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Assisted reproductive technology in Australia and New Zealand 2014

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The Fertility Society of Australia

Assisted reproductive technology in Australia and New Zealand 2014

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The National Perinatal Epidemiology and Statistics Unit (NPESU) aims to provide national information and statistics in reproductive and perinatal health.

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Abbreviations

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

Symbols

–	not applicable
%	percentage
n	number

Summary

Use of assisted reproductive technology treatment

Assisted reproductive technology (ART) is a group of procedures that involve the in vitro (outside of body) handling of human oocytes (eggs) and sperm or embryos for the purposes of establishing a pregnancy. Each ART treatment involves a number of stages and is generally referred to as an ART treatment cycle. The embryos transferred to a women can either originate from the cycle in which they were created (fresh cycle) or be frozen and thawed before transfer (thaw cycle).

There were 73,598 ART treatment cycles reported from Australian and New Zealand clinics in 2014 (67,707 and 5,891 respectively) representing a 2.4% increase in Australia and 9.6% increase in New Zealand on 2013. This represented 13.9 cycles per 1,000 women of reproductive age (15–44 years) in Australia, compared with 6.5 cycles per 1,000 women of reproductive age in New Zealand. Women used their own oocytes or embryos (autologous cycles) in 94.6% of treatments. Embryos that had been frozen and thawed where used in 37.4% of autologous cycles.

There were 37,281 women who undertook 69,638 autologous fresh and/or thaw cycles in Australia and New Zealand in 2014. On average, 1.8 fresh and/or thaw cycles per woman were undertaken in 2014, with more cycles per woman in Australia (1.9 cycles per woman) than in New Zealand (1.5 cycles per woman).The number of cycles where embryos were selected using preimplantation genetic diagnosis (PGD) increased from 2,740 in 2013 to 3,448 in 2014 (25.8% increase)

Over the last five years there has been an increasing trend in the proportion of cycles where all oocytes or embryos are cryopreserved for potential future use (*freeze-all* cycles) from 4.1% of initiated fresh cycles in 2010 to 13.0% of initiated fresh cycles in 2014. This practice reduces the risk of ovarian hyperstimulation syndrome (OHSS) in some patients, is often used in conjunction with PGD and fertility preservation, and is a deliberate treatment option used by some clinicians.

Patient's age

The average age of women undergoing autologous cycles was 35.8 years in 2014, similar to previous years. The average age of women undergoing ART treatment using donor oocytes or embryos was approximately five years older at 40.4 years. Approximately, one in four (25.5%) women who underwent an autologous cycle in 2014 was aged 40 or older. The average age of the male partner of the women undergoing autologous and recipient cycles was 38.2 years, with one-third (34.8%) aged 40 or older.

Treatment outcomes and number of babies

Of the 73,598 initiated cycles, 23.7% (17,427) resulted in a clinical pregnancy and 18.2% (13,373) in a live delivery. The overall clinical pregnancy rate for cycles reaching embryo transfer was 31.6%. The live delivery rate per initiated autologous fresh cycle was 15.3%, and 17.7% after *freeze-all* cycles were excluded. The live delivery rate for fresh cycles reaching embryo transfer was 23.5%. The live delivery rate per initiated thaw cycle was 23.6% and for thaw cycles reaching embryo transfer cycle was 25.2%.

There was a higher live delivery rate in younger women. For women aged under 30, the live delivery rate per embryo transfer was 38.7% for autologous fresh cycles and 29.5 % for autologous thaw cycles. For women aged over 44, the live delivery rate was 1.2% and 7.9% per embryo transfer for autologous fresh and thaw cycles.

There were 14,238 babies born (including 14,016 liveborn babies) following ART treatment in 2014. Of these, 12,875 (90.4%) were from Australian clinics and 1,363 (9.6%) from New Zealand clinics. Over three-quarters of the liveborn babies (78.1%) were full-term singletons of normal birthweight.

Cycle-specific success rates

ANZARD includes data items that make it possible to follow a woman's consecutive ART treatment cycles. A cohort of 15,055 women were followed from the start of their first autologous non *freeze-all* fresh cycle during 2012, through subsequent fresh and thaw cycles until December 2014 or until they achieved a live delivery. The cycle-specific live delivery rate per initiated cycle for all women was 22.8% in their first cycle, and around 9.0% after eight cycles. For women aged 30-34 the cycle-specific live delivery rate was 30.0% in the first cycle and around 23% in the following six cycles. Of women who did not achieve a live birth in a specific cycle, approximately one in four did not return for further ART treatment.

Trends in ART procedures

Treatment trends in the last five years have shown a shift from cleavage stage transfers to blastocyst transfers from 52.1% in 2010 to 67.5% in 2014; an increase in vitrification as a cryopreservation method from 62.6% of thaw blastocyst transfer cycles in 2010 to 85.6% in 2014. The use intracytoplasmic sperm injection (ICSI) has remained stable at around 63.0% of embryo transfer cycles in 2010-2014.

The proportion of embryo transfer cycles transferring a cryopreserved embryo increased from 41.0% of embryo transfer cycles in 2010 to 47.1% in 2014.

In the last five years the live delivery rate per fresh embryo transfer cycle remained stable around 23.0%, while the live delivery rate per frozen/thaw embryo transfer cycle increased from 20.0% to 24.9%. Overall the live birth rate per initiated cycle has increased by almost 10% from 18.1% in 2011 to 19.8% for 2014.

Multiple birth trends

A continuing trend in ART treatment in Australia and New Zealand has been the reduction in the rate of multiple deliveries, with a 38% decrease from 7.9% in 2010 to 4.9% in 2014. This was achieved by clinicians and patients shifting to single embryo transfer, with the proportion increasing from 69.6% in 2010 to 82.9% in 2014. Importantly, this decrease in the multiple delivery rate was achieved while overall live delivery rates per embryo transfer increased from 22.1% in 2010 to 24.3% in 2014.

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1 Introduction

Infertility affects approximately 15% of women of reproductive age at any given time, representing, the source of much personal suffering to millions around the world (World Health Organization 2010). The common medical definition of 'infertility' is 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 6 million children worldwide (ICMART2015).The most recent national estimates indicate that 4.4% of all women who gave birth in Australia in 2013 received some form of ART treatment (AIHW, 2015).

The purpose of this annual report is to inform clinicians, researchers, government and the community about ART treatment and the resulting pregnancy and birth outcomes; to provide ongoing 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), is committed to providing informative annual statistics on ART treatments and is pleased to present the 2014 annual report on the use of ART in Australia and New Zealand.

Treatments covered in this report

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

1. controlled ovarian stimulation during which an ovarian stimulation regimen, typically using follicle stimulating hormone (FSH), is administered to a woman over a number of days to induce the maturation of multiple oocytes
2. oocyte pick-up (OPU) where mature oocytes are aspirated from ovarian follicles
3. fertilisation of the collected oocytes using the woman's partner or donor sperm
4. embryo maturation during which a fertilised oocyte is cultured for 2–3 days to form a cleavage stage 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 to achieve pregnancy.

Treatment may be discontinued at any stage during a treatment cycle due to a number 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.

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

- intracytoplasmic sperm injection (ICSI), when a single sperm is injected directly into the oocyte
- assisted hatching, when the outer layer of the embryo, the zona pellucida, is either thinned or perforated in the laboratory to aid 'hatching' of the embryo

- gamete intrafallopian transfer (GIFT), when mature oocytes and sperm are placed directly into a woman's fallopian tubes so that fertilisation may take place in vivo (inside the body). While once popular, this procedure now accounts for only 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
- oocyte donation, when a woman donates her oocytes to others
- oocyte/embryo recipient, when a woman receives oocytes or embryos from another woman
- cryopreservation and storage of embryos that are not transferred in the initial fresh treatment cycle. Once thawed or warmed, the embryos can be transferred in subsequent treatment cycles. Cryopreservation techniques include both the traditional slow freezing method and a newer technique called 'vitrification'. Vitrification can be used to cryopreserve gametes and embryos, and uses an ultra-rapid temperature change with exposure to higher concentrations of cryoprotectants
- cryopreservation and storage of oocytes and embryos for fertility preservation
- *freeze-all* cycles are fresh ART treatment cycles where all oocytes or embryos are cryopreserved for potential future use.
- surrogacy arrangements, where a woman, known as the 'gestational carrier', agrees to carry a child for another person or couple, known as the 'intended parent(s)', with the intention that the child will be raised by the intended parent(s).

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

Data used in this report

This report provides information on ART and DI treatments and the resulting pregnancy and birth outcomes. Also included is an analysis of trends in ART treatments and outcomes in the five years from 2010 to 2014. Reporting of ART treatment cycles in Australia is a requirement for ART clinics to be licenced by the Reproductive Technology Accreditation Committee (RTAC). All ART clinics in Australia and New Zealand provided data to ANZARD for cycles performed in 2014.

As a joint initiative of the NPESU at UNSW and FSA, the 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, and duration of 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 2014 annual report presents cycle-specific success rates for women who started their first autologous (non *freeze-all*) fresh cycle during 2012. These women were followed from their first fresh cycle through subsequent fresh and thaw cycles (excluding *freeze-all* cycles) until 31 December 2014, or

until they achieved a live delivery (a delivery of at least one liveborn baby) up to and including 31 October 2015.

The 2014 data presented in this report were supplied by all 40 fertility centres (83 fertility clinics in Australia and 8 fertility clinics in New Zealand), and compiled into ANZARD2.0.

Structure of this report

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

Chapter 2—'Overview of ART treatment in 2014', 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 2014', presents data on the number of cycles, cycle types, and the outcomes of treatment in terms of discontinued treatment, clinical pregnancies and deliveries.

Chapter 4—'Pregnancy and birth outcomes following autologous and recipient embryo transfer cycles in 2014', presents data on the outcomes of clinical pregnancies and deliveries following autologous and recipient cycles including a description of perinatal outcomes.

Chapter 5—'Other cycle types, procedures and treatment complications in 2014', includes information on cycles, procedures and complications that do not fit into the chapters already described.

Chapter 6—'Donor sperm insemination cycles in 2014', presents data on DI cycles and their outcomes, including a description of pregnancy and perinatal outcomes.

Chapter 7—'Trends in ART treatment and outcomes: 2010–2014', presents trends in ART treatments during the last five years of data collection in Australia and New Zealand.

Chapter 8—'Women undertaking autologous treatment in 2014', presents information on the number of women undergoing ART treatment in 2014.

Chapter 9—'Cycle-specific rates for women who started their first ART treatment cycle in 2012', presents information for a cohort of women who started their first autologous (non-*freeze-all*) fresh ART treatment cycle during 2012, and were followed through subsequent fresh and thaw cycles (excluding *freeze-all* cycles) until 31 December 2014 or until they achieved a live delivery.

Appendices—Appendix A lists the contributing fertility clinics. Appendix B provides an overview of the ANZARD 2.0 data collection that was used to prepare this report. Appendix C provides a detailed list of the data items in the collection.

2 Overview of ART treatment in 2014

There were 73,598 ART treatment cycles reported from Australian and New Zealand clinics in 2014 (Table 1). Of these, 92.0% (67,707) were from Australian clinics and 8.0% (5,891) were from New Zealand clinics. The overall number of ART treatment cycles in 2014 increased by 2.9% from the 71,516 cycles in 2013, with a 2.4% increase in Australia and 9.6% increase in New Zealand. In 2014, the number of ART treatment cycles represented 13.9 cycles per 1,000 women of reproductive age (15–44 years) in Australia, compared with 6.5 cycles per 1,000 women of reproductive age in New Zealand (Australian Bureau of Statistics 2015; Statistics New Zealand 2015).

Nearly 95% of cycles in 2014 were autologous cycles (where a woman intended to use, or used her own oocytes or embryos). Of the 69,638 autologous cycles, 43,579 (62.6%) were fresh cycles and 26,059 (37.4%) were thaw cycles. Other treatment cycles accounted for small proportions: 3.1% were oocyte recipient cycles, 0.6% were embryo recipient cycles, 1.4% were oocyte donation cycles and 0.3% were surrogacy arrangement cycles (Table 1).

Of all initiated ART treatments in 2014, 23.7% (17,427) resulted in a clinical pregnancy and 18.2% (13,373) in a live delivery (Table 1). Of these clinical pregnancies, 15,772 (90.5%) were from Australian clinics and 1,655 (9.5%) from New Zealand clinics. There were 14,238 babies born, (including 14,016 liveborn babies) following ART treatment in 2014. Of these, 12,875 (90.4%) were from Australian clinics and 1,363 (9.6%) from New Zealand clinics. Of the liveborn babies, 78.1% (10,945) were singletons at term (gestational age of 37–41 weeks) with normal birthweight (≥ 2,500 grams).The multiple delivery rate was 4.9%.

Table 1: Number of initiated ART treatment cycles by treatment type, Australia and New Zealand, 2014

	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	69,638	94.6	16,666	12,808	13,423	10,510
Fresh	*43,579*	*59.2*	*8,619*	*6,671*	*6,998*	*5,425*
Thaw	*26,059*	*35.4*	*8,047*	*6,137*	*6,425*	*5,085*
Oocyte recipient	2,263	3.1	620	461	486	353
Embryo recipient	421	0.6	94	68	71	52
Oocyte donation	1,058	1.4	0	0	0	0
GIFT[(a)]	6	0.0	0	0	0	0
Surrogacy arrangement cycles	212	0.3	47	36	36	30
Commissioning cycles[(b)]	*55*	*0.1*	*0*	*0*	*0*	*0*
Gestational carrier cycles[(c)]	*157*	*0.2*	*47*	*36*	*36*	*30*
Total	**73,598**	**100.0**	**17,427**	**13,373**	**14,016**	**10,945**

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

(b) A variety of cycle types undertaken as part of surrogacy arrangements, e.g. cycles undertaken by intended parents or women donating their oocytes or embryos for use by the gestational carrier.

(c) A cycle undertaken by a 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 2014

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 or embryos.

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 36.0 years. For women undergoing oocyte/embryo recipient cycles, the mean age was 40.4 years, nearly five years older than for autologous cycles (35.8 years). Of all autologous and oocyte/embryo recipient cycles, 26.9% were undertaken by women aged 40 or older (Table 2). The average age of male partners was 38.2 years, with 34.8% aged 40 or older. For 17.9% of oocyte/embryo recipient 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, 2014

Age group (years)[(a)]	Autologous				Oocyte /embryo recipient		All	
	Fresh		Thaw					
	n	%	n	%	n	%	n	%
< 30	4,569	10.5	2,997	11.5	132	4.9	7,698	10.6
30–34	11,449	26.3	8,305	31.9	306	11.4	20,060	27.7
35–39	14,931	34.3	9,628	36.9	566	21.1	25,125	34.7
40–44	11,605	26.6	4,811	18.5	1,014	37.8	17,430	24.1
≥ 45	1,025	2.4	318	1.2	666	24.8	2,009	2.8
Total	**43,579**	**100.0**	**26,059**	**100.0**	**2,684**	**100.0**	**72,322**	**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 male partners' age group and treatment type, Australia and New Zealand, 2014

Age group (years)[(a)]	Autologous				Oocyte/embryo recipient		All	
	Fresh		Thaw					
	n	%	n	%	n	%	n	%
< 30	2,709	6.2	1,592	6.1	75	2.8	4,376	6.1
30–34	9,203	21.1	6,263	24	291	10.8	15,757	21.8
35–39	12,114	27.8	8,151	31.3	560	20.9	20,825	28.8
40–44	9,471	21.7	5,397	20.7	646	24.1	15,514	21.5
≥ 45	5,981	13.7	3,033	11.6	632	23.5	9,646	13.3
Not stated	4,101	9.4	1,623	6.2	480	17.9	6,204	8.6
Total	**43,579**	**100.0**	**26,059**	**100.0**	**2,684**	**100.0**	**72,322**	**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 72,322 initiated autologous and recipient cycles undertaken in 2014, 65.1% were undertaken by nulliparous women. Of autologous cycles (fresh and thaw), 64.9% were undertaken by nulliparous women, compared with 68.7% for oocyte/embryo recipient cycles (Table 4).

