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Assisted reproductive technology in Australia and New Zealand 2010

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ASSISTED REPRODUCTION SERIES
Number 16

Assisted reproductive technology in Australia and New Zealand 2010

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Australian Institute of Health and Welfare
Canberra
Cat. no. PER 55

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This publication is part of the Australian Institute of Health and Welfare's Assisted reproduction technology series. A complete list of the Institute's publications is available from the Institute's website <www.aihw.gov.au>.

ISSN 1038-7234
ISBN 978-1-74249-358-9

Suggested citation
Macaldowie A, Wang YA, Chambers GM & Sullivan EA 2012. Assisted reproductive technology in Australia and New Zealand 2010. Assisted reproduction technology series no. 16. Cat. no. PER 55. Canberra: AIHW.

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Published by the Australian Institute of Health and Welfare

Please note that there is the potential for minor revisions of data in this report. Please check the online version at <www.aihw.gov.au> for any amendments.

Contents

Acknowledgments

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

A number of organisations and people make the publication of this annual report possible. Firstly, 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. We also thank Dr Clare Boothroyd, Associate Professor Mark Bowman, Professor Michael Chapman, Dr Lyndon Hale, Associate Professor Peter Illingworth, Professor Gab Kovacs, Professor Robert Norman and Dr John Peek for peer reviewing the report. We would like to acknowledge the support of the AIHW NPESU by the School of Women's and Children's Health, UNSW and the Sydney Children's Hospital. We also acknowledge the financial support from the Fertility Society of Australia for the compilation of ANZARD and the preparation of this report.

Abbreviations and symbols

AIHW	Australian Institute of Health and Welfare
ANZARD	Australian and New Zealand Assisted Reproduction Database
ART	assisted reproductive technology
DET	double embryo transfer
DI	donor sperm insemination
EMSN	Extended Medicare Safety Net
FSA	Fertility Society of Australia
FSH	follicle stimulating hormone
GIFT	gamete intrafallopian transfer
ICSI	intracytoplasmic sperm injection
ICMART	International Committee Monitoring Assisted Reproductive Technologies
IVF	in vitro fertilisation
NPESU	National Perinatal Epidemiology and Statistics Unit
OHSS	ovarian hyperstimulation syndrome
OPU	oocyte pick-up
PGD	preimplantation genetic diagnosis
PRERU	Perinatal & Reproductive Epidemiology Research Unit
SET	single embryo transfer
SLK	statistical linkage key
UNSW	University of New South Wales
WHO	World Health Organization

Symbols

. .	not applicable

Summary

Use of assisted reproductive technology treatment cycles

There were 61,774 assisted reproductive technology (ART) treatment cycles performed in Australia and New Zealand in 2010 (56,489 and 5,285 respectively), representing decreases of 13.4% for Australia and 1% for New Zealand from the previous year. The substantial decrease in cycles in Australia coincided with a change in government funding for fertility treatment.

There were 30,588 women who undertook autologous ART treatment in Australia and New Zealand in 2010. On average, 1.9 cycles were undertaken in Australia compared with 1.4 cycles in New Zealand. Women used their own oocytes or embryos in 94.8% of treatments (autologous), and 35.1% of all cycles used frozen/thawed embryos.

Women's age and parity

One-quarter (25%) of ART treatment cycles were undertaken by women who had previously given birth. The average age of women undergoing autologous cycles was 36. In contrast, the average age of women undergoing ART treatment using donor oocytes or embryos was 5 years older (40.9). Almost one-quarter (24.3%) of autologous cycles in 2010 were undertaken by women aged 40 or older compared with 20.6% in 2006.

Treatment outcomes and number of babies

Of the 61,774 initiated treatment cycles, 23.9% resulted in a clinical pregnancy, and 18.1% in a live delivery (the birth of at least one liveborn baby). There were 12,056 liveborn babies following ART treatments in 2010, with almost three-quarters of these (74.4%) being full-term singletons of normal birthweight.

There was a higher live delivery rate in younger women. For women aged 30-34, the live delivery rate was 26.8% for fresh cycles and 21.8% for thaw cycles. For women aged over 44, it was less than 1% and 8.4% respectively.

Trends in ART procedures

In the last 5 years there has been a shift from day 2-3 embryo (cleavage stage) transfers to day 5–6 embryo (blastocyst) transfers. The proportion of blastocyst transfers has increased from 27.1% in 2006 to 52.1% in 2010. Similarly, there has been an increase in the transfer of vitrified (ultra-rapid frozen) embryos. Compared with 2009, the proportion has more than doubled from 18.3% to 38.2%.

Multiple births

A continuing trend in ART treatment in Australia and New Zealand has been the reduction in the rate of multiple birth deliveries, with a decrease from 12% in 2006 to 7.9% in 2010. This was achieved by clinicians and patients shifting to single embryo transfer, the proportion of which increased from 56.9% in 2006 to almost 70% in 2009 and 2010. Importantly, this decrease in the multiple delivery rate was achieved while clinical pregnancy rates remained stable at about 23% per cycle.

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 4.3 million children worldwide (ESHRE 2010).

In Australia and New Zealand, the numbers of ART treatment cycles and live deliveries grew steadily until 2009. The most recent estimates indicate that 3.6% and 2% of all women who gave birth in Australia and New Zealand in 2009 received some form of ART treatment (AIHW: Li et al. 2011; Statistics New Zealand 2011).

Scientific advancements continue to emerge in the field of ART treatment, clinical practice and patient characteristics. The purpose of this annual report on ART treatments undertaken in Australia and 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.

The Fertility Society of Australia (FSA), in collaboration with the University of New South Wales (UNSW) and the Australian Institute of Health and Welfare (AIHW), are committed to providing informative annual statistics on ART treatments and are pleased to present the sixteenth annual report on the use of ART in Australia and New Zealand.

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). The most common ART is a fresh in vitro fertilisation (IVF) cycle, typically involving 5 main 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 under anaesthesia.
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 to aid fertilisation
- 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 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 treatments. 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 using an ultra-rapid temperature change and 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).

Frequently used terminology

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.

Autologous cycle: an ART treatment cycle in which a woman intends to use, or uses her own oocytes or embryos.

Blastocyst: an embryo comprising about 100 cells usually developed by 5 or 6 days after fertilisation.

Cleavage stage embryo: an embryo comprising about 8 cells usually developed by 2 or 3 days after fertilisation.

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.

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

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

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

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

Data used in this report

This report provides information on ART and DI treatments and the resulting pregnancy and birth outcomes. Also included is an analysis of trends in ART treatments and outcomes in the 5 years from 2006 to 2010.

As a joint initiative of the Perinatal & Reproductive Epidemiology Research Unit (PRERU) 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 expanded treatment information in the collection includes data fields for oocyte/embryo vitrification, oocyte freezing/thawing process and duration of thawed oocytes and embryos in storage. The upgrade to a woman-based data collection was achieved by introducing a statistical linkage key (SLK) that links successive treatment cycles undertaken by one woman. The SLK is a combination of the first two letters of a woman's first name, the first two letters of her surname and her date of birth. The SLK enables the number of women undergoing treatment across time to be reported.

The ANZARD2.0 structure was implemented with the collection of treatment data from 2009 onwards. However, several clinics were unable to provide the SLK for women undergoing treatment in their clinics in 2010. Therefore, this report retains the cycle-based format used in previous reports for Chapters 2 to 7, and Chapter 8 presents information on the number of women who underwent ART treatment within clinics where the SLK is available.

The data presented in this report were supplied by all 37 fertility centres (79 fertility clinics in Australia and 7 fertility clinics in New Zealand), and compiled into ANZARD2.0.

Note: A data extraction error, where blastocyst transfer was incorrectly classified as cleavage embryo transfer, was identified for some clinics for treatment from 2002 to 2008. Therefore, the number of blastocyst transfers is underestimated in the trends analysis of this report for treatment years 2006 to 2008.

Structure of this report

This report has eight 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 Australia and 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—'GIFT cycles, surrogacy cycles, other procedures and complications in 2010', includes information on cycles, procedures and complications that do not fit into the chapters already described.

Chapter 6—'Donor sperm insemination cycles in 2010', presents data on DI cycles and their outcomes, including a description of pregnancy and perinatal outcomes.

Chapter 7—'Trends in ART treatment and outcomes: 2006–2010', presents trends in ART treatments during the last 5 years of data collection in Australia and New Zealand.

Chapter 8—'Women undertaking autologous treatment in 2010', presents information on the number of women undergoing ART treatment in 2010 and success rates.

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. Appendix C provides a detailed list of the data items in the collection.

Supplementary tables of this report are available on the AIHW website.

2 Overview of ART treatment in 2010

There were 61,774 ART treatment cycles reported from Australian and New Zealand clinics in 2010 (Table 1). Of these, 91.4% (56,489) were from Australian clinics and 8.6% (5,285) were from New Zealand clinics. The number of ART treatment cycles in 2010 decreased by 12.4% from the 70,541 cycles in 2009, with 13.4% and 1% deceases for Australia and New Zealand respectively. In 2010, the number of ART treatment cycles represented 12 cycles per 1,000 women of reproductive age (15–44 years) in Australia, compared with 5.8 cycles per 1,000 women of reproductive age in New Zealand.

About 95% of cycles in 2010 were autologous cycles (where a woman intended to use, or used her own oocytes or embryos). Of the 58,574 autologous cycles, 36,873 (63%) were fresh cycles and 21,701 (37%) were frozen/thaw cycles. Other treatment cycles accounted for small proportions, 2.9% were oocyte recipient cycles, 0.5% were embryo recipient cycles, 1.5% were oocyte donation cycles and 0.2% were surrogacy cycles (Table 1).

Of all ART treatments in 2010, 23.9% (14,752) resulted in a clinical pregnancy and 18.1% (11,169) in a live delivery (Table 1). Of these clinical pregnancies, 13,215 (89.6%) were from Australian clinics and 1,537 (10.4%) from New Zealand clinics. There were 12,180 babies born (including 12,056 liveborn) following ART treatment in 2010. Of these, 10,897 (89.5%) were from Australian clinics and 1,283 (10.5%) from New Zealand clinics. Of the liveborn babies, 74.4% (8,973) were singletons at term (gestational age of 37–41 weeks) with normal birthweight (≥ 2,500 grams). The multiple delivery rate was 7.9%.

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

Treatment type	Number of initiated ART cycles	Percentage 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	58,574	94.8	14,215	10,770	11,618	8,675
Fresh	*36,873*	*59.7*	*8,981*	*6,833*	*7,412*	*5,407*
Thaw	*21,701*	*35.1*	*5,234*	*3,937*	*4,206*	*3,268*
Oocyte donation	957	1.5	. .	. .	. .	. .
Oocyte recipient	1,796	2.9	450	336	370	251
Embryo recipient	317	0.5	68	46	49	34
GIFT[(a)]	11	0.0	3	3	3	3
Surrogacy arrangement cycles	119	0.2	16	14	16	10
Intended parent cycles[(b)]	*34*	*0.1*	. .	. .	. .	. .
Gestational carrier cycles[(c)]	*85*	*0.1*	*16*	*14*	*16*	*10*
Total	**61,774**	**100.0**	**14,752**	**11,169**	**12,056**	**8,973**

(a) GIFT cycles were classified separately from autologous cycles.

(b) A cycle undertaken by a person or couple who intends to raise a child that will be, or is intended to be, carried by a gestation carrier during pregnancy.

(c) A cycle undertaken by woman who carries, or intends to carry, a pregnancy on behalf of the intended parents with an agreement that the child will be raised by the intended parent(s).

3 Autologous and donation/recipient cycles in 2010

This chapter presents data on initiated autologous cycles, oocyte donation cycles and oocyte/embryo recipient cycles. Surrogacy cycles and GIFT cycles are presented separately in Chapter 5.

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.

3.1 Overview of autologous and recipient cycles

Age of women and their partners

The average age of women undergoing autologous and oocyte/embryo recipient cycles was 36. For women undergoing oocyte/embryo recipient cycles, the mean age was 40.9, 5 years older than for autologous cycles (35.8 years). Of all autologous and oocyte/embryo recipient cycles, 1 in 4 (25.7%) was undertaken by women aged 40 or older (Table 2). The average age of partners was 38.3, with one-third (34.8%) aged 40 or older. For 14.9% of oocyte/embryo cycles, the partner's age was not stated or no partner was involved (Table 3).

Table 2: Number of autologous and recipient cycles by women's age group and treatment type, Australia and 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	3,988	10.8	2,481	11.4	75	3.5	6,544	10.8
30–34	9,150	24.8	6,491	29.9	208	9.8	15,849	26.1
35–39	13,606	36.9	8,618	39.7	462	21.9	22,686	37.4
40–44	9,392	25.5	3,802	17.5	790	37.4	13,984	23.0
≥ 45	737	2.0	309	1.4	578	27.4	1,624	2.7
Total	**36,873**	**100.0**	**21,701**	**100.0**	**2,113**	**100.0**	**60,687**	**100.0**

(a) Age at start of a 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, Australia and 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	2,196	6.0	1,286	5.9	41	1.9	3,523	5.8
30–34	7,666	20.8	4,853	22.4	216	10.2	12,735	21.0
35–39	11,300	30.6	7,278	33.5	465	22.0	19,043	31.4
40–44	7,954	21.6	4,224	19.5	518	24.5	12,696	20.9
≥ 45	5,283	14.3	2,583	11.9	559	26.5	8,425	13.9
Not stated	2,474	6.7	1,477	6.8	314	14.9	4,265	7.0
Total	**36,873**	**100.0**	**21,701**	**100.0**	**2113**	**100.0**	**60,687**	**100.0**

(a) Age at start of a 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 60,687 initiated autologous and recipient cycles undertaken in 2010, 65.7% were undertaken by nulliparous women. Of autologous cycles (fresh and thaw), 65.5% were undertaken by nulliparous women, compared with 72.6% for oocyte/embryo recipient cycles (Table 4).

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

	Autologous				Oocyte/embryo recipient		All	
	Fresh		Thaw					
Parity	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Nulliparous	25,388	68.9	12,957	59.7	1,535	72.6	39,880	65.7
Parous	7,843	21.3	6,833	31.5	490	23.2	15,166	25.0
Not stated	3,642	9.9	1,911	8.8	88	4.2	5,641	9.3
Total	**36,873**	**100.0**	**21,701**	**100.0**	**2,113**	**100.0**	**60,687**	**100.0**

Cause of infertility

Causes of infertility may be known to relate to either the woman or her male partner, or both', or may be unexplained. The reported causes of infertility are based on clinical diagnosis by the treating clinician; however, the diagnostic definitions may vary among fertility centres.

Of the 60,687 initiated autologous and recipient cycles, 21.7% reported male infertility factors as the only cause of infertility; 38.6% reported only female infertility factors; 13.8% reported combined male–female factors; 25.2% reported unexplained infertility; and 0.7% were not stated.

Intracytoplasmic sperm injection procedures

Of the 32,803 autologous fresh cycles where fertilisation was attempted, 67.3% used ICSI procedures and 32.7% used IVF procedures. Of fresh oocyte recipient cycles where fertilisation was attempted, 75.3% used ICSI procedures and 24.7% used IVF procedures (Table 5).

