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Advisory Committee on Assisted Reproductive Technology

# Advisory Committee on Assisted Reproductive Technology

# Assisted Reproductive Technology in New Zealand 2010

June 2013

This report has been prepared for the Advisory Committee on Assisted Reproductive Technology by the Perinatal and Reproductive Epidemiology Research Unit (PRERU) of the University of New South Wales. PRERU has provided the data and analysis.

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# Foreword

On behalf of the Advisory Committee on Assisted Reproductive Technology (ACART) I am pleased to present this report, *Assisted Reproductive Technology in New Zealand 2010*, the second New Zealand-specific report based on the Australian and New Zealand Assisted Reproduction Database (ANZARD).

One of ACART's functions is to monitor the application and health outcomes of assisted reproductive treatments. New Zealand has good data about some uses of assisted reproduction. The Ethics Committee on Assisted Reproductive Technology provides an Annual Report that includes data about procedures that require ethical approval. District Health Boards hold information about publicly funded procedures. However, New Zealand lacks one collated source of comprehensive data looking at the full spectrum of procedures carried out, regardless of how they are funded or categorised in New Zealand's regulatory framework.

The well-established ANZARD report in most cases aggregates data from Australia and New Zealand. This means that the report, while valuable and comprehensive, lacks New Zealand specific detail. There are significant variations in the regulatory frameworks and funding arrangements for assisted reproductive technology in each country, and in patterns of usage. For these reasons, ACART decided in 2010 to commission New Zealand-specific reports from the ANZARD data.

The *Assisted Reproductive Technology in New Zealand 2010 Report* provides a quantitative report of the numbers, types and outcomes of assisted reproductive technology in New Zealand. It gives a fuller picture of the uses and outcomes of assisted reproductive procedures in New Zealand. We hope that the report will be useful to consumers, fertility services providers and others with an interest in how New Zealanders are using assisted reproductive technology. With successive annual reports, we will begin to build a picture of use and trends over time.

The Ministry of Health has supported ACART in obtaining this report. I would also like to thank Elizabeth Sullivan and Alex Wang of the Australian Institute of Health and Welfare for collaborating with ACART to develop the report.

**John Angus**
Chair, Advisory Committee on Assisted Reproductive Technology
23 September 2013

# Acknowledgements

The Australian and New Zealand Assisted Reproduction Database (ANZARD), funded by the Fertility Society of Australia (FSA), is a collaborative effort between the National Perinatal Epidemiology and Statistics Unit (NPESU) and fertility centres in Australia and New Zealand. The NPESU is a formally affiliated unit of the University of New South Wales (UNSW) under the School of Women's and Children's Health.

We would like to thank all staff in the fertility centres for their efforts in compiling the data and providing additional information when requested. A complete list of all contributing fertility clinics can be found in Appendix A.

# Abbreviations

| | |
|---|---|
| ANZARD | Australian and New Zealand Assisted Reproduction Database |
| ART | assisted reproductive technology |
| DI | donor sperm insemination |
| FSA | Fertility Society of Australia |
| FSH | follicle stimulating hormone |
| ICSI | intracytoplasmic sperm injection |
| ICMART | International Committee Monitoring Assisted Reproductive Technologies |
| IVF | in vitro fertilisation |
| NPESU | National Perinatal Epidemiology and Statistics Unit |
| OPU | oocyte pick-up |
| PGD | preimplantation genetic diagnosis |
| UNSW | University of New South Wales |

# Symbols

| | |
|---|---|
| – | not applicable |

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# Summary

## Use of ART treatment cycles

There were 5285 assisted reproductive technology (ART) treatment cycles reported in New Zealand in 2010. Autologous cycles (where a woman intended to use, or used her own oocytes or embryos) accounted for 91.0% of all treatment cycles. Of these 4809 autologous cycles, 3081 (64.1%) were fresh cycles and 1728 (35.9%) were thaw cycles.

## Treatment outcomes and number of babies

Of the 5285 ART treatment cycles, 29.1% resulted in a clinical pregnancy and 22.6% in a live delivery. There were 1273 liveborn babies, 78.2% (996) were singletons at term (gestational age of 37–41 weeks) with normal birthweight (≥ 2500 grams).

## Woman's age and parity

The average age of women undertaking autologous cycles was 35.9 years. One in five (20.6%) autologous fresh cycles were in women aged 40 years or over. For women undergoing ART treatment using donor oocytes/embryos, the average age was 39.7 years. One third (33.8%) of cycles in 2010 were undertaken by women who had previously given birth.

## Transfer of cryopreserved embryos

Of the 1687 frozen/thawed embryo transfer cycles, 15.6% involved the transfer of embryos that had been cryopreserved using an ultra-rapid method (vitrification). Of these vitrified embryo transfer cycles, one-third (33.1%) were cleavage embryo (day 2–3 embryo) transfers and two-thirds (66.9%) were blastocyst (day 5–6 embryo) transfers.

## Success by age

The live delivery rate per autologous fresh embryo transfer cycle was highest in women aged less than 35 years (31.8%). The rate declined steadily with advancing women's age.

## Deliveries by gestation and woman's age

Of deliveries following autologous and recipient cycles in 2010, 6.7% were multiple gestation deliveries. Women aged less than 35 years had a lower proportion of multiple gestation deliveries than women aged 35–39 years and those age 40 years or older.

# 1 Introduction

It is estimated that about 9% of couples at any given time experience infertility, representing the source of much personal suffering to millions around the world (Boivin et al 2007). The medical definition of infertility is usually defined as the failure to achieve a clinical pregnancy after 12 or more months of regular unprotected sexual intercourse (Zegers-Hochschild et al 2009). Infertility is increasingly being overcome through advancements in fertility treatment, in particular assisted reproductive technologies (ARTs). ARTs have evolved over the last three decades into a suite of mainstream medical interventions that have resulted in the birth of more than 5 million children worldwide (ICMART 2012).

Scientific advancements continue to emerge in the field of ART treatment, clinical practice and patient characteristics. The purpose of this report on ART treatments undertaken in New Zealand is to keep clinicians, researchers and the public informed about ART treatment and the resulting pregnancy outcomes; to provide an ongoing mechanism for monitoring of ART treatment practices, success rates and perinatal outcomes and; to provide information for national and international comparisons.