Table 4: Number of autologous and recipient cycles by parity and treatment type, Australia and New Zealand, 2014

	Autologous				Oocyte/embryo recipient		All	
	Fresh		Thaw					
Parity	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Nulliparous	30,663	70.4	14,561	55.9	1,845	68.7	47,069	65.1
Parous	9,529	21.9	9,104	34.9	659	24.6	19,292	26.7
Not stated	3,387	7.8	2,394	9.2	180	6.7	5,961	8.2
Total	**43,579**	**100.0**	**26,059**	**100.0**	**2,684**	**100.0**	**72,322**	**100.0**

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

Cause of infertility

Causes of infertility may 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 and should be interpreted with caution.

Of the 72,322 initiated autologous and recipient cycles, 19.7% reported male infertility factors as the only cause of infertility; 30.8% reported only female infertility factors; 12.5% reported combined male–female factors; 22.3% reported unexplained infertility; and 14.7% were not stated.

Intracytoplasmic sperm injection procedures

Of the 37,642 autologous fresh cycles where fertilisation was attempted, 67.9% used ICSI procedures and 32.1% used IVF procedures. Of fresh oocyte recipient cycles where fertilisation was attempted, 82.1% used ICSI procedures and 17.9% 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, 2014

	Autologous				Oocyte/embryo recipient			
	Fresh[(a)]		Thaw[(b)]		Fresh[(a)]		Thaw[(b)]	
Procedure	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
IVF	12,090	32.1	9,671	39.6	190	17.9	437	29.7
ICSI[(c)]	25,552	67.9	14,721	60.3	874	82.1	1,032	70.1
Not stated	0	0.0	3	0.0	0	0.0	4	0.3
Total	**37,642**	**100.0**	**24,395**	**100.0**	**1,064**	**100.0**	**1,473**	**100.0**

(a) Fresh cycles where fertilisation was attempted.

(b) Thaw cycles where embryos were transferred.

(c) Includes 870 Mixed IVF/ICSI cycles.

Number of embryos transferred

Of the 54,970 fresh and thawed embryo transfer cycles undertaken in autologous and recipient cycles, 82.9% were single embryo transfer (SET) cycles and 16.6% were double embryo transfer (DET). In women aged under 35, 90.1% of embryo transfer cycles were SET cycles and 9.8% were DET cycles. In women aged 35 or older, 78.0% of cycles were SET cycles and 21.2% were DET cycles (Table 6).

Table 6: Number of fresh and thawed embryos transferred per cycle and women's age group, Australia and New Zealand, 2014

	Number of embryos transferred							
	One		Two		Three or more		Total	
Age group (years)[(a)]	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
< 30	5,486	91.7	493	8.2	1	0.0	5,980	100.0
30–34	14,401	89.5	1,680	10.4	9	0.1	16,090	100.0
35–39	16,082	82.9	3,301	17.0	20	0.1	19,403	100.0
40–44	8,608	70.8	3,336	27.5	209	1.7	12,153	100.0
≥ 45	980	72.9	330	24.6	34	2.5	1,344	100.0
All	**45,557**	**82.9**	**9,140**	**16.6**	**273**	**0.5**	**54,970**	**100.0**

(a) Age at start of a treatment cycle.

Stage of embryo development

Of the 54,970 embryo transfer cycles, 67.4% involved the transfer of day 5–6 embryos (blastocysts) and 32.5% day 2–3 embryos (cleavage stage embryos). Of autologous cycles, blastocyst transfers made up 79.4% of thaw cycles compared with 57.5% of fresh cycles (Table 7).

Table 7: Number of embryo transfer cycles by treatment type and stage of embryo development, Australia and New Zealand, 2014

Type and procedure	Autologous				Oocyte/embryo recipient			
	Fresh		Thaw		Fresh		Thaw	
	n	%	n	%	n	%	n	%
Cleavage stage	12,055	42.5	5,031	20.6	249	32.4	532	36.1
Blastocyst[(a)]	16,278	57.5	19,364	79.4	520	67.6	941	63.9
Total	**28,333**	**100.0**	**24,395**	**100.0**	**769**	**100.0**	**1,473**	**100.0**

(a) Includes 26 cycles where both blastocyst and cleavage stage embryos and were transferred.

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 25,868 frozen/thawed embryo transfer cycles, 72.1% involved the transfer of vitrified embryos. Of the frozen/thawed blastocyst transfer cycles 85.6% had vitrified embryos transferred. By comparison, 24.4% of frozen/thawed cleavage stage embryo transfer cycles used vitrified embryos (Table 8).

Table 8: Number of embryo transfer cycles by cryopreservation method and stage of embryo development, Australia and New Zealand, 2014

Type and procedure	Autologous				Oocyte/embryo recipient			
	Cleavage stage		Blastocyst[(a)]		Cleavage stage		Blastocyst	
	n	%	n	%	n	%	n	%
Slow frozen	3,826	76.0	2,731	14.1	453	85.5	190	20.2
Vitrification[(b)]	1,205	24.4	16,633	85.9	77	14.5	749	79.3
Not stated[(c)]	-	-	-	-	2	0.0	2	0.0
Total	**5,031**	**100.0**	**19,364**	**100.0**	**532**	**100.0**	**941**	**100.0**

(a) Includes 16 cycles where both blastocyst and cleavage stage embryos and were transferred

(b) Includes 228 cycles where both vitrified and slow frozen embryos were transferred.

(c) Embryo recipient cycles where the method of freezing is unknown

3.2 Autologous fresh cycles

In 2014, there were 43,579 initiated autologous fresh cycles, comprising 43,184 (99.1%) FSH-stimulated cycles, 393 (0.9%) unstimulated cycles, plus 2 cycles with unknown stimulation status. There were 197 cycles in which thawed oocytes were used. Of the 43,579 initiated autologous fresh cycles, 92.4% (40,276) were in Australian clinics and 7.6% (3,303) 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.

Freeze-all cycles are fresh ART treatment cycles where all oocytes or embryos are frozen for potential future use. This increasingly common practice (Table 39) reduces the risk of OHSS in some patients, is often used in conjunction with PGD and fertility preservation, and is a deliberate treatment option used by some clinicians.

Of the 43,579 initiated autologous fresh cycles in 2014, 91.1% had OPU performed; 13.7% were *freeze-all* cycles; 65.0% had embryos transferred; 19.8% resulted in a clinical pregnancy; and 15.3% 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.

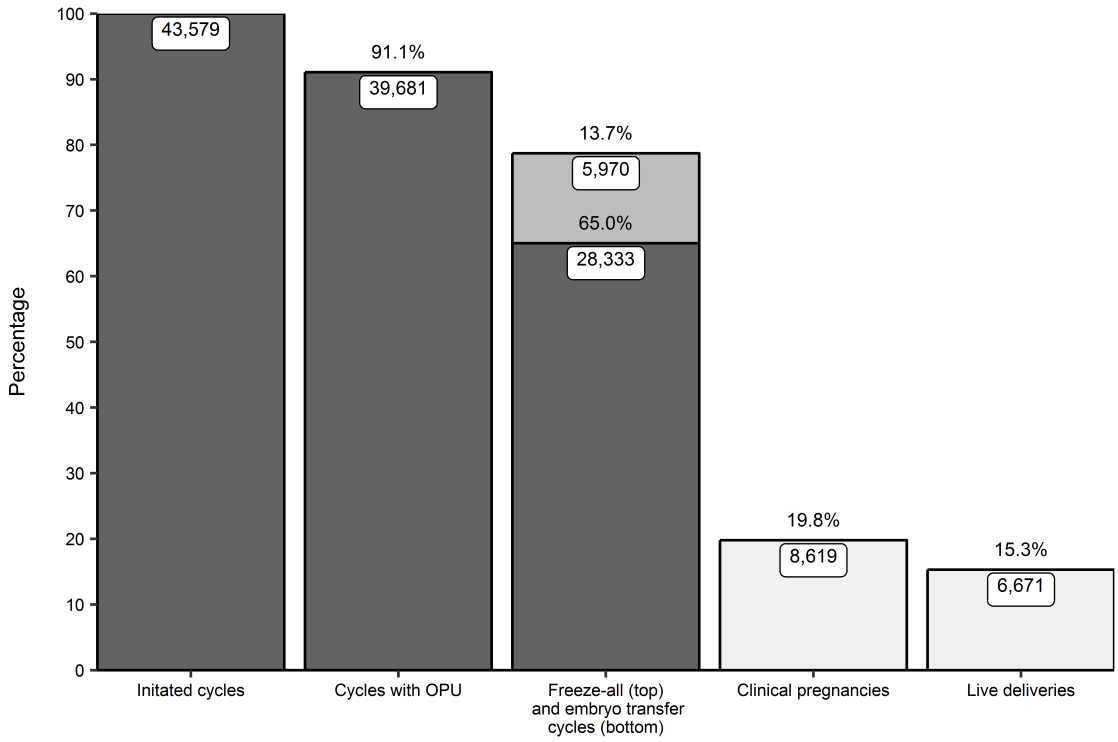

Figure 1: Progression of autologous fresh cycles, Australia and New Zealand, 2014

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 (38.7%). The rate declined with advancing women's age, with a rate of 9.9% for women aged 40–44 and 1.2% for women aged 45 or older (Table 9).

In women aged under 30 years *freeze-all* cycles accounted for 19.1% of initiated fresh cycles with the rate decreasing to 5.5% in women over 45 years. Table 9 presents the live delivery rate per initiated fresh cycle and the live delivery rate per initiated fresh cycle (excluding *freeze-all* cycles).

Table 9: Outcomes of autologous fresh cycles by women's age group, Australia and New Zealand, 2014

	Age group (years)[a]					
Stage/outcome of treatment	**< 30**	**30–34**	**35–39**	**40–44**	**≥ 45**	**All**
Initiated cycles	4,569	11,449	14,931	11,605	1,025	43,579
Cycles with OPU	4,199	10,675	13,744	10,196	867	39,681
Freeze-all cycles[b]	874	1,768	2,062	1,210	56	5,970
Embryo transfer cycles	3,022	7,950	9,908	6,933	520	28,333
Clinical pregnancies	1,361	3,056	3,071	1,110	21	8,619
Live deliveries	1,171	2,521	2,290	683	6	6,671
Live deliveries per initiated cycle (%)	*25.6*	*22.0*	*15.3*	*5.9*	*0.6*	*15.3*
Live deliveries per initiated cycle (excluding freeze-all)[c] (%)	*31.7*	*26.0*	*17.8*	*6.6*	*0.6*	*17.7*
Live deliveries per embryo transfer cycle (%)	*38.7*	*31.7*	*23.1*	*9.9*	*1.2*	*23.5*
Live deliveries per clinical pregnancy (%)	*86.0*	*82.5*	*74.6*	*61.5*	*28.6*	*77.4*

(a) Age at start of a treatment cycle.
(b) *Freeze-all* cycles are fresh ART treatment cycles where all oocytes or embryos are cryopreserved for potential future use.
(c) Live deliveries per initiated cycle (excluding *freeze-all*) were calculated using live deliveries as the numerator and initiated fresh cycles minus *freeze-all* cycles as the denominator

Figure 2 shows age-specific live delivery rates per initiated autologous fresh cycle by two-year age groups. The 95% confidence intervals describe the uncertainty surrounding the point estimates of the live delivery rates as representative of live delivery rates for otherwise similar women of that age-group.

The highest live delivery rates were for women aged between their mid-20s to early-30s. For women aged 45 or older, only one live delivery resulted from every 90 initiated cycles compared with one live delivery from every four initiated cycles in women aged between 25 and 34.

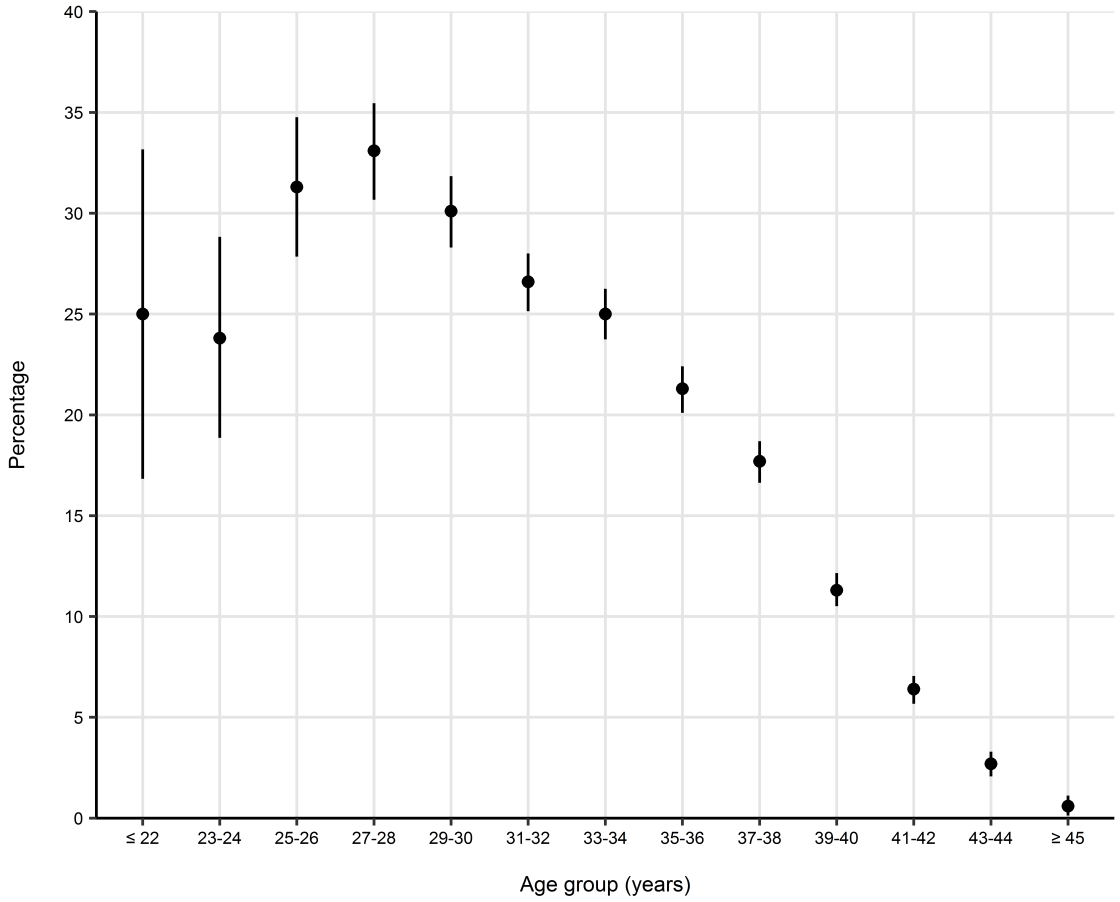

Figure 2: Live delivery rate (with 95% confidence interval) per initiated autologous fresh cycle (excluding *freeze-all*) by women's age at start of a treatment cycle, Australia and New Zealand, 2014

Clinical pregnancies and live deliveries by cause of infertility

Cycles reported with male factor infertility and female tubal disease as the only cause of infertility had the highest live delivery rates (19.8%), followed by cycles reported with female endometriosis as the only cause of infertility (19.4%) (Table 10).

