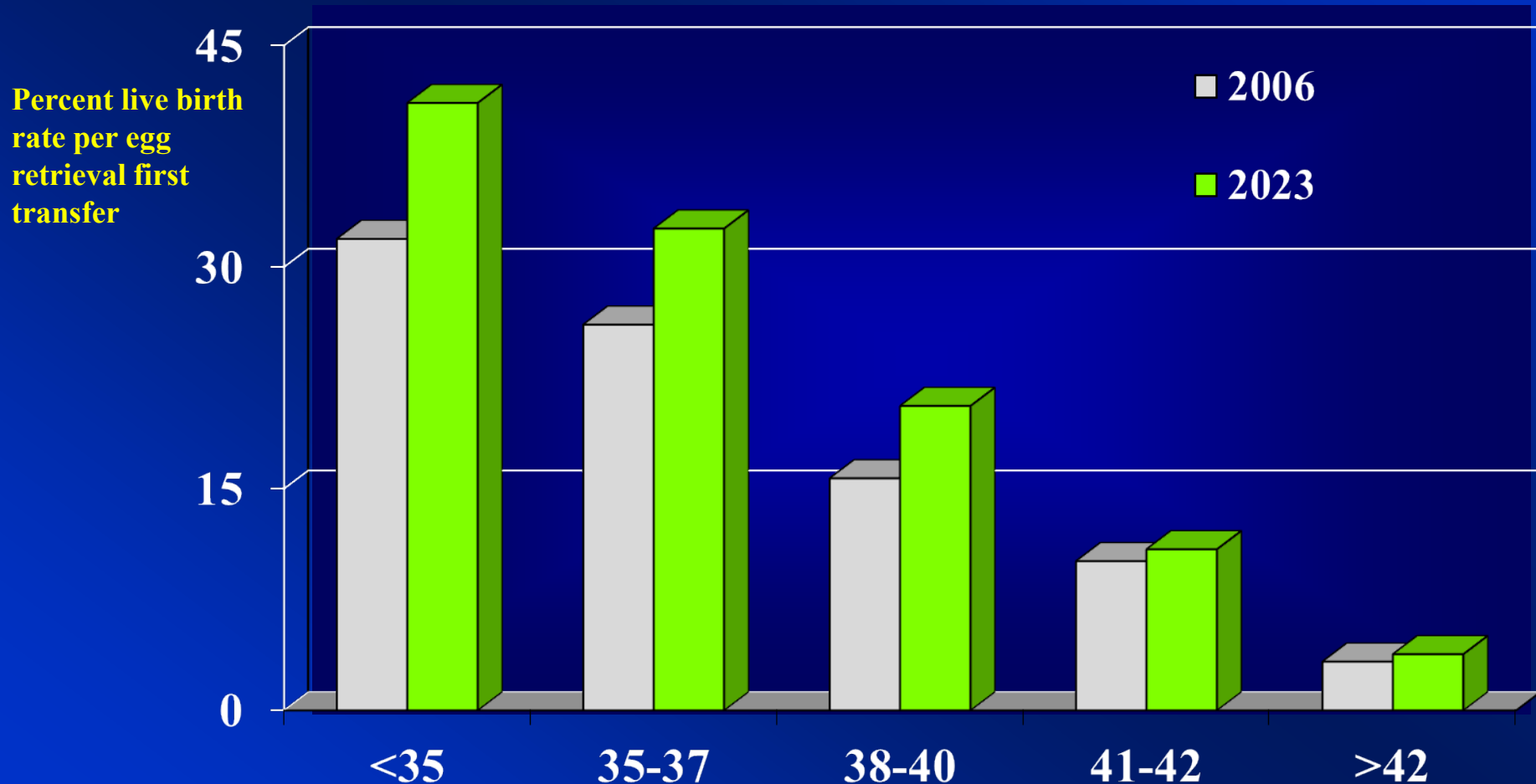


# Reasons for using ART – United States, 2022



# IVF Live Birth Rates by Age Groups

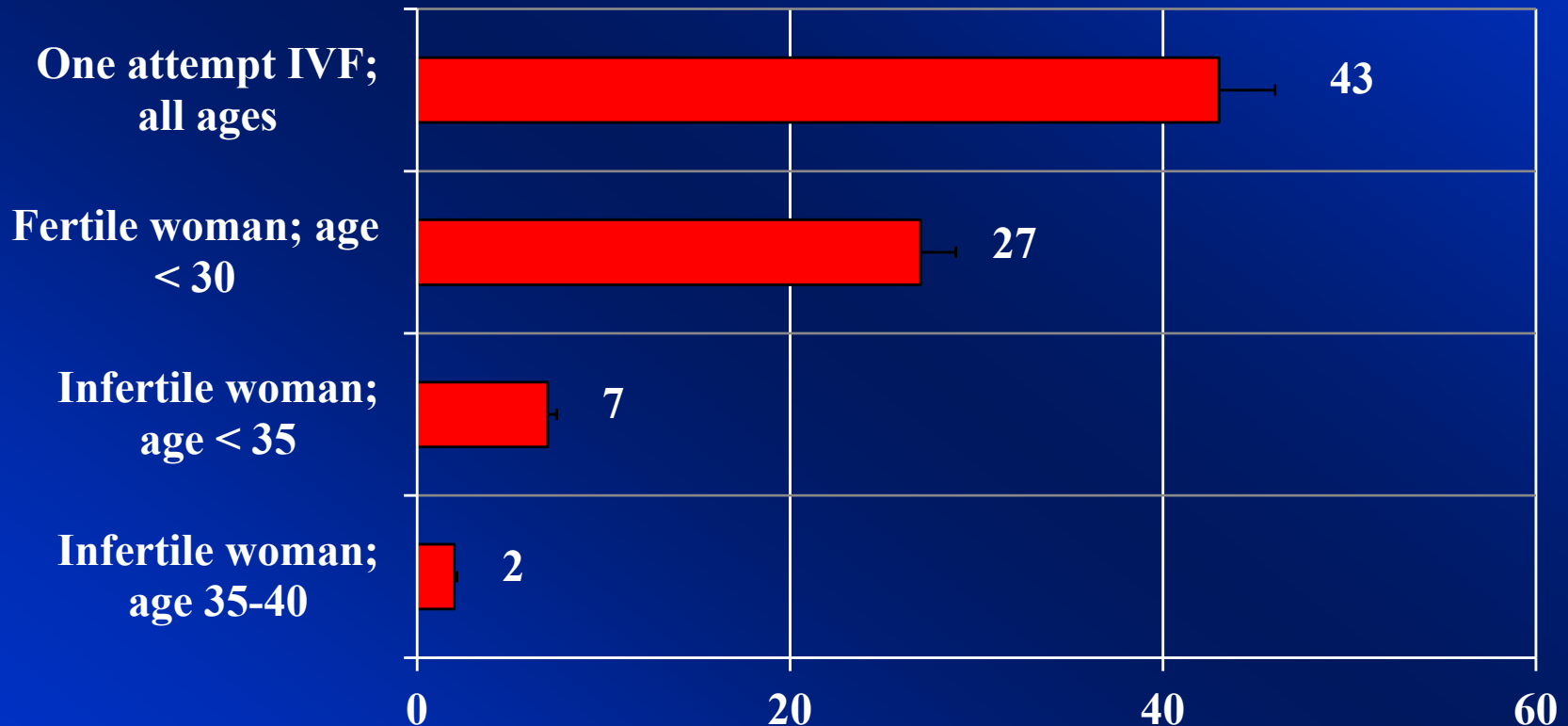
## SART 2023



**Fresh, non-donor cycles only**

<https://www.sartcorsonline.com/EmbryoOutcome/PublicSARTOutcomeTables>

# Monthly Fecundity Rate with Live Birth



NHS, 2003  
CDC/SART 2022

%

# ART

## Concerns in 2006

- **Exposure to superovulation**
  - discomfort
  - ovarian hyperstimulation syndrome
  - ?? risk of neoplasm
- **Risk of multiple pregnancy**
- **Risk to fetus**
  - ? increased incidence of low birthweight and preterm delivery
- **Cost**

