Canadian Assisted Reproductive Technologies Register Plus (CARTR Plus)

Canadian Fertility and Andrology Society
65th Annual Meeting – Ottawa
September 19 – 21, 2019
**List of abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS</td>
<td>Cycle start</td>
</tr>
<tr>
<td>RET</td>
<td>Oocyte retrieval</td>
</tr>
<tr>
<td>ET</td>
<td>Embryo transfer</td>
</tr>
<tr>
<td>IVF</td>
<td>In vitro fertilization</td>
</tr>
<tr>
<td>FET</td>
<td>Frozen embryo transfer</td>
</tr>
<tr>
<td>PGT-A/PGT-M</td>
<td>Preimplantation Genetic Testing for Aneuploidy/Monogenic (Single Gene) Diseases</td>
</tr>
<tr>
<td>IVM</td>
<td>In vitro maturation</td>
</tr>
<tr>
<td>OHSS</td>
<td>Ovarian hyperstimulation syndrome</td>
</tr>
<tr>
<td>eSET</td>
<td>Elective single embryo transfer</td>
</tr>
<tr>
<td>neSET</td>
<td>Non-elective single embryo transfer</td>
</tr>
<tr>
<td>eDET</td>
<td>Elective double embryo transfer</td>
</tr>
<tr>
<td>neDET</td>
<td>Non-elective double embryo transfer</td>
</tr>
</tbody>
</table>
Disclaimer

• This report is based on data submitted by assisted reproductive technology clinics from across Canada to the CARTR Plus database. Although significant effort has been made to ensure the accuracy of the information presented in this report, neither the authors nor BORN Ontario nor any other parties make any representation or warranties as to the accuracy, reliability or completeness of the information contained herein.

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Suggested citations


Notes

• All data current as of May 2019

• Treatment cycle outcomes for 2018 cycle starts
  – Based on 36 clinics

• Birth outcomes for 2017 cycle starts
  – Based on 36 clinics
Notes

- These slides present descriptive estimates on which no formal statistical tests have been carried out; therefore, differences across treatment cycles, patient characteristics or embryo transfer characteristics may not be statistically significant and should be interpreted cautiously.

- Unless otherwise specified, denominators for birth outcomes are based on the pregnancy level.
INTRODUCTION

All ART treatment cycles (fresh and frozen)
Total treatment records entered into CARTR Plus with a cycle start date between Jan 1, 2013 and Dec 31, 2018: 
n = 183,739

2013 Treatment cycles: 
n = 25,349

31 clinics

2014 Treatment cycles: 
n = 28,166

34 clinics

2015 Treatment cycles: 
n = 29,538

33 clinics

2016 Treatment cycles: 
n = 31,274

35 clinics

2017 Treatment cycles: 
n = 34,136

36 clinics

2018 Treatment cycles: 
n = 35,276

36 clinics

Birth outcomes

94.7% complete (8,930/9,429) per ongoing clinical pregnancy

* Unacknowledged records were included if they were “submitted” or if they linked to an outcome
Number of Unique Women

All ART treatment cycles

80,277 Unique Women from 2013-2018

2013: 17,051
2014: 18,424
2015: 18,914
2016: 20,644
2017: 21,816
2018: 22,516

Unique Women
Cycle Starts
Volume of treatment cycles by clinic

*All ART treatment cycles*

<table>
<thead>
<tr>
<th>Number of treatment cycles</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;200</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>200–499</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>9</td>
<td>9</td>
<td>7</td>
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<tr>
<td>500–999</td>
<td>11</td>
<td>10</td>
<td>13</td>
<td>12</td>
<td>12</td>
<td>10</td>
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<tr>
<td>≥1,000</td>
<td>11</td>
<td>8</td>
<td>11</td>
<td>13</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>TOTAL</td>
<td>31</td>
<td>33</td>
<td>34</td>
<td>34</td>
<td>36</td>
<td>36</td>
</tr>
</tbody>
</table>
Number of cycles

All ART treatment cycles

- Cycle starts: 35,276
- Oocyte Retrieval/Thaws: 34,301
- Embryo transfer cycles: 23,947
Number of clinical pregnancies

*Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy
†Ongoing clinical pregnancy: clinical pregnancy with ≥1 fetal heart beat on ultrasound
‡Multiple pregnancy: ongoing clinical pregnancy with >1 fetal heart beat on ultrasound
Percentage of multiple pregnancies

All ART treatment cycles

* Ongoing clinical pregnancy: clinical pregnancy with ≥1 fetal heart beat on ultrasound
† Multiple pregnancy: ongoing clinical pregnancy with >1 fetal heart beat on ultrasound
Percentage of multiple pregnancies in Ontario

All ART treatment cycles

<table>
<thead>
<tr>
<th>Year</th>
<th>Twin</th>
<th>Triplet+</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>585</td>
<td>25</td>
</tr>
<tr>
<td>2014</td>
<td>449</td>
<td>13</td>
</tr>
<tr>
<td>2015</td>
<td>398</td>
<td>22</td>
</tr>
<tr>
<td>2016</td>
<td>307</td>
<td>16</td>
</tr>
<tr>
<td>2017</td>
<td>292</td>
<td>4</td>
</tr>
<tr>
<td>2018</td>
<td>264</td>
<td>4</td>
</tr>
</tbody>
</table>

* Ongoing clinical pregnancy: clinical pregnancy with ≥1 fetal heart beat on ultrasound
† Multiple pregnancy: ongoing clinical pregnancy with >1 fetal heart beat on ultrasound
### Specialized services
#### All ART treatment cycles (fresh and frozen), 2018