Table 10: Outcomes of autologous fresh cycles by cause of infertility, Australia and New Zealand, 2014

Cause of infertility	Number of initiated cycles	Embryo transfer cycles per initiated cycle (%)	Clinical pregnancies per initiated non-*freeze-all* cycle[(a)] (%)	Live deliveries per initiated non-*freeze-all* cycle[(b)] (%)
Male factor only	8,537	71.1	24.9	19.8
Female factor	13,143	60.5	22.9	17.5
Tubal disease only	*1,602*	*71.7*	*25.3*	*19.8*
Endometriosis only	*1,968*	*70.0*	*25.3*	*19.4*
Other female factor only	*7,964*	*55.5*	*21.5*	*16.2*
Combined female factor	*1,609*	*61.8*	*24.0*	*18.7*
Combined male—female factors	5,565	63.5	23.4	18.3
Unexplained	9,784	65.6	22.0	17.1
Not stated	6,550	66.6	21.3	16.1
All	**43,579**	**65.0**	**22.9**	**17.7**

a) Clinical pregnancies per initiated non-*freeze-all* cycle is calculated using clinical pregnancies as the numerator and initiated cycles minus *freeze-all* cycles as the denominator

b) Live deliveries per initiated non-*freeze-all* cycle is calculated using live deliveries as the numerator and initiated cycles minus *freeze-all* cycles as the denominator

Clinical pregnancies and live deliveries by number of embryos transferred

Overall, 78.4% of autologous fresh embryo transfer cycles were SET cycles, 20.8% were DET cycles and 0.8% had three or more embryos transferred. In women aged under 35, three or more embryos transferred accounted for less than 0.1% of embryo transfer cycles. This increased to 6.0% in women aged 45 or older.

The overall live delivery rate was 25.0% for SET cycles and 18.7% for DET cycles (Table 11). Of embryo transfer cycles in women aged under 35 the live delivery rate was higher for SET cycles than DET cycles (34.0% and 30.3% respectively). Of embryo transfer cycles in women aged 35-39 and 40 or older, the live delivery rates were slightly lower for SET (22.9% and 9.2%) cycles than DET (23.9% and 9.5%) cycles. Caution should be taken when comparing live delivery rates following SET and DET cycles because patient characteristics and prognosis are different between these groups.

Table 11: Outcomes of autologous fresh embryo transfer cycles by women's age and number of embryos transferred, Australia and New Zealand, 2014

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	9,829	1,138	7,779	2,115	4,603	2,644	22,211	5,897
Clinical pregnancies	3,983	431	2,383	684	659	440	7,025	1,555
Live deliveries	3,344	345	1,782	505	422	252	5,548	1,102
Clinical pregnancies per embryo transfer cycle (%)	*40.5*	*37.9*	*30.6*	*32.3*	*14.3*	*16.6*	*31.6*	*26.4*
Live deliveries per embryo transfer cycle (%)	*34.0*	*30.3*	*22.9*	*23.9*	*9.2*	*9.5*	*25.0*	*18.7*

(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

Overall, 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 12.1 percentage points higher than for cleavage stage embryo transfer cycles.

Caution should be taken when comparing clinical pregnancy and live delivery rates following cleavage stage embryo and blastocyst transfer. Patient characteristics and prognosis are different between these groups, and generally fewer embryos are available for transfer and cryopreservation when blastocyst culture is used.

Table 12: Outcomes of autologous fresh embryo transfer cycles by women's age and stage of embryo development, Australia and New Zealand, 2014

Stage/outcome of treatment	Age group (years)[a]							
	< 35		35–39		≥ 40		All	
	CL[b]	BL[c]	CL[b]	BL[c d]	CL[b]	BL[c d]	CL[b]	BL[c]
Embryo transfer cycles	3,762	7,210	4,202	5,706	4,091	3,362	12,055	16,278
Clinical pregnancies	1,167	3,250	1,037	2,034	479	652	2,683	5,936
Live deliveries	969	2,723	759	1,531	277	412	2,005	4,666
Clinical pregnancies per embryo transfer cycle (%)	*31.0*	*45.1*	*24.7*	*35.6*	*11.7*	*19.4*	*22.3*	*36.5*
Live deliveries per embryo transfer cycle (%)	*25.8*	*37.8*	*18.1*	*26.8*	*6.8*	*12.3*	*16.6*	*28.7*

(a) Age at start of a treatment cycle.

(b) CL: cleavage stage embryo.

(c) BL: blastocyst.

(d) Includes 5 cycles where both cleavage stage embryos and blastocysts were transferred

Live deliveries from autologous fresh cycles among fertility centres

The live delivery rate per initiated non *freeze-all* autologous fresh cycle varied among fertility centres in 2014. This variation is measured using percentiles that rank a centre's live delivery rate per initiated non *freeze-all* autologous fresh cycle within the top and bottom middle 50% of centres. For example, the 25% of centres with the highest live birth rates have a live birth rate between the 75th and 100th percentile. The 100th percentile is the highest live delivery rate recorded for a centre and the 0th percentile is the lowest live delivery rate recorded for a centre.

For a centre to be included in the following analysis at least 50 autologous fresh cycles needed to be performed in 2014 and more than 95% of pregnancy outcomes had to be recorded. Of the 40 fertility centres, 4 were excluded because they performed less than 50 cycles. There were no clinics where excluded due to missing pregnancy outcomes.

The live delivery rate per initiated non *freeze-all* autologous fresh cycle ranged from 9.5% to 24.8% among fertility centres. The middle 50% of fertility centres (between the 25th and 75th percentiles) had live delivery rates between 15.1% and 20.7%. The highest 25% of centres (between the 75th and 100th percentiles) had live delivery rates between 20.7% and 24.8% (Table 13).

These data should be interpreted with caution because of the small number of patients who underwent autologous fresh cycles in some centres. There are also differences in the characteristics and prognosis of patients treated, coupled with different approaches to the use of ARTs and other fertility treatments among centres, which may influence the live delivery rate of an individual centre.

Table 13: Live deliveries per initiated autologous fresh cycle[(a)] (%) by women's age group among fertility centres, Australia and New Zealand, 2014

	Percentile					Overall
Age group (years)[(b)]	**0th [(c)]**	**25th**	**50th**	**75th**	**100th [(d)]**	
< 35	12.5	23.0	25.8	30.7	36.4	27.6
35–39	6.7	15.5	17.3	20.9	27.6	17.8
≥ 40	1.5	4.5	5.6	7.8	12.5	6.1
All	**9.5**	**15.1**	**17.6**	**20.7**	**24.8**	**17.7**

(a) Live delivery rates are calculated using live deliveries as the numerator and initiated cycles minus *freeze-all* cycles as the denominator.
(b) Age at start of a treatment cycle.
(c) The 0th percentile is the minimum live delivery rate per cycle recorded by a centre
(d) The 100th percentile is the maximum live delivery rate per cycle recorded by a centre

There was also variation among the 36 fertility centres, that performed at least 50 autologous fresh cycles, 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 per autologous fresh embryo transfer cycle and interquartile range by number of embryos transferred and stage of embryo development. For example, 50% of the clinics that performed single blastocyst transfers achieved a live delivery rate between 27.4% and 33.2%.

These data should be interpreted with caution because of the small number of patients who underwent autologous fresh cleavage stage 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, parity, cause of infertility and embryo quality may influence whether one or two embryos are transferred, and whether embryos are transferred at the cleavage or blastocyst stage.

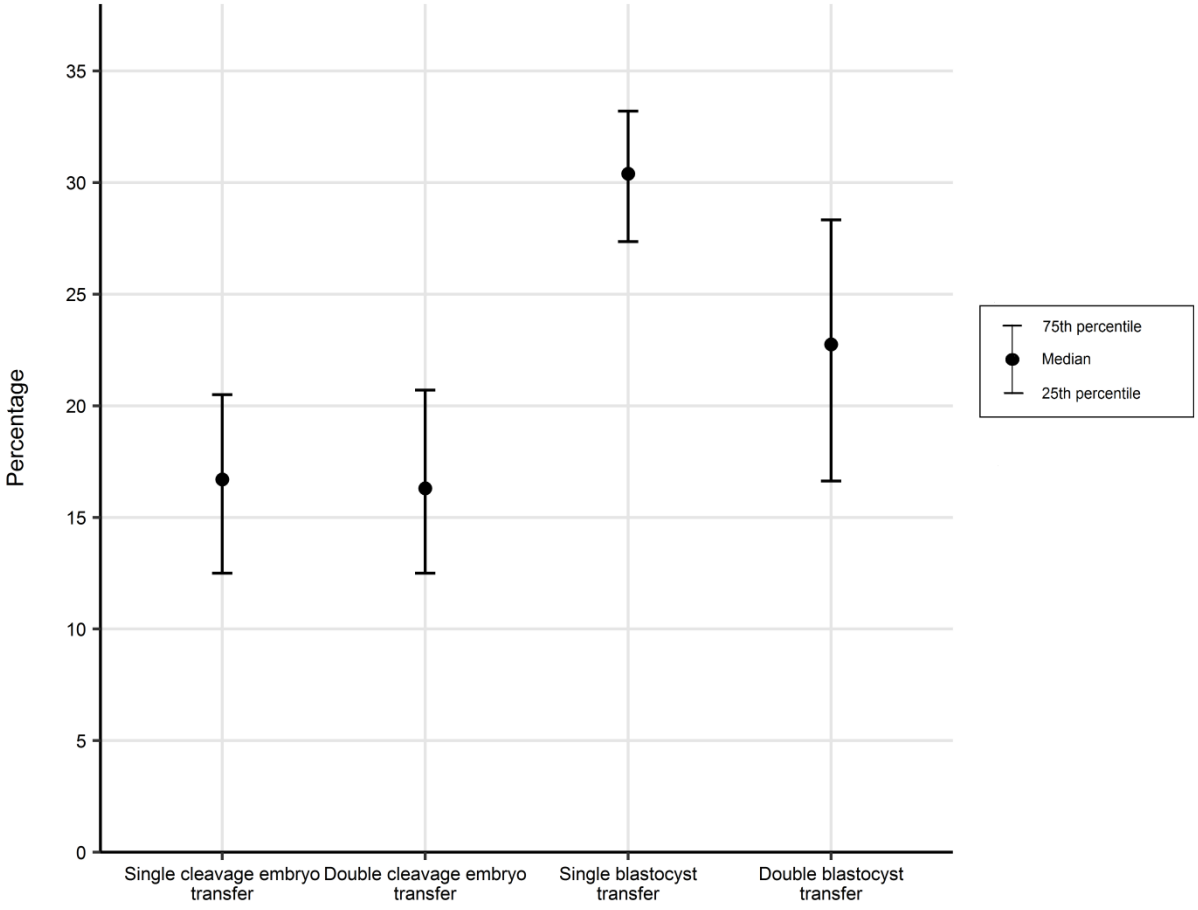

Figure 3: Live delivery rate per autologous fresh embryo transfer cycles by number of embryos transferred and stage of embryo development among fertility centres, Australia and New Zealand, 2014

3.3 Autologous thaw cycles

There were 26,059 autologous thaw cycles reported in 2014 (Figure 4). Of these, 91.6% (23,880) were in Australian clinics and 8.4% (2,179) 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 26,059 initiated autologous thaw cycles, 93.6% had embryos transferred, 30.9% resulted in a clinical pregnancy and 23.6% resulted in a live delivery (Figure 4). Almost 1 in 15 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 higher for autologous thaw cycles than for autologous fresh cycles in 2014 (23.6% and 15.3% respectively) (Figure 1 and Figure 4). Thawed embryos originate from a previous fresh cycle and therefore the age of a thaw embryo is younger than the chronological age of a woman at the time of transfer.

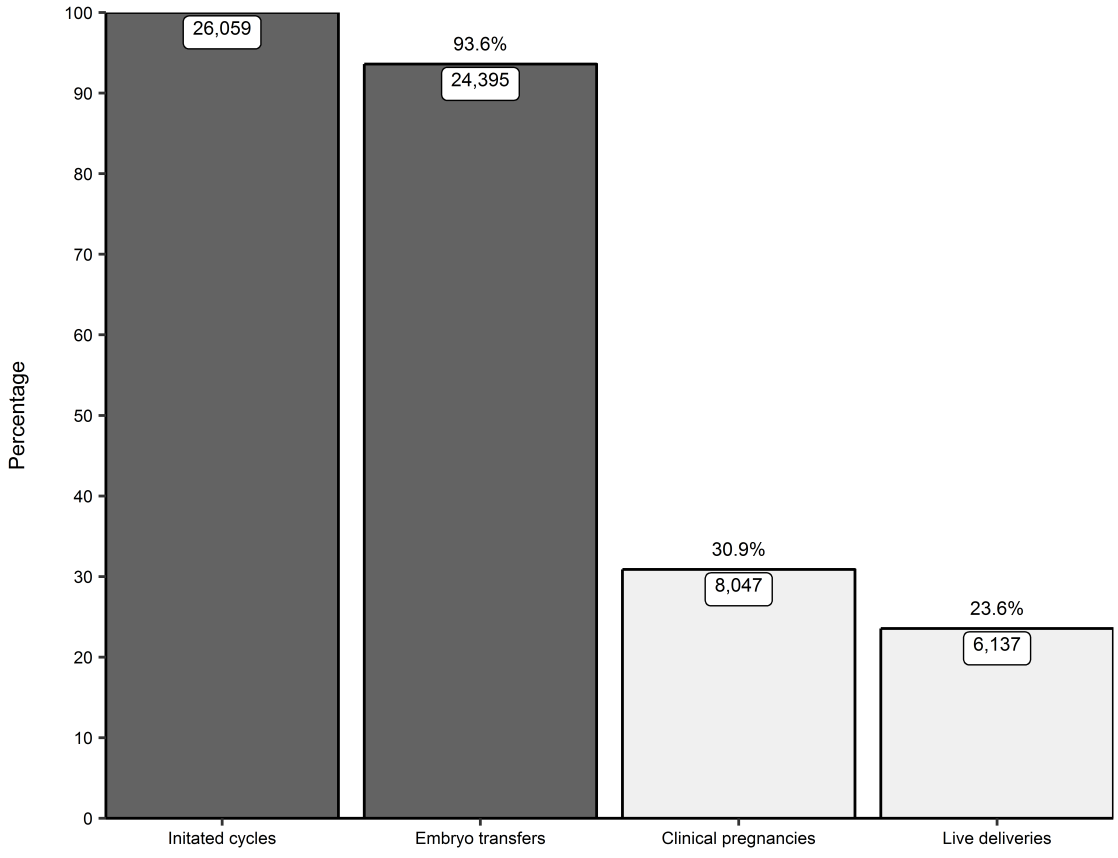

Figure 4: Progression of autologous thaw cycles, Australia and New Zealand, 2014

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 (Table 14). It is important to note that embryos thawed during a thaw cycle were created in 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, 2014

	Age group (years)[(a)]					
Stage/outcome of treatment	**< 30**	**30–34**	**35–39**	**40–44**	**≥ 45**	**All**
Initiated cycles	2,997	8,305	9,628	4,811	318	26,059
Embryo transfer cycles	2,853	7,883	9,021	4,373	265	24,395
Clinical pregnancies	1,053	2,971	2,978	1,013	32	8,047
Live deliveries	843	2,372	2,238	663	21	6,137
Live deliveries per initiated cycle (%)	*28.1*	*28.6*	*23.2*	*13.8*	*6.6*	*23.6*
Live deliveries per embryo transfer cycle (%)	*29.5*	*30.1*	*24.8*	*15.2*	*7.9*	*25.2*
Live deliveries per clinical pregnancy (%)	*80.1*	*79.8*	*75.2*	*65.4*	*65.6*	*76.3*

(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 95% confidence intervals describe the uncertainty surrounding the point estimates of the live delivery rates as representative of live delivery rates for otherwise similar women of that age-group.

The highest live delivery rates were for women in their mid-20s to mid-30s. The wider 95% confidence intervals for women in age groups under 30 years suggests greater variability in the point estimates of the delivery rates for these women as being representative of all women of similar age and characteristics. For women aged 45 or older, 6.6% 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 (0.6%) (Figures 2 and 5). As embryos thawed during a thaw cycle were created in an earlier initiated fresh cycle, a woman's age at the start of a thaw cycle is older than her age at the start of the initiated fresh cycle.