## Treatments covered in this report

ART is a group of procedures that involves the in vitro (outside of body) handling of human oocytes (eggs) and sperm or embryos for the purposes of establishing a pregnancy (Zegers-Hochschild et al 2009). A typical fresh in vitro fertilisation (IVF) cycle, involves the following five steps:

1. Controlled ovarian hyperstimulation during which follicle stimulating hormone (FSH) is administered to a woman over a number of days to induce the maturation of multiple oocytes.
2. Oocyte pick–up (OPU) where mature oocytes are aspirated from ovarian follicles.
3. Fertilisation of the collected oocytes by incubating them with sperm (from the woman's partner or donor) over a few hours in the laboratory.
4. Embryo maturation during which a fertilised oocyte is cultured for 2–3 days to form a cleavage embryo (6–8 cells) or 5–6 days to create a blastocyst (60–100 cells).
5. Transfer of one or more fresh embryos into the uterus in order for a pregnancy to occur.

Treatment may be discontinued at any stage during a treatment cycle due to a number of reasons including inadequate or excessive ovarian stimulation, failed fertilisation, inadequate embryo growth or patient choice.

Over the last three decades, ART has evolved to encompass complex ovarian hyperstimulation protocols and numerous variations to the typical fresh IVF treatment cycle described above. Some of these variations include:

- intracytoplasmic sperm injection (ICSI), when a single sperm is injected directly into the oocyte
- assisted hatching, when the outer layer of the embryo, the zona pellucida, is either thinned or perforated in the laboratory to aid 'hatching' of the embryo, the aim being to potentially improve the chance of implantation in the uterus
- gamete intrafallopian transfer (GIFT), when mature oocytes and sperm are placed directly into a woman's fallopian tubes so that in vivo (inside the body) fertilisation may take place. While once popular, this procedure now only accounts for a very small percentage of ART cycles
- preimplantation genetic diagnosis (PGD), when one or more cells are removed from the embryo and analysed for chromosomal disorders or genetic diseases before embryo transfer
- donor/recipient arrangements, when donor oocytes from a woman are used to create embryos for transfer to another (recipient) woman
- cryopreservation and storage of embryos that are not transferred in the initial fresh treatment cycle. Once thawed or warmed, the embryos can be transferred in subsequent treatment cycles. Cryopreservation techniques include both the traditional slow freezing method and a newer technique called vitrification. Vitrification can be used to cryopreserve gametes and embryos, and uses an ultra–rapid temperature change with exposure to higher concentrations of cryoprotectants
- surrogacy arrangements, where a woman, known as the gestational carrier, agrees to carry a child for another person or couple, known as the intended parent(s), with the intention that the child will be raised by the intended parent(s).

Along with ART, a number of other fertility treatments are undertaken in Australia and New Zealand. Artificial insemination is one such treatment by which sperm are placed into the female genital tract (for example, intracervical or intrauterine), and can be used with controlled ovarian hyperstimulation or in natural cycles. Artificial insemination can be undertaken using a partner's sperm, or donated sperm, also known as donor sperm insemination (DI).

## Data used in this report

This report provides information on ART and DI treatments and the resulting pregnancy and birth outcomes.

As a joint initiative of the National Perinatal Epidemiology and Statistics Unit (NPESU) at the University of New South Wales (UNSW) and the Fertility Society of Australia (FSA), the Australian and New Zealand Assisted Reproduction Database (ANZARD) was upgraded in 2009 to accommodate new ART treatment types and to transform ANZARD from a cycle-based data collection to a woman-based data collection (ANZARD2.0). A more detailed description of ANZARD2.0 can be found in Appendices B and C.

The data presented in this report were supplied by all seven fertility centres in New Zealand, and compiled into ANZARD2.0.

## Structure of this report

This report has six chapters, including this introductory chapter (Chapter 1).

- Chapter 2 –'Overview of ART treatment in 2010', provides an outline of the numbers and outcomes of all ART treatments undertaken in New Zealand.
- Chapter 3 – 'Autologous and donation/recipient cycles in 2010', presents data on women undergoing treatment, cycle types, and the outcomes of treatment in terms of discontinued treatment, clinical pregnancies and deliveries.
- Chapter 4 – 'Pregnancy and birth outcomes following embryo transfer cycles in 2010', presents data on the outcomes of clinical pregnancies and deliveries following autologous and recipient cycles including a description of perinatal outcomes.
- Chapter 5 – 'Preimplantation genetic diagnosis', includes information on the numbers of embryos that had cells removed and analysed for chromosomal disorders or genetic diseases before transfer.
- Chapter 6 – 'Donor sperm insemination cycles in 2010', presents data on DI cycles and their outcomes, including a description of pregnancy and perinatal outcomes.
- Appendices – Appendix A lists the contributing fertility clinics. Appendix B provides an overview of the ANZARD2.0 data collection that was used to prepare this report.

# 2 Overview of ART treatment in 2010

There were 5285 ART treatment cycles reported in New Zealand in 2010. Of these 91.0% of cycles were autologous cycles (where a woman intended to use, or used her own oocytes or embryos). Of these 4809 autologous cycles, 3081 (64.1%) were fresh cycles and 1728 (35.9%) were thaw cycles. Other treatment cycles accounted for a small proportion of cycles comprising 5.1% oocyte recipient cycles, 0.3% embryo recipient cycles, 2.9% oocyte donation cycles and 0.8% surrogacy cycles.

Of all the ART treatments in 2010, 29.1% (1537) resulted in a clinical pregnancy and 22.6% (1193) in a live delivery. There were 1273 liveborn babies, 78.2% (996) were singletons at term (gestational age of 37–41 weeks) with normal birthweight (≥ 2500 grams).