<table>
<thead>
<tr>
<th>Description</th>
<th>Number of cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestational carrier</td>
<td>949</td>
</tr>
<tr>
<td>PGT-A/PGT-M</td>
<td>6,535</td>
</tr>
<tr>
<td>Oocyte or embryo banking due to cancer treatment</td>
<td>464</td>
</tr>
<tr>
<td>Oocyte or embryo banking due to non-cancer/non-medical reasons</td>
<td>611</td>
</tr>
<tr>
<td>Any use of donor oocytes or embryos</td>
<td>3,563</td>
</tr>
<tr>
<td>Frozen oocyte IVF</td>
<td>655</td>
</tr>
</tbody>
</table>
# Oocyte or embryo freezing for non-medical reasons

**2013 – 2018**

<table>
<thead>
<tr>
<th>Year</th>
<th>Oocyte Freezing</th>
<th>Embryo Freezing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>94</td>
<td>40</td>
</tr>
<tr>
<td>2014</td>
<td>135</td>
<td>40</td>
</tr>
<tr>
<td>2015</td>
<td>204</td>
<td>80</td>
</tr>
<tr>
<td>2016</td>
<td>280</td>
<td>52</td>
</tr>
<tr>
<td>2017</td>
<td>357</td>
<td>64</td>
</tr>
<tr>
<td>2018</td>
<td>504</td>
<td>108</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td><strong>1,574</strong></td>
<td><strong>384</strong></td>
</tr>
</tbody>
</table>
# PGT-A and PGT-M

## 2013 – 2018

<table>
<thead>
<tr>
<th>Year</th>
<th>PGT-A</th>
<th>PGT-M</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># Cycles</td>
<td># Cycles</td>
</tr>
<tr>
<td>2013</td>
<td>243</td>
<td>240</td>
</tr>
<tr>
<td>2014</td>
<td>605</td>
<td>313</td>
</tr>
<tr>
<td>2015</td>
<td>1,660</td>
<td>951</td>
</tr>
<tr>
<td>2016</td>
<td>3,371</td>
<td>1,200</td>
</tr>
<tr>
<td>2017</td>
<td>4,700</td>
<td>1,182</td>
</tr>
<tr>
<td>2018</td>
<td>6,090</td>
<td>640</td>
</tr>
<tr>
<td>Overall</td>
<td>16,669</td>
<td>4,526</td>
</tr>
</tbody>
</table>
TREATMENT CYCLES FOR 2018

All ART treatment cycles (fresh and frozen)
**Number of treatment cycles**

**2018**

- **Fresh IVF own oocytes**: 6,492 (Cycle starts / Embryo thaw cycles: 6,492, ET cycles: 158)
- **Frozen oocyte IVF own oocytes**: 83 (Cycle starts / Embryo thaw cycles: 83, ET cycles: 158)
- **FET own oocytes**: 14,606 (Cycle starts / Embryo thaw cycles: 14,606, ET cycles: 1,015)
- **Fresh IVF donor oocytes**: 181 (Cycle starts / Embryo thaw cycles: 181, ET cycles: 181)
- **Frozen oocyte IVF donor oocytes**: 427 (Cycle starts / Embryo thaw cycles: 427, ET cycles: 427)
- **FET donor oocytes**: 2,154 (Cycle starts / Embryo thaw cycles: 2,154, ET cycles: 2,154)

* Own oocytes exclusively
† Includes Natural & Modified Natural IVF, own oocytes
Number of treatment cycles, by year

*IVF and FET – own oocytes, 2013 – 2018*

<table>
<thead>
<tr>
<th>Year</th>
<th>Cycle starts / Embryo thaw cycles</th>
<th>ET cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>15,716</td>
<td>7,528</td>
</tr>
<tr>
<td>2014</td>
<td>16,934</td>
<td>8,873</td>
</tr>
<tr>
<td>2015</td>
<td>16,635</td>
<td>9,888</td>
</tr>
<tr>
<td>2016</td>
<td>15,592</td>
<td>12,138</td>
</tr>
<tr>
<td>2017</td>
<td>16,145</td>
<td>13,878</td>
</tr>
<tr>
<td>2018</td>
<td>15,952</td>
<td>14,784</td>
</tr>
</tbody>
</table>

* Own oocytes exclusively
† Includes Natural & Modified Natural IVF, own oocytes
Number of treatment cycles, by year

IVF and FET – donor oocytes, 2013 – 2018

* Any donor oocytes
## Type of treatment cycle, per cycle start

*All ART treatment cycles (fresh and frozen), 2018*

<table>
<thead>
<tr>
<th>Type of treatment cycle</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>IVF – own oocytes*†</td>
<td>15,952</td>
<td>45.2</td>
</tr>
<tr>
<td>Frozen oocyte IVF – own oocytes*</td>
<td>158</td>
<td>0.5</td>
</tr>
<tr>
<td>FET – own oocytes*</td>
<td>14,784</td>
<td>41.9</td>
</tr>
<tr>
<td>IVF – donor oocytes</td>
<td>900</td>
<td>2.6</td>
</tr>
<tr>
<td>Frozen oocyte IVF – donor oocytes</td>
<td>497</td>
<td>1.4</td>
</tr>
<tr>
<td>FET – donor oocytes</td>
<td>2,155</td>
<td>6.1</td>
</tr>
<tr>
<td>Oocyte banking</td>
<td>817</td>
<td>2.3</td>
</tr>
<tr>
<td>IVM</td>
<td>13</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>TOTAL TREATMENT CYCLES</strong></td>
<td>35,276</td>
<td></td>
</tr>
</tbody>
</table>