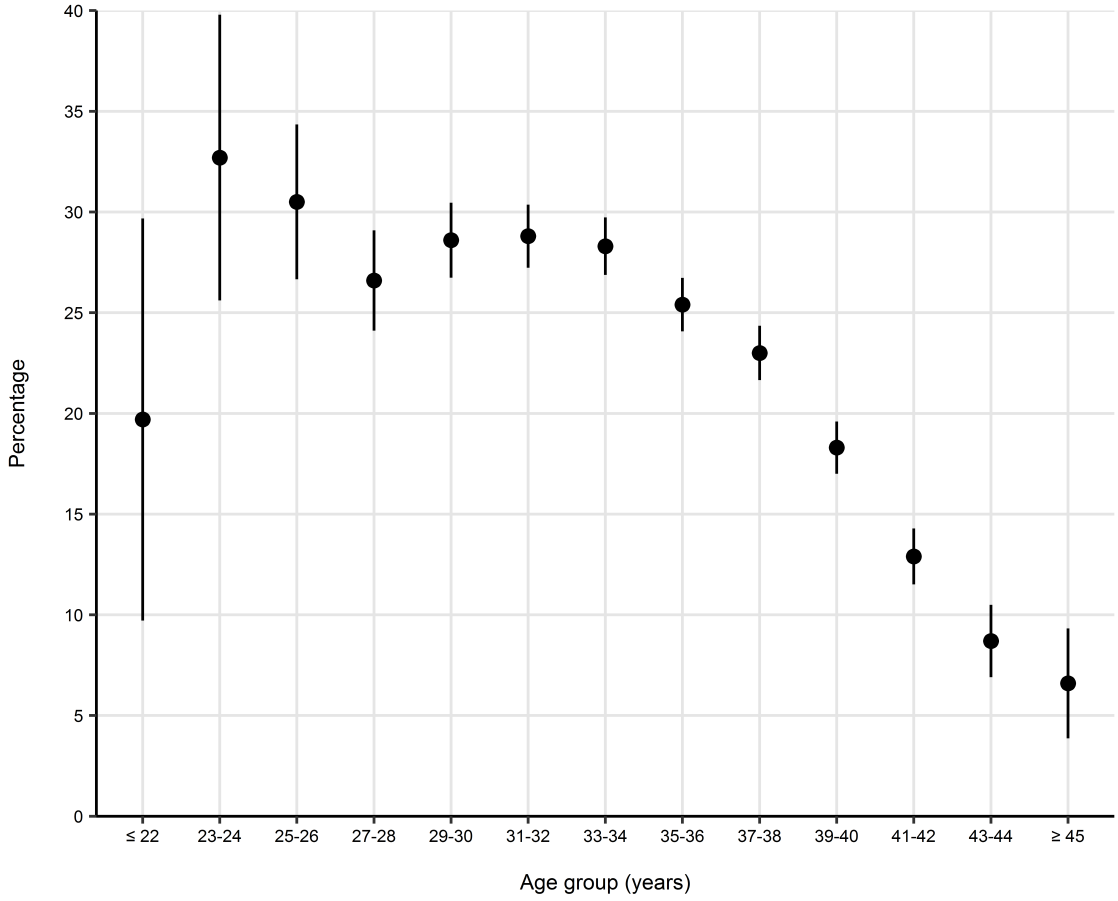

Figure 5: Live delivery rate (with 95% confidence intervals) per initiated autologous thaw cycle by women's age at start of a treatment cycle, Australia and New Zealand, 2014

Clinical pregnancies and live deliveries by cause of infertility

Cycles reported with male factor as the only cause of infertility had a higher rate of live delivery per initiated thaw cycle (25.4%) than those with female factor-only infertility (24.0%) (Table 15).

Table 15: Outcomes of autologous thaw cycles by cause of infertility, Australia and New Zealand, 2014

Cause of infertility	Number of initiated cycles	Embryo transfer cycles per initiated cycle (%)	Clinical pregnancies per initiated cycle (%)	Live deliveries per initiated cycle (%)
Male factor only	5,423	95.1	32.5	25.4
Female factor	7,863	93.9	31.6	24.0
Tubal disease only	*1,168*	*94.5*	*29.6*	*21.7*
Endometriosis only	*1,250*	*95.4*	*31.6*	*24.0*
Other female factor only	*4,499*	*93.2*	*32.2*	*24.9*
Combined female factor	*946*	*94.3*	*30.8*	*22.7*
Combined male–female factors	*3,166*	*94.9*	*33.0*	*25.3*
Unexplained	5,955	93.3	30.1	22.9
Not stated	3,649	90.4	26.5	19.4
All	**26,059**	**93.6**	**30.9**	**23.6**

Clinical pregnancies and live deliveries by number of embryos transferred

Of the 24,395 autologous embryo transfer cycles, 87.9% were SET cycles, 11.9% were DET cycles and 0.2% transferred three or more embryos. No women under 30 received transfers of three or more embryos. In women aged between 30 and 40, three or more frozen/thawed embryos were transferred in less than 0.1% of embryo transfer cycles, compared with 1.0% in women aged 40 or older. Overall SET resulted in an increase in live deliveries per embryo transfer cycle of 2 percentage points more than DET (Table 16). Caution should be taken when comparing live delivery rates following SET and DET cycles because patient characteristics and prognosis are different between these groups.

Table 16: Outcomes of autologous thaw embryo transfer cycles by women's age and number of embryos transferred, Australia and New Zealand, 2014

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	9,734	999	7,929	1,087	3,791	812	21,454	2,898
Clinical pregnancies	3,638	385	2,612	362	854	185	7,104	932
Live deliveries	2,907	307	1,978	257	565	114	5,450	678
Clinical pregnancies per embryo transfer cycle (%)	*37.4*	*38.5*	*32.9*	*33.3*	*22.5*	*22.8*	*33.1*	*32.2*
Live deliveries per embryo transfer cycle (%)	*29.9*	*30.7*	*24.9*	*23.6*	*14.9*	*14.0*	*25.4*	*23.4*

(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

The rates of clinical pregnancy and live delivery were higher for blastocyst transfer cycles than for cleavage stage embryo transfer cycles, regardless of a woman's age. Overall, the rate of live delivery for blastocyst transfer cycles was 14.2 percentage points higher than for cleavage stage embryo transfer cycles (Table 17).

Caution should be taken when comparing clinical pregnancy and live delivery rates following cleavage stage embryo and blastocyst transfer. Patient characteristics and prognosis are different between these groups, and generally fewer embryos are available for transfer and cryopreservation when blastocyst culture is used.

Table 17: Outcomes of autologous thaw embryo transfer cycles by women's age and stage of embryo development, Australia and New Zealand, 2014

Stage/outcome of treatment	Age group (years)[a]							
	< 35		35–39		≥ 40		All	
	CL[b]	BL[c,d]	CL[b]	BL[c,e]	CL[b]	BL[c,e]	CL[b]	BL[c]
Embryo transfer cycles	1,862	8,874	1,817	7,204	1,352	3,286	5,031	19,364
Clinical pregnancies	436	3,588	359	2,619	166	879	961	7,086
Live deliveries	337	2,878	264	1,974	99	585	700	5,437
Clinical pregnancies per embryo transfer cycle (%)	*23.4*	*40.4*	*19.8*	*36.4*	*12.3*	*26.8*	*19.1*	*36.6*
Live deliveries per embryo transfer cycle (%)	*18.1*	*32.4*	*14.5*	*27.4*	*7.3*	*17.8*	*13.9*	*28.1*

(a) Age at start of a treatment cycle.
(b) CL: cleavage stage embryo.
(c) BL: blastocyst.
(d) Includes 4 cycles where both blastocyst and cleavage stage embryos were transferred
(e) Includes 6 cycles where both blastocyst and cleavage stage embryos were transferred

Clinical pregnancies and live deliveries by embryo freezing methods

Of the autologous thaw cycles where a blastocyst was transferred, 85.9% used vitrified embryos compared with 24.0% of cycles where a cleavage stage embryo was transferred. The rates of clinical pregnancy and live delivery were higher for the transfer of vitrified (cleavage stage and blastocyst) embryos than for slow frozen (cleavage stage and blastocyst) embryos (Table 18).

Table 18: Outcomes of autologous thaw embryo transfer cycles by stage of embryo development and embryo freezing methods, Australia and New Zealand, 2014

	Stage of embryo development					
	Cleavage stage		Blastocyst[a]		All	
Stage/outcome of treatment	Slow freezing	Vitrification[b]	Slow freezing	Vitrification[c]	Slow freezing	Vitrification[d]
Embryo transfer cycles	3,826	1,205	2,731	16,633	6,557	17,838
Clinical pregnancies	717	244	860	6,226	1,577	6,470
Live deliveries	509	191	647	4,790	1,156	4,981
Clinical pregnancies per embryo transfer cycle (%)	*18.7*	*20.2*	*31.5*	*37.4*	*24.1*	*36.3*
Live deliveries per embryo transfer cycle (%)	*13.3*	*15.9*	*23.7*	*28.8*	*17.6*	*27.9*

(a) Includes 16 cycles where both blastocyst and cleavage stage embryos were transferred
(b) Includes 22 cycles where both vitrified and slow frozen cycles were transferred
(c) Includes 201 cycles where both vitrified and slow frozen cycles were transferred
(d) Includes 223 cycles where both vitrified and slow frozen cycles were transferred

Live deliveries from initiated autologous thaw cycles among fertility centres

The live delivery rate per initiated autologous thaw cycle varied among fertility centres in 2014. There were 34 fertility centres that were included in the following analysis, which performed more than 50 autologous thaw cycles in 2014 with no centres missing more than 95% of pregnancy outcomes from autologous thaw cycles.

The live delivery per initiated autologous thaw cycle ranged from 7.1% to 32.9% among the 34 centres. The middle 50% of fertility centres achieved live delivery rates between 16.1% and 24.8% (Table 19). The highest 25% of centres (between 75th and 100th percentiles had live delivery rates between 24.8% and 32.9%.

These data should be interpreted with caution because of the small number of patients who underwent autologous thaw treatments in some centres. There were also differences in the characteristics and prognosis of patients treated, coupled with different approaches to the use of ARTs and other fertility treatments among centres, which may influence the live delivery rates of an individual centre.

Table 19: Live deliveries per initiated autologous thaw cycle (%) by women's age group among fertility centres, Australia and New Zealand, 2014

	Percentile					Overall
Age group (years)[(a)]	**0th[(b)]**	**25th**	**50th**	**75th**	**100th[(c)]**	
< 35	10.4	17.4	24.1	31.2	37.8	28.4
35–39	4.4	15.2	20.6	24.4	39.6	23.2
≥ 40	0.0	5.8	11.5	18.1	25.8	13.3
All	**7.1**	**16.1**	**20.4**	**24.8**	**32.9**	**23.5**

(a) Age at start of a treatment cycle.
(b) The 0th percentile is the minimum live delivery rate per cycle recorded by a centre
(c) The 100th percentile is the maximum live delivery rate per cycle recorded by a centre

There was also variation among the 34 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. For example, 50% of the clinics who performed single frozen/thawed blastocyst transfers achieved a live delivery rate of between 18.8% and 29.1%.

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.

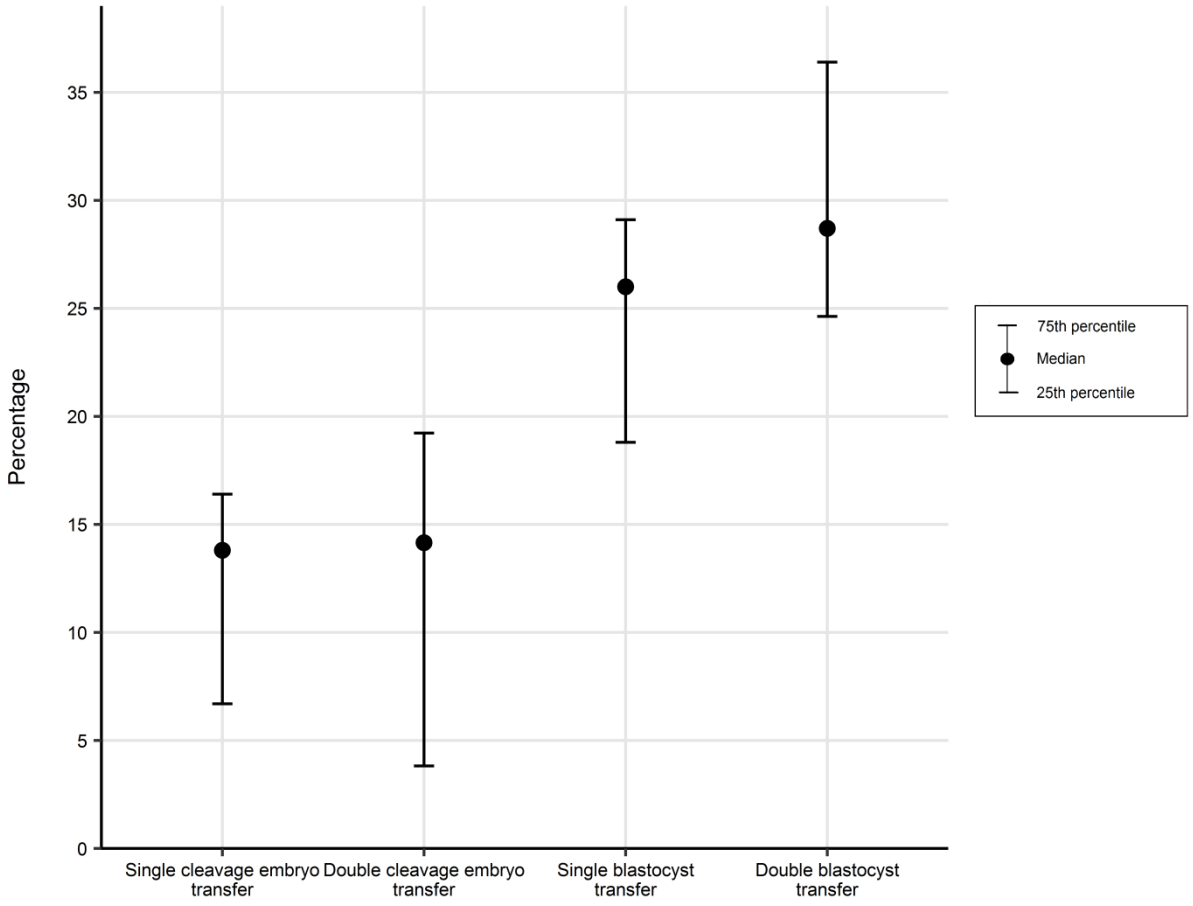

Figure 6: Live delivery rate per autologous thaw embryo transfer cycles by number of embryos transferred and stage of embryo development among fertility centres, Australia and New Zealand, 2014

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 2014, donation and recipient cycles accounted for 5.1% (3,742) of all treatment cycles in Australia and New Zealand. There were 1,058 initiated cycles where the intention was to donate oocytes to a recipient woman, consisting of 915 (86.5%) cycles in Australia and 143 (13.5%) in New Zealand. There were 2,684 oocyte/embryo recipient cycles (Table 1), comprising 2,451 (91.3%) cycles in Australia and 233 (8.7%) cycles in New Zealand.

Oocyte donation cycles

Of the 1,058 cycles in Australia and New Zealand where the intention was to donate oocytes to a recipient, 42 (4.0%) cycles were cancelled before OPU, and a further 43 did not result in oocytes being donated.

The average age of women donating oocytes was 32.4 years, with 37.5% of cycles in women aged 35 or older (Table 20).