**Table 1: Number of initiated ART treatment cycles by treatment type, New Zealand, 2010**

| Treatment type | Number of initiated ART cycles | Per cent of treatment types | Number of clinical pregnancies | Number of live deliveries | Number of liveborn babies | Number of liveborn singletons at term with normal birthweight |
|---|---|---|---|---|---|---|
| Autologous | 4809 | 91.0 | 1435 | 1120 | 1199 | 929 |
| *Fresh* | *3081* | *58.3* | *963* | *746* | *815* | *595* |
| *Thaw* | *1728* | *32.7* | *472* | *374* | *384* | *334* |
| Oocyte recipient | 270 | 5.1 | 92 | 67 | 68 | 61 |
| Embryo recipient | 14 | 0.3 | 4 | 1 | 1 | 1 |
| Oocyte donation | 152 | 2.9 | – | – | – | – |
| Surrogacy arrangement cycles | 40 | 0.8 | 6 | 5 | 5 | 5 |
| *Intended parent cycles* | 10 | 0.2 | – | – | – | – |
| *Gestational carrier cycles* | 30 | 0.6 | 6 | 5 | 5 | 5 |
| **Total** | **5285** | **100.0** | **1537** | **1193** | **1273** | **996** |

# 3 Autologous and donation/recipient cycles in 2010

This chapter presents data on initiated autologous cycles, oocyte donation cycles and oocyte/embryo recipient cycles.

An autologous cycle is defined as an ART treatment cycle in which a woman intends to use, or uses her own oocytes.

A donation cycle is defined as an ART treatment cycle in which a woman intends to donate, or donates her oocytes to others. A donation cycle may result in the donation of either oocytes or embryos to a recipient woman. The use of donor sperm does not influence the donor status of the cycle.

A recipient cycle is defined as an ART treatment cycle in which a woman receives oocytes or embryos from another woman.

Autologous and donor/recipient cycles can involve the use of, or intended use of, either fresh or frozen/thawed embryos.

## Age of women and their partners

The average age of women undertaking autologous and oocyte/embryo recipient cycles was 35.9 years. For women undergoing oocyte/embryo recipient cycles, the mean age was 39.7 years, four years older than for autologous cycles (35.7 years).

Of all autologous and oocyte/embryo recipient cycles, one in five (20.6%) was undertaken by women aged 40 years or older (Table 2). The average age of partners was 38.8 years, with more than one-third (38.3%) aged 40 years or older (Table 3).

**Table 2: Number of autologous and recipient cycles by women's age group and treatment type, New Zealand, 2010**

| Age group (years)[(a)] | Autologous | | | | Oocyte/embryo recipient | | All | |
|---|---|---|---|---|---|---|---|---|
| | Fresh | | Thaw | | | | | |
| | Number | Per cent | Number | Per cent | Number | Per cent | Number | Per cent |
| < 30 | 292 | 9.5 | 158 | 9.1 | 2 | 0.7 | 452 | 8.9 |
| 30–34 | 773 | 25.1 | 485 | 28.1 | 36 | 12.7 | 1294 | 25.4 |
| 35–39 | 1366 | 44.3 | 841 | 48.7 | 91 | 32.0 | 2298 | 45.1 |
| 40–44 | 629 | 20.4 | 235 | 13.6 | 114 | 40.1 | 978 | 19.2 |
| ≥ 45 | 21 | 0.7 | 9 | 0.5 | 41 | 14.4 | 71 | 1.4 |
| **Total** | **3081** | **100.0** | **1728** | **100.0** | **284** | **100.0** | **5093** | **100.0** |

(a) Age at start of treatment cycle.

*Note: Data are collected for each treatment cycle. Therefore, some individuals may be counted more than once.*

**Table 3: Number of autologous and recipient cycles by women's partners' age group and treatment type, New Zealand, 2010**

| Age group (years)[(a)] | Autologous | | | | Oocyte/embryo recipient | | All | |
|---|---|---|---|---|---|---|---|---|
| | Fresh | | Thaw | | | | | |
| | Number | Per cent | Number | Per cent | Number | Per cent | Number | Per cent |
| < 30 | 151 | 4.9 | 76 | 4.4 | 2 | 0.7 | 229 | 4.5 |
| 30–34 | 616 | 20.0 | 356 | 20.6 | 28 | 9.9 | 1000 | 19.6 |
| 35–39 | 1002 | 32.5 | 651 | 37.7 | 84 | 29.6 | 1737 | 34.1 |
| 40–44 | 716 | 23.2 | 378 | 21.9 | 84 | 29.6 | 1178 | 23.1 |
| ≥ 45 | 469 | 15.2 | 231 | 13.4 | 71 | 25.0 | 771 | 15.1 |
| Not stated | 127 | 4.1 | 36 | 2.1 | 15 | 5.3 | 178 | 3.5 |
| **Total** | **3081** | **100.0** | **1728** | **100.0** | **284** | **100.0** | **5093** | **100.0** |

(a) Age at start of treatment cycle.

*Note: Data are collected for each treatment cycle. Therefore, some individuals may be counted more than once.*

## Parity

Parity is the number of previous pregnancies of 20 weeks or more gestation experienced by a woman. A woman who has had no previous pregnancies of 20 or more weeks gestation is called nulliparous. A woman who has had at least one previous pregnancy of 20 weeks or more gestation is described as parous.

Of the 5093 initiated autologous and recipient cycles undertaken in 2010, 66.2% were undertaken by nulliparous women. Of autologous cycles (fresh and thaw), 66.0% were undertaken by nulliparous women compared with 69.7% for oocyte/embryo recipient cycles (Table 4).

**Table 4: Number of autologous and recipient cycles by parity and treatment type, New Zealand, 2010**

| Parity | Autologous | | | | Oocyte/embryo recipient | | All | |
|---|---|---|---|---|---|---|---|---|
| | Fresh | | Thaw | | | | | |
| | Number | Per cent | Number | Per cent | Number | Per cent | Number | Per cent |
| Nulliparous | 2287 | 74.2 | 888 | 51.4 | 198 | 69.7 | 3373 | 66.2 |
| Parous | 793 | 25.7 | 840 | 48.6 | 86 | 30.3 | 1719 | 33.8 |
| Not stated | 1 | 0.0 | – | – | – | – | 1 | 0.0 |
| **Total** | **3081** | **100.0** | **1728** | **100.0** | **284** | **100.0** | **5093** | **100.0** |

**Table 5: Number of autologous and recipient cycles with fertilisation attempted by treatment type and procedure, New Zealand, 2010**

| | Autologous | | | | Oocyte/embryo recipient | | | |
|---|---|---|---|---|---|---|---|---|
| | Fresh[(a)] | | Thaw[(b)] | | Fresh[(a)] | | Thaw[(b)] | |
| **Procedure** | **Number** | **Per cent** | **Number** | **Per cent** | **Number** | **Per cent** | **Number** | **Per cent** |
| IVF | 1208 | 42.7 | 750 | 48.3 | 70 | 49.0 | 80 | 59.3 |
| ICSI[(c)] | 1623 | 57.3 | 801 | 51.6 | 73 | 51.0 | 55 | 40.7 |
| Not stated | – | – | 1 | 0.1 | – | – | – | – |
| **Total** | **2831** | **100.0** | **1552** | **100.0** | **143** | **100.0** | **135** | **100.0** |

(a) Fresh cycles where fertilisation was attempted.