* Own oocytes exclusively
† Includes Natural & Modified Natural IVF, own oocytes
Reasons for treatment

All ART treatment cycles (fresh and frozen), 2018

- Male Factor: 32.9%
- Advanced Female Age: 19.6%
- Unexplained Infertility: 19.1%
- Diminished Ovarian Reserve: 16.8%
- PGT-A: 12.9%
- PCOS: 8.9%
- Tubal Factor: 8.6%
- Endometriosis: 6.9%
- Other Female Factor: 4.9%
- No Male Partner: 4.5%
- Other Ovulatory Disorder: 4.2%
- Uterine Factor: 3.1%
- Other Reasons: 2.7%
- PGT-M: 1.4%
- Oocyte/Embryo Banking for Cancer Treatment: 1.3%
- Oocyte/Embryo Banking for Non-Cancer/Non-Medical Reasons: 0.3%

* Categories are not mutually exclusive
† Other reasons include: gonadotoxic therapy, no female partner and peritoneal factor or severe adhesions
Clinical pregnancy by type of treatment cycle

2018

Clinical pregnancies‡

- Fresh IVF – own oocytes**: 2,344
- Frozen oocyte IVF – own oocytes*: 27
- FET – own oocytes*: 6,010
- Fresh IVF – donor oocytes: 94
- Frozen oocyte IVF – donor oocytes: 228
- FET – donor oocytes: 876

* Own oocytes exclusively
† Includes Natural & Modified Natural IVF, own oocytes
‡ Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy
Singleton ongoing clinical pregnancy by type of treatment cycle

2018

* Own oocytes exclusively
† Includes Natural & Modified Natural IVF, own oocytes
‡ Singleton pregnancy: ongoing clinical pregnancy with only one fetal heart beat on ultrasound

<table>
<thead>
<tr>
<th>Treatment Type</th>
<th>Per cycle start / embryo thaw cycle</th>
<th>Per ET cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh IVF – own oocytes*†</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td>Frozen oocyte IVF – own oocytes*</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>FET – own oocytes*</td>
<td>34</td>
<td>35</td>
</tr>
<tr>
<td>Fresh IVF – donor oocytes</td>
<td>9</td>
<td>43</td>
</tr>
<tr>
<td>Frozen oocyte IVF – donor oocytes</td>
<td>39</td>
<td>45</td>
</tr>
<tr>
<td>FET – donor oocytes</td>
<td>35</td>
<td>35</td>
</tr>
</tbody>
</table>

Singleton pregnancies‡: 1,876, 21, 5,066, 78, 192, 754
Patient age

All ART treatment cycles (fresh and frozen), 2018
TREATMENT CYCLES FOR 2018

*ART cycles using IVF – own oocytes*
Stage of treatment and treatment outcomes

ART cycles using IVF – own oocytes, 2018

- Cycle starts (CS): 15,798
- Oocyte retrieval cycles (RET): 14,871
- Embryo transfer cycles (ET): 6,447
- Clinical pregnancies*: 2,328
- Ongoing clinical pregnancies‡: 2,084
- Singleton pregnancies‡: 1,863

- 927 cancelled: 5.9% per CS
- 8,424 no ET: 56.6% per RET
- 14.7% per CS
- 15.7% per RET
- 36.1% per ET
- 13.2% per CS
- 14.0% per RET
- 32.3% per ET
- 11.8% per CS
- 12.5% per RET
- 28.9% per ET

* Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy
‡ Ongoing clinical pregnancy: clinical pregnancy with ≥1 fetal heart beat on ultrasound
‡ Singleton pregnancy: ongoing clinical pregnancy with only one fetal heart beat on ultrasound

89.4% of ongoing clinical pregnancies
Reasons for no embryo transfer

* ART cycles using IVF – own oocytes, 2018

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percent per cycle with no embryo transfer (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeze all, PGT-A</td>
<td>30.69</td>
</tr>
<tr>
<td>Freeze all, other reason than OHSS risk or PGT</td>
<td>25.68</td>
</tr>
<tr>
<td>Freeze all, OHSS risk</td>
<td>18.44</td>
</tr>
<tr>
<td>Freeze all, other reason than OHSS risk (unknown PGT)</td>
<td>4.29</td>
</tr>
<tr>
<td>Freeze all, PGT-M</td>
<td>2.35</td>
</tr>
<tr>
<td>No utilizable embryos</td>
<td>11.24</td>
</tr>
<tr>
<td>No normal fertilization</td>
<td>3.64</td>
</tr>
<tr>
<td>No oocytes</td>
<td>1.60</td>
</tr>
<tr>
<td>No utilizable oocytes</td>
<td>1.15</td>
</tr>
<tr>
<td>Inadequate uterine lining</td>
<td>0.56</td>
</tr>
<tr>
<td>No sperm</td>
<td>0.34</td>
</tr>
<tr>
<td>Patient Choice</td>
<td>0.02</td>
</tr>
</tbody>
</table>

* Categories are mutually exclusive
Reasons for no embryo transfer

*ART cycles using IVF – own oocytes, 2018*

- Freeze all, PGT-A: 17.38%
- Freeze all, other reason than OHSS risk or PGT: 14.55%
- Freeze all, OHSS risk: 10.44%
- Freeze all, other reason than OHSS risk (unknown PGT): 2.43%
- Freeze all, PGT-M: 1.33%
- No utilizable embryos: 6.37%
- No normal fertilization: 2.06%
- No oocytes: 0.91%
- No utilizable oocytes: 0.65%
- Inadequate uterine lining: 0.32%
- No sperm: 0.20%
- Patient Choice: 0.01%