Table 20: Number of oocyte donation cycles by donor's age group, Australia and New Zealand, 2014

Age group (years) [(a)]	Initiated cycles (n)	Cycles with OPU performed (n)	Cycles with OPU performed (%)	Cycles with oocytes donated (n)	Cycles with oocytes donated (%)
< 30	286	276	96.5	263	92.0
30–34	375	365	97.3	347	92.5
35–39	334	320	95.8	309	92.5
≥ 40	63	55	88.9	54	87.1
Total	**1,058**	**1,016**	**96.1**	**973**	**92.1**

(a) Donor's age at start of a treatment cycle.

Oocyte/embryo recipient cycles

There were 2,684 oocyte/embryo recipient cycles in 2014. Of these, 84.3% (2,263) were oocyte recipient cycles and 15.7% (421) were embryo recipient cycles (Table 1). The average age of women undertaking an oocyte/embryo recipient cycle was 40.4 years.

Progression of oocyte/embryo recipient cycles

Figure 7 shows the main stages of oocyte/embryo recipient cycles and the treatment outcomes. Of the 2,684 initiated oocyte/embryo recipient cycles undertaken in 2014, 83.5% resulted in an embryo transfer; 26.6% resulted in a clinical pregnancy and 19.7% in a live delivery.

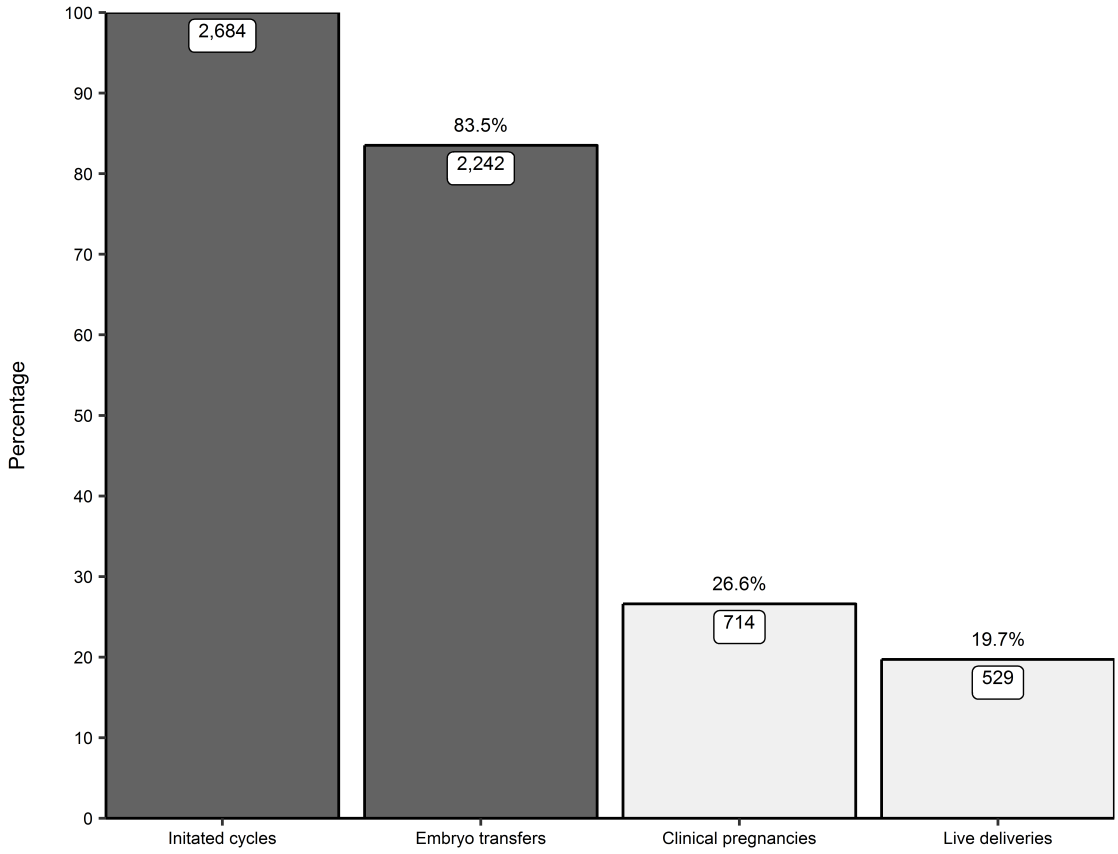

Figure 7: Progression of fresh and thaw oocyte/embryo recipient cycles, Australia and New Zealand, 2014

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

Of the 2,263 oocyte recipient cycles, 47.1% were fresh cycles and 52.9% were thaw cycles. The live delivery rate per initiated cycle was 21.0% for fresh oocyte recipient cycles, higher than for thawed oocyte recipient cycles (19.8%).

All 421 embryo recipient cycles were thaw cycles. The overall live delivery rate per initiated cycle was 16.2% for embryo recipient cycles (Table 21).

Table 21: Outcomes of oocyte/embryo recipient cycles by treatment type, Australia and New Zealand, 2014

	Oocyte recipient			
Stage/outcome of treatment	**Fresh**	**Thaw**	**Embryo recipient**	**All**
Initiated cycles	1,066	1,197	421	2,684
Embryo transfer cycles	769	1,137	336	2,242
Clinical pregnancies	289	331	94	714
Live deliveries	224	237	68	529
Live deliveries per initiated cycle (%)	*21.0*	*19.8*	*16.2*	*19.7*
Live deliveries per embryo transfer cycle (%)	*29.1*	*20.9*	*20.2*	*23.6*
Live deliveries per clinical pregnancy (%)	*77.5*	*71.6*	*72.3*	*74.1*

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 19.7%, varying between 18.3% and 21.9% by recipient's age group (Table 22). The live delivery rate per initiated cycle of oocyte/embryo recipient cycles in recipients aged ≥ 45 (18.3%) was markedly higher than the rate for autologous fresh cycles (0.6%) and the rate for autologous thaw cycles (6.6%) in women aged ≥ 45 (Table 9 and Table 14).

Table 22: Outcomes of oocyte/embryo recipient cycles by recipient's age group, Australia and New Zealand, 2014

	Age group (years)[(a)]					
Stage/outcome of treatment	**< 30**	**30–34**	**35–39**	**40–44**	**≥ 45**	**All**
Initiated cycles	132	306	566	1,014	666	2,684
Embryo transfer cycles	105	257	474	847	559	2,242
Clinical pregnancies	35	94	150	268	167	714
Live deliveries	25	67	124	191	122	529
Live deliveries per initiated cycle (%)	*18.9*	*21.9*	*21.9*	*18.8*	*18.3*	*19.7*
Live deliveries per embryo transfer cycle (%)	*23.8*	*26.1*	*26.2*	*22.6*	*21.8*	*23.6*
Live deliveries per clinical pregnancy (%)	*71.4*	*71.3*	*82.7*	*71.3*	*73.1*	*74.1*

(a) Recipient age at start of a treatment cycle.

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

Advancing donor's age was associated with a decrease in the live delivery rate (Table 23). The live delivery rate per initiated cycle in which the donor's age was under 40 was 19.9% compared to 10.4% for cycles in which the donor's age was 40 years or more (Table 23).

Table 23: Outcomes of oocyte/embryo recipient cycles by donor's age group, Australia and New Zealand, 2014

	Age group (years)[a]				
Stage/outcome of treatment	**< 30**	**30–34**	**35–39**	**≥ 40**	**All[b]**
Initiated cycles	583	853	781	125	2,684
Embryo transfer cycles	473	702	631	95	2,242
Clinical pregnancies	177	232	182	19	714
Live deliveries	131	175	135	13	529
Live deliveries per initiated cycle (%)	*22.5*	*20.5*	*17.3*	*10.4*	*19.7*
Live deliveries per embryo transfer cycle (%)	*27.7*	*24.9*	*21.4*	*13.7*	*23.6*
Live deliveries per clinical pregnancy (%)	*74.0*	*75.4*	*74.2*	*68.4*	*74.1*

(a) Donor 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 2,242 oocyte/embryo recipient cycles where embryos were transferred, 84.4% were SET, 15.4% were DET and five cycles (0.2%) transferred three or more embryos.

The live delivery rate per oocyte/embryo recipient cycle where embryos were transferred was higher for DET cycles (30.3%) than SET cycles (25.1%) for women aged 35-39. Overall, the difference in live delivery rate per initiated cycle was 6.0 percentage points higher for DET than SET cycles (28.7% and 22.7% respectively) (Table 24).

Table 24: Outcomes of oocyte/embryo recipient cycles by recipient's age and number of embryos transferred, Australia and New Zealand, 2014

	Age group (years)[a]							
	< 35		35–39		≥ 40		All	
Stage/outcome of treatment	SET[b]	DET[c]	SET[b]	DET[c]	SET[b]	DET[c]	SET[b]	DET[c]
Embryo transfer cycles	324	36	374	99	1,194	210	1,892	345
Clinical pregnancies	119	10	114	36	355	79	588	125
Live deliveries	85	7	94	30	250	62	429	99
Clinical pregnancies per embryo transfer cycle (%)	*36.7*	*27.8*	*30.5*	*36.4*	*29.7*	*37.6*	*31.1*	*36.2*
Live deliveries per embryo transfer cycle (%)	*26.2*	*19.4*	*25.1*	*30.3*	*20.9*	*29.5*	*22.7*	*28.7*

(a) Recipient 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 stage embryo transfer cycles regardless of a recipient's age group. Overall, the difference in live delivery rates for cleavage stage embryo and blastocyst transfer cycles was 11.5 percentage points (16.1% and 27.6% respectively) (Table 25).

Table 25: Outcomes of oocyte/embryo recipient cycles by recipient's age and stage of embryo development, Australia and New Zealand, 2014

	Age group (years)[a]							
	< 35		35–39		≥ 40		All	
Stage/outcome of treatment	CL[b]	BL[c]	CL[b]	BL[c]	CL[b]	BL[c]	CL[b]	BL[c]
Embryo transfer cycles	100	262	158	316	523	883	781	1,461
Clinical pregnancies	19	110	34	116	119	316	172	542
Live deliveries	16	76	29	95	81	232	126	403
Clinical pregnancies per embryo transfer cycle (%)	*19.0*	*42.0*	*21.5*	*36.7*	*22.8*	*35.8*	*22.0*	*37.1*
Live deliveries per embryo transfer cycle (%)	*16.0*	*29.0*	*18.4*	*30.1*	*15.5*	*26.3*	*16.1*	*27.6*

(a) Recipient age at start of a treatment cycle.
(b) CL: cleavage stage embryo.
(c) BL: blastocyst.

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

More than three-quarters (79.7%) of oocyte/embryo recipient thaw cycles where a blastocyst was transferred used vitrified embryos, compared with 14.5% of cycles where a cleavage stage embryo was transferred. The rates of clinical pregnancy and live delivery were higher for the transfer of vitrified blastocysts than slow frozen blastocysts. In contrast, the rates of clinical pregnancy and live delivery were higher for slow frozen cleavage stage embryos than vitrified cleavage stage embryos (Table 26).

Table 26: Outcomes of oocyte/embryo recipient thaw cycles by stage of embryo development and embryo freezing methods, Australia and New Zealand, 2014

	Stage of embryo development					
	Cleavage embryo		Blastocyst		All[a]	
Stage/outcome of treatment	Slow freezing	Vitrification[b]	Slow freezing	Vitrification[c]	Slow freezing	Vitrification
Embryo transfer cycles	453	77	190	749	645	828
Clinical pregnancies	95	12	49	267	145	280
Live deliveries	66	9	31	197	98	207
Clinical pregnancies per embryo transfer cycle (%)	*21.0*	*15.6*	*25.8*	*35.6*	*22.4*	*33.8*
Live deliveries per embryo transfer cycle (%)	*14.6*	*11.7*	*16.3*	*26.3*	*15.2*	*25.0*

(a) Includes 4 embryo recipient cycles where the method of cryopreservation is unknown
(b) Includes 1 cycle where both vitrified and slow frozen embryos were transferred
(c) Includes 4 cycles where both vitrified and slow frozen embryos were transferred

4 Pregnancy and birth outcomes following autologous and recipient embryo transfer cycles in 2014

4.1 Clinical pregnancies

Clinical pregnancies overview

There were 54,970 autologous and recipient embryo transfer cycles undertaken in Australian and New Zealand fertility centres, of which 17,380 resulted in a clinical pregnancy. Of these clinical pregnancies, 15,732 (90.5%) were reported from fertility centres in Australia and 1,648 (9.5%) from New Zealand centres. Clinical pregnancies that resulted from other cycles are described in Chapter 5.

Of the 17,380 clinical pregnancies, 77.8% resulted in a delivery and 21.2% resulted in early pregnancy loss (less than 20 weeks gestation and less than 400 grams birthweight). The outcomes of 171 (1.0%) clinical pregnancies were not known because women could not be followed up or contacted by fertility centres.

Fetal hearts by number of embryos transferred

Of the 17,380 clinical pregnancies, 82.6% had one fetal heart (single fetus) detected, 4.7% had multiple fetal hearts (multiple fetuses) detected and 10.9% had no fetal heart detected at the time of ultrasound (Table 27). Multiple fetuses are closely related to the number of embryos transferred in ART treatment. Two fetal hearts were detected in 18.6% of clinical pregnancies following DET cycles compared with in 2.0% of clinical pregnancies following SET cycles (Table 27).

Table 27: Clinical pregnancies by number of fetal hearts and number of embryos transferred, Australia and New Zealand, 2014

Number of fetal hearts	One embryo		Two embryos		Three or more embryos		All	
	n	%	n	%	n	%	n	%
0[(a)]	1,552	10.5	340	13.0	8	15.7	1,900	10.9
1	12,611	85.7	1,713	65.6	33	64.7	14,357	82.6
2	291	2.0	486	18.6	8	15.7	785	4.5
3 or 4	10	0.1	19	0.7	2	3.9	31	0.2
Not stated	253	1.7	54	2.1	0	0.0	307	1.8
Total	**14,717**	**100 .0**	**2,612**	**100.0**	**51**	**100.0**	**17,380**	**100.0**

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

Early pregnancy loss

There were 3,684 early pregnancy losses (less than 20 weeks gestation and less than 400 grams birthweight) following embryo transfers, representing 21.1% of clinical pregnancies. Pregnancies following SET resulted in a lower rate of early pregnancy loss (20.3%) and higher delivery rate (78.7%) than pregnancies following DET (25.5% and 73.2% respectively) (Table 28).

Table 28: Early pregnancy loss by pregnancy outcome and number of embryos transferred, Australia and New Zealand, 2014

Pregnancy outcome	One embryo		Two embryos		Three or more embryos		All	
	n	%	n	%	n	%	n	%
Early pregnancy loss	2,996	20.3	669	25.5	19	37.3	3,684	21.2
Miscarriage	*2,744*	*18.6*	*615*	*23.5*	*17*	*33.3*	*3,376*	*19.4*
Reduction or termination	*74*	*0.5*	*19*	*0.7*	*1*	*2.0*	*94*	*0.5*
Ectopic or heterotopic	*178*	*1.2*	*35*	*1.3*	*1*	*2.0*	*214*	*1.2*
Delivery	11,581	78.7	1,913	73.2	31	60.8	13,525	77.8
Not stated	140	1.0	30	1.1	1	2.0	171	1.0
Total	**14,717**	**100.0**	**2,612**	**100.0**	**51**	**100.0**	**17,380**	**100.0**

4.2 Deliveries

There were 13,525 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, 98.6% (13,337) gave birth to at least one liveborn baby (live delivery). The proportion of term live deliveries (≥ 37 weeks) 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, 2014

Pregnancy outcome	Autologous				Oocyte /embryo recipient		All	
	Fresh		Thaw					
	n	%	n	%	n	%	n	%
Live delivery	6,671	98.5	6,137	98.6	529	98.9	13,337	98.6
< 37 weeks	*869*	*12.8*	*723*	*11.6*	*99*	*18.5*	*1,691*	*12.5*
≥ 37 weeks	*5,800*	*85.7*	*5,412*	*87.0*	*430*	*80.4*	*11,642*	*86.1*
Gestational age unknown	*2*	*0.0*	*2*	*0.0*	*0*	*0.0*	*4*	*0.0*
Stillbirth[(a)]	67	1.0	58	0.9	4	0.7	129	1.0
Not stated	33	0.5	24	0.4	2	0.4	59	0.4
Total	**6,771**	**100.0**	**6,219**	**100.0**	**535**	**100.0**	**13,525**	**100.0**

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

Deliveries by number of embryos transferred

Of the 13,525 deliveries, 4.9% had multiple deliveries (Table 30), a lower proportion than in 2013 (5.6%) (Macaldowie et al. 2015). By comparison, the proportion of multiple deliveries in Australia from all conceptions in 2013 was 1.5% (AIHW, 2015).