(b) Thaw cycles where embryos were transferred.

(c) Mixed IVF/ICSI cycles were classed as ICSI cycles.

**Table 6: Number of autologous and recipient embryo transfer cycles by number of embryos transferred per cycle and women's age group, New Zealand, 2010**

| | Number of embryos transferred | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | One | | Two | | Three or more | | All | |
| **Age group (years)[(a)]** | **Number** | **Per cent** | **Number** | **Per cent** | **Number** | **Per cent** | **Number** | **Per cent** |
| < 30 | 343 | 93.7 | 23 | 6.3 | – | – | 366 | 100.0 |
| 30–34 | 1003 | 89.4 | 119 | 10.6 | – | – | 1122 | 100.0 |
| 35–39 | 1457 | 72.9 | 539 | 27.0 | 2 | 0.1 | 1998 | 100.0 |
| 40–44 | 371 | 44.0 | 440 | 52.1 | 33 | 3.9 | 844 | 100.0 |
| ≥ 45 | 35 | 57.4 | 19 | 31.1 | 7 | 11.5 | 61 | 100.0 |
| **Total** | **3209** | **73.1** | **1140** | **26.0** | **42** | **1.0** | **4391** | **100.0** |

(a) Age at start of a treatment cycle.

**Table 7: Number of autologous and recipient embryo transfer cycles by treatment type and stage of embryo development, New Zealand, 2010**

| | Autologous | | | | Oocyte/embryo recipient | | | |
|---|---|---|---|---|---|---|---|---|
| | Fresh | | Thaw | | Fresh | | Thaw | |
| **Type and procedure** | **Number** | **Per cent** | **Number** | **Per cent** | **Number** | **Per cent** | **Number** | **Per cent** |
| Cleavage embryo | 1653 | 64.5 | 513 | 33.1 | 71 | 50.4 | 45 | 33.3 |
| Blastocyst | 910 | 35.5 | 1039 | 66.9 | 70 | 49.6 | 90 | 66.7 |
| **Total** | **2563** | **100.0** | **1552** | **100.0** | **141** | **100.0** | **135** | **100.0** |

**Table 8: Number of autologous and recipient embryo transfer cycles by freezing method and stage of embryo development, New Zealand, 2010**

| Type and procedure | Autologous | | | | Oocyte/embryo recipient | | | |
|---|---|---|---|---|---|---|---|---|
| | Cleavage embryo | | Blastocyst | | Cleavage embryo | | Blastocyst | |
| | Number | Per cent | Number | Per cent | Number | Per cent | Number | Per cent |
| Slow frozen embryo | 504 | 98.2 | 920 | 88.5 | 43 | 95.6 | 76 | 84.4 |
| Vitrified embryo | 9 | 1.8 | 119 | 11.5 | 1 | 2.2 | 14 | 15.6 |
| Not stated | – | – | – | – | 1 | 2.2 | – | – |
| **Total** | **513** | **100.0** | **1039** | **100.0** | **45** | **100.0** | **90** | **100.0** |

(a) Ultra-rapid cryopreservation.

## Clinical pregnancies and live deliveries from autologous fresh cycles by women's age

The overall live delivery rate per autologous fresh embryo transfer cycle was 24.2%. The highest live delivery rate per embryo transfer cycle was in women aged less than 35 years (31.8%). The rate declined steadily with advancing women's age (Table 9).

**Table 9: Outcomes of autologous fresh cycles by women's age group, New Zealand, 2010**

| Stage/outcome of treatment | Age group (years)[(a)] | | | | | |
|---|---|---|---|---|---|---|
| | < 30 | 30–34 | 35–39 | 40–44 | ≥ 45 | All |
| Initiated cycles | 292 | 773 | 1366 | 629 | 21 | 3081 |
| Cycles with OPU | 277 | 740 | 1274 | 580 | 19 | 2890 |
| Embryo transfers | 220 | 656 | 1145 | 527 | 15 | 2563 |
| Clinical pregnancies | 99 | 297 | 446 | 121 | – | 963 |
| Live deliveries | 89 | 250 | 330 | 77 | – | 746 |
| *Live deliveries per initiated cycle (per cent)* | *30.5* | *32.3* | *24.2* | *12.2* | – | *24.2* |
| *Live deliveries per embryo transfer cycle (per cent)* | *40.5* | *38.1* | *28.8* | *14.6* | – | *29.1* |
| *Live deliveries per clinical pregnancy (per cent)* | *89.9* | *84.2* | *74.0* | *63.6* | – | *77.5* |

(a) Age at start of a treatment cycle.

## Clinical pregnancies and live deliveries from autologous thaw cycles by women's age

The overall live delivery rate per autologous thawed embryo transfer cycle was 21.6%, varying between 24.3% and 11.1% (Table 10). It is important to note that embryos thawed during a thaw cycle were created at an earlier initiated fresh cycle, therefore a woman's age at the start of a thaw cycle is older than her age at the start of the initiated fresh cycle.

**Table 10: Outcomes of autologous thaw cycles by women's age group, New Zealand, 2010**

| | Age group (years)[a] | | | | | |
|---|---|---|---|---|---|---|
| **Stage/outcome of treatment** | **< 30** | **30–34** | **35–39** | **40–44** | **≥ 45** | **All** |
| Initiated cycles | 158 | 485 | 841 | 235 | 9 | 1728 |
| Embryo transfers | 144 | 430 | 763 | 207 | 8 | 1552 |
| Clinical pregnancies | 40 | 143 | 232 | 56 | 1 | 472 |
| Live deliveries | 27 | 118 | 185 | 43 | 1 | 374 |
| *Live deliveries per initiated cycle (per cent)* | *17.1* | *24.3* | *22.0* | *18.3* | *11.1* | *21.6* |
| *Live deliveries per embryo transfer cycle (per cent)* | *18.8* | *27.4* | *24.2* | *20.8* | *12.5* | *24.1* |
| *Live deliveries per clinical pregnancy (per cent)* | *67.5* | *82.5* | *79.7* | *76.8* | *100.0* | *79.2* |

(a) Age at start of a treatment cycle.