*Categories are mutually exclusive*
Clinical pregnancy and implantation rate

ART cycles using IVF – own oocytes, 2018

- Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy
- Implantation rate: number of gestational sacs observed on ultrasound, divided by the total number of embryos transferred
Number of embryos transferred, by year

ART cycles using IVF – own oocytes, 2013 – 2018

* Excludes records with missing number of embryos transferred
Clinical pregnancy and implantation rate

*ART cycles using IVF – own oocytes, 2018*

Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy

Implantation rate: number of gestational sacs observed on ultrasound, divided by the total number of embryos transferred
Clinical pregnancy and implantation rate

**ART cycles using IVF – own oocytes, 2018**

- **Clinical pregnancy**: clinical intrauterine, heterotopic, or ectopic pregnancy.
- **Implantation rate**: number of gestational sacs observed on ultrasound, divided by the total number of embryos transferred.

### Embryo transfer day

- **Day 3**:
  - Clinical pregnancy: 25.1%
  - Implantation rate: 18.4%

- **Day 5**:
  - Clinical pregnancy: 41.2%
  - Implantation rate: 34.7%

- **Overall**:
  - Clinical pregnancy: 36.1%
  - Implantation rate: 28.9%
Proportion of cycles resulting in an ongoing clinical pregnancy

ART cycles using IVF – own oocytes, 2018

![Bar chart showing the proportion of cycles resulting in an ongoing clinical pregnancy by patient age group.](chart.png)

- Singleton pregnancy: clinical pregnancy with ≥1 fetal heart beat on ultrasound
- Multiple pregnancy: ongoing clinical pregnancy with >1 fetal heart beat

* Ongoing clinical pregnancy: clinical pregnancy with ≥1 fetal heart beat on ultrasound
† Singleton pregnancy: ongoing clinical pregnancy with only one fetal heart beat on ultrasound; multiple pregnancy: ongoing clinical pregnancy with >1 fetal heart beat
Proportion of cycles resulting in an ongoing clinical pregnancy

**ART cycles using IVF – own oocytes, 2018**

![Graph showing the proportion of cycles resulting in an ongoing clinical pregnancy for different number of embryos transferred.](image)

**NOTE:** In rare cases, a single embryo may divide and produce twins or triplets. For this reason, a small percentage of multiple pregnancies can result from a single embryo transfer.

*Ongoing clinical pregnancy:* clinical pregnancy with ≥1 fetal heart beat on ultrasound

† Singleton pregnancy: ongoing clinical pregnancy with only one fetal heart beat on ultrasound; multiple pregnancy: ongoing clinical pregnancy with >1 fetal heart beat
Proportion of cycles resulting in an ongoing clinical pregnancy

**ART cycles using IVF – own oocytes, 2018**

- **Singleton pregnancy**
- **Multiple pregnancy**

---

* Ongoing clinical pregnancy: clinical pregnancy with ≥1 fetal heart beat on ultrasound
† Singleton pregnancy: ongoing clinical pregnancy with only one fetal heart beat on ultrasound; multiple pregnancy: ongoing clinical pregnancy with >1 fetal heart beat
TREATMENT CYCLES FOR 2018

ART cycles using FET – own oocytes
Stage of treatment and treatment outcomes

ART cycles using FET – own oocytes, 2018

- **Embryo thaw cycles**: 14,784
- **Embryo transfer cycles (ET)**: 14,606
- **Clinical pregnancies**: 6,010
- **Ongoing clinical pregnancies†**: 5,408
- **Singleton pregnancies‡**: 5,066

- **178 no ET**: 1.2% per thaw, 40.7% per ET
- **Clinical pregnancy**: clinical intrauterine, heterotopic, or ectopic pregnancy
- **Ongoing clinical pregnancy†**: ongoing clinical pregnancy with ≥1 fetal heart beat on ultrasound
- **Singleton pregnancy‡**: ongoing clinical pregnancy with only one fetal heart beat on ultrasound

* 36.6% per thaw, 37.0% per ET
† 34.3% per thaw, 34.7% per ET
Clinical pregnancy and implantation rate

ART cycles using FET – own oocytes, 2018

Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy

Implantation rate: number of gestational sacs observed on ultrasound, divided by the total number of embryos transferred

Age at time of oocyte retrieval (years)

Percent (%)

<35
35–37
38–40
41–42
≥43
OVERALL

Clinical pregnancy, per ET cycle
Implantation rate
Number of embryos transferred, by year

*ART cycles using FET – own oocytes, 2018*

*Excludes records with missing number of embryos transferred*
Clinical pregnancy and implantation rate

*ART cycles using FET – own oocytes, 2018*

![Bar chart showing clinical pregnancy and implantation rate](chart.png)

- **Clinical pregnancy, per ET cycle**
- **Implantation rate**

*Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy*

†Implantation rate: number of gestational sacs observed on ultrasound, divided by the total number of embryos transferred
Proportion of cycles resulting in an ongoing clinical pregnancy

ART cycles using FET – own oocytes, 2018

Ongoing clinical pregnancy: clinical pregnancy with ≥1 fetal heart beat on ultrasound
Singleton pregnancy: ongoing clinical pregnancy with only one fetal heart beat on ultrasound; multiple pregnancy: ongoing clinical pregnancy with >1 fetal heart beat
Proportion of cycles resulting in an ongoing clinical pregnancy

**ART cycles using FET – own oocytes, 2018**

NOTE: In rare cases, a single embryo may divide and produce twins or triplets. For this reason, a small percentage of multiple pregnancies can result from a single embryo transfer.