Table 5: Number of autologous and recipient cycles with fertilisation attempted by treatment type and procedure, Australia and 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	10,732	32.7	8,067	41.1	227	24.7	426	37.9
ICSI[(c)]	22,071	67.3	10,782	55.0	691	75.3	697	62.0
Not stated	0	0.0	768	3.9	0	0.0	1	0.1
Total	**32,803**	**100.0**	**19,617**	**100.0**	**918**	**100.0**	**1,124**	**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.

Number of embryos transferred

Of the 50,495 fresh and thawed embryo transfer cycles, 69.6% were single embryo transfer (SET) cycles and 29.6% were double embryo transfer (DET). In women aged under 35, 79.1% of embryo transfer cycles were SET and 20.8% were DET. In women aged 35 or older, 63.8% of cycles were SET and 35% were DET (Table 6).

Table 6: Number of fresh and thawed embryos transferred per cycle and women's age group, Australia and 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	4,503	81.7	1,007	18.3	3	0.1	5,513	100.0
30–34	10,707	78.1	2,989	21.8	22	0.2	13,718	100.0
35–39	13,365	70.1	5,653	29.7	38	0.2	19,056	100.0
40–44	5,862	53.2	4,861	44.1	293	2.7	11,016	100.0
≥ 45	719	60.3	419	35.2	54	4.5	1,192	100.0
Total	**35,156**	**69.6**	**14,929**	**29.6**	**410**	**0.8**	**50,495**	**100.0**

(a) Age at start of a treatment cycle.

Stage of embryo development

Of the 50,495 embryo transfer cycles, 52.1% involved the transfer of day 5–6 embryos (blastocysts) with the remainder day 2–3 embryos (cleavage embryos). Of autologous cycles, blastocyst transfers made up 58.4% of thaw cycles compared with 48.2% of fresh cycles (Table 7).

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

Type and procedure	Autologous				Oocyte/embryo recipient			
	Fresh		Thaw		Fresh		Thaw	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Cleavage embryo	15,010	51.8	8,169	41.6	423	52.9	565	50.3
Blastocyst	13,945	48.2	11,448	58.4	376	47.1	559	49.7
Total	**28,955**	**100.0**	**19,617**	**100.0**	**799**	**100.0**	**1,124**	**100.0**

Transfer of cryopreserved embryos

Embryos created in a fresh cycle can be cryopreserved by either slow freezing or ultra-rapid (vitrification) methods. Slow frozen and vitrified embryos can be thawed/warmed, and then transferred in subsequent cycles.

Of the 20,741 frozen/thawed embryo transfer cycles, 38.2% involved the transfer of vitrified embryos. More than 60% of frozen/thawed blastocyst transfer cycles had vitrified blastocysts transferred. By comparison, 4.5% of frozen/thawed cleavage embryo transfer cycles using vitrified embryos (Table 8).

Table 8: Number of embryo transfer cycles by freezing method and stage of embryo development, Australia and 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	7,808	95.6	4,267	37.3	533	94.3	210	37.6
Vitrification[(a)]	361	4.4	7,181	62.7	31	5.5	346	61.9
Not stated	0	0.0	0	0.0	1	0.2	3	0.5
Total	**8,169**	**100.0**	**11,448**	**100.0**	**565**	**100.0**	**559**	**100.0**

(a) Ultra-rapid cryopreservation.

3.2 Autologous fresh cycles

In 2010, there were 36,873 initiated autologous fresh cycles, comprising 36,544 (99.1%) ovarian stimulated cycles and 329 (0.9%) unstimulated cycles. There were 89 cycles in which thawed oocytes were used.

Of the 36,873 initiated autologous fresh cycles, 91.6% (33,792) were in Australian clinics and 8.4% (3,081) were in New Zealand clinics.

Progression of autologous fresh cycles

Figure 1 shows the main stages of autologous fresh cycles and the resulting treatment outcomes.

Of the 36,873 initiated autologous fresh cycles in 2010, 91.9% had OPU performed, 78.5% had embryos transferred, 24.4% resulted in a clinical pregnancy and 18.5% resulted in a live delivery (Figure 1). A live delivery is the delivery of one or more liveborn infants, with the birth of twins and triplets counted as one live delivery.

A treatment can be discontinued for a variety of reasons, including inadequate response of ovaries to medication, excessive ovarian stimulation, failure to obtain oocytes, failure of oocyte fertilisation, inadequate embryo growth or patient choice.

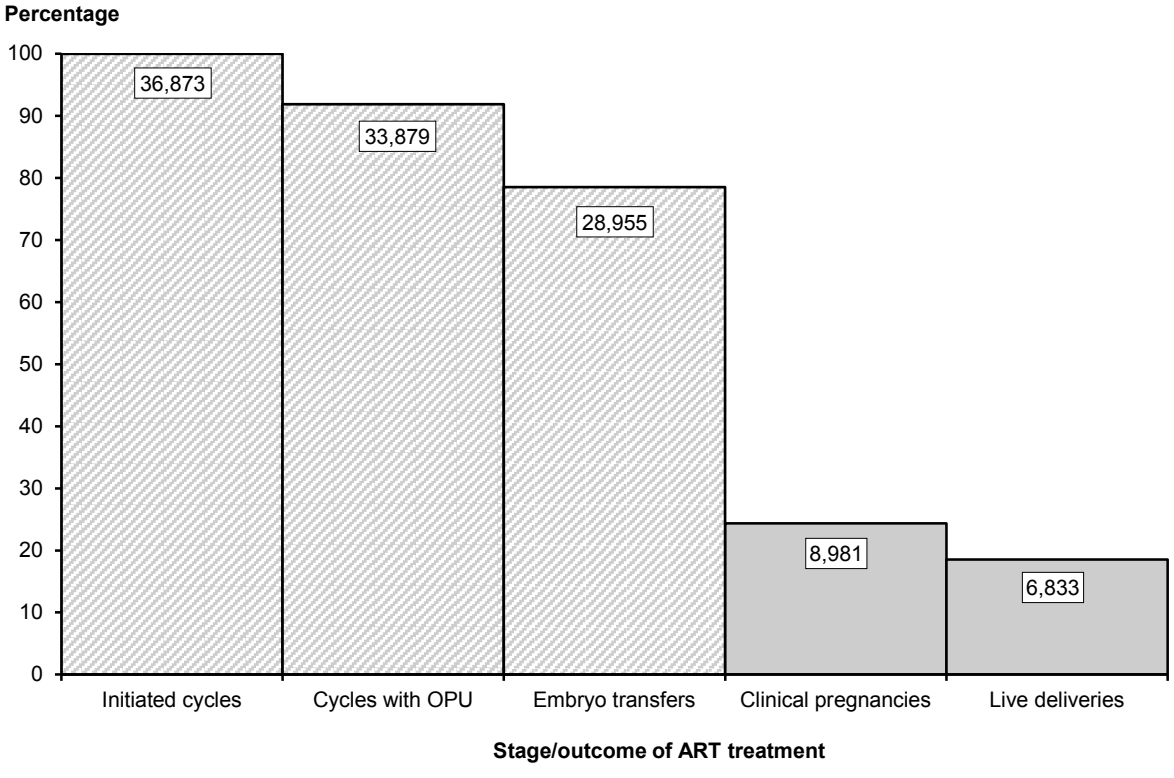

Figure 1: Progression of autologous fresh cycles, Australia and New Zealand, 2010

Clinical pregnancies and live deliveries by women's age

Maternal age is one of the key factors associated with the outcomes of autologous fresh cycles. The highest live delivery rate per embryo transfer cycle was in women aged under 30 (36.8%). The rate declined with advancing women's age, with a rate of 9.4% for women aged 40–44 and 0.2% for women aged 45 or older (Table 9).

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

	Age group (years)[(a)]					
Stage/outcome of treatment	**< 30**	**30–34**	**35–39**	**40–44**	**≥ 45**	**All**
Initiated cycles	3,988	9,150	13,606	9,392	737	36,873
Cycles with OPU	3,703	8,578	12,574	8,398	626	33,879
Embryo transfer cycles	3,165	7,561	10,860	6,939	430	28,955
Clinical pregnancies	1,374	3,022	3,441	1,135	9	8,981
Live deliveries	1,164	2,451	2,565	652	1	6,833
Live deliveries per initiated cycle (per cent)	*29.2*	*26.8*	*18.9*	*6.9*	*0.1*	*18.5*
Live deliveries per embryo transfer cycle (per cent)	*36.8*	*32.4*	*23.6*	*9.4*	*0.2*	*23.6*
Live deliveries per clinical pregnancy (per cent)	*84.7*	*81.1*	*74.5*	*57.4*	*11.1*	*76.1*

(a) Age at start of a treatment cycle.

Figure 2 shows age-specific live delivery rates per initiated autologous fresh cycle by two-year age groups. The highest live delivery rates were for women aged between 25 and 32. The live delivery rate declined steadily for women older than 32. For women aged 45 or older, only one delivery resulted from every 700 initiated cycles compared with 202 live deliveries from every 700 initiated cycles in women aged between 25 and 32.

The lower live delivery rate in women in their early 20s is probably associated with some unknown factors regarding different reasons behind infertility in young women.

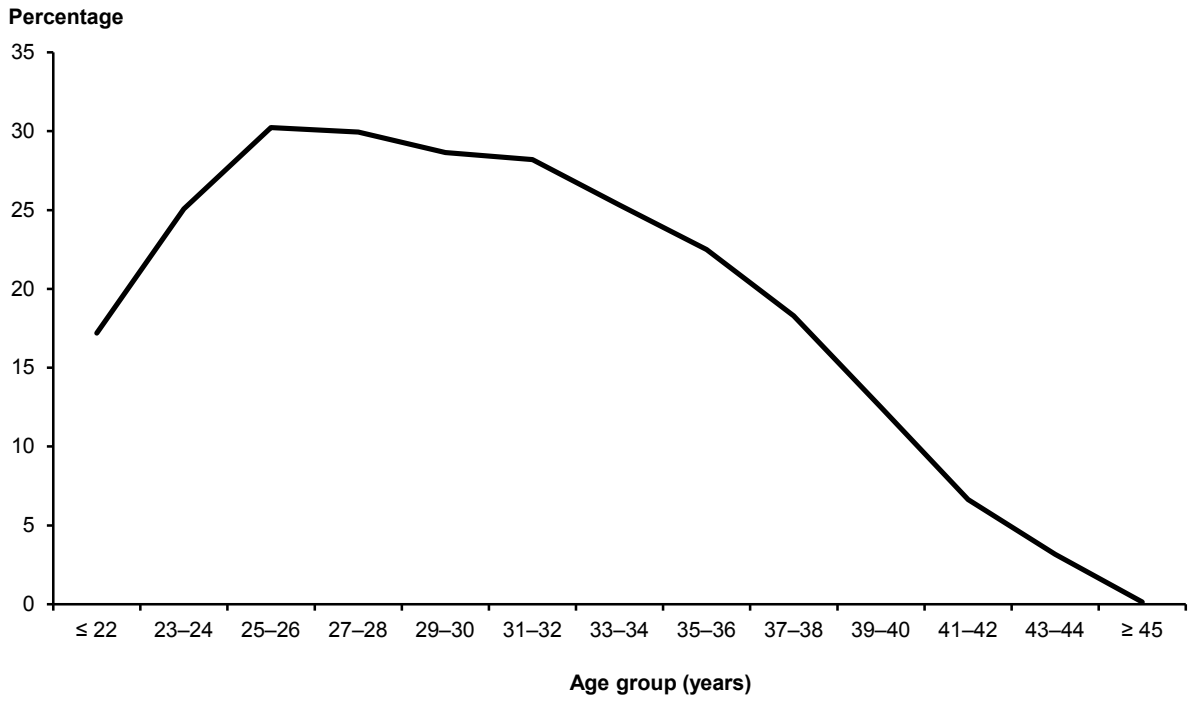

Figure 2: Live deliveries per initiated autologous fresh cycle by women's age at start of a treatment cycle, Australia and New Zealand, 2010

Clinical pregnancies and live deliveries by cause of infertility

Cycles reported with male factor as the only cause of infertility had higher rates of clinical pregnancy and live delivery than cycles that reported female-factor-only infertility, with a 13% higher chance of live delivery for cycles with male-factor-only infertility than female factor infertility (Table 10).

Table 10: Outcomes of autologous fresh cycles by cause of infertility, Australia and New Zealand, 2010

Cause of infertility	Initiated cycles (number)	Embryo transfer cycles per initiated cycle (per cent)	Clinical pregnancies per initiated cycle (per cent)	Live deliveries per initiated cycle (per cent)
Male-factor-only	8,180	80.3	25.8	19.7
Female factor	13,672	77.0	23.3	17.3
Tubal disease only	*1,588*	*81.4*	*25.1*	*18.3*
Endometriosis only	*4,919*	*75.8*	*20.8*	*15.4*
Other female-factor-only	*5,806*	*75.9*	*24.5*	*18.5*
Combined female factor	*1,359*	*80.7*	*25.7*	*18.3*
Combined male—female factors	5,381	78.3	25.2	19.7
Unexplained	9,525	79.9	24.3	18.7
Not stated	115	35.7	12.2	11.3
Total	**36,873**	**78.5**	**24.4**	**18.5**

Clinical pregnancies and live deliveries by number of embryos transferred

Overall, 64.7% of embryo transfer cycles were SET cycles, 34.2% were DET cycles and 1.1% had three or more embryos transferred. In women aged under 35, three or more embryos transferred accounted for less than 0.2% of embryo transfer cycles. This increased to 3.9% in women aged 40 or older.

Overall, the live delivery rate was 25% for SET and 21.4% for DET (Table 11). Of embryo transfer cycles in women aged under 35, the live delivery rate was slightly higher for SET than DET (33.8% and 33.5% respectively). Of embryo transfer cycles in women aged 35 or older, the live delivery rate was lower for SET than DET (22.9% and 24.9% respectively for women aged 35–39, and 7% and 10.5% respectively for women aged 40 or older).

Table 11: Outcomes of autologous fresh embryo transfer cycles by women's age and number of embryos transferred, Australia and New Zealand, 2010

Stage/outcome of treatment	Age group (years)[a]							
	< 35		35–39		≥ 40		All	
	SET[b]	DET[c]	SET[b]	DET[c]	SET[b]	DET[c]	SET[b]	DET[c]
Embryo transfer cycles	8,410	2,299	7,000	3,829	3,310	3,772	18,720	9,900
Clinical pregnancies	3,463	932	2,180	1,253	430	672	6,073	2,857
Live deliveries	2,844	770	1,605	955	232	397	4,681	2,122
Clinical pregnancies per embryo transfer cycle (per cent)	*41.2*	*40.5*	*31.1*	*32.7*	*13.0*	*17.8*	*32.4*	*28.9*
Live deliveries per embryo transfer cycle (per cent)	*33.8*	*33.5*	*22.9*	*24.9*	*7.0*	*10.5*	*25.0*	*21.4*

(a) Age at start of a treatment cycle.

(b) SET: single embryo transfer.

(c) DET: double embryo transfer.

Clinical pregnancies and live deliveries by stage of embryo development

Comparatively, the rates of clinical pregnancy and live delivery were higher in blastocyst transfer cycles than in cleavage stage embryo transfer cycles regardless of a woman's age (Table 12). The live delivery rate for blastocyst transfer cycles was 51% higher than for cleavage stage embryo transfer cycles.