## Oocyte donation cycles

The average age of women donating oocytes was 33.1 years, with 44.1% of cycles in women aged 35 years or older. Nearly all (99.3%) of the initiated oocyte donation cycles resulted in donations (Table 11).

**Table 11: Number of oocyte donation cycles by donor's age group, New Zealand, 2010**

| Age group (years)[a] | Initiated cycles (Number) | Cycles with OPU performed (Number) | Cycles with OPU performed (Per cent) | Cycles with oocyte donated (Number) | Cycles with oocyte donated (Per cent) |
|---|---|---|---|---|---|
| < 30 | 28 | 28 | 100.0 | 28 | 100.0 |
| 30–34 | 57 | 57 | 100.0 | 57 | 100.0 |
| 35–39 | 64 | 63 | 98.4 | 63 | 98.4 |
| ≥ 40 | 3 | 3 | 100.0 | 3 | 100.0 |
| **Total** | **152** | **151** | **99.3** | **151** | **99.3** |

(a) Age at start of a treatment cycle.

## Clinical pregnancies and live deliveries from oocyte/embryo recipient cycles by type of recipient cycle

There were 284 oocyte/embryo recipient cycles in 2010. The majority of these, 95.1% (270) were oocyte recipient cycles and 4.9% (14) were embryo recipient cycles. Of the 270 oocyte recipient cycles, 47.0% were thaw cycles (Table 12).

Of the 127 thaw oocyte recipient cycles, 28.3% resulted in a live delivery, which is markedly higher than the live delivery rate for fresh oocyte recipient cycles (21.7%). The live delivery rate for embryo recipient cycles was 7.1%, however the number of embryo recipient cycles was considerably smaller than the number of oocyte recipient cycles.

**Table 12: Outcomes of oocyte/embryo recipient cycles by treatment type, New Zealand, 2010**

| Stage/outcome of treatment | Oocyte recipient | | Embryo recipient | All |
|---|---|---|---|---|
| | Fresh | Thaw | | |
| Initiated cycles | 143 | 127 | 14 | 284 |
| Embryo transfers | 141 | 122 | 13 | 276 |
| Clinical pregnancies | 49 | 43 | 4 | 96 |
| Live deliveries | 31 | 36 | 1 | 68 |
| *Live deliveries per initiated cycle (per cent)* | *21.7* | *28.3* | *7.1* | *23.9* |
| *Live deliveries per embryo transfer cycle (per cent)* | *22.0* | *29.5* | *7.7* | *24.6* |
| *Live deliveries per clinical pregnancy (per cent)* | *63.3* | *83.7* | *25.0* | *70.8* |

## Clinical pregnancies and live deliveries from oocyte/embryo recipient cycles by recipient's age

The clinical pregnancy and live delivery rates of recipient cycles varied by recipient's age group. The overall live delivery rate per initiated cycle was 23.9%. The live delivery rate per initiated cycle ranged between 19.3% and 50.0%. The live delivery rate of oocyte/embryo recipient cycles in recipients aged ≥ 45 years (26.8%) was higher (Table 13) than the rate of autologous thaw cycles (11.1%), while there were no live deliveries from the 21 autologous fresh cycles (Tables 9 and 10).

**Table 13: Outcomes of oocyte/embryo recipient cycles by recipient's age group, New Zealand, 2010**

| Stage/outcome of treatment | Age group (years)[(a)] | | | | | |
|---|---|---|---|---|---|---|
| | < 30 | 30–34 | 35–39 | 40–44 | ≥ 45 | All |
| Initiated cycles | 2 | 36 | 91 | 114 | 41 | 284 |
| Embryo transfers | 2 | 36 | 90 | 110 | 38 | 276 |
| Clinical pregnancies | 1 | 14 | 34 | 33 | 14 | 96 |
| Live deliveries | 1 | 10 | 24 | 22 | 11 | 68 |
| *Live deliveries per initiated cycle (per cent)* | *50.0* | *27.8* | *26.4* | *19.3* | *26.8* | *23.9* |
| *Live deliveries per embryo transfer cycle (per cent)* | *50.0* | *27.8* | *26.7* | *20.0* | *28.9* | *24.6* |
| *Live deliveries per clinical pregnancy (per cent)* | *100.0* | *71.4* | *70.6* | *66.7* | *78.6* | *70.8* |

(a) Age at start of a treatment cycle.

## Clinical pregnancies and live deliveries from oocyte/embryo recipient cycles by donor's age

The live delivery rate per embryo transfer cycle varied by donor's age, ranging from 14.3% for cycles in donors aged ≥ 40 years to 33.3% of cycles in donors aged 30-34 years (Table 14).

**Table 14: Outcomes of oocyte/embryo recipient cycles by donor's age group, New Zealand, 2010**

| | Age group (years)[(a)] | | | | | |
|---|---|---|---|---|---|---|
| **Stage/outcome of treatment** | **< 25** | **25–29** | **30–34** | **35–39** | **≥ 40** | **All** |
| Initiated cycles | 9 | 36 | 119 | 113 | 7 | 284 |
| Embryo transfer cycles | 8 | 34 | 117 | 111 | 6 | 276 |
| Clinical pregnancies | 2 | 16 | 40 | 37 | 1 | 96 |
| Live deliveries | 2 | 12 | 31 | 22 | 1 | 68 |
| *Live deliveries per initiated cycle (per cent)* | *22.2* | *33.3* | *26.1* | *19.5* | *14.3* | *23.9* |
| *Live deliveries per embryo transfer cycle (per cent)* | *25.0* | *35.3* | *26.5* | *19.8* | *16.7* | *24.6* |
| *Live deliveries per clinical pregnancy (per cent)* | *100.0* | *75.0* | *77.5* | *59.5* | *100.0* | *70.8* |

(a) Age at start of treatment cycle.