- Ongoing clinical pregnancy: clinical pregnancy with ≥1 fetal heart beat on ultrasound
- Singleton pregnancy: ongoing clinical pregnancy with only one fetal heart beat on ultrasound; multiple pregnancy: ongoing clinical pregnancy with >1 fetal heart beat

<table>
<thead>
<tr>
<th>Number of embryos transferred</th>
<th>Percent per ET cycle (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>36.8</td>
</tr>
<tr>
<td>2</td>
<td>38.9</td>
</tr>
<tr>
<td>≥3</td>
<td>25.5</td>
</tr>
<tr>
<td>Overall</td>
<td>37.0</td>
</tr>
</tbody>
</table>
PRIMARY TRANSFER PREGNANCY RATE
Primary transfer rate

• **Cohort:**
  – Patients with first IVF cycle in CARTR Plus and no documented prior treatment cycle using own oocytes

  – The first treatment cycle with an embryo transfer
    • IVF with own oocytes
    • FET with own oocytes

  – **Rate per patient:** treatment cycle outcomes can be linked for a patient throughout the database
Primary transfer clinical pregnancy rate per patient

*IVF and FET – own oocytes, 2013 – 2018*

- **<35 years**: 46.4%
- **35-37 years**: 41.8%
- **38-40 years**: 35.0%
- **41-42 years**: 24.4%
- **≥43 years**: 15.7%

* Own oocytes exclusively
† Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy
Primary transfer clinical pregnancy rate per patient

*IVF and FET – own oocytes, 2013 – 2018*

<table>
<thead>
<tr>
<th>Patient age at Oocyte Retrieval (years)</th>
<th>Percent per primary transfer (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;35</td>
<td>54.9</td>
</tr>
<tr>
<td>35-37</td>
<td>55.7</td>
</tr>
<tr>
<td>38-40</td>
<td>49.5</td>
</tr>
<tr>
<td>41-42</td>
<td>44.0</td>
</tr>
<tr>
<td>≥43</td>
<td>32.3</td>
</tr>
</tbody>
</table>

* Own oocytes exclusively
† Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy
Primary transfer clinical pregnancy rate per patient

*IVF and FET – donor oocytes, 2013 – 2018*

- **Percent per primary transfer (%)**
- **Patient age (years)**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percent per Primary Transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;35</td>
<td>50.0</td>
</tr>
<tr>
<td>35-37</td>
<td>45.9</td>
</tr>
<tr>
<td>38-40</td>
<td>51.4</td>
</tr>
<tr>
<td>41-42</td>
<td>45.1</td>
</tr>
<tr>
<td>≥43</td>
<td>47.4</td>
</tr>
</tbody>
</table>

* Any donor oocytes
† Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy
CUMULATIVE PREGNANCY RATE
Cumulative pregnancy rate

• Definition:
  – The number of clinical pregnancies resulting from one or more ART cycles, including the cycle when fresh embryos are transferred and all related subsequent frozen/thawed embryo transfer cycles if the fresh embryo transfer did not result in a pregnancy

• Rationale:
  – Estimates cumulative success with ongoing treatment, rather than success per individual stage of the treatment process
Cumulative pregnancy rate

- Several options for calculation:
  - **Per patient**: treatment cycle outcomes can be linked for a patient throughout the database
  - **Per batch of oocytes collected**: treatment cycles that used frozen oocytes or embryos can be linked to the IVF cycle where the oocytes were collected
Cumulative pregnancy rate, per patient

*IVF and FET – own oocytes, 2013 – 2018*

- **Own oocytes exclusively**
- **Clinical pregnancy:** clinical intrauterine, heterotopic, or ectopic pregnancy
Cumulative pregnancy rate, per patient, by patient age

IVF and FET – own oocytes, 2013 – 2018

Cumulative pregnancy rate (%)

Number of Embryo Transfer Cycles

- <35 years
- 35-37 years
- 38-40 years
- 41-42 years
- ≥43 years

* Own oocytes exclusively
† Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy
Cumulative pregnancy rate, per patient, 1 year follow-up

*IVF and FET – own oocytes, 2013 – 2018*

- **Cumulative pregnancy rate (%)**
  - **Number of Embryo Transfer Cycles**
    - 1: 40.7%
    - 2: 49.9%
    - 3: 53.6%
    - 4: 54.6%

* Own oocytes exclusively
† Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy
Cumulative pregnancy rate, per patient, 1 year follow-up by patient age

*IVF and FET – own oocytes, 2013 – 2018*

- **Cumulative pregnancy rate (%)**
- **Number of Embryo Transfer Cycles**

- <35 years
- 35-37 years
- 38-40 years
- 41-42 years
- ≥43 years

* Own oocytes exclusively
† Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy
Cumulative pregnancy rate, per batch

IVF and FET – own oocytes, 2013 – 2018

* Own oocytes exclusively
† Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy
Cumulative pregnancy rate, per batch, by patient age

IVF and FET – own oocytes, 2013 – 2018

Cumulative pregnancy rate (%) vs Number of Embryo Transfer Cycles

- <35 years
- 35-37 years
- 38-40 years
- 41-42 years
- ≥43 years

* Own oocytes exclusively
† Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy
Cumulative pregnancy rate, per batch, 1 year follow-up

IVF and FET – own oocytes, 2013 to 2018

* Own oocytes exclusively
† Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy
Cumulative pregnancy rate, per batch, 1 year follow-up by patient age