Table 12: Outcomes of autologous fresh embryo transfer cycles by women's age and stage of embryo development, Australia and New Zealand, 2010

Stage/outcome of treatment	Age group (years)[a]							
	< 35		35–39		≥ 40		All	
	CL[b]	BL[c]	CL[b]	BL[c]	CL[b]	BL[c]	CL[b]	BL[c]
Embryo transfer cycles	4,792	5,934	5,545	5,315	4,673	2,696	15,010	13,945
Clinical pregnancies	1,711	2,685	1,491	1,950	596	548	3,798	5,183
Live deliveries	1,412	2,203	1,105	1,460	329	324	2,846	3,987
Clinical pregnancies per embryo transfer cycle(per cent)	*35.7*	*45.2*	*26.9*	*36.7*	*12.8*	*20.3*	*25.3*	*37.2*
Live deliveries per embryo transfer cycle (per cent)	*29.5*	*37.1*	*19.9*	*27.5*	*7.0*	*12.0*	*19.0*	*28.6*

(a) Age at start of a treatment cycle.

(b) CL: cleavage embryo.

(c) BL: blastocyst.

Live deliveries among fertility centres

The live delivery rate per initiated autologous fresh cycle varied among the 35 fertility centres that performed autologous fresh treatments in 2010. This variation is measured using quartiles that rank a centre's live delivery rate within the top and bottom 25% or the middle 50% of centres. There were 8 or 9 centres in each quartile.

The live delivery rate per initiated autologous fresh cycle ranged from 4.4% to 31% among fertility centres. The middle 50% of fertility centres (second and third quartiles) had live delivery rates between 13.5% and 21.8% (Table 13).

These data should be interpreted with caution because of the small number of patients who underwent autologous fresh treatments in some centres coupled with potential variation in patient characteristics that may influence the live delivery rate of an individual centre.

Table 13: Live delivery rate of autologous fresh cycles by women's age group among fertility centres, Australia and New Zealand, 2010

Age group (years)[a]	Live deliveries per initiated autologous fresh cycle (per cent)[b]				
	Overall	First quartile	Second quartile	Third quartile	Fourth quartile
< 35	27.5	32.1–39.4	26.3–32.0	18.9–26.2	5.7–18.8
35–39	18.9	20.2–30.7	17.6–20.1	14.9–17.5	6.3–14.8
≥ 40	6.4	7.5–16.4	6.0–7.4	3.6–5.9	0.0–3.5
All	**18.5**	**21.9–31.0**	**18.0–21.8**	**13.5–17.9**	**4.4–13.4**

(a) Age at start of a treatment cycle.

(b) Less than 30 initiated cycles were undertaken in some centres.

There was also variation in the outcomes of autologous fresh cycles by number of embryos transferred and stage of embryo development. Figure 3 shows the median live delivery rate and interquartile range among the 35 fertility centres that performed autologous fresh cleavage stage embryo or blastocyst transfers. The rates were unadjusted for women's age and parity which may vary between centres.

These data should be interpreted with caution because of the small number of patients who underwent autologous fresh cleavage embryo or blastocyst transfers in some centres coupled with potential variation in patient characteristics which may influence the live delivery rate of an individual centre. A woman's age and embryo quality may influence whether one or two embryos are transferred, and whether embryos are transferred at the cleavage or blastocyst stage.

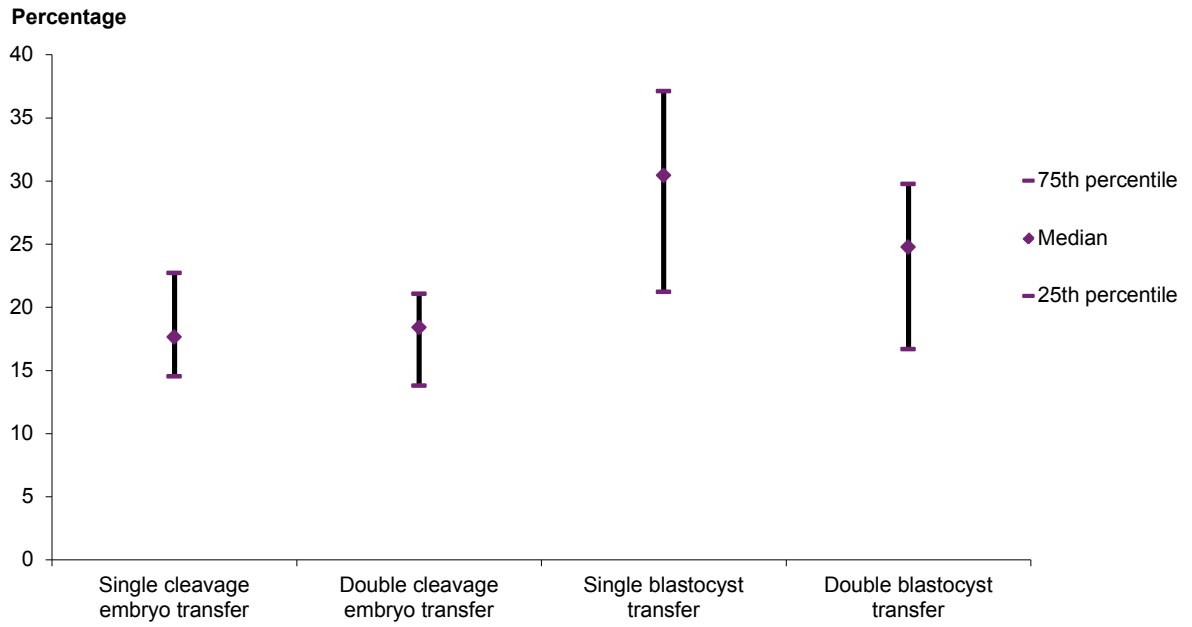

Figure 3: Live deliveries per autologous fresh embryo transfer cycle by number of embryos transferred and stage of embryo development among fertility centres, Australia and New Zealand, 2010

3.3 Autologous thaw cycles

There were 21,701 autologous thaw cycles reported in 2010 (Figure 4). Of these, 92% (19,973) were in Australian clinics and 8% (1,728) in New Zealand clinics.

Progression of autologous thaw cycles

Figure 4 shows the main stages of autologous thaw cycles and the resulting treatment outcomes.

Of the 21,701 initiated autologous thaw cycles, 90.4% had embryos transferred, 24.1% resulted in a clinical pregnancy and 18.1% resulted in a live delivery (Figure 4). Almost 1 in 10 initiated autologous thaw cycles did not progress to embryo transfer, principally due to non-viability following thawing of cryopreserved (frozen) embryo(s).

The rate of live deliveries per initiated cycle was slightly lower for autologous thaw cycles than for autologous fresh cycles in 2010 (18.1% and 18.5% respectively) (Figures 1 and 4).

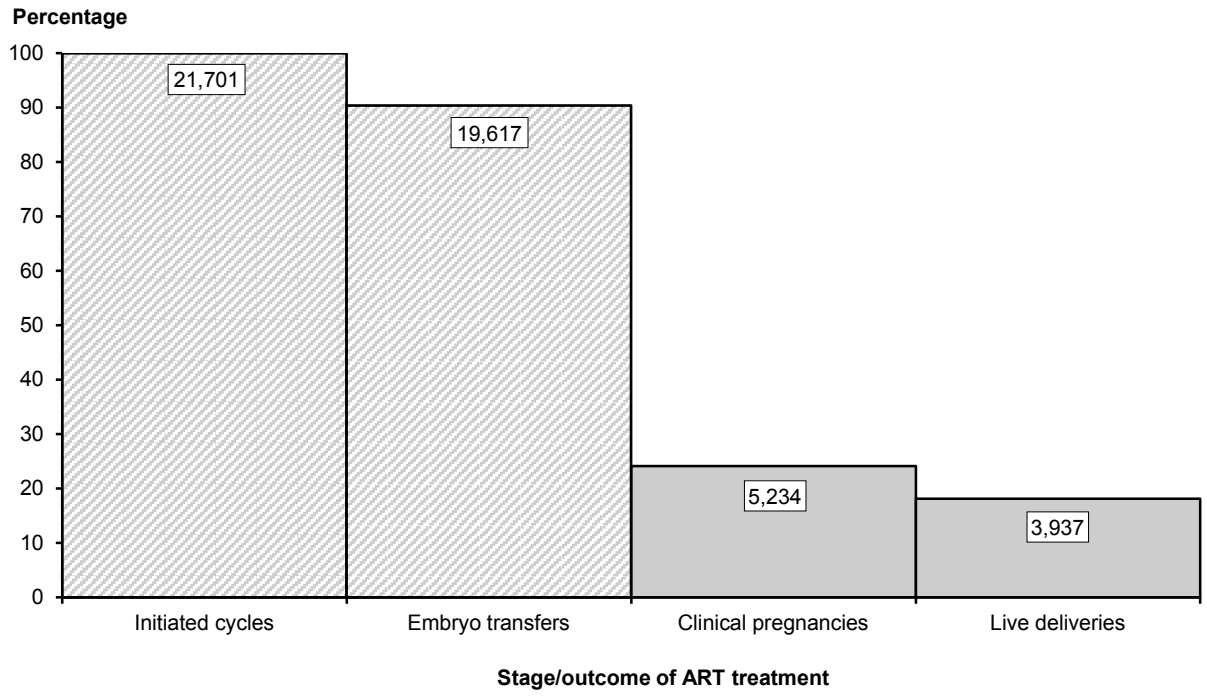

Figure 4: Progression of autologous thaw cycles, Australia and New Zealand, 2010

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

Similar to autologous fresh embryo transfer cycles, the live delivery rate per thawed embryo transfer cycle declined with advancing women's age. The highest live delivery rate per embryo transfer cycle was in women aged 30–34 (Table 14). 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 14: Outcomes of autologous thaw cycles by women's age group, Australia and New Zealand, 2010

	Age group (years)[(a)]					
Stage/outcome of treatment	**< 30**	**30–34**	**35–39**	**40–44**	**≥ 45**	**All**
Initiated cycles	2,481	6,491	8,618	3,802	309	21,701
Embryo transfer cycles	2,279	5,967	7,776	3,345	250	19,617
Clinical pregnancies	673	1,808	2,098	620	35	5,234
Live deliveries	530	1,417	1,570	394	26	3,937
Live deliveries per initiated cycle (per cent)	*21.4*	*21.8*	*18.2*	*10.4*	*8.4*	*18.1*
Live deliveries per embryo transfer cycle (per cent)	*23.3*	*23.7*	*20.2*	*11.8*	*10.4*	*20.1*
Live deliveries per clinical pregnancy (per cent)	*78.8*	*78.4*	*74.8*	*63.5*	*74.3*	*75.2*

(a) Age at start of the thaw treatment cycle.

Figure 5 shows age-specific live delivery rates per initiated autologous thaw cycle by two-year age groups. The highest live delivery rates were for women in their mid-20s to mid-30s. The live delivery rate declined steadily for women aged 33 and older. For women aged 45 or older, 8.4% of initiated autologous thaw cycles resulted in a live delivery, which is higher than the live delivery rate per initiated autologous fresh cycle in this age group (0.1%) (Figures 2 and 5).

The lower live delivery rate in women in their early 20s is probably associated with some unknown factors regarding different reasons behind infertility in young women.

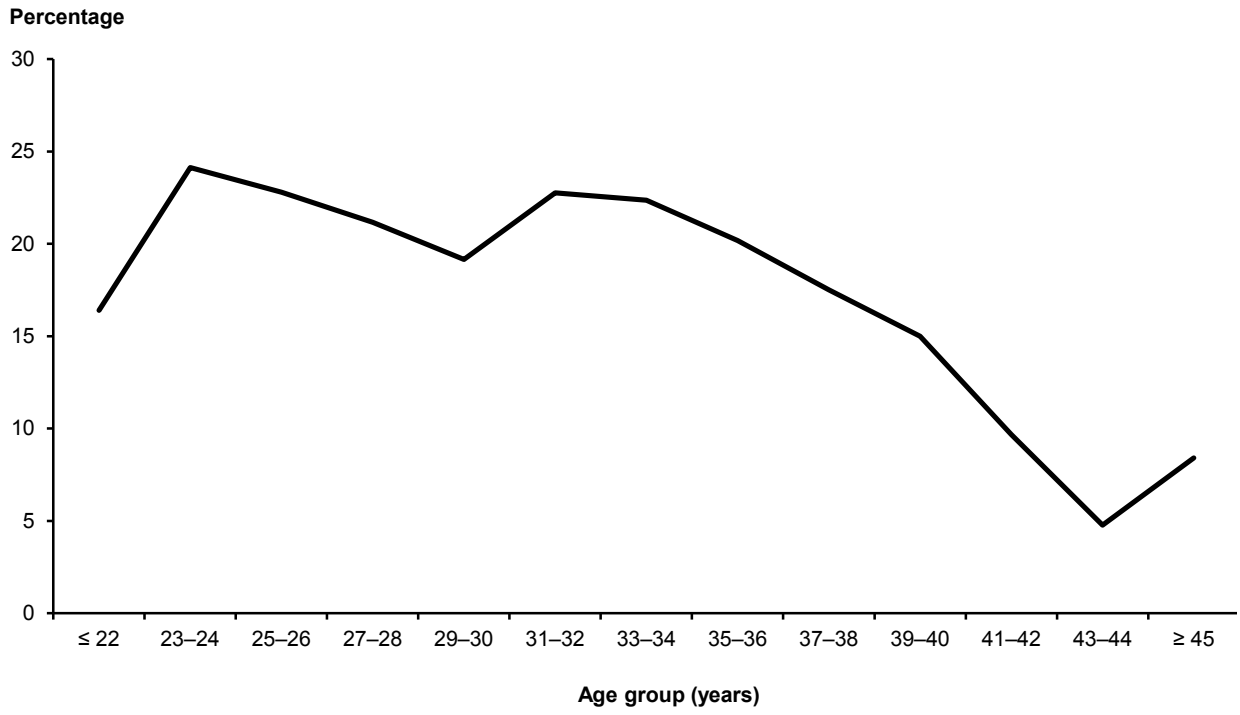

Figure 5: Live deliveries per initiated autologous thaw cycle by women's age at start of the thaw treatment cycle, Australia and New Zealand, 2010

Clinical pregnancies and live deliveries by cause of infertility

Cycles reported with male factor as the only cause of infertility had the highest rate of live delivery per initiated cycle (20.2%) (Table 15). Compared with female-factor-only infertility, male-factor-only infertility resulted in a 21% higher chance of a live delivery.