LONG

A

B

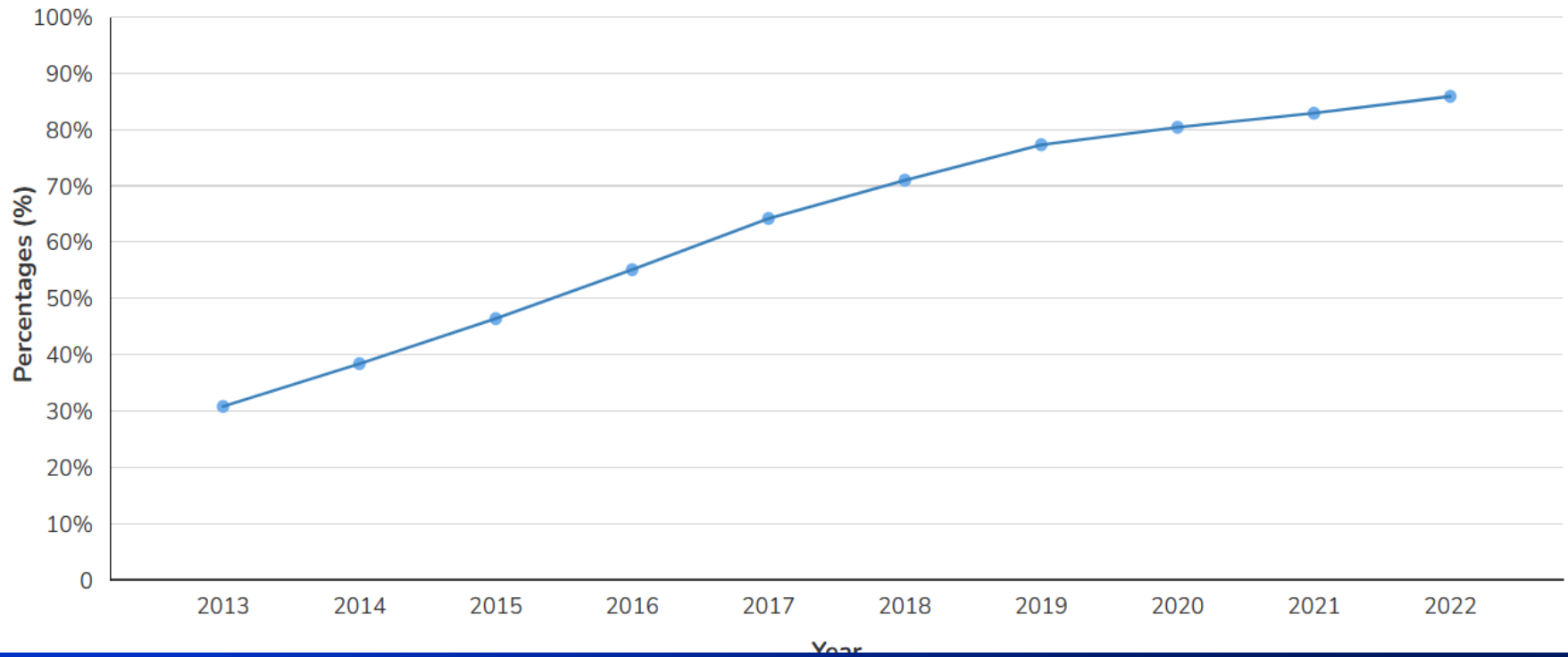
C

D

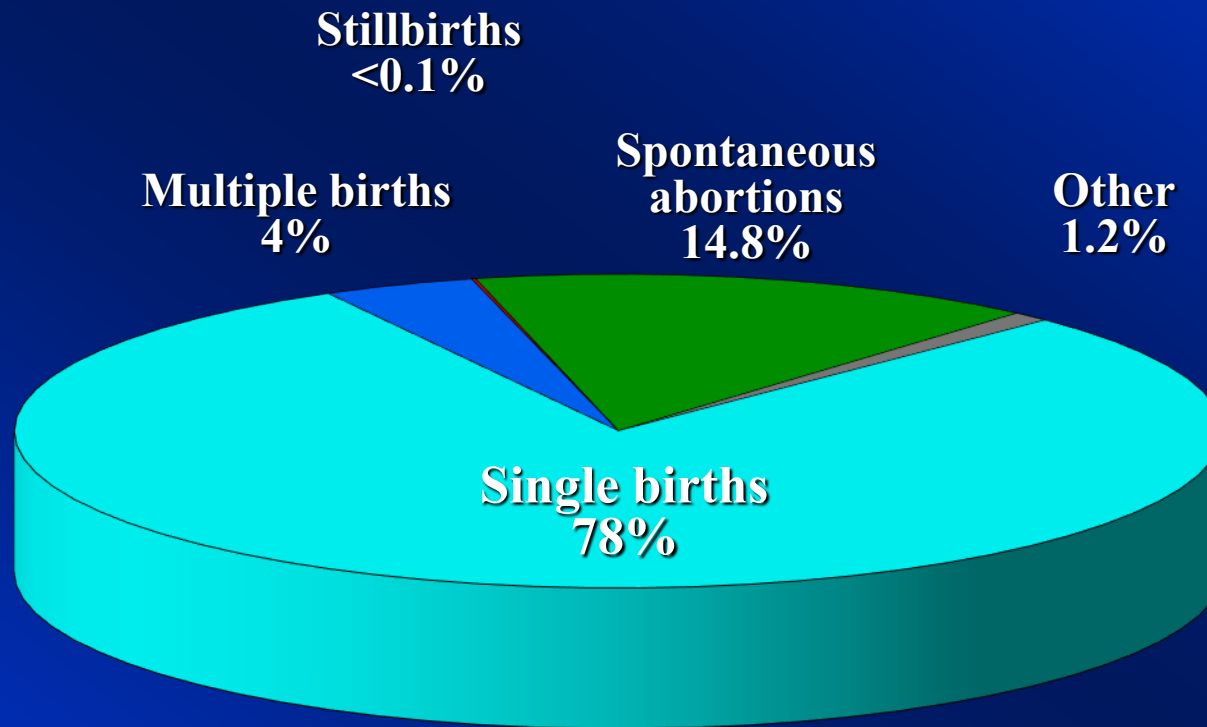


# Single Embryo Transfer

Percentage of Embryo Transfer Cycles in Which a Single Embryo Was Transferred, 2013–2022