*IVF and FET – own oocytes, 2013 to 2018*

- **Cumulative pregnancy rate (%)**
- **Number of Embryo Transfer Cycles**

*Own oocytes exclusively*

† Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy
BIRTH OUTCOMES FOR 2017

All ART treatment cycles (fresh and frozen)
Birth outcomes

All ART treatment cycles (fresh and frozen), 2013-2017

Live birth

Singleton live birth

Good perinatal outcome*

<table>
<thead>
<tr>
<th>Year</th>
<th>Live birth</th>
<th>Singleton live birth</th>
<th>Good perinatal outcome*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>6,903</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>6,389</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Good perinatal outcome: singleton live birth at ≥37 weeks’ gestation and a birth weight ≥2,500 grams
† Cycle starts, oocyte retrievals/thaws and embryo transfers with an unknown birth outcome were removed from the denominator (n=501)
Birth outcome rates

All ART treatment cycles (fresh and frozen), 2017

* Good perinatal outcome: singleton live birth at ≥37 weeks’ gestation and a birth weight ≥2,500 grams

OCP - Ongoing clinical pregnancy: a clinical pregnancy with documentation of at least one fetal heart beat on ultrasound

Cycle starts, oocyte retrievals/thaws and embryo transfers with an unknown birth outcome were removed from the denominator (n=501)
Distribution of birth outcomes among ongoing clinical pregnancies

*ART cycles using IVF and FET – own oocytes, 2017*

**IVF – own oocytes**
- Singleton live birth: 68.9%
- Multiple live birth: 7.2%
- Stillbirth: 0.8%
- Miscarriage: 19.7%
- Unknown: 3.4%

**FET – own oocytes**
- Singleton live birth: 68.1%
- Multiple live birth: 4.6%
- Stillbirth: 0.5%
- Miscarriage: 20.9%
- Unknown: 5.8%

**Total samples**
- IVF – own oocytes: n = 2,502
- FET – own oocytes: n = 5,692
Proportion of Live Births

*IVF and FET – own oocytes, 2013 to 2017*

*Patient age at cycle start for IVF cycles and patient age at time of oocyte retrieval for FET cycles*
Proportion of Miscarriages

IVF and FET – own oocytes, 2013 – 2017

*Patient age at cycle start for IVF cycles and patient age at time of oocyte retrieval for FET cycles
† Miscarriage: birth outcome where all fetuses were a ‘pregnancy loss’ at <20 weeks’ gestation
Proportion of Stillbirths

**IVF and FET – own oocytes, 2013 – 2017**

* Patient age at cycle start for IVF cycles and patient age at time of oocyte retrieval for FET cycles

† Stillbirths: birth outcome where no fetus(es) was born alive and at least one stillbirth at ≥ 20 weeks’ gestation
Proportion of singleton and multiple live births

All ART treatment cycles (fresh and frozen), 2017

<table>
<thead>
<tr>
<th>Embryos</th>
<th>Singleton live birth</th>
<th>Twin live birth</th>
<th>Triplet+ live birth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 embryo</td>
<td>98.4 (%)</td>
<td>1.6 (%)</td>
<td>0.2 (%)</td>
</tr>
<tr>
<td>2 embryos</td>
<td>72.5 (%)</td>
<td>27.3 (%)</td>
<td>0.2 (%)</td>
</tr>
<tr>
<td>≥3 embryos</td>
<td>78.7 (%)</td>
<td>19.2 (%)</td>
<td>2.1 (%)</td>
</tr>
</tbody>
</table>

Live births

Singleton live birth: one live birth
Twin live birth: two births and at least one live birth
Triplet+ live birth: three or more births and at least one live birth
Percentage of multiple live births by province

All ART treatment cycles (fresh and frozen), 2017

Percent per live birth (%)

<table>
<thead>
<tr>
<th>Province</th>
<th>Percent per live birth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario</td>
<td>5.9</td>
</tr>
<tr>
<td>Quebec</td>
<td>4.6</td>
</tr>
<tr>
<td>Rest of Canada</td>
<td>11.1</td>
</tr>
<tr>
<td>Overall</td>
<td>7.4</td>
</tr>
</tbody>
</table>

Multiple births

- Ontario: 217
- Quebec: 43
- Rest of Canada: 254
- Overall: 514

Ongoing clinical pregnancy: documentation of at least one fetal heart beat on ultrasound
Multiple birth: At least one live birth from a multiple pregnancy
Birth outcomes by province

*All ART treatment cycles (fresh and frozen), 2017*

- **Ontario**
  - Live birth: 29%
  - Singleton live birth: 27%
  - Live birth: 23%

- **Quebec**
  - Live birth: 27%
  - Singleton live birth: 25%
  - Live birth: 22%

- **Rest of Canada**
  - Live birth: 33%
  - Singleton live birth: 29%
  - Live birth: 21%

*Good perinatal outcome*: singleton live birth at ≥37 weeks’ gestation and a birth weight ≥2,500 grams

Cycle starts, and embryo transfers with an unknown birth outcome were removed from the denominator (n=501)
Proportion of singleton and multiple live births

All ART treatment cycles, 2013 – 2017

<table>
<thead>
<tr>
<th>Year</th>
<th>Singletons</th>
<th>Multiples</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>4,932</td>
<td>868</td>
</tr>
<tr>
<td>2014</td>
<td>5,413</td>
<td>802</td>
</tr>
<tr>
<td>2015</td>
<td>5,658</td>
<td>721</td>
</tr>
<tr>
<td>2016</td>
<td>5,957</td>
<td>557</td>
</tr>
<tr>
<td>2017</td>
<td>6,389</td>
<td>514</td>
</tr>
</tbody>
</table>