Table 15: Outcomes of autologous thaw cycles by cause of infertility, Australia and New Zealand, 2010

Cause of infertility	Initiated cycles (number)	Embryo transfer cycles per initiated cycle (per cent)	Clinical pregnancies per initiated cycle (per cent)	Live deliveries per initiated cycle (per cent)
Male-factor-only	4,807	92.3	25.9	20.2
Female factor	8,382	91.2	22.7	16.7
Tubal disease only	*1,132*	*91.6*	*22.4*	*16.7*
Endometriosis only	*3,218*	*91.5*	*21.6*	*16.6*
Other female-factor-only	*3,331*	*90.8*	*23.5*	*16.8*
Combined female factor	*701*	*91.2*	*24.5*	*16.7*
Combined male–female factors	2,588	90.6	25.4	19.4
Unexplained	5,629	91.6	25.2	18.8
Not stated	295	11.5	3.7	2.7
Total	**21,701**	**90.4**	**24.1**	**18.1**

Clinical pregnancies and live deliveries by number of embryos transferred

Overall, of the 19,617 embryo transfer cycles, 76.9% were SET cycles, 22.7% were DET cycles and 0.4% transferred three or more embryos. In women aged under 40, three or more frozen/thawed embryos were transferred in less than 0.1% of embryo transfer cycles, compared with 1.6% in women aged 40 or older.

The overall difference in live delivery rates for SET and DET in autologous thaw cycles was 2.7 percentage points (19.4% and 22.3% respectively). The rates of clinical pregnancy and live delivery were lower for SET than DET regardless of a woman's age (Table 16).

Table 16: Outcomes of autologous thaw embryo transfer cycles by women's age and number of embryos transferred, Australia and New Zealand, 2010

Stage/outcome of treatment	Age group (years)[a]							
	< 35		35–39		≥ 40		All	
	SET[b]	DET[c]	SET[b]	DET[c]	SET[b]	DET[c]	SET[b]	DET[c]
Embryo transfer cycles	6,603	1,637	6,076	1,694	2,412	1,124	15,091	4,455
Clinical pregnancies	1,918	561	1,552	545	426	217	3,896	1,323
Live deliveries	1,502	443	1,156	413	273	136	2,931	992
Clinical pregnancies per embryo transfer cycle (per cent)	*29.0*	*34.3*	*25.5*	*32.2*	*17.7*	*19.3*	*25.8*	*29.7*
Live deliveries per embryo transfer cycle (per cent)	*22.7*	*27.1*	*19.0*	*24.4*	*11.3*	*12.1*	*19.4*	*22.3*

(a) Age at start of a treatment cycle.

(b) SET: single embryo transfer.

(c) DET: double embryo transfer.

Clinical pregnancies and live deliveries by stage of embryo development

The rates of clinical pregnancy and live delivery were higher for blastocyst transfer cycles than for cleavage embryo transfer cycles, regardless of a woman's age (Table 17). The rate of live delivery for blastocyst transfer cycles was 46% higher than that of cleavage stage embryo transfer cycles.

Table 17: Outcomes of autologous thaw embryo transfer cycles by women's age and stage of embryo development, Australia and New Zealand, 2010

Stage/outcome of treatment	Age group (years)[a]							
	< 35		35–39		≥ 40		All	
	CL[b]	BL[c]	CL[b]	BL[c]	CL[b]	BL[c]	CL[b]	BL[c]
Embryo transfer cycles	3,155	5,091	3,175	4,601	1,839	1,756	8,169	11,448
Clinical pregnancies	767	1,714	714	1,384	239	416	1,720	3,514
Live deliveries	611	1,336	537	1,033	146	274	1,294	2,643
Clinical pregnancies per embryo transfer cycle (per cent)	*24.3*	*33.7*	*22.5*	*30.1*	*13.0*	*23.7*	*21.1*	*30.7*
Live deliveries per embryo transfer cycle (per cent)	*19.4*	*26.2*	*16.9*	*22.5*	*7.9*	*15.6*	*15.8*	*23.1*

(a) Age at start of a treatment cycle.

(b) CL: cleavage embryo.

(c) BL: blastocyst.

Clinical pregnancies and live deliveries by embryo freezing methods

More than 60% of autologous thaw cycles where a blastocyst was transferred used vitrified embryos, compared with 4.4% of cycles where a cleavage embryo was transferred. The rates of clinical pregnancy and live delivery were higher for transfer of vitrified blastocysts than slow frozen blastocysts. The difference in live delivery rates between transfer of slow frozen blastocysts and transfer of vitrified blastocysts was 5.1 percentage points (19.9% and 25% respectively) (Table 18).

Table 18: Outcomes of autologous thaw embryo transfer cycles by stage of embryo development and embryo freezing methods, Australia and New Zealand, 2010

	Stage of embryo development					
	Cleavage embryo		Blastocyst		All	
Stage/outcome of treatment	Slow freezing	Vitrification[(a)]	Slow freezing	Vitrification[(a)]	Slow freezing	Vitrification[(a)]
Embryo transfer cycles	7,808	361	4,267	7,181	12,075	7,542
Clinical pregnancies	1,661	59	1,112	2,402	2,773	2,461
Live deliveries	1,259	35	850	1,793	2,109	1,828
Clinical pregnancies per embryo transfer cycle (per cent)	*21.3*	*16.3*	*26.1*	*33.4*	*23.0*	*32.6*
Live deliveries per embryo transfer cycle (per cent)	*16.1*	*9.7*	*19.9*	*25.0*	*17.5*	*24.2*

(a) Ultra-rapid cryopreservation.

Live deliveries from autologous thaw cycles among fertility centres

The live delivery rate per initiated autologous thaw cycle ranged from 5% to 33.3% among the 35 fertility centres that performed autologous thaw cycles in 2010. The middle 50% of fertility centres (second and third quartiles) achieved rates between 12.3% and 22%. Overall the live delivery rate was 18.1% for autologous thaw cycles in all centres in Australia and New Zealand (Table 19).

These data should be interpreted with caution because of the small number of patients who underwent autologous thaw cycles in some centres and potential variation in patient characteristics which may influence the live delivery rate of an individual centre.

Table 19: Live delivery rate of autologous thaw cycles by women's age group among fertility centres, Australia and New Zealand, 2010

Age group (years)[a]	Live deliveries per initiated autologous thaw cycle (per cent)[b]				
	Overall	First quartile	Second quartile	Third quartile	Fourth quartile
< 35	21.7	24.4–34.4	19.1–24.3	14.5–19.0	0.0–14.4
35–39	18.2	19.8–40.0	16-5–19.7	11.1–16.4	0.0–11.0
≥ 40	10.2	12.5–25.0	8.5–12.4	4.3–8.4	0.0–4.2
All	**18.1**	**22.1–33.3**	**15.8–22.0**	**12.3–15.7**	**5.0–12.2**

(a) Age at start of the thaw treatment cycle.

(b) Less than 30 initiated cycles were undertaken in some centres.

There was also variation among the 35 fertility centres in the outcomes of autologous thaw cycles by number and type of embryos transferred. Figure 6 shows the median live delivery rate for autologous thaw embryo transfer cycles and the interquartile range by number of embryos transferred and stage of embryo development among the fertility centres. The rates are unadjusted for women's age and parity which may vary between centres.

These data should be interpreted with caution because of the small number of patients who underwent autologous thaw cleavage stage embryo or blastocyst transfers in some centres and potential variation in patient characteristics which may influence the live delivery rate of an individual centre.

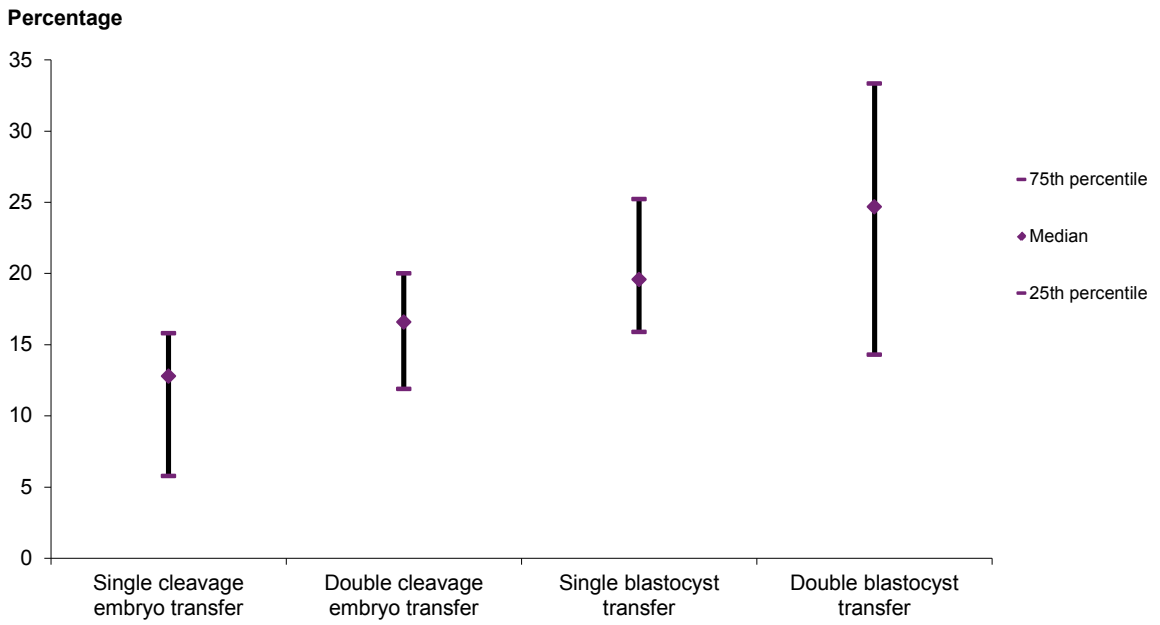

Figure 6: Live delivery rate of autologous thaw embryo transfer cycles by number of embryos transferred and stage of embryo development among fertility centres, Australia and New Zealand, 2010

3.4 Donation and recipient cycles

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

In 2010, donation and recipient cycles accounted for 5% (3,070) of all treatment cycles in Australia and New Zealand. There were 957 initiated cycles where the intention was to donate oocytes, consisting of 919 (96%) cycles in Australia and 38 (4%) in New Zealand. There were 2,113 cycles started for women where the intention was to receive donated oocytes or embryos (Table 1), including 1,829 cycles in Australia and 284 cycles in New Zealand.

3.4.1 Oocyte donation cycles

Of the 957 cycles in Australia and New Zealand where the intention was to donate oocytes to a recipient, 38 (4%) cycles were cancelled before OPU.

The average age of women donating oocytes was 33, with 43.9% of cycles in women aged 35 or older. More than 95% of the initiated oocyte donation cycles resulted in donations (Table 20).

Table 20: Number of oocyte donation cycles by donor's age group, Australia and New Zealand, 2010

Age group (years) [(a)]	Initiated cycles (number)	Cycles with OPU performed (number)	Cycles with OPU performed (per cent)	Cycles with oocytes donated (number)	Cycles with oocytes donated (per cent)
< 30	221	214	96.8	214	96.8
30–34	316	302	95.6	300	94.9
35–39	362	346	95.6	344	95.0
≥ 40	58	57	98.3	55	94.8
Total	**957**	**919**	**96.0**	**913**	**95.4**

(a) Age at start of a treatment cycle.

3.4.2 Oocyte/embryo recipient cycles

There were 2,113 oocyte/embryo recipient cycles in 2010. Of these, 85% (1,796) were oocyte recipient cycles and 15% (317) were embryo recipient cycles (Table 1). The average age of women having an oocyte/embryo recipient cycle was 40.9 years.

Progression of oocyte/embryo recipient cycles

Figure 7 shows the main stages of fresh and thaw oocyte/embryo recipient cycles and the resulting treatment outcomes. Of the 2,113 initiated oocyte/embryo recipient cycles undertaken in 2010, 24.5% resulted in a clinical pregnancy and 18.1% in a live delivery.

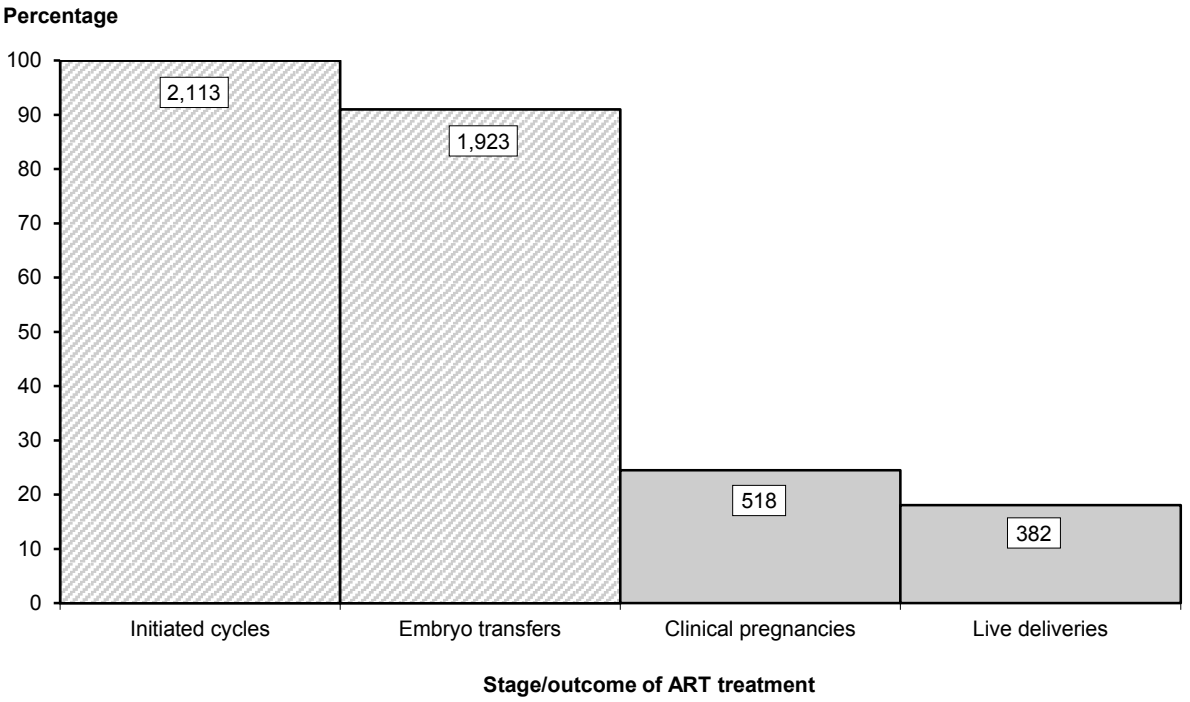

Figure 7: Progression of fresh and thaw oocyte/embryo recipient cycles, Australia and New Zealand, 2010

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

Of the 1,796 oocyte recipient cycles, 51.4% were fresh cycles and 48.6% were thaw cycles. The live delivery rate was 19% for fresh oocyte recipient cycles, marginally higher than for thawed oocyte recipient cycles (18.3%).

Of the 317 embryo recipient cycles, less than 5 were fresh cycles. The overall live delivery rate was 14.5% for embryo recipient cycles (Table 21).

Table 21: Outcomes of oocyte/embryo recipient cycles by treatment type, Australia and New Zealand, 2010

	Oocyte recipient			
Stage/outcome of treatment	Fresh	Thaw	Embryo recipient	All
Initiated cycles	924	872	317	2,113
Embryo transfer cycles	799	831	293	1,923
Clinical pregnancies	249	201	68	518
Live deliveries	176	160	46	382
Live deliveries per initiated cycle (per cent)	*19.0*	*18.3*	*14.5*	*18.1*
Live deliveries per embryo transfer cycle (per cent)	*22.0*	*19.3*	*15.7*	*19.9*
Live deliveries per clinical pregnancy (per cent)	*70.7*	*79.6*	*67.6*	*73.7*

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 18.1%. Of cycles in recipients aged ≥ 40, 16.6% of initiated cycles resulted in a live delivery, lower than for other age groups (Table 22). However, the live delivery rate of oocyte/embryo recipient cycles in recipients aged ≥ 45 (16.4%), was markedly higher than the rate for autologous fresh cycles (0.1%) and the rate of autologous thaw cycles (8.4%) in women aged ≥ 45 (Tables 9 and 14).