Twin deliveries accounted for 4.8% of deliveries following embryo transfer cycles in 2014. Of twin deliveries, 64.3% resulted from the transfer of two or more embryos. Of the 1,913 deliveries following DET cycles, 21.5% were twins, markedly higher than the proportion following SET cycles (2.0%) (Table 30).

Table 30: Deliveries by gestation and number of embryos transferred, Australia and New Zealand, 2014

	One embryo		Two embryos		Three or more embryos		Total	
Gestation	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Singleton	11,347	98.0	1,491	77.9	25	80.6	12,863	95.1
Multiple	234	2.0	422	22.1	6	19.3	662	4.9
Twin	*231*	*2.0*	*411*	*21.5*	*5*	*16.1*	*647*	*4.8*
Higher order multiple	*3*	*0.0*	*11*	*0.6*	*1*	*3.2*	*15*	*0.1*
Total	**11,581**	**100.0**	**1,913**	**100.0**	**31**	**100.0**	**13,525**	**100.0**

Deliveries by maternal age

The average age of women at the time of delivery was 35.0 years. This is five years older than the average age (30.1 years) of women who gave birth in Australia in 2013 (AIHW, 2015).

Multiple delivery rates were similar across age groups, where women under 35 years had the lowest multiple delivery rate (4.8%) and women aged 40 years or over had the highest multiple delivery rate (5.1%). Of deliveries following DET, the proportion of multiple deliveries was higher for women aged under 35 (29.9%) compared with women aged 35–39 (21.8%) and women aged 40 or older (14.2%) (Table 31).

Table 31: Deliveries by gestation and maternal age group and number of embryos transferred, Australia and New Zealand, 2014

	Age group (years)[a]								
	< 35			35–39			≥ 40		
Gestation	One embryo	Two embryos	All[b]	One embryo	Two embryos	All[b]	One embryo	Two embryos	All[b]
					n				
Singleton	5,511	408	5,921	4,222	606	4,830	1,614	477	2,112
Multiple	124	174	299	78	169	250	32	79	113
Twin	*121*	*171*	*292*	*78*	*163*	*244*	*32*	*77*	*111*
Higher order multiple	*3*	*3*	*7*	*0*	*6*	*6*	*0*	*2*	*2*
Total	**5,635**	**582**	**6,220**	**4,300**	**775**	**5,080**	**1,646**	**556**	**2,225**
					%				
Singleton	97.8	70.1	95.2	98.2	78.2	95.1	98.1	85.8	94.9
Multiple	2.2	29.9	4.8	1.8	21.8	4.9	1.9	14.2	5.1
Twin	*2.1*	*29.4*	*4.7*	*1.8*	*21.1*	*4.8*	*1.9*	*13.8*	*5.0*
Higher order multiple	*0.1*	*0.5*	*0.1*	*0.0*	*0.8*	*0.1*	*0.0*	*0.4*	*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) Includes three or more embryos.

Caesarean section

Nearly half (49.4%) 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 2013 (33.0%) (AIHW, 2015). 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: 36.6% of women aged less than 30 had a caesarean section compared with 78.9% of women aged 45 or older (Table 32).

The caesarean section rate varied by plurality, with 47.9% for singleton deliveries, 78.7% for twin deliveries and 93.3% for triplet deliveries.

Table 32: Deliveries by method of delivery and maternal age group, Australia and New Zealand, 2014

	Age group (years)[(a)]					
Method of delivery	**< 30**	**30–34**	**35–39**	**40–44**	**≥ 45**	**Total**
			n			
Caesarean section	569	2,111	2,572	1,261	168	6,681
Other	979	2,543	2,498	743	44	6,807
Not stated	8	10	10	8	1	37
Total	**1,556**	**4,664**	**5,080**	**2,012**	**213**	**13,525**
			%			
Caesarean section	36.6	45.3	50.6	62.7	78.9	49.4
Other	62.9	54.5	49.2	36.9	20.7	50.3
Not stated	0.5	0.2	0.2	0.4	0.5	0.3
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

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

There were 14,202 babies born to women who had autologous and recipient embryo transfer cycles, 90.4% (12,844) were reported from fertility centres in Australia and 9.6% (1,358) from fertility centres in New Zealand. Of the 14,202 babies, 90.6% were singletons, 9.1% were twins and 0.3% were triplets. There were 13,980 liveborn babies (98.4%). The birth status was not reported for 66 (0.5%) babies.

Sex distribution in liveborn babies

There were 7,188 (51.4%) liveborn male babies, 6,740 (48.2%) liveborn female babies and 52 (0.4%) liveborn babies where sex was not stated. For the 13,928 liveborn babies where the baby's sex was stated, the sex ratio was 106.6 male babies for every 100 female babies, similar to the ratio for all Australian liveborn babies born in 2012 (106.0) (AIHW, 2015).

Liveborn babies following cleavage stage embryo transfers had a sex ratio of 100.4 male babies for every 100 female babies. Liveborn babies following blastocyst transfers had a sex ratio of 108.4 male babies for every 100 female babies. In comparison, in 2013, liveborn babies following cleavage stage embryo transfers had a sex ratio of 101.2 male babies for every 100 female babies, and liveborn babies following blastocyst transfers had a sex ratio of 104.5 male babies for every 100 female babies (Macaldowie et al. 2015).

Gestational age of babies

The average gestational age of babies born following autologous and recipient embryo transfer cycles was 37.9 weeks (Table 33). This is lower than the average gestational age of 38.7 weeks for all babies born in Australia in 2013 (AIHW, 2015).

One in six babies (16.1%) were preterm (less than 37 weeks gestation), which was markedly higher than the proportion of preterm babies (8.6%) born in Australia in 2013 (AIHW, 2015). For ART singletons and twins, 10.5% and 69.3% were preterm compared with 7% and 62% of babies born in Australia in 2013 (AIHW, 2015).

Table 33: Babies by gestational age and plurality, Australia and New Zealand, 2014

Gestational age (weeks)	Singletons		Twins		Higher order multiples		Total	
Mean	*38.3*		*34.5*		*31.5*		*37.9*	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
≤ 27	*189*	*1.5*	*90*	*7.0*	*6*	*13.3*	*285*	*2.0*
28–31	*169*	*1.3*	*156*	*12.1*	*24*	*53.3*	*349*	*2.5*
32–36	*987*	*7.7*	*650*	*50.2*	*12*	*26.7*	*1,649*	*11.6*
≤ 36	1,345	10.5	896	69.3	42	93.3	2,283	16.1
≥ 37	11,515	89.5	396	30.6	3	6.7	11,914	83.9
Not stated	3	0.0	2	0.2	0	0.0	5	0.0
Total	**12,863**	**100.0**	**1,294**	**100.0**	**45**	**100.0**	**14,202**	**100.0**

Figure 8 shows the distribution of gestational age for singletons and twins born to women who had autologous and recipient embryo transfer cycles in 2014. Singletons following SET cycles had a lower proportion of preterm birth (10.1%) than singletons following DET cycles (13.0%). The overall proportions of preterm singletons (10.5%) and twins (69.3%) born to women who had embryo transfer cycles in 2014 were higher than the overall proportions of preterm singletons and twins born in Australia in 2013 (7% and 62% respectively) (AIHW, 2015).

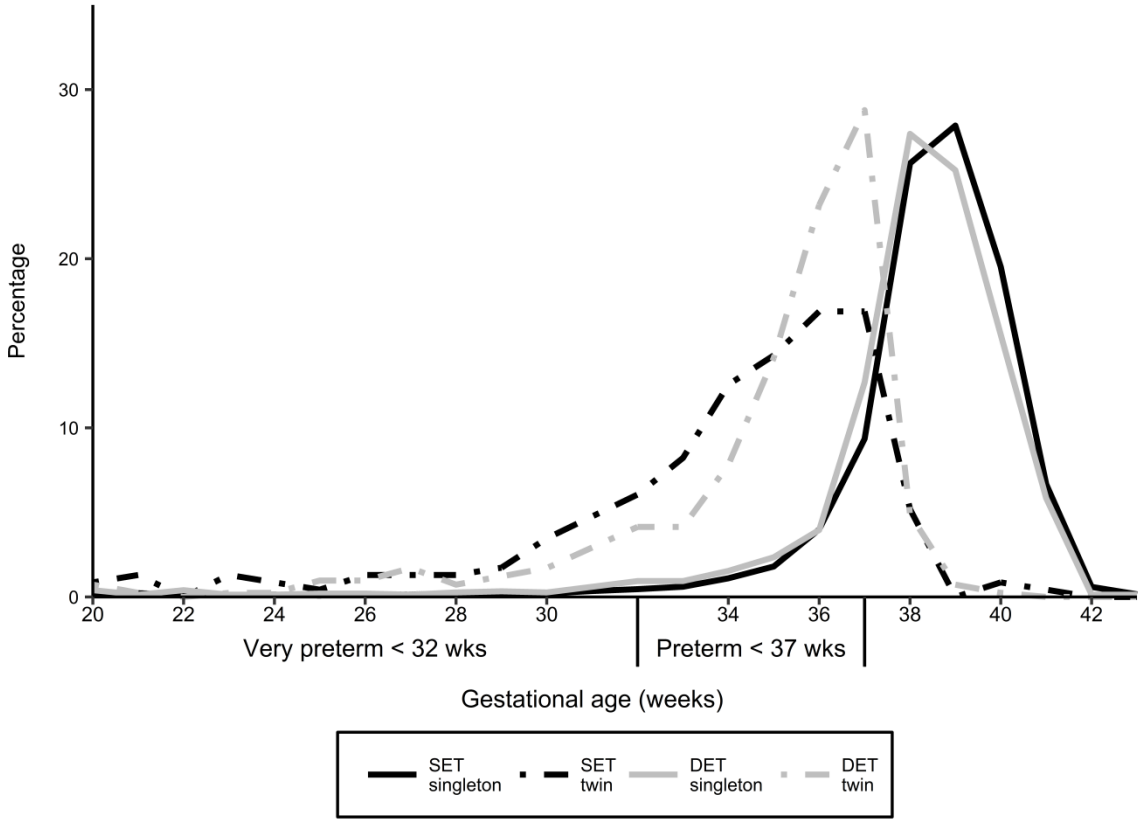

Figure 8: Percentage of babies born following embryo transfer cycles by gestational age, Australia and New Zealand, 2014

Birthweight of liveborn babies

The average birthweight for liveborn babies to women who had autologous and recipient embryo transfer cycles was 3,215 grams. One in ten (11.7%) of these babies were low birthweight (less than 2,500 grams) (Table 34).

The average birthweight was 3,311 grams and 2,379 grams for liveborn ART singletons and twins respectively. These were slightly lower than the mean birthweight of all liveborn singletons (3,386 grams) and twins (2,349 grams) in Australia in 2013 (AIHW, 2015). Low birthweight was reported for 6.6% of liveborn singletons following SET and 9.5% of liveborn singletons following DET in comparison with 6.4% of singleton births in Australia in 2013 (AIHW, 2015). For ART twins 57.5% were reported as low birthweight in comparison with 56% of twin births in Australia in 2013 (AIHW, 2015).

Table 34: Liveborn babies by birthweight group and plurality, Australia and New Zealand, 2014

	Singletons				
Birthweight (grams)	**SET[(a)]**	**DET[(b)]**	**Twins**	**Higher order multiples**	**Total[(c)]**
			n		
< 1,000	*63*	*13*	*44*	*2*	*122*
1,000–1,499	*70*	*12*	*101*	*7*	*192*
1,500–1,999	*127*	*28*	*166*	*21*	*342*
2,000–2,499	*484*	*87*	*406*	*5*	*983*
< 2,500	744	140	717	35	1,639
2,500–2,999	1,802	268	383	0	2,459
3,000–3,499	4,160	557	104	0	4,831
3,500–3,999	3,304	356	12	0	3,676
≥ 4,000	1,069	111	1	0	1,183
Not stated	121	32	30	9	192
Total	**11,200**	**1,464**	**1,247**	**44**	**13,980**
			%		
< 1,000	*0.6*	*0.9*	*3.5*	*4.5*	*0.9*
1,000–1,499	*0.6*	*0.8*	*8.1*	*15.9*	*1.4*
1,500–1,999	*1.1*	*1.9*	*13.3*	*47.7*	*2.4*
2,000–2,499	*4.3*	*5.9*	*32.6*	*11.4*	*7.0*
< 2,500	6.6	9.5	57.5	79.5	11.7
2,500–2,999	16.1	18.3	30.7	0.0	17.6
3,000–3,499	37.1	38	8.3	0.0	34.6
3,500–3,999	29.5	24.3	1.0	0.0	26.3
≥ 4,000	9.5	7.6	0.1	0.0	8.5
Not stated	1.1	2.2	2.4	20.5	1.4
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(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 stillbirths (fetal deaths) and neonatal deaths (defined as the death of liveborn infants within 28 days of birth).

There were 201 reported perinatal deaths, including 156 stillbirths and 45 neonatal deaths. The perinatal mortality rate in 2014 was 14.2 deaths per 1,000 births (Table 35), which was higher than the rate of 10 per 1,000 births for all births in Australia in 2013 (AIHW, 2015). Singletons had a markedly lower perinatal mortality rate (11.5 deaths per 1,000 births) compared with multiples (39.6 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 2014, information relating to pregnancy outcomes was not stated for 1.0% of clinical pregnancies.

Table 35: Perinatal mortality of babies by type of death and plurality, Australia and New Zealand, 2014

			Stillbirths[(a)]		Neonatal Deaths		Perinatal Deaths[(b)]	
Plurality	**All births**	**Live births**	**n**	**Rate[(c)(e)]**	**n**	**Rate[(d)(f)]**	**n**	**Rate[(c)(g)]**
Singletons	12,863	12,689	121	9.4	27	2.1	148	11.5
Multiples	1339	1,291	34	26.1	18	13.9	53	39.6
Total	**14,202**	**13,980**	**156**	**11.0**	**45**	**3.2**	**201**	**14.2**

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

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

(c) Stillbirth and perinatal mortality rates were calculated using all births (live births and stillbirths) as the denominator.

(d) Neonatal death rate was calculated using live births as the denominator.

(e) Stillbirths per 1,000 births

(f) Neonatal deaths per 1,000 live births

(g) Perinatal deaths per 1,000 births

Note: The birth status was not reported for 66 babies.

5 Other cycle types, procedures and treatment complications in 2014

5.1 Gestational surrogacy cycles

Gestational 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 212 gestational surrogacy cycles in 2014, including 157 gestational carrier cycles and 55 commissioning cycles. Commissioning cycles include a variety of cycle types involved in the provision of oocytes or embryos by either the intended parents or donors. Among the 157 gestational carrier cycles, 130 (82.8%) involved the transfer of at least one embryo, 47 (29.9%) resulted in a clinical pregnancy and 36 (22.9%) resulted in a live delivery.