# Outcomes of Pregnancies From ART 2022 CDC





# Cryopreservation: Vitrification

**7.5% ethylene glycol  
7.5% DMSO  
20% SSS  
in M199-H**

**Equilibration  
Solution**

**15% ethylene glycol  
15% DMSO  
0.5 M sucrose  
20% SSS  
in M199-H**

**Vitrification  
Solution**

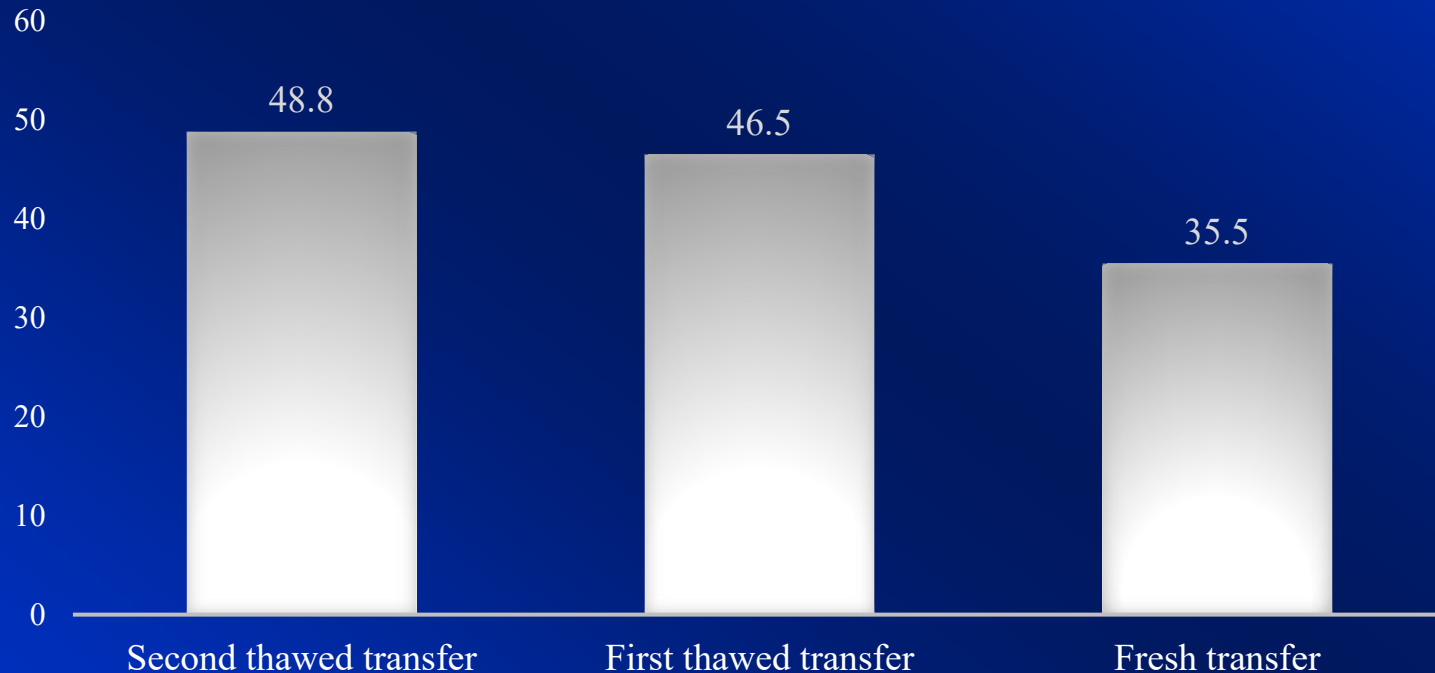
**Liquid Nitrogen Plunge**

**Expose Time 50  
to 60 Sec.**



# Fresh vs Thawed Embryo Transfer

LIVE BIRTH RATE PER  
RETRIEVAL/THAW (%)