# 4 Pregnancy and birth outcomes following autologous and recipient cycles in 2010

There were 1531 clinical pregnancies following autologous and recipient embryo transfer cycles in 2010. Over three-quarters of the clinical pregnancies (77.6%) resulted in a delivery and 20.5% resulted in early pregnancy loss (less than 20 weeks gestation and less than 400 grams birthweight). The outcomes of 20 (1.3%) clinical pregnancies were not known because women could not be followed up or contacted by fertility centres.

## Early pregnancy loss

Of the 314 early pregnancy losses, 93.3% were miscarriages, 1.9% were due to termination of pregnancy, and 4.8% were ectopic or heterotopic pregnancies.

**Table 15: Early pregnancy losses by pregnancy outcome and treatment type, New Zealand, 2010**

| Pregnancy outcome | Autologous | | | | Oocyte/embryo recipient | | All | |
|---|---|---|---|---|---|---|---|---|
| | Fresh | | Thaw | | | | | |
| | Number | Per cent | Number | Per cent | Number | Per cent | Number | Per cent |
| Miscarriage | 180 | 92.3 | 87 | 93.5 | 26 | 100.0 | 293 | 93.3 |
| Termination | 4 | 2.1 | 2 | 2.2 | – | – | 6 | 1.9 |
| Ectopic or heterotopic pregnancy | 11 | 5.6 | 4 | 4.3 | – | – | 15 | 4.8 |
| **Total** | **195** | **100.0** | **93** | **100.0** | **26** | **100.0** | **314** | **100.0** |

## Deliveries by delivery outcomes and treatment type

There were 1197 women who gave birth to at least one baby of 20 weeks or more gestation or at least 400 grams birthweight following embryo transfer cycles. Of these, 99.2% (1188) gave birth to at least one liveborn baby (live delivery). Nearly all autologous cycles and oocyte/embryo recipient cycles resulted in a live delivery (99.4% and 97.1% respectively) (Table 16).

**Table 16: Deliveries by delivery outcome and treatment type, New Zealand, 2010**

| Pregnancy outcome | Autologous | | | | Oocyte /embryo recipient | | All | |
|---|---|---|---|---|---|---|---|---|
| | Fresh | | Thaw | | | | | |
| | Number | Per cent | Number | Per cent | Number | Per cent | Number | Per cent |
| Live delivery | | | | | | | | |
| *< 37 weeks* | 746 | 99.2 | 374 | 99.7 | 68 | 97.1 | 1188 | 99.2 |
| *≥ 37 weeks* | *103* | 13.7 | *30* | 8.0 | *4* | 5.7 | *137* | 11.4 |
| Fetal death (stillbirth)[(a)] | *643* | 85.5 | *344* | 91.7 | *64* | 91.4 | *1051* | 87.8 |
| Not stated | 6 | 0.8 | 1 | 0.3 | 2 | 2.9 | 9 | 0.8 |
| **Total** | **752** | **100.0** | **375** | **100.0** | **70** | **100.0** | **1197** | **100.0** |

(a) Fetal death (stillbirth) is reported by patients to fertility centre staff. These data are not vital statistics.

## Deliveries by maternal age

The average age of women at the time of delivery was 35.8 years. Of the 1197 deliveries, 6.7% were multiple gestation deliveries. Women aged less than 35 years had the lowest proportion of multiple gestation deliveries (5.1%)(Table 17).

**Table 17: Deliveries by gestation and maternal age group, New Zealand, 2010**

| Gestation | Age group (years)[(a)] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | < 35 | | | 35–39 | | | ≥ 40 | | |
| | One embryo | Two embryos | All[(b)] | One embryo | Two embryos | All[(b)] | One embryo | Two embryos | All[(b)] |
| | | | | | Number | | | | |
| Singleton | 387 | 23 | 410 | 392 | 100 | 493 | 110 | 100 | 214 |
| Multiple | 6 | 16 | 22 | 8 | 36 | 44 | 2 | 11 | 14 |
| *Twin* | *6* | *16* | *22* | *8* | *35* | *43* | *2* | *11* | *14* |
| *Higher order multiple* | – | – | – | – | *1* | *1* | – | – | – |
| Total | **393** | **39** | **432** | **400** | **136** | **537** | **112** | **111** | **228** |
| | | | | | Per cent | | | | |
| Singleton | 98.5 | 59.0 | 94.9 | 98.0 | 73.5 | 91.8 | 98.2 | 90.1 | 93.9 |
| Multiple | 1.5 | 41.0 | 5.1 | 2.0 | 26.5 | 8.2 | 1.8 | 9.9 | 6.1 |
| *Twin* | *1.5* | *41.0* | *5.1* | *2.0* | *25.7* | *8.0* | *1.8* | *9.9* | *6.1* |
| *Higher order multiple* | – | – | – | – | *0.7* | *0.2* | – | – | – |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

(a) Age at time of delivery.

(b) Included three or more embryos.

## Birth outcomes

The babies described in this section were those born at 20 weeks or more gestational age or at least 400 grams birthweight following autologous and recipient embryo transfer cycles.

There were 1268 babies born to women who had autologous and recipient cycles. Of these babies, 87.4% were singletons, 12.4% twins and 0.2% triplets. There were 1268 liveborn babies.

The overall rate of low birthweight for liveborn babies was 12.6%, with 6.4% for liveborn singletons and 54.8% for liveborn twins.

**Table 18: Liveborn babies by birthweight group and plurality, New Zealand, 2010**

| | Singletons | | Twins | | Higher order multiples | | Total | |
|---|---|---|---|---|---|---|---|---|
| **Birthweight (g)** | **Number** | **Per cent** | **Number** | **Per cent** | **Number** | **Per cent** | **Number** | **Per cent** |
| *Mean* | 3361 | | 2343 | | 2100 | | 3236 | |
| < 1000 | 7 | 0.6 | 6 | 3.8 | – | – | 13 | 1.0 |
| 1000–1499 | 8 | 0.7 | 9 | 5.7 | – | – | 17 | 1.3 |
| 1500–1999 | 17 | 1.5 | 25 | 15.9 | – | – | 42 | 3.3 |
| 2000–2499 | 39 | 3.5 | 46 | 29.3 | 3 | 100.0 | 88 | 6.9 |
| 2500–2999 | 169 | 15.3 | 40 | 25.5 | – | – | 209 | 16.5 |
| 3000–3499 | 397 | 35.8 | 21 | 13.4 | – | – | 418 | 33.0 |
| 3500–3999 | 337 | 30.4 | 4 | 2.5 | – | – | 341 | 26.9 |
| ≥ 4000 | 129 | 11.6 | – | – | – | – | 129 | 10.2 |
| Not stated | 5 | 0.5 | 6 | 3.8 | – | – | 11 | 0.9 |
| **Total** | **1,108** | **100.0** | **157** | **100.0** | **3** | **100.0** | **1,268** | **100.0** |
| *< 2500* | 71 | 6.4 | 86 | 54.8 | 3 | 100.0 | 160 | 12.6 |