5.2 Preimplantation genetic diagnosis

Preimplantation genetic diagnosis (PGD) is a procedure in which one or more cells are removed from the embryo and analysed for chromosomal disorders or genetic diseases. The indication for PGD is not recorded in ANZARD. The number of cycles where PGD was performed in 2014 increased by 25.8% from 2,740 in 2013 (Macaldowie et al. 2015) to 3,448 in 2014(Table 36). More than two-thirds (67.1%) of the 3,448 cycles where PGD was performed were in woman aged 35 or older. Of the 3,448 PGD cycles, 47.7% (1,645) had embryos transferred and resulted in 680 clinical pregnancies and 560 live deliveries. The clinical pregnancy rate and live deliveries rate per embryo transfer were 41.3% and 34.0% respectively.

Table 36: Number of cycles with PGD by type of embryo, Australia and New Zealand, 2014

	Stage of treatment	
Type of embryo	**Number of cycles with embryo fertilised/thawed**	**Number of cycles with PGD**
Fresh	36,626	2,154
Thaw	27,228	1,294
Total	**63,854**	**3,448**

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.

There were 1,601 assisted hatching cycles reported in 2014 that were not associated with PGD. Of these, 1,409 (88.0%) had embryos transferred, resulting in 343 (21.4%) clinical pregnancies and 217 (13.6%) live deliveries. There were 237 births born following assisted hatching cycles, including 199 singletons, 32 twins and 6 triplets.

5.4 GIFT cycles

Gamete intrafallopian transfer (GIFT) is an ART treatment where mature oocytes and sperm are placed directly into a woman's fallopian tubes. In 2014, there were 6 GIFT cycles, none of which resulted in a clinical pregnancy.

5.5 Ovarian hyperstimulation syndrome

Ovarian hyperstimulation syndrome (OHSS) is a complication of controlled ovarian stimulation 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 274 OHSS cases reported in 2014 that were admitted to hospital. A higher number of oocytes retrieved at OPU is associated with OHSS (Table 37). Caution should be used when interpreting these data because OHSS is not well reported.

Table 37: Number of cycles with OPU performed and OHSS by number of oocytes collected, Australia and New Zealand, 2014

	Number of oocytes collected						
	None	**1–4**	**5–9**	**10–14**	**15–19**	**≥ 20**	**All**
Cycles with OHSS	0	7	30	64	68	105	274
Cycles with OPU	823	10,043	14,546	8,763	3,968	2,555	40,698
OHSS per OPU cycle (%)	*0.0*	*0.1*	*0.2*	*0.7*	*1.7*	*4.1*	*0.7*

6 Donor sperm insemination cycles in 2014

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 2014, there were 3,089 DI cycles reported, which included 37.3% (1,152) undertaken with controlled ovarian hyperstimulation and 58.0% (1,792) undertaken in unstimulated cycles. Of all DI cycles, 15.4% resulted in a clinical pregnancy and 12.8% resulted in a live delivery (Table 38).The multiple birth rate following DI cycles was 3.4%.

The average age of women who had a DI cycle was 34.8.The clinical pregnancy rate and live delivery rate was highest in women aged under 35 and decreased with advancing women's age. Of the DI cycles in women aged under 35, 15.7% resulted in a live delivery, compared with 4.7% 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, 2014

	Age group (years)[(a)]				
Stage/outcome of treatment	**< 30**	**30–34**	**35–39**	**≥ 40**	**Total**
DI cycles	473	955	1134	527	3,089
Clinical pregnancies	84	168	190	34	476
Live deliveries	75	149	147	25	396
Clinical pregnancies per DI cycle (%)	*17.8*	*17.6*	*16.8*	*6.5*	*15.4*
Live deliveries per DI cycle (%)	*15.9*	*15.6*	*13.0*	*4.7*	*12.8*
Live deliveries per clinical pregnancy (%)	*89.3*	*88.7*	*77.4*	*73.5*	*83.2*

(a) Age at start of a treatment cycle.

Clinical pregnancies following DI cycles

Of the 476 clinical pregnancies following DI cycles, 84.2% resulted in a delivery, 13.6% ended in early pregnancy loss (including 12.4% miscarriages and 0.8% ectopic/heterotopic pregnancies), and 2.1% were unknown pregnancy outcomes. Of the 401 deliveries, 386 (96.3%) were singleton deliveries, 11 (2.7%) were twin deliveries and 4 (1.0%) were triplet deliveries.

Perinatal outcomes of babies

There were 420 babies born to women who had DI treatment, including 414 liveborn and 5 stillborn babies and one baby with unknown outcome. Of these liveborn babies, 57 (13.7%) were born preterm (less than 37 weeks gestation). The mean birthweight of liveborn babies following DI treatment was 3,285 grams. This was higher than the mean birthweight (3,215 grams) of liveborn babies following autologous and recipient embryo transfer cycles. Forty-three liveborn babies (10.4%) were born with low birthweight (less than 2,500 grams).

7 Trends in ART treatment and outcomes: 2010 – 2014

This section includes autologous cycles, donation/recipient cycles, surrogacy cycles and GIFT cycles undertaken in Australia and New Zealand from 2010 to 2014. It does not include DI cycles.

ART treatment and outcomes

In 2014, there were 73,598 initiated ART cycles in Australia and New Zealand, a 2.9% increase on 2013.Of these initiated ART cycles, 45,775 were fresh cycles, representing an increase of 1.5% on 2013. Since 2010 there has been a reduction in the yearly rate of increase in fresh ART cycles, from a 9.8% increase in 2010/2011, to the current 1.5% increase for 2013/2014 (Table 39).

The proportion of initiated fresh cycles reaching embryo transfer has decreased from 76.8% in 2010 to 63.6% in 2014 partly due to changes in clinical practice, including increasing proportions of *freeze-all* cycles. Since 2010 there has been an average 39% yearly increase in the number of *freeze-all* cycles (Table 39)

Between 2010 and 2014, the clinical pregnancy and live delivery rates per initiated fresh cycle ranged from 19.5% to 23.8% and from 15.1% to 18.1% respectively. The live delivery rate per initiated cycle with *freeze-all* cycles excluded ranged from 17.3% to 18.9% (Table 39).

Table 39: Number of fresh cycles by stage/outcome of treatment, Australia and New Zealand, 2010 to 2014

Stage/outcome of treatment	2010	2011	2012	2013	2014
Initiated cycles[(a)]	38,796	42,629	44,238	45,115	45,775
Cycles with OPU[(b)]	34,824	38,222	39,709	40,524	40,735
Freeze-all[(c)]	1,610	2,117	3,183	4,717	5,970
Embryo transfers	29,775	31,837	31,837	30,460	29,137
Clinical pregnancies	9,236	9,346	9,673	9,410	8,920
Live deliveries	7,014	7,117	7,275	7,230	6,903
Clinical pregnancy per embryo transfer (%)	*31.0*	*29.4*	*30.4*	*30.9*	*30.6*
Clinical pregnancies per initiated cycle (%)	*23.8*	*21.9*	*21.9*	*20.9*	*19.5*
Live deliveries per embryo transfer (%)	*23.6*	*22.4*	*22.9*	*23.7*	*23.7*
Live deliveries per initiated cycle (%)	*18.1*	*16.7*	*16.4*	*16.0*	*15.1*
Live deliveries per initiated non freeze-all cycle (%)[(d)]	*18.4*	*18.9*	*17.6*	*17.7*	*17.3*

(a) Included autologous cycles, oocyte donation cycles, oocyte/embryo recipient cycles, GIFT cycles and surrogacy cycles.
(b) Cycles with OPU includes cycles where no oocytes were collected during the procedure.
(c) *Freeze-all* cycles are fresh ART treatment cycles where all oocytes or embryos are cryopreserved for potential future use
(d) *Live deliveries per initiated non freeze-all cycle* are calculated using live deliveries as the numerator and initiated cycles minus *freeze-all* cycles as the denominator.

In comparison, 27,823 initiated thaw cycles were undertaken in 2014, an increase of 5.4% on 2013 (Table 40). Since 2010 the average yearly increase in thaw cycles has been 4.9%, and has ranged from 2.2% to 8.9%. The live delivery rate per initiated thaw cycle increased from 18.1% in 2010 to 23.3% in 2014 (Table 40).

For the period 2010 to 2014 the clinical pregnancy and live delivery rate per embryo transfer has remained stable for fresh embryo transfers while increasing for thaw embryo transfers (Figure 9). Overall (for fresh and thaw cycles) the live birth rate per initiated cycle has increased by almost 10% from 18.1% in 2011 to 19.8% for 2014.

Table 40: Number of thaw cycles by stage/outcome of treatment, Australia and New Zealand, 2010 to 2014

Stage/outcome of treatment	2010	2011	2012	2013	2014
Initiated cycles[(a)]	22,978	23,718	25,844	26,401	27,823
Embryo transfers	20,805	21,974	23,891	24,607	25,969
Clinical pregnancies	5,516	5,973	7,044	7,644	8,507
Live deliveries	4,155	4,523	5,246	5,767	6,470
Clinical pregnancy per embryo transfer (%)	*26.5*	*27.2*	*29.5*	*31.1*	*32.8*
Clinical pregnancies per initiated cycle (%)	*24.0*	*25.2*	*27.3*	*29.0*	*30.7*
Live deliveries per embryo transfer (%)	*20.0*	*20.6*	*22.0*	*23.4*	*24.9*
Live deliveries per initiated cycle (%)	*18.1*	*19.1*	*20.3*	*21.8*	*23.3*

(a) Included autologous cycles, oocyte/embryo recipient cycles and surrogacy cycles.

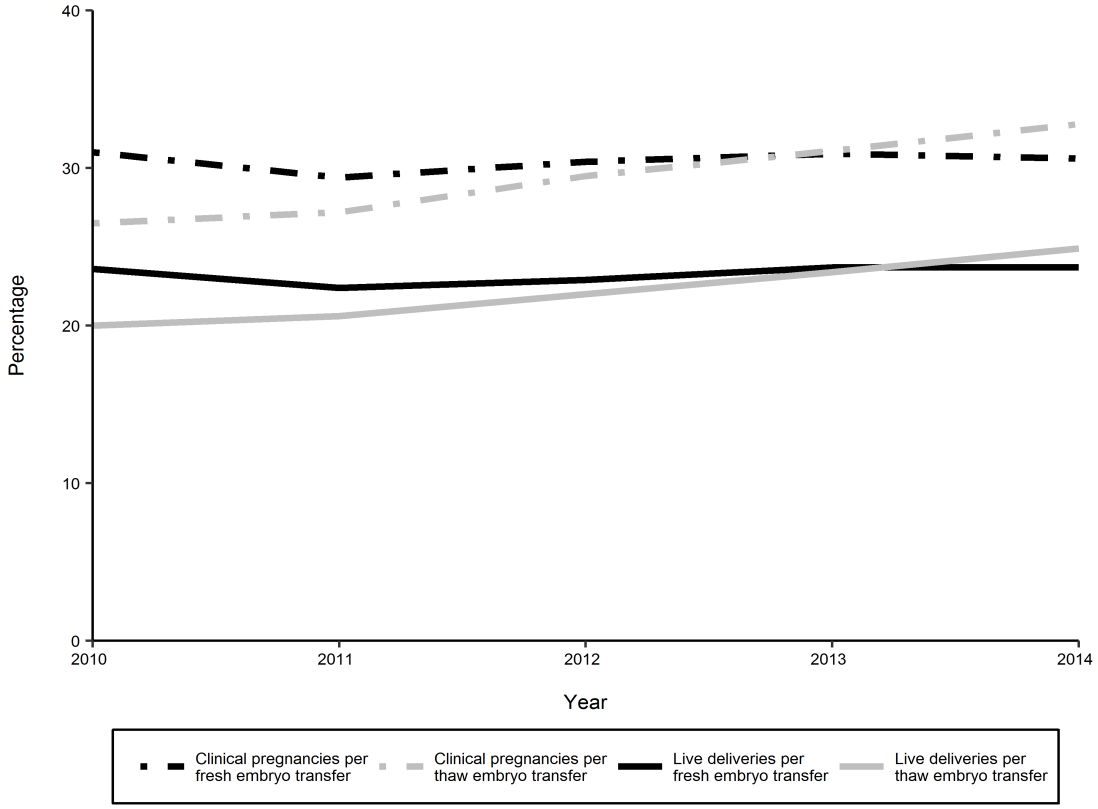

Figure 9: Clinical pregnancy and live delivery rates per fresh and thaw embryo transfers, Australia and New Zealand, 2010 to 2014

Multiple gestation deliveries

The decline in multiple gestation deliveries resulting from ART treatment continued in 2014. The proportion of multiple deliveries decreased from 7.9% in 2010 to 4.9% in 2014 (Table 41). The decline is primarily the result of the increasing uptake of SET (Table 45).

Table 41: Number of deliveries following ART treatment by gestation, Australia and New Zealand, 2010 to 2014

	2010		2011		2012		2013		2014	
Gestation	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Singleton	10,382	92.1	10,977	93.1	11,919	93.5	12,460	94.4	12,900	95.1
Multiple	890	7.9	815	6.9	826	6.5	733	5.6	662	4.9
Twin	*874*	*7.8*	*799*	*6.8*	*807*	*6.3*	*720*	*5.5*	*647*	*4.8*
Higher order multiple	*16*	*0.1*	*16*	*0.1*	*19*	*0.1*	*13*	*0.1*	*15*	*0.1*
Total[(a)]	**11,272**	**100.0**	**11,792**	**100.0**	**12,745**	**100.0**	**13,193**	**100.0**	**13,562**	**100.0**

(a) Includes cycles in which gestation was unknown.

Women's age for autologous cycles

The majority of autologous cycles undertaken between 2010 and 2014 were in women aged 35 to 39. The average age of women having autologous cycles remained relatively stable over the period ranging from 35.8 to 35.9 years. The proportion of autologous cycles in women aged 40 and older increased from 24.3% in 2010 to 25.5% in 2014 (Table 42).

Table 42: Number of fresh and thaw autologous cycles by women's age group, Australia and New Zealand, 2010 to 2014

Age group (years)[(a)]	2010		2011		2012		2013		2014	
Mean	*35.8*		*35.9*		*35.8*		*35.9*		*35.8*	
	n	%	n	%	n	%	n	%	n	%
< 30	6,469	11.0	6,720	10.7	7,353	11.0	7,257	10.7	7,566	10.9
30–34	15,641	26.7	17,129	27.2	18,132	27.2	18,791	27.6	19,754	28.4
35–39	22,224	37.9	23,314	37.0	24,344	36.5	24,548	36.1	24,559	35.3
40–44	13,194	22.5	14,670	23.3	15,763	23.6	16,167	23.8	16,416	23.6
≥ 45	1,046	1.8	1,231	2.0	1,118	1.7	1,217	1.8	1,343	1.9
Total	**58,574**	**100.0**	**63,064**	**100.0**	**66,710**	**100.0**	**67,980**	**100.0**	**69,638**	**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 embryo transfer cycles that used embryos created with ICSI remained stable around 64.0% in the period 2010-2014. The proportion of blastocyst transfer cycles increased from 52.1% in 2010 to 67.5% in 2014 (Table 43). The proportion of thaw embryo transfer cycles that used vitrified embryos increased for both cleavage stage embryos and blastocysts (Table 44).

Table 43: Number of embryo transfer cycles by treatment type, Australia and New Zealand, 2010 to 2014

Treatment type and procedure	2010		2011		2012		2013		2014	
	n	%	n	%	n	%	n	%	n	%
Fertilisation procedure										
IVF	18,237	36.1	18,873	35.1	19,653	35.3	19,900	36.1	19,935	36.2
ICSI[(a)]	31,564	62.4	34,006	63.2	36,067	64.7	35,162	63.9	35,161	63.8
Not stated	769	1.5	922	1.7	2	0.0	1	0.0	4	0.0
Total	**50,570**	**100.0**	**53,801**	**100.0**	**55,722**	**100.0**	**55,063**	**100.0**	**55,100**	**100.0**
Stage of embryo development										
Cleavage stage	24,200	47.9	22,760	42.3	22,392	40.2	21,408	38.9	17,907	32.5
Blastocyst[(b)]	26,370	52.1	31,041	57.7	33,330	59.8	33,655	61.1	37,193	67.5
Total	**50,570**	**100.0**	**53,801**	**100.0**	**55,722**	**100.0**	**55,063**	**100.0**	**55,100**	**100.0**

(a) Includes cycles where both ICSI and IVF fertilised embryos were transferred.
(b) Includes cycles where both cleavage stage embryos and blastocysts were transferred.