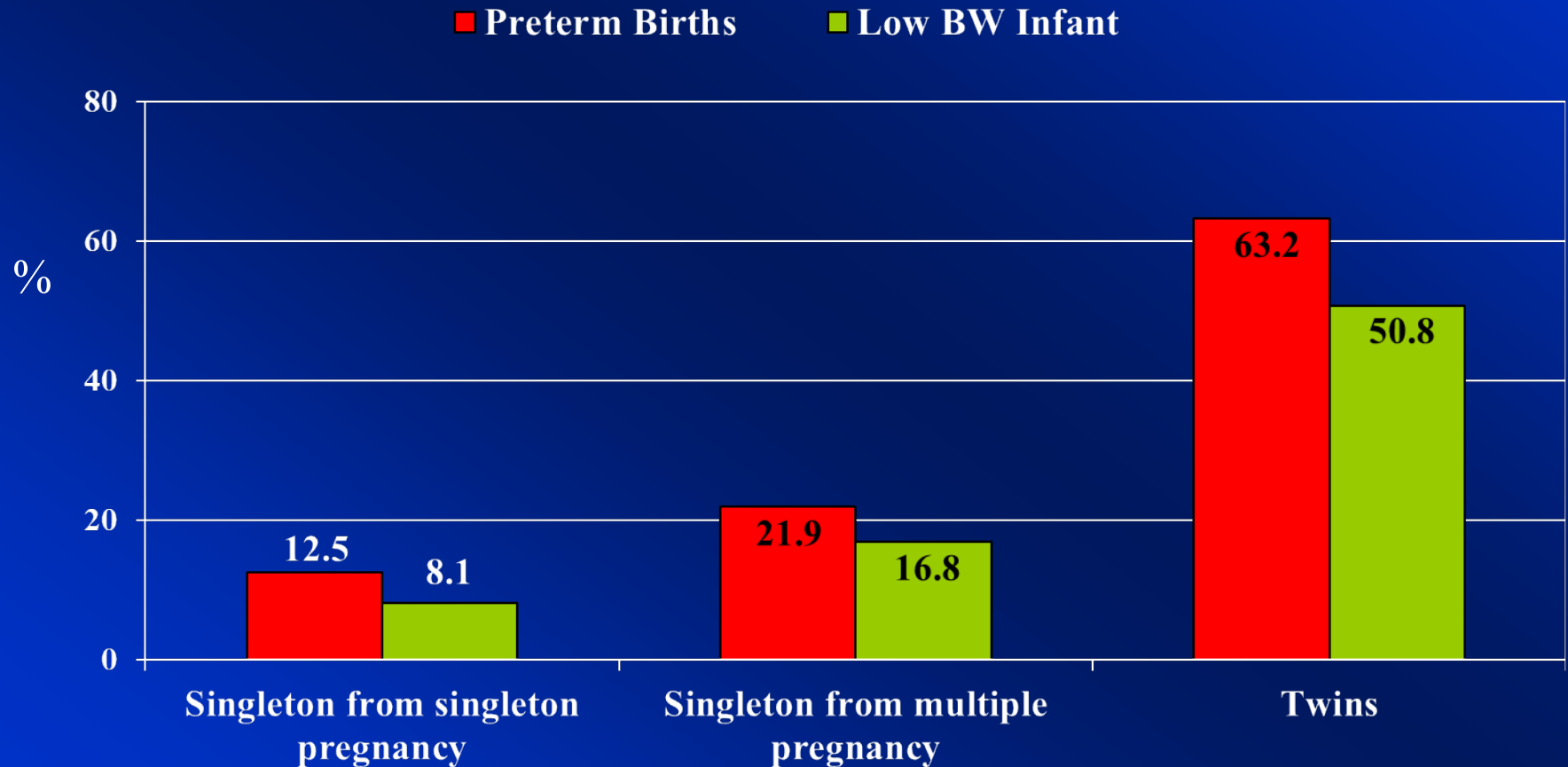
Based on 53,088 egg retrievals: under 35, non-donor oocytes

<https://www.sartcorsonline.com/EmbryoOutcome/PublicSARTOutcomeTables>

# Thawed Embryo Transfer

- Only 12% of egg retrievals result in fresh embryo transfer
- Vitrification of embryos preserves embryonic competence
- Controlled ovarian hyperstimulation may adversely affect uterine receptivity
- Allows for widespread pre-implantation genetic testing
- Further reduces risk of ovarian hyperstimulation syndrome

# Risk of Pre-term Birth and Low Birthweight in Infants Conceived with ART – CDC 2022



# Risk of Congenital Anomalies

	Absolute risk per 1000 ART Births	Odds Ratio
<b>Major birth defects</b>	<b>43</b>	<b>1.5</b>
<i>Hypospadias</i>	<i>7.6</i>	<i>3.1</i>
<b>Epigenetic or Imprinting Disorder</b>	<b>0.3</b>	<b>17.8</b>
Beckwith Wiedemann Angelman		
<b>ICSI-Sex chromosome aneuploidy</b>	<b>6</b>	<b>3.0</b>