# 5 Preimplantation genetic diagnosis in 2010

Preimplantation genetic diagnosis (PGD) is a procedure in which cells from the embryo are removed and analysed for chromosomal disorders or genetic diseases before embryo transfer. In 2010, PGD was performed in 54 cycles, representing 1.1% of cycles in which embryos were created or thawed.

**Table 19: Number of cycles with PGD by type of embryo, New Zealand, 2010**

| | Stage of treatment | | |
|---|---|---|---|
| Type of embryo | Number of cycles with embryo fertilised/thawed | Number of cycles with PGD | PGD per cycle with embryo fertilised/thawed (per cent) |
| Fresh | 2861 | 40 | 1.4 |
| Thaw | 1865 | 14 | 0.8 |
| **Total** | **4726** | **54** | **1.1** |

# 6 Donor insemination cycles in 2010

In 2010, there were 494 donor insemination (DI) cycles reported in New Zealand. The average age of women who had a DI cycle was 36.5 years. The overall live delivery rate per DI cycle was 16.6%. The live delivery rate for women aged under 35 years was 25.9% and decreased steadily with advancing women's age.

**Table 20: Outcomes of DI cycles by women's age group, New Zealand, 2010**

| | Age group (years)[(a)] | | | | |
|---|---|---|---|---|---|
| **Stage/outcome of treatment** | **< 30** | **30–34** | **35–39** | **≥ 40** | **Total** |
| DI cycles | 34 | 113 | 230 | 117 | 494 |
| Clinical pregnancies | 8 | 32 | 36 | 6 | 82 |
| Live deliveries | 8 | 30 | 25 | 3 | 66 |
| *Clinical pregnancies per DI cycle (per cent)* | 23.5 | 28.3 | 15.7 | 5.1 | 16.6 |
| *Live deliveries per DI cycle (per cent)* | 23.5 | 26.5 | 10.9 | 2.6 | 13.4 |
| *Live deliveries per clinical pregnancy (per cent)* | 100.0 | 93.8 | 69.4 | 50.0 | 80.5 |

(a) Age at start of treatment cycle.

# Appendix A: Contributing fertility clinics

Fertility Associates, Auckland (Dr Mary Birdsall)
Fertility Associates Hamilton, Hamilton (Dr VP Singh)
Fertility Associates Wellington, Wellington (Dr Andrew Murray)
Fertility Plus, Auckland (Dr Barry Lowe)
Repromed Auckland, Auckland (Dr Guy Gudex)
Repromed Christchurch, Christchurch (Dr Greg Phillipson)
The Otago Fertility Services, Dunedin (Associate Professor Wayne Gillett)

# Appendix B: Data used in this report

The data presented in this report are supplied by 7 fertility centres in New Zealand and are compiled into ANZARD2.0. ANZARD2.0 includes autologous treatment cycles, treatment involving donated oocytes or embryos and treatment involving surrogacy arrangements. ANZARD2.0 collects data on the use of ART techniques such as ICSI, oocyte/embryo freezing methods, PGD and cleavage/blastocyst transfers. In addition to ART procedures, ANZARD2.0 also collects data from fertility centres about artificial insemination cycles using donated sperm. The outcomes of pregnancies, deliveries and babies born following ART and DI treatments are also maintained in ANZARD2.0. This includes the method of birth, birth status, birthweight, gestational age, plurality, perinatal mortality and selected information on maternal morbidity.

This report presents information on ART and DI treatment cycles that took place in fertility clinics New Zealand in 2010, and the resulting pregnancies and births. The babies included in this report were conceived through treatment cycles undertaken in 2010, and were born in either 2010 or 2011.

## Data validation

Most fertility centres have computerised data information management systems and are able to provide NPESU with high quality data. All data processed by NPESU undergo a validation process, with data queries being followed up with fertility centre staff. In 2010, information relating to pregnancy and birth outcomes was not provided for 1.3% of clinical pregnancies.

The Reproductive Technology Accreditation Committee of FSA also plays a role in ensuring the quality of ANZARD2.0 data by validating selected records against clinic files in their annual inspections.

## Data presentation

Data presented in the report are for treatment cycles and not patients. It is possible for an individual woman to undergo more than one treatment cycle in a year or experience more than one pregnancy. This means that information reported about patient characteristics, such as age, parity and cause of infertility, is based on calculations in which individuals may be counted more than once.

The rates of clinical pregnancy and live delivery were measured per initiated cycle. Where the number of initiated cycles was not available, the rates were measured per embryo transfer cycle.

Where applicable, percentages in tables have been calculated including the 'Not stated' category. Throughout the report, for totals, percentages may not add up to 100.0 and, for subtotals, they may not add up to the sum of the percentages for the categories. This is due to rounding error.

## Data limitations

Follow-up of pregnancy and birth outcomes is limited because the ongoing care of pregnant patients is often carried out by non-ART practitioners. The method of follow-up varies by fertility centre and includes follow-up with the patient or clinician or the use of routine data sourced from a health department. In a small proportion of cases this information is not available. For pregnancies in which there is successful follow-up, data are limited by the self-reported nature of the information. Fertility centre staff invest significant effort in validating such information by obtaining medical records from clinicians or hospitals.

# Glossary

This report categorises ART treatments according to whether a woman used her own oocytes or embryos, or oocytes/embryos were donated by another woman/couple, and whether the embryos were transferred soon after fertilisation or following cryopreservation.

**Artificial insemination**: a range of techniques of placing sperm into the female genital tract, and can be used with controlled ovarian hyperstimulation or in unstimulated cycles. These techniques are referred to as donor insemination (DI) in this report.