Table 22: Outcomes of oocyte/embryo recipient cycles by recipient's age group, Australia and New Zealand, 2010

	Recipient's age group (years)[(a)]					
Stage/outcome of treatment	< 30	30–34	35–39	40–44	≥ 45	All
Initiated cycles	75	208	462	790	578	2,113
Embryo transfer cycles	69	190	420	732	512	1,923
Clinical pregnancies	19	60	134	176	129	518
Live deliveries	14	49	92	132	95	382
Live deliveries per initiated cycle (per cent)	*18.7*	*23.6*	*19.9*	*16.7*	*16.4*	*18.1*
Live deliveries per embryo transfer cycle (per cent)	*20.3*	*25.8*	*21.9*	*18.0*	*18.6*	*19.9*
Live deliveries per clinical pregnancy (per cent)	*73.7*	*81.7*	*68.7*	*75.0*	*73.6*	*73.7*

(a) Age at start of a treatment cycle.

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

The clinical pregnancy and live delivery rates were higher for recipient cycles where donors were in their late 20s to early 30s than for cycles with donors in all other age groups. Advancing donor's age was associated with a decrease in the live delivery rate from 20.1% of cycles with donors aged 25–29 to 9.9% of cycles with donors aged ≥ 40 (Table 23).

Table 23: Outcomes of oocyte/embryo recipient cycles by donor's age group, Australia and New Zealand, 2010

	Donor's age group (years)[a]					
Stage/outcome of treatment	**< 25**	**25–29**	**30–34**	**35–39**	**≥ 40**	**All[b]**
Initiated cycles	112	309	639	712	142	2,113
Embryo transfer cycles	98	282	572	652	123	1,923
Clinical pregnancies	26	85	167	168	21	518
Live deliveries	18	62	123	122	14	382
Live deliveries per initiated cycle (per cent)	*16.1*	*20.1*	*19.2*	*17.1*	*9.9*	*18.1*
Live deliveries per embryo transfer cycle (per cent)	*18.4*	*22.0*	*21.5*	*18.7*	*11.4*	*19.9*
Live deliveries per clinical pregnancy (per cent)	*69.2*	*72.9*	*73.7*	*72.6*	*66.7*	*73.7*

(a) Age at start of a treatment cycle.

(b) Includes cycles where donor's age was not stated.

Clinical pregnancies and live deliveries from oocyte/embryo recipient cycles by number of embryos transferred

Of the 1,923 oocyte/embryo recipient cycles where embryos were transferred, 70% were SET, 29.9% were DET and only 4 cycles (0.1%) transferred three or more embryos.

The live delivery rate per oocyte/embryo recipient cycle where embryos were transferred was higher for DET cycles than SET cycles regardless of the recipient's age. Overall, the difference in the live delivery rate between SET cycles and DET cycles was 5.5 percentage points (18.2% and 23.7% respectively) (Table 24).

Table 24: Outcomes of oocyte/embryo recipient cycles by recipient's age and number of embryos transferred, Australia and New Zealand, 2010

Stage/outcome of treatment	Recipient's age group (years)[a]							
	< 35		35–39		≥ 40		All	
	SET[b]	DET[c]	SET[b]	DET[c]	SET[b]	DET[c]	SET[b]	DET[c]
Embryo transfer cycles	197	60	289	130	859	384	1,345	574
Clinical pregnancies	53	25	86	48	192	113	331	186
Live deliveries	41	21	63	29	141	86	245	136
Clinical pregnancies per embryo transfer cycle (per cent)	*26.9*	*41.7*	*29.8*	*36.9*	*22.4*	*29.4*	*24.6*	*32.4*
Live deliveries per embryo transfer cycle (per cent)	*20.8*	*35.0*	*21.8*	*22.3*	*16.4*	*22.4*	*18.2*	*23.7*

(a) Age at start of a treatment cycle.

(b) SET: single embryo transfer.

(c) DET: double embryo transfer.

Clinical pregnancies and live deliveries from oocyte/embryo recipient cycles by stage of embryo development

The live delivery rate per oocyte/embryo recipient cycle with embryos transferred was higher for blastocyst transfer cycles than cleavage embryo transfer cycles regardless of recipient's age. Overall, the difference in live delivery rates for cleavage stage embryos and blastocysts was 5.3 percentage points (17.3% and 22.6% respectively) (Table 25).

Table 25: Outcomes of oocyte/embryo recipient cycles by recipient's age and stage of embryo development, Australia and New Zealand, 2010

Stage/outcome of treatment	Recipient's age group (years)[a]							
	< 35		35–39		≥ 40		All	
	CL[b]	BL[c]	CL[b]	BL[c]	CL[b]	BL[c]	CL[b]	BL[c]
Embryo transfer cycles	119	140	204	216	665	579	988	935
Clinical pregnancies	26	53	50	84	149	156	225	293
Live deliveries	23	40	38	54	110	117	171	211
Clinical pregnancies per embryo transfer cycle (per cent)	*21.8*	*37.9*	*24.5*	*38.9*	*22.4*	*26.9*	*22.8*	*31.3*
Live deliveries per embryo transfer cycle (per cent)	*19.3*	*28.6*	*18.6*	*25.0*	*16.5*	*20.2*	*17.3*	*22.6*

(a) Age at start of a treatment cycle.

(b) CL: cleavage embryo.

(c) BL: blastocyst.

Clinical pregnancies and live deliveries from oocyte/embryo recipient cycles by stage of embryo development and embryo freezing methods

Over 60% of oocyte/embryo recipient thaw cycles where a blastocyst was transferred used vitrified embryos, compared with 5.5% of cycles where a cleavage embryo was transferred. Overall the live delivery rate of oocyte/embryo recipient thaw cycles was similar for slow frozen and vitrified embryos (18.3% and 18.6% respectively) (Table 26).

Table 26: Outcomes of oocyte/embryo recipient thaw cycles by stage of embryo development and embryo freezing methods, Australia and New Zealand, 2010

	Stage of embryo development					
	Cleavage embryo		Blastocyst		All	
Stage/outcome of treatment	Slow freezing	Vitrification	Slow freezing	Vitrification	Slow freezing	Vitrification
Embryo transfer cycles	533	31	210	346	743	377
Clinical pregnancies	110	7	66	86	176	93
Live deliveries	87	3	49	67	136	70
Clinical pregnancies per embryo transfer cycle (per cent)	*20.6*	*22.6*	*31.4*	*24.9*	*23.7*	*24.7*
Live deliveries per embryo transfer cycle (per cent)	*16.3*	*9.7*	*23.3*	*19.4*	*18.3*	*18.6*

4 Pregnancy and birth outcomes following embryo transfer cycles in 2010

4.1 Clinical pregnancies

Clinical pregnancies overview

Of the 50,495 autologous and recipient embryo transfer cycles undertaken in Australian and New Zealand fertility centres, 14,733 resulted in a clinical pregnancy. Of these, 13,202 (89.6%) were reported from fertility centres in Australia and 1,531 (10.4%) from New Zealand centres. Clinical pregnancies that resulted from GIFT and surrogacy cycles are described in Chapter 5.

Over three-quarters of the 14,733 clinical pregnancies (76.4%) resulted in a delivery and 21.7% resulted in early pregnancy loss (less than 20 weeks gestation and less than 400 grams birthweight). The outcomes of 284 (1.9%) clinical pregnancies were not known because women could not be followed up or contacted by fertility centres.

The majority of clinical pregnancies followed SET (69.9%) and DET (29.6%). Just 0.5% of clinical pregnancies followed the transfer of three or more embryos.

Fetal hearts by number of embryos transferred

Of the 14,733 clinical pregnancies, 79.6% had one fetal heart (single fetus) detected, 7.4% had multiple fetal hearts (multiple fetuses) detected and 9% had no fetal heart detected at the time of ultrasound (Table 27). Multiple gestation pregnancies are closely related to the number of embryos transferred in ART treatment. Two fetal hearts were detected in 19.4% of clinical pregnancies following DET cycles and in 1.9% of clinical pregnancies following SET cycles (Table 27). Multiple fetus pregnancies following SET are probably related to embryo splitting in which the transferred embryo split into two or more embryos.

Of the pregnancies achieved following SET of cleavage stage embryos, 1.3% had two fetal hearts detected. Of the pregnancies achieved following SET of blastocyst embryos, 2.3% had two fetal hearts detected.

Table 27: Clinical pregnancies by number of fetal hearts and number of embryos transferred, Australia and New Zealand, 2010

Number of fetal hearts	Number of embryos transferred							
	One		Two		Three or more		All	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
0[(a)]	960	9.3	365	8.4	4	6.0	1,329	9.0
1	8,792	85.4	2,892	66.2	48	71.6	11,732	79.6
2	200	1.9	848	19.4	8	11.9	1,056	7.2
3 or 4	5	0.0	29	0.7	1	1.5	35	0.2
Not stated	343	3.3	232	5.3	6	9.0	581	3.9
Total	**10,300**	**100.0**	**4,366**	**100.0**	**67**	**100.0**	**14,733**	**100.0**

(a) No fetal heart detected at the time of ultrasound.

Early pregnancy loss

There were 3,194 early pregnancy losses (less than 20 weeks gestation and less than 400 grams birthweight) following embryo transfers, representing 21.7% of clinical pregnancies.

Pregnancies following SET resulted in a lower rate of early pregnancy loss (21%) than pregnancies following DET (23.2%) and those following transfer of three or more embryos (31.3%) (Table 28).

Table 28: Early pregnancy losses by pregnancy outcome and number of embryos transferred, Australia and New Zealand, 2010

Pregnancy outcome	Number of embryos transferred							
	One		Two		Three or more		All	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Early pregnancy loss	2,158	21.0	1,015	23.2	21	31.3	3,194	21.7
Miscarriage	*1,958*	*19.0*	*922*	*21.1*	*20*	*29.9*	*2,900*	*19.7*
Reduction or termination	*64*	*0.6*	*28*	*0.6*	*0*	*0.0*	*92*	*0.6*
Ectopic or heterotopic pregnancy	*136*	*1.3*	*65*	*1.5*	*1*	*1.5*	*202*	*1.4*
Delivery	7,929	77.0	3,281	75.1	45	67.2	11,255	76.4
Not stated	213	2.1	70	1.6	1	1.5	284	1.9
Total	**10,300**	**100.0**	**4,366**	**100.0**	**67**	**100.0**	**14,733**	**100.0**

4.2 Deliveries

There were 11,255 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, 99.1% (11,152) gave birth to at least one liveborn baby (live delivery). The proportion of term live deliveries among all deliveries was higher for autologous cycles than for oocyte/embryo recipient cycles (Table 29).

Table 29: Deliveries by delivery outcome and treatment type, Australia and 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	6,833	99.0	3,937	99.2	382	99.0	11,152	99.1
< 37 weeks	*998*	*14.5*	*443*	*11.2*	*70*	*18.1*	*1,511*	*13.4*
≥ 37 weeks	*5,835*	*84.6*	*3,494*	*88.0*	*312*	*80.8*	*9,641*	*85.7*
Fetal death (stillbirth)[(a)]	67	1.0	31	0.8	4	1.0	102	0.9
Not stated	0	0.0	1	0.0	0	0.0	1	0.0
Total	**6,900**	**100.0**	**3,969**	**100.0**	**386**	**100.0**	**11,255**	**100.0**

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

Deliveries by the number of embryos transferred

Of the 11,255 deliveries, 7.9% had multiple gestation deliveries (Table 30), a slightly lower proportion than in 2009 (8.2%) (AIHW: Wang et al. 2011). By comparison, the proportion of multiple gestation deliveries in Australia from spontaneous conceptions as well as ART in 2009 was 1.6% (AIHW: Li et al. 2011).

Twin deliveries accounted for 7.7% of deliveries following embryo transfer cycles in 2010, with 4 out of 5 twin deliveries from DET (707/872) and 1 in 5 from SET cycles (161/872). Of the 3,281 deliveries following DET, 21.5% were twins, markedly higher than the proportion following SET (2%) (Table 30).

Table 30: Deliveries by gestation and number of embryos transferred, Australia and New Zealand, 2010

Gestation	Number of embryos transferred							
	One		Two		Three or more		All	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Singleton	7,767	98.0	2,559	78.0	41	91.1	10,367	92.1
Multiple	*162*	*2.0*	*722*	*22.0*	*4*	*8.9*	*888*	*7.9*
Twin	161	2.0	707	21.5	4	8.9	872	7.7
Higher order multiple	1	0.0	15	0.5	0	0.0	16	0.1
Total	**7,929**	**100.0**	**3,281**	**100.0**	**45**	**100.0**	**11,255**	**100.0**

Deliveries by maternal age

The average age of women at the time of delivery was 35. This is 5 years older than the average age (30) of women who gave birth in Australia in 2009 and in New Zealand in 2009 (29.6) (AIHW: Li et al. 2011; Statistics New Zealand 2012).

Women aged under 35 had a marginally higher proportion (8.2%) of multiple gestation deliveries compared with women aged 35–39 (7.9%) and women aged 40 or older (7.1%). Of deliveries following DET, the proportion of multiple gestation deliveries was markedly higher for women aged under 35 (30.2%) compared with women aged 35–39 (20.9%) and women aged 40 or older (13.3%) (Table 31).

Table 31: Deliveries by gestation and maternal age group, Australia and New Zealand, 2010

	Age group (years)[a]								
	< 35			35–39			≥ 40		
Gestation	SET[b]	DET[c]	All[d]	SET[b]	DET[c]	All[d]	SET[b]	DET[c]	All[d]
					Number				
Singleton	3,829	753	4,585	2,989	1,076	4,071	949	730	1,711
Multiple	*81*	*326*	*407*	*67*	*284*	*351*	*14*	*112*	*130*
Twin	80	319	399	67	277	344	14	111	129
Higher order multiple	1	7	8	0	7	7	0	1	1
Total	**3,910**	**1,079**	**4,992**	**3,056**	**1,360**	**4,422**	**963**	**842**	**1,841**
					Per cent				
Singleton	97.9	69.8	91.8	97.8	79.1	92.1	98.5	86.7	92.9
Multiple	*2.1*	*30.2*	*8.2*	*2.2*	*20.9*	*7.9*	*1.5*	*13.3*	*7.1*
Twin	2.0	29.6	8.0	2.2	20.4	7.8	1.5	13.2	7.0
Higher order multiple	0.0	0.6	0.2	0.0	0.5	0.2	0.0	0.1	0.1
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) SET: single embryo transfer.

(c) DET: double embryo transfer.

(d) Included three or more embryos.

Caesarean section

Almost half (48.9%) of deliveries following embryo transfer cycles were by caesarean section (Table 32). This is a markedly higher rate than for all deliveries in Australia in 2009 (31.5%) (AIHW: Li et al. 2011). The higher rate of caesarean section following ART treatment may be related to the fact that women were five years older on average and that there were more multiple births following ART treatment.