# ART

## Trends in 2025

- Pre-implantation genetic testing
- Fertility preservation
- Cost

# Preimplantation Genetic Testing

- **Identifies embryonic genotype**
  - **Aneuploidy - PGT-A**
  - **Single gene mutation - PGT-M**
  - **Chromosomal rearrangements - PGT-SR**
  - **Sex selection**
  - **Polygenic conditions?**
- **Avoids pregnancy termination**
- **Opportunity for gene therapy**



# PGT-A

- Implantation rate improved with PGT-A in all age groups
- Miscarriage rate was lower with PGT-A in all age groups
- Livebirth rate improved in age > 37yo

**Chang J et al. Fertil Steril 2016;105:394**

- Number needed to treat for one additional livebirth :
  - 21 cycles or 35 embryo transfers

**Kushnir et al. Fertil Steril 2016;106:75**

ORIGINAL ARTICLE

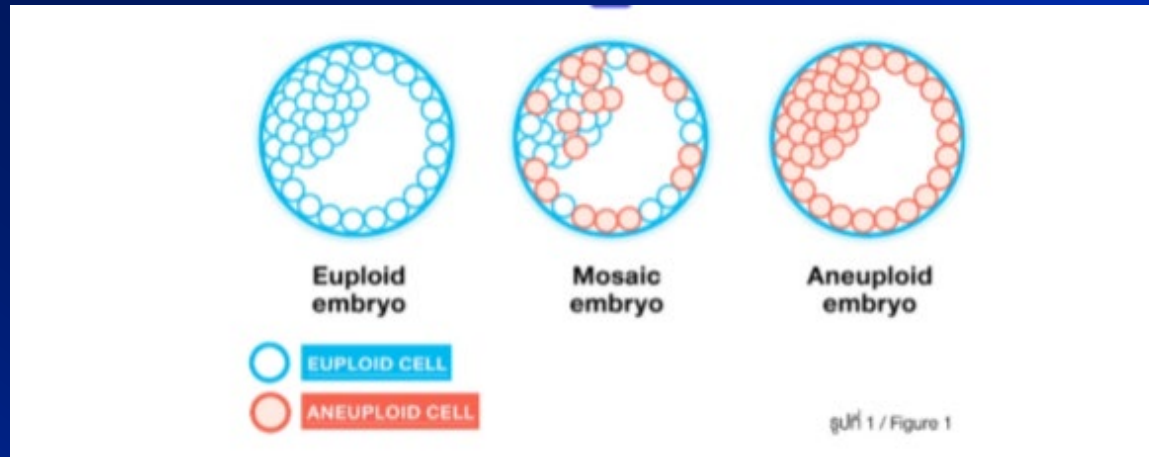
## Live Birth with or without Preimplantation Genetic Testing for Aneuploidy

J. Yan, Y. Qin, H. Zhao, Y. Sun, F. Gong, R. Li, X. Sun, X. Ling, H. Li, C. Hao, J. Tan, J. Yang, Y. Zhu, F. Liu, D. Chen, D. Wei, J. Lu, T. Ni, W. Zhou, K. Wu, Y. Gao, Y. Shi, Y. Lu, T. Zhang, W. Wu, X. Ma, H. Ma, J. Fu, J. Zhang, Q. Meng, H. Zhang, R.S. Legro, and Z.-J. Chen

ABSTRACT

- **1212 good-prognosis patients randomly assigned to PGT-A or no PGT-A**
- **69.8% of all biopsied embryos were euploid**
- **No difference in cumulative live birth rate (77.2% vs 81.8%)**
- **Pregnancy loss was decreased with PGT-A (8.7% vs 12.6%)**

# Embryonic Mosaicism



- 18 transfers of mosaic embryo in women with no available euploid embryos
- Results in six euploid healthy livebirths and two miscarriages  
Greco E et al. NEJM 2015, 373: 2089
- False positive rate of 0-30% with next gen sequencing (NGS)  
Goodrich D et al. J Assist Reprod Genet. 2016; 33:1473-1480

[Our Tests](#)[Who We Serve](#)[Our Approach](#)[About Us](#)[Resources](#)

# Genomic Analysis for Personalized Healthcare

Using whole genome sequencing and state-of-the-art bioinformatics, MyOme analyzes a single patient sample to produce comprehensive and clinically actionable reports that allow patients and their providers to make personalized lifestyle, prevention, and treatment choices.