Live Births: 5,800, 6,215, 6,379, 6,514, 6,903

† Cycle starts, oocyte retrievals/thaws and embryo transfers with an unknown birth outcome were removed from the denominator (n=501)
Proportion of preterm births by plurality

*All ART treatment cycles (fresh and frozen), 2013-2017*

<table>
<thead>
<tr>
<th>Year</th>
<th>Singleton</th>
<th>Multiple</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>14</td>
<td>63</td>
</tr>
<tr>
<td>2014</td>
<td>11</td>
<td>70</td>
</tr>
<tr>
<td>2015</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td>2016</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td>2017</td>
<td>10</td>
<td>61</td>
</tr>
</tbody>
</table>

*Preterm birth <37 weeks’ gestation.*
Proportion of singleton and multiple live births by province

All ART treatment cycles, 2013 – 2017

† Cycle starts, oocyte retrievals/thaws and embryo transfers with an unknown birth outcome were removed from the denominator (n=501)
CUMULATIVE LIVE BIRTH RATE
Cumulative live birth rate, per patient

*IVF and FET – own oocytes, 2013 – 2017*

*Own oocytes exclusively*
Cumulative live birth rate, per patient, by patient age

*IVF and FET – own oocytes, 2013 – 2017*

![Graph showing cumulative live birth rate by patient age and number of embryo transfer cycles. The graph includes data for different age groups: <35 years, 35-37 years, 38-40 years, 41-42 years, and ≥43 years. The cumulative live birth rates are presented for each age group across different cycle stages.]

*Own oocytes exclusively*
Cumulative live birth rate, per patient, 1 year follow-up

* IVF and FET – own oocytes, 2013 – 2017

- Own oocytes exclusively

Cumulative live birth rate (%)

Number of Embryo Transfer Cycles

- 1 cycle: 30.2%
- 2 cycles: 37.1%
- 3 cycles: 41.9%
- 4 cycles: 43.9%

* Own oocytes exclusively
Cumulative live birth rate, per patient, 1 year follow-up by patient age

**IVF and FET – own oocytes, 2013 – 2017**

*Own oocytes exclusively*
Cumulative live birth rate, per batch

IVF and FET – own oocytes, 2013 – 2017

Cumulative live birth rate (%)

Number of Embryo Transfer Cycles

* Own oocytes exclusively
Cumulative live birth rate, per batch, by patient age

IVF and FET – own oocytes, 2013 – 2017

* Own oocytes exclusively
Cumulative live birth rate, per batch, 1 year follow-up

*IVF and FET – own oocytes, 2013 – 2017*

* Own oocytes exclusively
Cumulative live birth rate, per batch, 1 year follow-up by patient age

*IVF and FET – own oocytes, 2013 – 2017*

---

* Own oocytes exclusively
ONTARIO FERTILITY PROGRAM
Ontario Fertility Program

2016

• **4,828 unique patients:**
  - 4,768 IVF cycle starts
  - 60 fertility preservation cycles

• **70 gestational carrier cycles**
Ontario Fertility Program

2016

- Treatment cycles:
  - 5,673 IVF cycle starts
    - 0.86% cancellation rate
  - 5,524 embryo transfer cycles
  - 1,988 clinical pregnancies
    - 36.0% clinical pregnancy rate per ET
  - 1,811 ongoing clinical pregnancy
    - 32.8% ongoing clinical pregnancy rate per ET
  - 95 multiple pregnancies
    - 5.25% multiple pregnancy rate per ongoing clinical pregnancy
Reasons for treatment

All OFP ART treatment cycles (fresh and frozen), 2016

- Male Factor: 34.8%
- Advanced Female Age: 21.4%
- Unexplained Infertility: 18.3%
- Diminished Ovarian Reserve: 12.3%
- PGT-A/PGT-M: 11.7%
- PCOS: 10.8%
- Tubal Factor: 8.6%
- Endometriosis: 7.8%
- Other Female Factor: 5.5%
- Other Ovulatory Disorder: 3.8%
- No Male Partner: 3.7%
- Uterine Factor: 2.5%
- Oocyte/Embryo Banking for Cancer Treatment: 0.8%
- Other Reasons: 0.4%
- Oocyte/Embryo Banking for Non-Cancer/Non-Medical Reasons: 0.2%

Excludes fertility preservation cycles
* Categories are not mutually exclusive
† Other reasons include: gonadotoxic therapy, no female partner and peritoneal factor or severe adhesions
Patient age

*All OFP ART treatment cycles (fresh and frozen), 2016*

Excludes fertility preservation cycles
Clinical pregnancy and implantation rate

*All OFP ART treatment cycles (fresh and frozen), 2016*

![Graph showing clinical pregnancy and implantation rate across different patient age groups.](chart)

- **Clinical pregnancy, per ET cycle:**
  - <35: 39.6%
  - 35–37: 37.0%
  - 38–40: 33.7%
  - 41–42: 26.5%
  - ≥43: 25.7%
  - OVERALL: 36.0%

- **Implantation rate:**
  - <35: 39.2%
  - 35–37: 34.9%
  - 38–40: 26.8%
  - 41–42: 20.1%
  - ≥43: 19.5%
  - OVERALL: 32.0%

*Clinical pregnancy: clinical intrauterine, heterotopic, or ectopic pregnancy*

†Implantation rate: number of gestational sacs observed on ultrasound, divided by the total number of embryos transferred
Ontario Fertility Program

2016

• Birth outcomes:
  – 1,489 live births
  – 1,423 singleton live births
  – 1,249 live births with a good perinatal outcome

* Good perinatal outcome: singleton live birth at ≥37 weeks’ gestation and a birth weight ≥2,500 grams
Birth outcome rates