**ART (assisted reproductive technology):** treatments or procedures that involve the in vitro handling of human oocytes (eggs) and sperm or embryos for the purposes of establishing a pregnancy. ART does not include artificial insemination.

**Assisted hatching:** when the outer layer of the embryo, the zona pellucida, is either thinned or perforated in the laboratory to aid 'hatching' of the embryo, the aim being to potentially improve the chance of implantation in the uterus.

**Autologous cycle:** an ART treatment cycle in which a woman intends to use, or uses her own oocytes or embryos. GIFT cycles are classified separately from autologous cycles.

**Blastocyst:** an embryo comprising about 100 cells usually developed by five or six days after fertilisation.

**Caesarean section:** an operative delivery by surgical incision through the abdominal wall and uterus.

**Cleavage stage embryo**: an embryo comprising about eight cells usually developed by two or three days after fertilisation.

**Clinical pregnancy:** a pregnancy in which at least one of the following criteria is met:

- known to be ongoing at 20 weeks
- evidence by ultrasound of an intrauterine sac (with or without a fetal heart)
- examination of products of conception reveal chorionic villi, or
- an ectopic pregnancy has been diagnosed by laparoscope or by ultrasound.

**Controlled ovarian hyperstimulation:** medical treatment to induce the development of multiple ovarian follicles in order to obtain multiple oocytes at oocyte pick-up (OPU).

**Cryopreservation:** freezing embryos for potential future ART treatment.

**Delivery:** a birth event in which one or more babies of 20 weeks or more gestation or of 400 grams or more birthweight are born.

**DI (donor insemination) cycle:** an artificial insemination cycle in which sperm not from the woman's partner (donor sperm) is used.

**Discontinued cycle:** an ART cycle that does not proceed to oocyte pick-up (OPU) or embryo transfer.

**Donation cycle:** an ART treatment cycle where a woman intends to donate, or donates her oocytes to others. A donation cycle may result in the donation of either oocytes or embryos to a recipient woman. The use of donor sperm does not alter the donor status of the cycle.

**Ectopic pregnancy:** a pregnancy in which implantation takes place outside the uterine cavity.

**Embryo:** an egg that has been fertilised by a sperm and has undergone one or more divisions.

**Embryo transfer:** a procedure whereby embryo(s) are placed in the uterus or fallopian tube. The embryo(s) can be fresh or thawed following cryopreservation, and may include the transfer of cleavage stage embryos or blastocysts.

**Fetal death (stillbirth):** the birth of an infant after 20 or more weeks gestation or 400 grams or more birthweight that shows no signs of life.

**Fresh cycle:** an ART treatment cycle that intends to use, or uses embryo(s) that have not been cryopreserved (frozen).

**Gestational age:** the completed weeks of gestation of the fetus. This is calculated as follows:

- Cycles with embryos transferred: (pregnancy end date – embryo transfer date + 16 days) for transfer of cleavage stage embryos and (pregnancy end date – embryo transfer date + 19 days) for transfer of blastocysts.
- GIFT cycles: (pregnancy end date – OPU date) + 14 days.
- DI cycles: (pregnancy end date – date of insemination) + 14 days.

**GIFT (gamete intrafallopian transfer):** an ART treatment where mature oocytes and sperm are placed directly into a woman's fallopian tubes so that in vivo fertilisation may take place. GIFT cycles are classified separately from autologous cycles.

**Heterotopic pregnancy:** a double gestation pregnancy in which implantation takes place both inside and outside the uterine cavity.

**ICSI (intracytoplasmic sperm injection):** a procedure whereby a single sperm is injected directly into the oocyte to aid fertilisation. If an embryo transfer cycle involves the transfer of at least one embryo created using ICSI, it is counted as an ICSI cycle.

**IVF (In vitro fertilisation):** an ART procedure that involves extracorporeal fertilisation.

**Live birth:** according to the World Health Organization (WHO) definition, a live birth is defined as the complete expulsion or extraction from its mother of a product of conception irrespective of the duration of the pregnancy, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of the voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered liveborn. In this report, live births are included if they meet the WHO definition and if they are of 20 weeks or more gestation or 400 grams or more birthweight.

**Live delivery:** a live delivery is the delivery of one or more liveborn infants, with the birth of twins, triplets or more counted as one live delivery.

**Low birthweight:** a birthweight of less than 2500 grams.

**Oocyte (egg):** a female reproductive cell.

**OPU (oocyte pick-up):** the procedure to collect oocytes from ovaries, usually by ultrasound guided transvaginal aspiration and rarely by laparoscopic surgery.

**Parity:** a classification of a woman in terms of the number of previous pregnancies experienced that reached 20 weeks or more gestation.

**Parous:** refers to a woman who has had at least one previous pregnancy of 20 weeks or more gestation.

**PGD (preimplantation genetic diagnosis):** a procedure where embryonic cells are removed and screened for chromosomal disorders or genetic diseases before embryo transfer.

**Nulliparous:** refers to a woman who has never had a pregnancy of 20 weeks or more gestation.

**Perinatal death:** a fetal death (stillbirth) or neonatal death of at least 20 weeks gestation or at least 400 grams birthweight.

**Preterm:** a gestation of less than 37 weeks.

**Recipient cycle:** an ART treatment cycle in which a woman receives oocytes or embryos from another woman.

**Secondary sex ratio:** the number of male liveborn babies per 100 female liveborn babies.

**Surrogacy arrangement**: an arrangement where a woman, known as the gestational carrier agrees to carry a child for another person or couple, known as the intended parent(s), with the intention that the child will be raised by the intended parent(s). The oocytes and/or sperm used to create the embryo(s) in the surrogacy cycle can be either from the intended parents or from a donor(s).

**Thaw cycle:** an ART treatment cycle in which cryopreserved embryos are thawed with the intention of performing embryo transfer.

**Thawed embryo:** an embryo thawed after cryopreservation. It is used in thaw cycles.

**Vitrification:** an ultra-rapid cryopreservation method that prevents ice formation within the suspension which is converted to a glass-like solid.

*Note:* The International Committee Monitoring Assisted Reproductive Technologies (ICMART) has published an ART glossary for the terms used in ART data collections (Zegers-Hochschild et al. 2009). However, the terminology used in this report may differ from that in the ICMART glossary.

# References

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