# **Fertility Preservation**

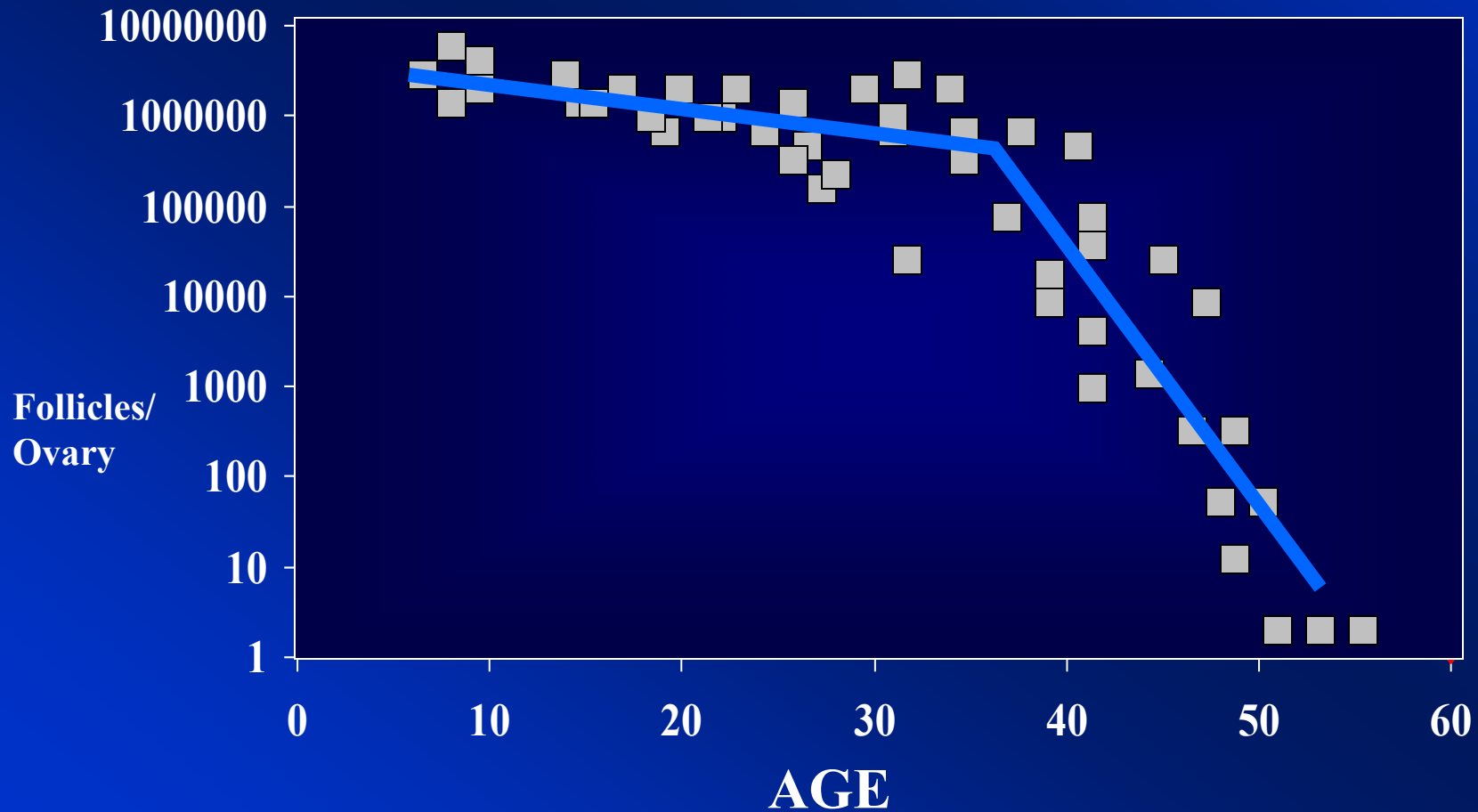
## **Mature Oocyte Cryopreservation**

- **Prior to gonadotoxic treatment or gonadectomy in reproductive age females**
- **Excessive available oocytes during IVF**
- **Unavailable male partner**
- **Elective fertility preservation (EFP)**

# American Society of Clinical Oncology (ASCO) Guidelines

- As part of informed consent prior to therapy, oncologists should address the possibility of infertility with patients
- Referrals for interested patients to reproductive specialists
- Discussion at the earliest possible opportunity
- Sperm, oocyte and embryo cryopreservation for centers with expertise are standard practice