All OFP ART treatment cycles (fresh and frozen), 2016

* Good perinatal outcome: singleton live birth at ≥37 weeks’ gestation and a birth weight ≥2,500 grams
Birth outcomes by patient age

All OFP ART treatment cycles (fresh and frozen), 2016

* Good perinatal outcome: singleton live birth at ≥37 weeks’ gestation and a birth weight ≥2,500 grams
GESTATIONAL AGE AT TIME OF DELIVERY

*Ontario births: IVF conceptions compared to spontaneous conceptions*
Preterm birth


- **Preterm birth:**
  - <37 weeks’ gestation
  - RR = 2.16 95% CI: 2.08–2.24
  - adjusted RR = 2.05 95% CI: 1.97–2.14

- **Singleton preterm births:**
  - <37 weeks’ gestation
  - RR = 1.51 95% CI: 1.44–1.59
  - adjusted RR = 1.46 95% CI: 1.39–1.54

* Adjusted for maternal age at delivery.
Preterm birth in Ontario

*Preterm birth is defined as live birth or stillbirth at ≤37 weeks gestation.

*Error bars represent 95% Confidence Intervals
## Gestational age at time of delivery


<table>
<thead>
<tr>
<th>Gestational age at delivery</th>
<th>Total births</th>
<th>ART</th>
<th></th>
<th></th>
<th>Non-ART</th>
<th></th>
<th></th>
<th>RR (95% CI)</th>
<th>Adj. RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;32 weeks</td>
<td>11,932</td>
<td>488</td>
<td>3.46</td>
<td>11,444</td>
<td>1.46</td>
<td>2.38 (2.17, 2.60)</td>
<td>2.20 (2.01, 2.41)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 weeks</td>
<td>2,529</td>
<td>106</td>
<td>0.75</td>
<td>2,423</td>
<td>0.31</td>
<td>2.44 (2.01, 2.96)</td>
<td>2.33 (1.91, 2.84)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33 weeks</td>
<td>3,833</td>
<td>196</td>
<td>1.39</td>
<td>3,637</td>
<td>0.46</td>
<td>3.00 (2.60, 3.46)</td>
<td>2.83 (2.45, 3.28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34 weeks</td>
<td>6,847</td>
<td>280</td>
<td>1.99</td>
<td>6,567</td>
<td>0.84</td>
<td>2.38 (2.11, 2.67)</td>
<td>2.26 (2.00, 2.55)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 weeks</td>
<td>11,669</td>
<td>417</td>
<td>2.96</td>
<td>11,252</td>
<td>1.43</td>
<td>2.07 (1.86, 2.27)</td>
<td>2.01 (1.82, 2.21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36 weeks</td>
<td>23,784</td>
<td>771</td>
<td>5.47</td>
<td>23,013</td>
<td>2.93</td>
<td>1.87 (1.74, 2.00)</td>
<td>1.79 (1.67, 1.92)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥37 weeks</td>
<td>738,422</td>
<td>11,827</td>
<td>83.97</td>
<td>726,595</td>
<td>92.56</td>
<td>0.91 (0.90, 0.91)</td>
<td>0.91 (0.90, 0.92)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Adjusted for maternal age at delivery.
**Gestational age at time of delivery for singleton pregnancies**

*ART vs. Non-ART Ontario – 2013 – 2017*

<table>
<thead>
<tr>
<th>Gestational age at delivery</th>
<th>Total births</th>
<th>ART</th>
<th>Non-ART</th>
<th>RR (95% CI)</th>
<th>Adj. RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;32 weeks</td>
<td>10,563</td>
<td>335</td>
<td>10,228</td>
<td>2.00 (1.80, 2.23)</td>
<td>1.85 (1.66, 2.07)</td>
</tr>
<tr>
<td>32 weeks</td>
<td>2,079</td>
<td>60</td>
<td>2,019</td>
<td>1.82 (1.41, 2.35)</td>
<td>1.75 (1.35, 2.27)</td>
</tr>
<tr>
<td>33 weeks</td>
<td>3,148</td>
<td>105</td>
<td>3,043</td>
<td>2.11 (1.74, 2.57)</td>
<td>1.99 (1.64, 2.43)</td>
</tr>
<tr>
<td>34 weeks</td>
<td>5,798</td>
<td>142</td>
<td>5,656</td>
<td>1.54 (1.30, 1.81)</td>
<td>1.48 (1.25, 1.75)</td>
</tr>
<tr>
<td>35 weeks</td>
<td>10,142</td>
<td>253</td>
<td>9,889</td>
<td>1.57 (1.38, 1.77)</td>
<td>1.54 (1.36, 1.75)</td>
</tr>
<tr>
<td>36 weeks</td>
<td>21,069</td>
<td>502</td>
<td>20,567</td>
<td>1.49 (1.37, 1.63)</td>
<td>1.46 (1.34, 1.59)</td>
</tr>
<tr>
<td>≥37 weeks</td>
<td>732,405</td>
<td>11,218</td>
<td>721,187</td>
<td>0.95 (0.95, 0.96)</td>
<td>0.95 (0.95, 0.96)</td>
</tr>
</tbody>
</table>

* Adjusted for maternal age at delivery.
THANK YOU!

Dr. Andrea Lanes, Clinical Content Specialist  
alanes@bornontario.ca

Lynn Meng, Epidemiologist  
lmeng@bornontario.ca

Moya Johnson, Coordinator – CARTR Plus  
mojohnson@bornontario.ca

Shelley Dougan, Manager  
sdougan@bornontario.ca