The caesarean section rate increased with advancing women's age at delivery: 36.7% of women aged less than 30 years had a caesarean section compared with 77.1% of women aged 45 years or older (Table 32).

The caesarean section rate varied by plurality, with 46.7% for singleton deliveries, 78% for twin deliveries and 93.8% for triplet deliveries.

Table 32: Deliveries by method of delivery and maternal age group, Australia and New Zealand, 2010

Method of delivery	Age group (years)[(a)]					
	< 30	30–34	35–39	40–44	≥ 45	Total
			Number			
Caesarean section	488	1,615	2,288	989	128	5,508
Other	837	2,028	2,114	676	36	5,691
Not stated	6	18	20	10	2	56
Total	**1,331**	**3,661**	**4,422**	**1,675**	**166**	**11,255**
			Per cent			
Caesarean section	36.7	44.1	51.7	59.0	77.1	48.9
Other	62.9	55.4	47.8	40.4	21.7	50.6
Not stated	0.5	0.5	0.5	0.6	1.2	0.5
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Age at time of delivery.

4.3 Perinatal outcomes of babies born following embryo transfer cycles

The babies described in this section were those born at 20 weeks or more gestational age or at least 400 grams birthweight following embryo transfer cycles. The outcomes of babies born from GIFT and surrogacy cycles are described in Chapter 5.

There were 12,159 babies born to women who had embryo transfer cycles— 89.5% (10,881) were reported from fertility centres in Australia and 10.5% (1,278) from fertility centres in New Zealand. Of the 12,159 babies, 85.3% were singletons, 14.3% twins and 0.4% triplets. There were 12,037 liveborn babies (98.6%). The birth status was not reported for two babies.

Sex distribution in liveborn babies

There were 6,263 (52%) liveborn male babies, 5,756 (47.8%) liveborn female babies and 18 (0.1%) liveborn babies where sex was not stated. For the 12,037 liveborn babies where baby sex was stated, the sex ratio was 108.8 male for every 100 female babies, significantly higher than the ratio for all Australian liveborn babies born in 2009 (106.0) (AIHW: Li et al. 2011).

Liveborn babies following cleavage embryo transfers had a sex ratio of 100.1 male babies for every 100 female babies. In comparison, liveborn babies following blastocyst transfers had a sex ratio of 114.3 male for every 100 female babies.

Gestational age of babies

The average gestational age of all babies born following embryo transfer cycles was 37.9 weeks (Table 33). This is lower than the average gestational age of 38.8 weeks for all babies born in Australia in 2009 (AIHW: Li et al. 2011).

Almost 18% of babies were preterm (less than 37 weeks gestation), which was markedly higher than the proportion of preterm babies (8.2%) born in Australia in 2009 (AIHW: Li et al. 2011). The average gestational age of singletons was 38.4 weeks, similar to the average gestational age of 39.0 weeks for all singletons born in Australia in 2009. The average gestational age for ART twins was 34.9 weeks, similar to the average gestational age of 35.2 weeks for all twins born in Australia in 2009 (AIHW: Li et al. 2011).

Table 33: Babies by gestational age and plurality, Australia and New Zealand, 2010

Gestational age (weeks)	Singletons		Twins		Higher order multiples		Total	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Mean	*38.4*		*34.9*		*30.5*		*37.9*	
≤ 27	121	1.2	66	3.8	6	12.5	193	1.6
28–31	117	1.1	140	8.0	18	37.5	275	2.3
32–36	805	7.8	870	49.9	24	50.0	1,699	14.0
≥ 37	9,324	89.9	668	38.3	0	0.0	9,992	82.2
Total	**10,367**	**100.0**	**1,744**	**100.0**	**48**	**100.0**	**12,159**	**100.0**
≤ 36	*1,043*	*10.1*	*1,076*	*61.7*	*48*	*100.0*	*2,167*	*17.8*

Figure 8 shows the distribution of gestational age for singletons and twins born to women who had embryo transfer cycles in 2010. Singletons following SET had a lower proportion of preterm birth (9.7%) than singletons following DET (11.2%). The overall proportions of preterm singletons (10.1%) and twins (61.7%) born to women who had embryo transfer cycles in 2010 were higher than the proportions of preterm singletons and twins born in Australia in 2009 (6.6% and 56.7% respectively) (AIHW: Li et al. 2011).

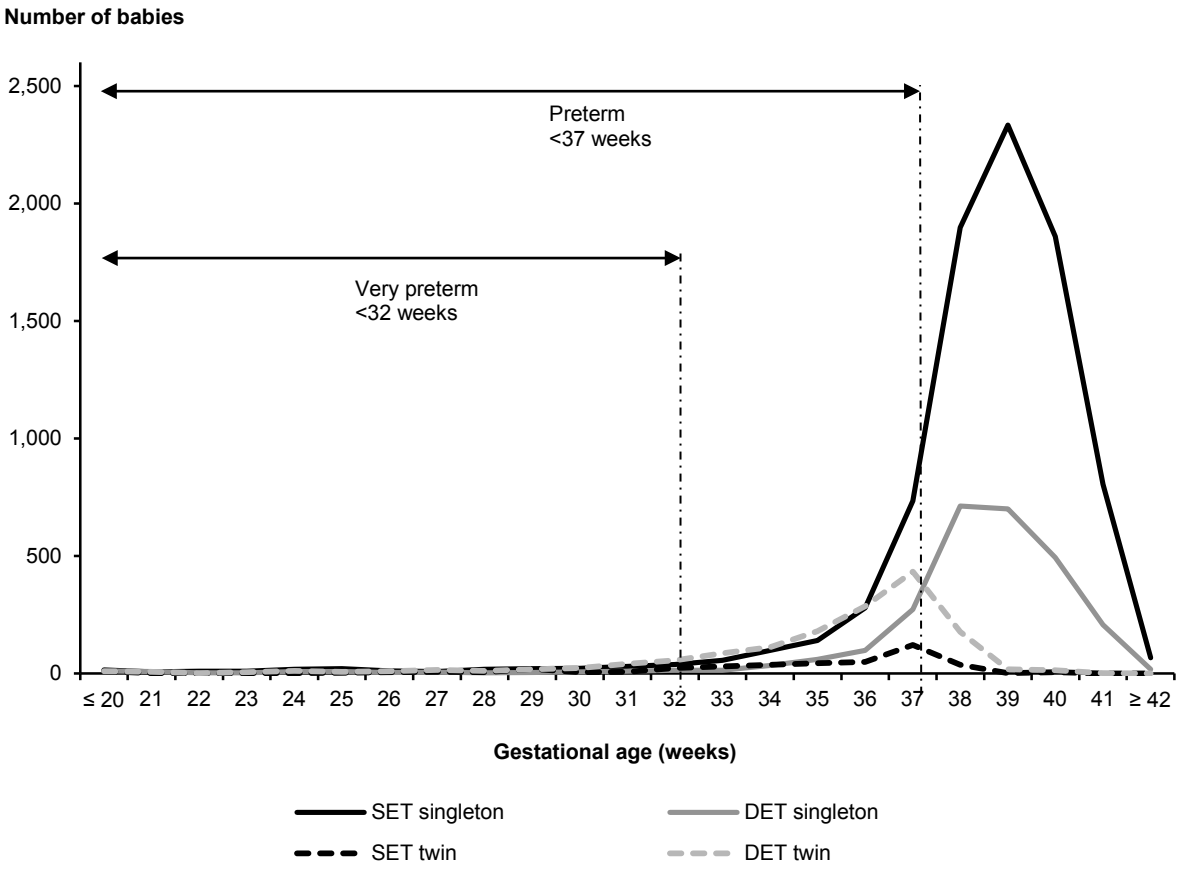

Figure 8: Number of babies born following embryo transfer cycles by gestational age, Australia and New Zealand, 2010

Birthweight of liveborn babies

The average birthweight for liveborn babies to women who had embryo transfer cycles was 3,182 grams. More than 13% of these babies were low birthweight (less than 2,500 grams) (Table 34).

The average birthweight was 3,326 grams for liveborn ART singletons and 2,355 grams for twins. These were lower than the mean birthweight of all liveborn singletons (3,405 grams) and twins (2,400 grams) in Australia in 2009 (AIHW: Li et al. 2011). Low birthweight was reported for 6.1% of liveborn singletons following SET, lower than the 7.5% of those following DET.

Table 34: Liveborn babies by birthweight group and plurality, Australia and New Zealand, 2010

Birthweight (grams)	Singletons		Twins	Higher order multiples	Total[(c)]
	SET[(a)]	DET[(b)]			
			Number		
< 1,000	35	16	39	4	94
1,000–1,499	57	17	108	15	198
1,500–1,999	86	42	243	17	388
2,000–2,499	292	116	533	8	953
2,500–2,999	1,257	426	556	1	2,249
3,000–3,499	2,774	903	186	0	3,877
3,500–3,999	2,302	722	20	0	3,054
≥ 4,000	804	265	3	0	1,073
Not stated	90	26	30	3	151
Total	**7,697**	**2,533**	**1,718**	**48**	**12,037**
< 2,500	*470*	*191*	*923*	*44*	*1,633*
			Per cent		
< 1,000	0.5	0.6	2.3	8.3	0.8
1,000–1,499	0.7	0.7	6.3	31.3	1.6
1,500–1,999	1.1	1.7	14.1	35.4	3.2
2,000–2,499	3.8	4.6	31.0	16.7	7.9
2,500–2,999	16.3	16.8	32.4	2.1	18.7
3,000–3,499	36.0	35.6	10.8	0.0	32.2
3,500–3,999	29.9	28.5	1.2	0.0	25.4
≥ 4,000	10.4	10.5	0.2	0.0	8.9
Not stated	1.2	1.0	1.7	6.3	1.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
< 2,500	6.1	7.5	53.7	91.7	13.6

(a) SET: single embryo transfer.

(b) DET: double embryo transfer.

(c) Included singletons following transfer of three or more embryos.

Perinatal mortality

Perinatal mortality is a summary measure of fetal deaths (stillbirths) and neonatal deaths (defined as the death of liveborn infants within 28 days of birth).

There were 164 reported perinatal deaths, representing 1.3% of all babies born following embryo transfer cycles. Of these, 120 were fetal deaths and 44 were neonatal deaths. The perinatal mortality rate in 2010 was 13.5 deaths per 1,000 births (Table 35), which was lower than the rate of 15.3 deaths per 1,000 ART births in 2009 (AIHW: Wang et al. 2011), and higher than the rate of 9.8 per 1,000 births to all women who gave birth in Australia in 2009 (AIHW: Li et al. 2011). Singletons had a lower perinatal mortality rate (11.0 deaths per 1,000 births) compared with multiples (27.9 deaths per 1,000 births) (Table 35).

These data should be interpreted with caution because of the small numbers and potential variability in case reporting, which is compounded by the self-reported nature of ART birth outcome data. In 2010 information relating to birth outcomes was not stated for 1.9% of clinical pregnancies.

Table 35: Perinatal mortality of babies by type of death and plurality, Australia and New Zealand, 2010

Birth outcome	Singletons	Multiples	Total
		Number	
Fetal death (stillbirth)	95	25	120
Neonatal death	19	25	44
Perinatal death[(a)]	114	50	164
All births	**10,367**	**1,792**	**12,159**
All live births	**10,271**	**1,766**	**12,037**
		Rate[(b)]	
Fetal deaths per 1,000 births	*9.2*	*14.0*	*9.9*
Neonatal deaths per 1,000 live births	*1.8*	*14.2*	*3.7*
Perinatal deaths per 1,000 births	*11.0*	*27.9*	*13.5*

(a) Perinatal deaths are reported by patients to fertility centre staff. These data are not official vital statistics.

(b) Fetal and perinatal mortality rates were calculated using all births (live births and fetal deaths) as the denominator. The neonatal mortality rate was calculated using live births as the denominator.

Note: The birth status was not reported for two babies.

5 GIFT cycles, surrogacy cycles, other procedures and complications in 2010

5.1 GIFT cycles

Gamete intrafallopian transfer (GIFT) is an ART treatment where mature oocytes and sperm are placed directly into a woman's fallopian tubes. The use of GIFT has been declining in Australia and New Zealand in recent years. In 2010, there were 11 GIFT cycles that resulted in three clinical pregnancies and three liveborn singletons.

5.2 Surrogacy cycles

Surrogacy is 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).

There were 119 surrogacy cycles in 2010, including 85 gestational carrier cycles and 34 cycles undertaken by intended parents. Among the 85 gestational carrier cycles, 16 (18.8%) resulted in a clinical pregnancy and 14 (16.5%) resulted in a delivery. All 16 babies born to gestational carriers were liveborn and included two set of twins.

5.3 Assisted hatching

Assisted hatching is an ART procedure where 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.

There were 2,815 assisted hatching cycles reported in 2010. Of these, 2,669 (94.8%) had embryos transferred, resulting in 777 (27.6%) clinical pregnancies, 600 deliveries (550 singletons, 2 stillborn and 100 twins, all liveborn) and 598 (21.2%) live deliveries.

5.4 Preimplantation genetic diagnosis

Preimplantation genetic diagnosis (PGD) is a procedure in which one or more cells from the embryo are removed and analysed for chromosomal disorders or genetic diseases before embryo transfer. In 2010, PGD was performed in 915 cycles, representing 1.7% of cycles in which embryos were created or thawed. Most PGD cycles (704/915) were fresh cycles (Table 36).

Of the 915 PGD cycles, 68.5% (627) had embryos transferred and resulted in 177 (19.3%) clinical pregnancies and 139 (15.2%) live deliveries.

Table 36: Number of cycles with PGD by type of embryo, Australia and New Zealand, 2010

	Stage of treatment		
Type of embryo	Number of cycles with embryos fertilised/thawed	Number of cycles with PGD	PGD per cycle with embryos fertilised/thawed (per cent)
Fresh	32,185	704	2.2
Thaw	22,265	211	0.9
Total	**54,450**	**915**	**1.7**

5.5 Ovarian hyperstimulation syndrome

Morbidity information that is specifically related to ART treatment was collected in ANZARD2.0. One type is ovarian hyperstimulation syndrome (OHSS), a complication of controlled ovarian hyperstimulation, where excessive follicles are produced with high levels of oestrogen secretion.

Cases of OHSS that require hospitalisation are reported by patients and clinicians, and validated against hospital records by fertility centre staff. There were 206 OHSS cases reported in 2010 that were admitted to hospital. It is possible this information is under-reported as there is no nationally agreed definition for OHSS.

A higher number of oocytes retrieved at OPU is associated with OHSS (Table 37).

Table 37: Number of cycles with OPU performed and OHSS by number of oocytes collected, Australia and New Zealand, 2010

	Number of oocytes collected						
	None	1–4	5–9	10–14	15–19	≥ 20	All
Cycles with OHSS	0	2	16	45	52	89	204
Cycles with OPU	608	8,157	12,464	7,954	3,508	2,219	34,910
OHSS per OPU cycle (per cent)	*0.0*	*0.0*	*0.1*	*0.6*	*1.5*	*4.0*	*0.6*

6 Donor sperm insemination cycles in 2010

Donor sperm insemination (DI) covers a range of techniques of placing sperm into the female genital tract using donated sperm from a man who is not the woman's partner. The information presented in this section only describes DI cycles undertaken in fertility centres in Australia and New Zealand, and does not include DI undertaken outside of this setting.