# Age-Related Changes in Ovarian Reserve



Richardson SJ et al, 1987



# Elective Fertility Preservation (EFP)

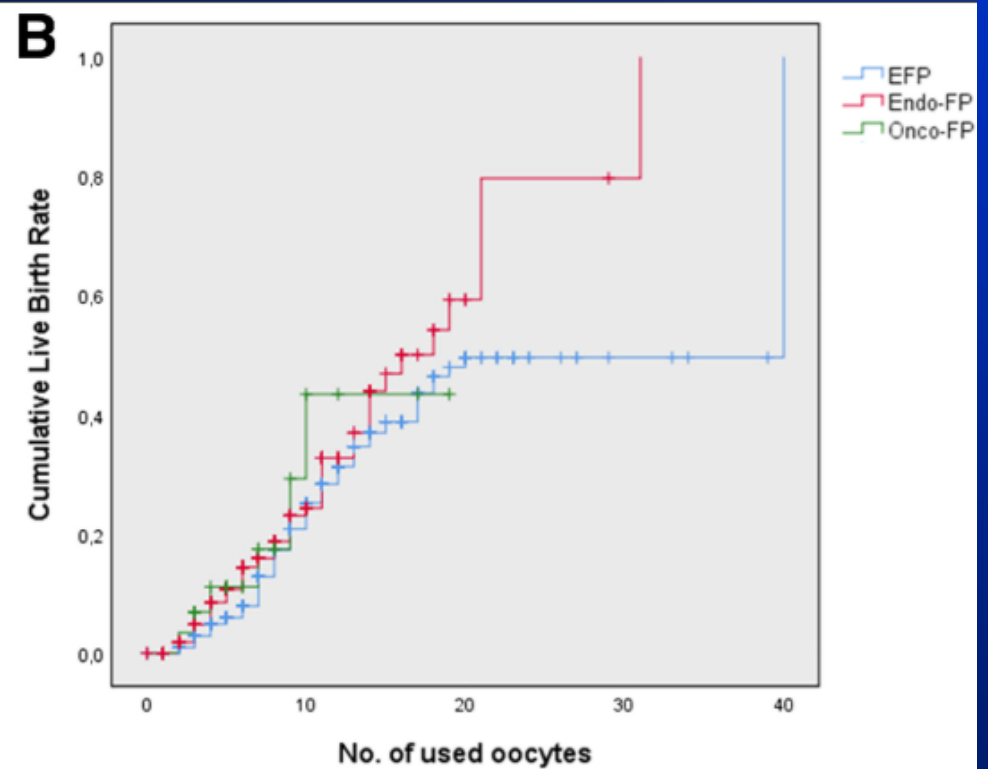
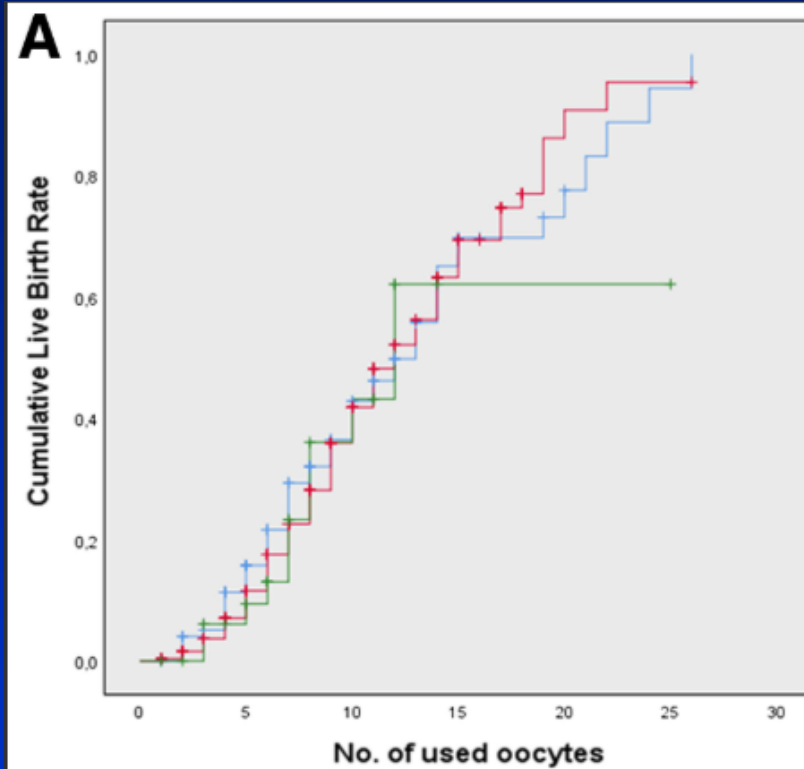
- 1468 patients
  - mean age: 37.2
  - mean no. vitrified oocytes per retrieval: 9.8
- 137 patients returned for IVF
  - Mean age at return: 39.2
  - 85.2% survival rate
  - 27% ongoing preg rate per patient

Cobo A, et al. Fertil Steril 2016:755

# Fertility Preservation

Age  $\leq 35$

Age  $> 35$



EFP: elective fertility preservation

Endo-FP: endometriosis

Onco-FP: oncologic

Cobo A, et al. Fertil Steril 2021;1091



# TIME

How a dazzling  
array of medical  
breakthroughs  
has made

## CURING INFERTILITY

more than just  
a dream