Number and outcomes of DI cycles

In 2010, there were 2,405 DI cycles reported, which included 21.7% (523) undertaken with controlled ovarian hyperstimulation and 72.7% (1,882) undertaken in unstimulated cycles. Of all DI cycles, 14.5% resulted in a clinical pregnancy and 10.8% resulted in a live delivery (Table 38).

The average age of women who had a DI cycle was 35.4. In general, the clinical pregnancy rate and live delivery rate decreased with advancing women's age. Of the DI cycles in women aged under 30, 14.3% resulted in a live delivery, compared with 3.9% of DI cycles in women aged 40 or older (Table 38).

Table 38: Outcomes of DI cycles by women's age group, Australia and New Zealand, 2010

	Age group (years)[(a)]				
Stage/outcome of treatment	**< 30**	**30–34**	**35–39**	**≥ 40**	**Total**
DI cycles	300	667	974	464	2,405
Clinical pregnancies	60	120	141	28	349
Live deliveries	43	100	98	18	259
Clinical pregnancies per DI cycle (per cent)	*20.0*	*18.0*	*14.5*	*6.0*	*14.5*
Live deliveries per DI cycle (per cent)	*14.3*	*15.0*	*10.1*	*3.9*	*10.8*
Live deliveries per clinical pregnancy (per cent)	*71.7*	*83.3*	*69.5*	*64.3*	*74.2*

(a) Age at start of a treatment cycle.

Clinical pregnancies following DI cycles

Of the 349 clinical pregnancies following DI cycles, 24.6% ended in early pregnancy loss (including 21.2% miscarriages, 2.3% ectopic/heterotopic pregnancies and 1.1% terminations/reductions). More than 75% of clinical pregnancies (263/349) resulted in a delivery. Of the 263 deliveries, 242 (92%) were singleton deliveries and 21 (8%) were multiple deliveries including one set of triplets.

Perinatal outcomes of babies

There were 285 babies born to women who had DI treatment, including 281 liveborn babies and one birth status unknown. Of these liveborn babies, 44 (15.4%) were born preterm (less than 37 weeks gestation). The mean birthweight of liveborn babies following DI treatment was 3,281 grams. This was higher than the mean birthweight (3,182 grams) of liveborn babies following embryo transfer cycles. Twenty-seven liveborn babies (12.5%) were born with low birthweight (less than 2,500 grams).

7 Trends in ART treatment and outcomes: 2006–2010

This section includes autologous cycles, donation/recipient cycles, GIFT cycles and surrogacy cycles undertaken in Australia and New Zealand from 2006 to 2010. It does not include DI cycles.

ART treatment and outcomes

In 2010, 61,774 initiated ART treatment cycles were undertaken in Australia and New Zealand. This is a decrease of 12.4% on the number of treatment cycles performed in 2009 and is the first time that ANZARD has recorded a decrease in ART utilisation. This decrease in utilisation coincided with a change in government funding in 2010 for fertility treatment in Australia. Medicare, Australia's universal health insurance scheme, continues to subsidise almost all ART services undertaken in Australia, and through its Extended Medicare Safety Net (EMSN) scheme, continues to provide an additional rebate for out-of-hospital ART services once a relevant annual threshold for total out-of-pocket costs has been reached. However in 2010, a limit on the annual amount Medicare pays in EMSN benefits for a selected number of Medicare services was introduced. This included all ART Medicare services regardless of a women's age or number of cycles previously undertaken. The change in the EMSN scheme resulted in an increase in the average out-of-pocket expenses paid by patients for ART treatment cycles, leading to fewer cycles being undertaken in 2010 (Chambers et al. 2012).

The decrease in the number of treatment cycles in 2010 is also reflected in the decrease in the number of clinical pregnancies and live deliveries resulting from ART treatment in 2010.

Between 2006 and 2010, the pregnancy and live delivery rates per initiated cycle ranged from 22.6% to 23.9% and from 17.2% to 18.1% respectively (Table 39).

Table 39: Number of ART treatment cycles by stage/outcome of treatment, Australia and New Zealand, 2006 to 2010

Stage/outcome of treatment	2006	2007	2008	2009	2010
Initiated cycles[(a)]	50,521	56,817	61,929	70,541	61,774
Oocyte/embryo transfers[(b)]	41,447	46,620	50,645	57,320	50,580
Clinical pregnancies	11,720	12,815	13,983	15,975	14,752
Live deliveries	8,999	9,874	10,633	12,127	11,169
Clinical pregnancies per initiated cycle (per cent)	*23.2*	*22.6*	*22.6*	*22.6*	*23.9*
Live deliveries per initiated cycle (per cent)	*17.8*	*17.4*	*17.2*	*17.2*	*18.1*

(a) Includes all ART treatment (autologous cycles, oocyte donation cycles, oocyte/embryo recipient cycles, GIFT cycles, surrogacy cycles and unclassified cycles).

Multiple gestation deliveries

The decline in multiple gestation deliveries resulting from ART treatment continued in 2010. The proportion of multiple deliveries significantly decreased from 12% in 2006 to 7.9% in 2010 (Table 40). The decline is primarily the result of increasing uptake of SET (Table 43).

Table 40: Number of deliveries following ART treatment by gestation, Australia and New Zealand, 2006 to 2010

	2006		2007		2008		2009		2010	
Gestation	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Singleton	8,016	88.0	8,990	90.0	9,880	91.6	11,272	91.8	10,382	92.1
Multiple	*1,093*	*12.0*	*994*	*10.0*	*903*	*8.4*	*1,006*	*8.2*	*890*	*7.9*
Twin	1,070	11.7	978	9.8	879	8.2	987	8.0	874	7.8
Higher order multiple	23	0.3	16	0.2	24	0.2	19	0.2	16	0.1
Total[(a)]	**9,109**	**100.0**	**9,984**	**100.0**	**10,783**	**100.0**	**12,278**	**100.0**	**11,272**	**100.0**

(a) Includes cycles in which gestation was unknown.

Women's age for autologous cycles

While the majority of autologous cycles undertaken between 2006 and 2010 were in women aged 30 to 40, the proportion of autologous cycles in women aged 40 and older increased from 20.6% in 2006 to 24.3% in 2010. The average age of women having autologous cycles increased from 35.4 in 2006 to 35.8 in 2010 (Table 41).

Table 41: Number of fresh and thaw autologous cycles by women's age group, Australia and New Zealand, 2006 to 2010

	2006		2007		2008		2009		2010	
Age group (years)[(a)]	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Mean	*35.4*		*35.5*		*35.7*		*35.8*		*35.8*	
< 30	5,539	11.6	6,021	11.2	6,373	10.8	7,303	10.9	6,469	11.0
30–34	14,312	30.0	15,376	28.6	16,154	27.5	17,979	26.7	15,641	26.7
35–39	17,947	37.7	20,799	38.7	22,572	38.4	25,953	38.6	22,224	37.9
40–44	9,153	19.2	10,680	19.9	12,663	21.6	14,853	22.1	13,194	22.5
≥ 45	688	1.4	819	1.5	977	1.7	1,141	1.7	1,046	1.8
Not stated	4	0	1	0	1	0	0	0.0	0	0.0
Total	**47,643**	**100.0**	**53,696**	**100.0**	**58,740**	**100.0**	**67,229**	**100.0**	**58,574**	**100.0**

(a) Age at start of a treatment cycle.

Types of ART treatment and stage of embryo development

In Australia and New Zealand, the proportion of ART treatment cycles that used ICSI continued to increase, from 55.4% of cycles in 2006 to 62.4% in 2010 (Table 42).

The number and proportion of blastocyst transfer cycles increased significantly from 27.1% in 2006 to 52.1% in 2010 (Table 42).

This increase in blastocyst transfer cycles from 2006 to 2010 must be interpreted with caution as a data extraction error, where blastocyst transfer was misclassified as cleavage embryo transfer, was identified from some clinics for treatment years from 2002 to 2008. Therefore, the number of blastocyst transfers is under-estimated in the trends analysis of this report for treatment years 2006 to 2008.

Table 42: Number of embryo transfer cycles by treatment type, Australia and New Zealand, 2006 to 2010

	2006		2007		2008		2009		2010	
Treatment type/procedure	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Fertilisation procedure										
IVF	17,625	42.7	18,774	40.4	19,761	39.1	21,790	38.0	18,237	36.1
ICSI	22,890	55.4	26,611	57.2	29,864	59.0	34,489	60.2	31,564	62.4
Not stated	809	2.0	1,128	2.4	944	1.9	1,028	1.8	769	1.5
Stage of embryo development										
Cleavage	30,145	72.9	32,261	69.4	31,066	61.4	28,780	50.2	24,200	47.9
Blastocyst[(a)]	11,179	27.1	14,252	30.6	19,503	38.6	28,527	49.8	26,370	52.1

(a) The number of blastocyst transfers is under-estimated for treatment years 2006 to 2008.

Number of embryos transferred per embryo transfer cycle

There has been a shift in ART practice to an increase in the number of SET cycles in Australia and New Zealand. In 2006, the proportion of SET cycles accounted for 56.9% of embryo transfer cycles and by 2009 this proportion had increased to 69.7%. In 2010, the proportion was similar at 69.6% (Table 43).

Table 43: Proportion of embryo transfer cycles by number of embryos transferred, Australia and New Zealand, 2006 to 2010

Number of embryos transferred	2006	2007	2008	2009	2010
One embryo	56.9	63.7	67.8	69.7	69.6
Two embryos	42.2	35.7	31.6	29.6	29.5
Three or more embryos	1.0	0.6	0.6	0.7	0.8

8 Women undertaking autologous treatment in 2010

ANZARD was transformed from a cycle-based data collection to a woman-based data collection for treatments undertaken from 2009 onwards (ANZARD2.0). This allows reporting of the number of women undergoing treatment and number of cycles per woman over time.

This section presents the number of women who underwent autologous ART treatment in 2010. The number of cycles undertaken by a woman included both fresh and thaw cycles. For some women, if their fresh cycles were undertaken in previous years, only thaw cycles were reported and presented. Of the 58,574 autologous ART treatment cycles performed in 2010, 2,844 (4.9%) cycles were excluded due to several clinics being unable to provide the SLK for women undergoing treatment in their clinics, leaving 55,730 autologous cycles to be reported in this section.

Women who undertook autologous treatment

There were 30,588 women who undertook the 55,730 autologous fresh and/or thaw cycles for which SLK information was available, in Australia and New Zealand in 2010. Of these women, 27,274 had treatment in Australia, 3,317 in New Zealand, and three had treatment in both Australia and New Zealand.

On average, 1.8 fresh and/or thaw cycles per woman were undertaken in 2010, with more cycles per woman in Australia (1.9 cycles per woman) than in New Zealand (1.4 cycles per woman). Slightly more than half (51.3%) of the women in Australia had one autologous treatment cycle compared with 68.7% of women in New Zealand. In line with this, 9.4% of women in Australia had four or more cycles compared with 2.8% of women in New Zealand (Table 44).

Table 44: Women undertaking autologous fresh and/or thaw cycles by number of cycles, Australia and New Zealand, 2010

	Australia		New Zealand		All	
Number of cycles	**Number**	**Per cent**	**Number**	**Per cent**	**Number**	**Per cent**
One	13,986	51.3	2,279	68.7	16,259	53.2
Two	7,244	26.6	704	21.2	7,951	26.0
Three	3,480	12.8	240	7.2	3,720	12.2
Four or more	2,564	9.4	94	2.8	2,658	8.7
Total	**27,274**	**100.0**	**3,317**	**100.0**	**30,588**	**100.0**

Note: Only women who undertook cycles in 2010 are included.

Women who undertook autologous fresh cycles

There were 35,001 fresh cycles undertaken by 24,475 women in Australia and New Zealand in 2010, an average of 1.4 fresh cycles per woman. Younger women had fewer fresh cycles with about 77% of women aged under 35 having only one autologous fresh cycle. This partly reflects the higher success rate per initiated fresh autologous cycle among younger women and the fact that younger women tend to have more cryopreserved embryos available for thaw cycles. Less than 1% of women aged under 30 had four or more cycles. This proportion increased to 5.8% for women aged 40–44 and 6% for women aged 45 or older (Table 45).

Table 45: Women undertaking autologous fresh cycles by number of cycles, Australia and New Zealand, 2010

	Age group (years)[(a)]					
Number of cycles	**< 30**	**30–34**	**35–39**	**40–44**	**≥ 45**	**All**
			Number			
One	2,386	4,996	6,383	3,125	230	17,120
Two	509	1,203	2,032	1,348	94	5,186
Three	106	325	532	513	34	1,510
Four or more	23	73	234	306	23	659
Total	**3,024**	**6,597**	**9,181**	**5,292**	**381**	**24,475**
			Per cent			
One	78.9	75.7	69.5	59.1	60.4	69.9
Two	16.8	18.2	22.1	25.5	24.7	21.2
Three	3.5	4.9	5.8	9.7	8.9	6.2
Four or more	0.8	1.1	2.5	5.8	6.0	2.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Age at start of first autologous fresh cycle in 2010.

Women who undertook autologous thaw cycles

There were 20,729 thaw cycles undertaken by 13,846 women in Australia and New Zealand in 2010, representing an average of 1.5 thaw cycles per woman. The proportion of women who had only one thaw cycle increased from 64.2% for women aged under 30 to 78.7% in women aged 45 or older (Table 46). A higher proportion of younger women had two or more thaw cycles, while a higher proportion of older women underwent two or more fresh cycles (Tables 45 and 46).

Table 46: Women undertaking autologous thaw cycles by number of cycles, Australia and New Zealand, 2010

	Age group (years)[(a)]					
Number of cycles	**< 30**	**30–34**	**35–39**	**40–44**	**≥ 45**	**All**
			Number			
One	1,013	2,664	3,644	1,749	163	9,233
Two	366	931	1,245	501	30	3,073
Three	134	338	428	136	5	1,041
Four or more	66	158	184	82	9	499
Total	**1,579**	**4,091**	**5,501**	**2,468**	**207**	**13,846**
			Per cent			
One	64.2	65.1	66.2	70.9	78.7	66.7
Two	23.2	22.8	22.6	20.3	14.5	22.2
Three	8.5	8.3	7.8	5.5	2.4	7.5
Four or more	4.2	3.9	3.3	3.3	4.3	3.6
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Age at start of first autologous thaw cycle in 2010.

Appendix A: Contributing fertility clinics

Australian Capital Territory

Canberra Fertility Centre, Deakin (Dr Martyn Stafford-Bell)

ISIS Fertility, Barton (Dr Nicole Sides)

Sydney IVF—Canberra, Deakin (Associate Professor Mark Bowman)

New South Wales

Albury Reproductive Medicine Centre, Albury (Dr Scott Giltrap)

Demeter Laboratories, Liverpool (Dr David Knight)

Fertility East, Bondi Junction (Dr Joel Bernstein)

Fertility First, Hurstville (Dr Anne Clark)

Hunter IVF (Monash), New Lambton Heights (Dr Steven Raymond, Dr Andrew Hedges)

IVF Australia—Central Coast, Gosford (Dr Malcolm Tucker)

IVF Australia—Eastern Suburbs, Maroubra (Dr Graeme Hughes)

IVF Australia—North Shore, Greenwich (Dr Frank Quinn)

IVF Australia—Southern Sydney, Kogarah (Dr Andrew Kan)

IVF Australia—Western Sydney, Westmead (Associate Professor Peter Illingworth)

Next Generation Fertility, Parramatta (Dr Kim Matthews)

Royal Hospital for Women, Randwick (Dr Stephen Steigrad)

Sydney IVF, Sydney (Dr Mark Bowman)

Sydney IVF—Coffs Harbour, Coffs Harbour (Associate Professor Mark Bowman)

Sydney IVF—Illawarra, Wollongong (Associate Professor Mark Bowman

Sydney IVF—Lismore, Lismore (Associate Professor Mark Bowman)

Sydney IVF—Liverpool, Liverpool (Associate Professor Mark Bowman)

Sydney IVF—Newcastle, Merewether (Associate Professor Mark Bowman)

Sydney IVF—Northwest, Baulkham Hills (Associate Professor Mark Bowman)

Sydney IVF—Orange, Orange (Associate Professor Mark Bowman)

Sydney IVF—RPAH, Camperdown (Associate Professor Mark Bowman)

Westmead Fertility Centre, Westmead (Dr Howard Smith)

Northern Territory

Repromed Darwin, Tiwi (Dr Richard Henshaw)

Queensland

Assisted Conception Australia, Greenslopes (Dr Clare Boothroyd)

Cairns Fertility Centre, Dr John Yovich

City Fertility Centre, Brisbane (Dr Ashish Das)

City Fertility Centre Gold Coast, Robina (Dr Ashish Das)

City Fertility Centre Southside, (Dr Ashish Das)

Coastal IVF, Maroochydore (Dr Paul Stokes)

Fertility Solutions Sunshine Coast, Nambour (Dr Kristen Small)

Fertility Solutions Sunshine Coast, Bundaberg (Dr Kristen Small)

IVF Caboolture, Caboolture (Dr James Moir)

IVF Sunshine Coast, Birtinya (Dr James Moir)

Life Fertility Clinic, Brisbane (Dr Glenn Sterling)

Monash IVF Gold Coast, Southport (Dr Irving Korman)

Monash IVF Queensland, Sunnybank (Dr Kevin Forbes)

Monash IVF Rockhampton, Rockhampton (Professor Gab Kovacs)

Monash IVF Townsville, Townsville (Professor Gab Kovacs)

QFG Cairns, Cairns (Dr Robert Miller)

QFG Gold Coast, Benowa (Dr Andrew Cary)

QFG Mackay, North Mackay (Dr Lance Herron)

QFG Toowoomba IVF, Toowoomba (Dr John Esler)

QFG Townsville, Hyde Park (Dr Ron Chang)

Queensland Fertility Group, Brisbane (Dr David Molloy)

The Wesley/Monash IVF Services, Auchenflower (Dr John Allan)

South Australia

Fertility SA, Adelaide (Dr Jodie Semmler)

Flinders Reproductive Medicine, Bedford Park (Dr Enzo Lombardi)

Repromed, Dulwich (Dr Richard Henshaw)

Tasmania

Sydney IVF—Launceston, Launceston (Associate Professor Mark Bowman)

TasIVF, Hobart (Dr Bill Watkins)

Victoria

Ballarat IVF, Wendouree (Dr Russell Dalton)

City Fertility Centre Melbourne, Melbourne (Dr David Wilkinson)

Melbourne IVF, East Melbourne (Dr Lyndon Hale)

Monash IVF, Epworth Hospital, Richmond (Dr Peter Lutjen)

Monash IVF, Bendigo (Dr Mark Jalland)

Monash IVF, Monash Surgical Private Hospital, Clayton (Dr Peter Lutjen)

Monash IVF Casterton, Casterton (Professor David Healy)

Monash IVF Geelong, Geelong (Professor Gab Kovacs)

Monash IVF Sale, Sale (Dr Mac Talbot)

Monash IVF Sunshine, St Albans (Dr Mac Talbot)

Reproductive Services, Carlton (Dr Lyndon Hale)

Repromed Mildura, Mildura (Dr Richard Henshaw)

Western Australia

Concept Fertility Centre, Subiaco (Dr Rob Mazzucchelli)

Fertility North, Joondalup (Dr Vince Chapple)

Fertility Specialists South, Attadale (Professor Roger Hart)

Fertility Specialists WA, Claremont (Professor Roger Hart)

Hollywood Fertility Centre, Hollywood (Dr Simon Turner)

PIVET Medical Centre, Leederville (Dr John Yovich)

The Keogh Institute for Medical Research, Nedlands (Dr Bronwyn Stuckey)

New Zealand

Fertility Associates, Auckland (Dr Mary Birdsall)

Fertility Associates Hamilton, Hamilton (Dr VP Singh)

Fertility Associates Wellington, Wellington (Dr Andrew Murray)

Fertility Plus, Auckland (Dr Neil Johnson)

Repromed Auckland, Auckland (Dr Guy Gudex)

Repromed Christchurch, Christchurch (Dr Peter Benny)

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 37 fertility centres in Australia and 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 in Australia and 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 the National Perinatal Epidemiology and Statistics Unit (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 1.9% of clinical pregnancies.

The Reproductive Technology Accreditation Committee of the Fertility Society of Australia 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 Chapters 2 to 7 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 in Chapters 2 to 7 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. Data about previous ART treatment and history of pregnancies are, in some cases, reported by patients.

Appendix C: ANZARD2.0 data items

Variable	*Data domain*
Unit identifier	3-digit code for clinics provided by NPESU.
Site of the unit	Where the cycle was initiated.
Unit patient ID/medical record number	Unique ID for patient.
First two letters of first name	First two letters of female patient first name.
First two letters of surname	First two letters of female patient surname.
Female patient date of birth	DD/MM/YYYY.
Husband/male partner date of birth	DD/MM/YYYY.
Age of oocyte/embryo donor	Completed age at time of OPU.
Cause of infertility: tubal disease	Yes–in the opinion of the treating clinician or clinic there is sub-fertility due to tubal disease. No–other.
Cause of infertility: endometriosis	Yes–in the opinion of the treating clinician or clinic there is sub-fertility due to endometriosis. No–other.
Cause of infertility: other female factors	Yes–in the opinion of the treating clinician or clinic there is sub-fertility due to other female factors apart from tubal disease and endometriosis. Possible examples could include fibroids, ovulation disorders or premature ovarian failure. No–other.
Cause of infertility: male factor	Yes–in the opinion of the treating clinician or clinic there is a significant male factor problem. No–other.
Cause of infertility: unexplained	Yes–in the opinion of the clinic or clinician there is sub-fertility without any apparent explanation. No–if yes answered to any of the previous cause of infertility fields.
Any pregnancies ≥ 20 weeks	Yes–if the female patient has had a pregnancy of 20 complete weeks or more by ART or by a different partner. No–if the female patient has had no previous pregnancy of 20 complete weeks or more.
Cycle ID	Unique cycle identifier.
Cycle date	Cycle date is coded by: 1. The first date where FSH/stimulation drug is administered 2. The date of LMP for unstimulated cycles (including natural fresh cycles and thaw cycles) 3. The date of embryos disposed for embryo disposal cycles 4. The date of oocytes/embryos imported or exported for oocyte/embryo import/export cycles 5. The date of embryos donated for frozen embryos donation cycles 6. The date of embryos received for non-transfer embryo recipient cycles.
Surrogacy arrangement	Yes–if surrogacy arrangement is involved in this cycle. No–if surrogacy arrangement is not involved in this cycle.
Ovarian stimulation	Yes–FSH administered. Does not include clomiphene or hCG alone unless FSH was also given. No–other.
First ever FSH stimulated cycle for OPU	Yes–if the current cycle is the first ever FSH stimulated cycle with the intention of OPU. No–other.
Date of intrauterine insemination	DD/MM/YYYY.
Date of cancellation for cancelled OPU	Date of the last day FSH is administered in a cancelled cycle. DD/MM/YYYY.

Variable	*Data domain*
OPU date	Date of oocyte pickup.
Number of eggs retrieved	Number of eggs retrieved at OPU.
Number of eggs donated	Number of eggs donated to someone else.
Number of eggs received	Number of eggs received from someone else.
Number of eggs imported	Records number of oocytes imported into the current unit from another unit.
Number of eggs exported	Records number of oocytes exported from the current unit into another unit.
Number of oocytes slow frozen	Number of oocytes frozen by slow freezing method in this cycle.
Number of oocytes vitrified	Number of oocytes frozen by vitrification in this cycle.
Number of slow frozen oocytes thawed	Number of slow frozen oocytes thawed in this cycle.
Number of vitrified oocytes warmed	Number of vitrified oocytes warmed in this cycle.
Freezing date of thawed/warmed oocytes	DD/MM/YYYY.
Number of eggs GIFT	Number of eggs replaced in a GIFT procedure.
Number of eggs IVF	Number of eggs treated (inseminated) with IVF.
Number of eggs ICSI	Number of eggs treated with ICSI.
Site of sperm used	Site of sperm extraction: ejaculated, epididymal (whether by open biopsy or by PESA), testicular or other.
Person who provided sperm	Husband/partner (h), known donor (k), anonymous donor (a), unknown (u).
Number of eggs fertilised normally	Number of eggs fertilised normally.
Preimplantation genetic diagnosis	Yes–preimplantation genetic diagnosis in any form (including aneuploidy screening or sex selection) has been performed on any of the embryos (transferred or not). No–PGD not performed.
Assisted hatching	Yes–where assisted hatching in any form has been performed on any of the embryos (transferred or not). No–assisted hatching not performed.
Number of embryos imported from another clinic	Records number of embryos imported into the unit from another unit.
Number of embryos received from another patient/ clinic	Records the number of embryos that a patient/couple received from another patient/couple.
Number of slow frozen cleavage embryos thawed	Number of slow frozen cleavage embryos thawed with the intention of performing an embryo transfer.
Number of vitrified cleavage embryos warmed	Number of vitrified cleavage embryos warmed with the intention of performing an embryo transfer.
Number of slow frozen blastocysts thawed	Number of slow frozen blastocysts thawed with the intention of performing an embryo transfer.
Number of vitrified blastocysts warmed	Number of vitrified blastocyst embryos warmed with the intention of performing an embryo transfer.
Freezing date of thawed/warmed embryos	Freezing date of thawed/warmed embryos.
Thawed/warmed embryos originally from oocyte donor or embryo donor	o–embryo from donated oocyte. e–donated embryo.
ET date	Embryo transfer date.
Number of cleavage embryos transferred	Number of cleavage stage embryos transferred.
Number of blastocyst transferred	Number of blastocyst stage embryos transferred.
Any embryos ICSI?	Yes–any embryos transferred were fertilised by ICSI. No–no transferred embryos were fertilised by ICSI.
Number of cleavage embryos slow	Number of cleavage embryos frozen by slow freezing method in this cycle.

Variable	*Data domain*
frozen	
Number of cleavage embryos vitrified	Number of cleavage embryos frozen by vitrification in this cycle.
Number of blastocysts slow frozen	Number of blastocysts frozen by slow freezing method in this cycle.
Number of blastocysts vitrified	Number of blastocysts frozen by vitrification method in this cycle.
Number of embryos exported	Number of embryos exported from the current unit to another unit.
Number of embryos donated	Number of embryos donated to another patient.
Number of potentially usable frozen embryos discarded	Frozen embryos disposed in accordance with patient's request or Government regulation.
Clinical pregnancy	A pregnancy that fulfils one of the following criteria: 1. Known to be ongoing at 20 weeks 2. Evidence by ultrasound of an intrauterine sac (with or without a fetal heart) 3. Examination of products of conception reveal chorionic villi 4. A definite ectopic pregnancy that has been diagnosed laparoscopically or by ultrasound.
Date pregnancy ended	Date on which delivery, miscarriage or termination takes place.
Number of fetal hearts	Number of fetal hearts seen on first ultrasound (intrauterine only).
Ectopic pregnancy	If this pregnancy is an ectopic pregnancy, or a combined ectopic and uterine pregnancy (heterotopic). n–No e–Ectopic h–Heterotopic
Elective termination of pregnancy	Yes–pregnancy is terminated. No–pregnancy not terminated.
Selective reduction performed	Yes–If selective reduction has been performed due to fetal abnormality/other reasons. No–If no selective reduction has been performed.
Fetal abnormality in a pregnancy ending < 20 weeks or by selective reduction	Fetal abnormality in a pregnancy ending < 20 weeks or by selective reduction.
Maternal complications of pregnancy	Maternal complications of pregnancy.
Number of babies delivered	Include all liveborn and stillborn babies after 20 weeks gestation or at least 400 grams birthweight.
Caesarean delivery	Yes–delivery by planned or emergency caesarean section. No–other.
Baby 1 outcome	Liveborn, stillborn or neonatal death.
Baby 1 sex	Male or female.
Baby 1 birthweight	Weight in grams.
Baby 1 abnormality	Describes any known congenital malformation.
Baby 1 date of neonatal death	Date of neonatal death.
Baby 2 outcome	Liveborn, stillborn or neonatal death.
Baby 2 sex	Male or female.
Baby 2 weight	Weight in grams.
Baby 2 abnormality	Describes any known congenital malformation.
Baby 2 date of neonatal death	Date of neonatal death.
Baby 3 outcome	Liveborn, stillborn or neonatal death.
Baby 3 sex	Male or female.
Baby 3 weight	Weight in grams.

Variable	*Data domain*
Baby 3 abnormality	Describes any known congenital malformation.
Baby 3 date of neonatal death	Date of neonatal death.
Baby 4 outcome	Liveborn, stillborn or neonatal death.
Baby 4 sex	Male or female.
Baby 4 weight	Weight in grams.
Baby 4 abnormality	Describes any known congenital malformation.
Baby 4 date of neonatal death	Date of neonatal death.
Admitted with ART morbidity	Yes–woman is admitted to hospital with any condition (excluding any pregnancy-related issues, such as ectopic pregnancy) that could be in any way related to fertility treatment.
OHSS	Yes–admission to hospital is due to symptoms of OHSS.
Morbidity detail	Describes symptoms of treatment-related morbidity.
Postcode	Postcode of patient residential area.
Comments	Any comments on this cycle.

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 5 or 6 days after fertilisation.

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

Cleavage stage embryo: an embryo comprising about 8 cells usually developed by 2 or 3 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 2,500 grams.

OHSS (ovarian hyperstimulation syndrome): the complication of ovulation stimulation therapy, which involves the administration of follicle stimulating hormone (FSH). OHSS symptoms include abdominal pain and fluid retention.

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.

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List of tables

Supplementary tables

The supplementary tables are available on the internet at <www.aihw.gov.au/publications>.

List of figures

In 2010, there were 61,774 assisted reproductive technology (ART) treatment cycles performed in Australia and New Zealand. Of these, 23.9% resulted in a clinical pregnancy and 18.1% in a live delivery (the birth of at least one liveborn baby). There were 12,056 liveborn babies following ART treatments in 2010.