Table 44: Number of embryo transfer cycles by cryopreservation method and stage of embryo development, Australia and New Zealand, 2010 to 2014

Treatment type and procedure	2010		2011		2012		2013		2014	
	n	%	n	%	n	%	n	%	n	%
Cleavage stage										
Slow frozen	8,360	95.4	7,381	92.7	6,839	88.4	5,951	84.4	4,313	77.0
Vitrification[(a)]	393	4.5	573	7.2	892	11.5	1,097	15.6	1,282	22.9
Not stated	7	0.1	8	0.1	4	0.1	1	0.0	5	0.1
Total	**8,760**	**100.0**	**7,962**	**100.0**	**7,735**	**100.0**	**7,049**	**100.0**	**5,600**	**100.0**
Blastocyst										
Slow frozen	4,495	37.3	3,769	26.9	3,734	23.1	2,982	17.0	2,928	14.4
Vitrification[(a)]	7,539	62.6	10,230	73.0	12,409	76.8	14,558	82.9	17,428	85.6
Not stated	11	0.1	13	0.1	13	0.1	18	0.1	13	0.1
Total	**12,045**	**100.0**	**14,012**	**100.0**	**16,156**	**100.0**	**17,558**	**100.0**	**20,369**	**100.0**

(a) Includes cycles were both vitrified and slow frozen embryos were transferred.

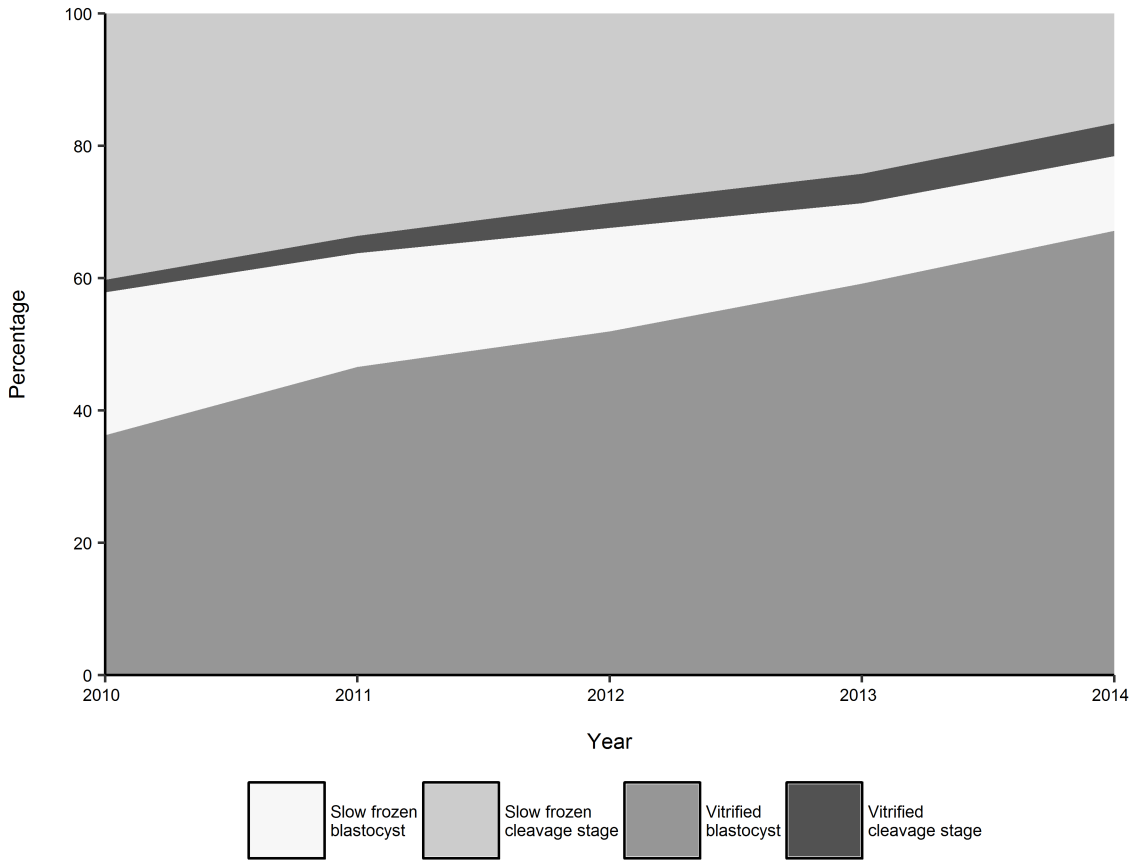

Figure 10: Percentage of embryo transfer cycles by cryopreservation method and stage of embryo development, Australia and New Zealand, 2010 to 2014

Number of embryos transferred per embryo transfer cycle

There has been an ongoing shift in ART practice to SET cycles in Australia and New Zealand. In 2010, the proportion of SET cycles accounted for 69.9% of embryo transfer cycles and by 2014 this proportion had increased to 82.9% (Table 45).

Table 45: Percentage of embryo transfer cycles by number of embryos transferred, Australia and New Zealand, 2010 to 2014

Number of embryos transferred	2010	2011	2012	2013	2014
One embryo	69.6	73.2	76.3	79.2	82.9
Two embryos	29.5	26.0	23.0	20.1	16.6
Three or more embryos	0.8	0.7	0.7	0.7	0.5

8 Women undertaking autologous treatment in 2014

ANZARD was upgraded 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 the number of cycles per woman over time. 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. This section presents the number of women who underwent autologous ART treatment in 2014. 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.

Women who undertook autologous treatment

There were 37,281 women who undertook 69,638 autologous fresh and/or thaw cycles in Australia and New Zealand in 2014. Of these women, 33,750 had treatment in Australia, 3,544 in New Zealand, and 13 had treatment in both Australia and New Zealand.

On average, 1.8 fresh and/or thaw cycles per woman were undertaken in 2014, with more cycles per woman in Australia (1.9 cycles per woman) than in New Zealand (1.5 cycles per woman). In Australia, half (50.4%) of the women had two or more autologous treatment cycles compared with 37.4% of women in New Zealand. In line with this, 10.2% of women in Australia had four or more cycles in 2014 compared with 3.7% of women in New Zealand (Table 46).

Table 46: Women undertaking autologous fresh and/or thaw cycles by number of cycles, Australia and New Zealand, 2014

Number of cycles	Australia		New Zealand		All	
	n	%	n	%	n	%
One	16,728	49.6	2,218	62.6	18,928	50.8
Two	9,238	27.4	893	25.2	10,135	27.2
Three	4,333	12.8	301	8.5	4,634	12.4
Four or more	3,451	10.2	132	3.7	3,584	9.6
Total	**33,750**	**100.0**	**3,544**	**100.0**	**37,281**	**100.0**

Note: Only women who undertook cycles in 2014 are included. Thirteen women had treatment in both Australia and New Zealand.

Women who undertook autologous fresh cycles

There were 43,579 fresh cycles undertaken by 29,705 women in Australia and New Zealand in 2014; an average of 1.5 fresh cycles per woman. Younger women had fewer fresh cycles with one in five (21.4%) women aged under 30 having two or more autologous fresh cycles. 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 subsequent thaw cycles. Less than 1.0% of women aged under 30 had four or more cycles. This proportion increased to 6.8% for women aged 40 to 44 and 8.8% for women aged 45 or older (Table 47).

Table 47: Women undertaking autologous fresh cycles by number of cycles, Australia and New Zealand, 2014

	Age group (years)[(a)]					
Number of cycles	**< 30**	**30–34**	**35–39**	**40–44**	**≥ 45**	**All**
			n			
One	2,837	6,392	6,849	3,749	300	20,127
Two	622	1,680	2,345	1,792	159	6,598
Three	123	411	710	753	52	2,049
Four or more	29	106	286	461	49	931
Total	**3,611**	**8,589**	**10,190**	**6,755**	**560**	**29,705**
			%			
One	78.6	74.4	67.2	55.5	53.6	67.8
Two	17.2	19.6	23.0	26.5	28.4	22.2
Three	3.4	4.8	7.0	11.1	9.3	6.9
Four or more	0.8	1.2	2.8	6.8	8.8	3.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Age at start of first autologous fresh cycle in 2014.

Women who undertook autologous thaw cycles

There were 26,059 thaw cycles undertaken by 17,797 women in Australia and New Zealand in 2014; an average of 1.5 thaw cycles per woman. One third (35.1%) of women aged under 30 had two or more thaw cycles compared with 17.8% of women aged 45 or older (Table 48).

Advancing women's age was associated with a decrease in the proportion of women having two or more thaw cycles, while advancing women's age saw an increase in the proportion of women having two or more fresh cycles (Table 47 and Table 48).

Table 48: Women undertaking autologous thaw cycles by number of cycles, Australia and New Zealand, 2014

	Age group (years)[(a)]					
Number of cycles	**< 30**	**30–34**	**35–39**	**40–44**	**≥ 45**	**All**
			n			
One	1,283	3,731	4,479	2,319	217	12,029
Two	458	1,277	1,485	717	36	3,973
Three	165	439	461	215	10	1,290
Four or more	71	158	188	87	1	505
Total	**1,977**	**5,605**	**6,613**	**3,338**	**264**	**17,797**
			%			
One	64.9	66.6	67.7	69.5	82.2	67.6
Two	23.2	22.8	22.5	21.5	13.6	22.3
Three	8.3	7.8	7.0	6.4	3.8	7.2
Four or more	3.6	2.8	2.8	2.6	0.4	2.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Age at start of first autologous thaw cycle in 2014.

9 Cycle-specific rates for women who started their first ART treatment cycle in 2012

This Chapter presents information for the cohort of women who started their first ART treatment cycle between 1 January 2012 and 31 December 2012. Women in this cohort were followed from the start of their first autologous (non *freeze-all*) fresh cycle through subsequent fresh and thaw cycles, excluding *freeze-all* cycles, until 31 December 2014 or until they achieved a live delivery (a delivery of at least one liveborn baby). This cohort was defined using the SLK described in Chapter 8.

This longitudinal perspective provides a measure of the outcomes of successive ART treatment cycles undertaken by the same woman. These women might have had additional treatment cycles after 2014 and their treatment information and resulting outcomes will be captured in subsequent annual reports. Therefore, in this dynamic cohort of women undergoing their first autologous fresh ART treatment in 2012, the cycle-specific live delivery rates may change over time as more women return for treatment at a later date.

ART treatment cycles presented in Tables 49 to 54 include all initiated autologous fresh and thaw cycles, excluding *freeze-all* cycles. Donor sperm insemination cycles, oocyte/embryo recipient cycles, oocyte/embryo donation cycles, surrogacy arrangement cycles and GIFT cycles were also excluded. A pregnancy that ended before 20 weeks or in a stillbirth (fetal death) are not counted as a live delivery.

In 2012, 15,466 women were identified as having their first ever fresh autologous cycle in that year. Information on whether a fresh cycle was a first or subsequent cycle was not available for 1871 women representing 6.5% of all women having autologous fresh cycles in 2012. Of the 15,466 women identified as having their first fresh autologous cycle in 2012, 411 had only *freeze-all* cycles without subsequent embryo transfers, and are therefore excluded from the cycle-specific live birth rates.

Table 49 presents the number of cycles undertaken by 15,055 women who undertook their first autologous (non *freeze-all*) fresh cycle in 2012. Tables 50 to 54 present cycle-specific live delivery rates and non-progression rates for these women. The rates are presented for all women (Table 50) and by women's age group at the time of their first cycle in 2012, <30, 30–34, 35–39 and 40–44 (Tables 51 to 54). Only the first 10 cycles are presented in Tables 49 to 54 due to the small number of women (144 women and 30 live deliveries) undertaking 11 or more treatment cycles between 1 January 2012 and 31 December 2014.

The *cycle-specific live delivery* rate is calculated as the number of live deliveries in that cycle divided by the number of women who commenced ART treatment in that cycle. The *non-progression rate* for a specific cycle is calculated as the number of women who did not return for further ART treatment cycles before 31 December 2014, divided by the number of women who did not have a live delivery in that cycle.

Number of cycles by women's age group

Table 49 presents the number of cycles by women's age group. About three-quarters (74.3%) of these women had between one and three cycles, and one-quarter (25.7%) had four or more cycles.

Table 49 : Number of cycles by women's age group for all women who started their first autologous fresh cycle (excluding *freeze-all* cycles [(a)]) between 1 January 2012 and 31 December 2012, Australia and New Zealand[(b)]

	Age group (years)[(b)]					
Cycle number	**< 30**	**30-34**	**35-39**	**40-44**	**≥ 45**	**All**
			n			
One	946	1,864	1,686	828	72	5,396
Two	577	1,105	1,166	684	40	3,572
Three	359	658	783	398	13	2,211
Four	202	409	481	286	12	1,390
Five	111	271	347	191	5	925
Six	62	163	224	137	4	590
Seven	40	109	138	95	3	385
Eight	28	50	86	59	3	226
Nine	10	31	49	32	0	122
Ten or more	18	45	101	74	0	238
Total	**2,353**	**4,705**	**5,061**	**2,784**	**152**	**15,055**
			%			
One	40.2	39.6	33.3	29.7	47.4	35.8
Two	24.5	23.5	23.0	24.6	26.3	23.7
Three	15.3	14.0	15.5	14.3	8.6	14.7
Four	8.6	8.7	9.5	10.3	7.9	9.2
Five	4.7	5.8	6.9	6.9	3.3	6.1
Six	2.6	3.5	4.4	4.9	2.6	3.9
Seven	1.7	2.3	2.7	3.4	2.0	2.6
Eight	1.2	1.1	1.7	2.1	2.0	1.5
Nine	0.4	0.7	1.0	1.1	0.0	0.8
Ten or more	0.8	1.0	2.0	2.7	0.0	1.6
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) *Freeze-all* cycles are fresh ART treatment cycles where all oocytes or embryos are frozen and an embryo transfer does not take place.

(b) Age at start of first autologous fresh ART treatment cycle (excluding *freeze-all* cycles) undertaken in 2012.

Note: Women who started their first autologous fresh non-*freeze-all* ART treatment cycle between 1 January 2012 and 31 December 2012 and were followed through subsequent fresh and thaw cycles, excluding *freeze-all* cycles, until 31 December 2014 or delivery of a liveborn baby up to 31 October 2015.Totals and subtotals may not equal 100.0 due to rounding. Data should be interpreted with caution due to small numbers in certain cells.

Cycle-specific live delivery rates

How to interpret Tables 50 to 54

- The following tables report on women who started their first ART treatment cycle in 2012. They present the proportion of live deliveries achieved in the first and subsequent ART cycles.
- The first cycle is always a fresh ART treatment cycle, but cycles two to ten, can be either a fresh or frozen/thaw cycle.
- Only cycles undertaken in 2012–2014 are counted.
- Only the first live delivery by a woman is counted.
- The *cycle-specific rate* is the percentage of women who had a live delivery in a specific cycle after previous failed treatment attempts. For example, 15.9% of women who undertook a fifth cycle achieved a live delivery in that cycle (Table 50).
- The *non-progression rate* is the percentage of women who did not return for further ART treatment cycles before 31 December 2014. For example, 25.3% of women who did not achieve a live delivery by their fifth cycle did not return for a sixth cycle (Table 50).

Table 50: Cycle-specific live delivery rates for all women who started their first autologous fresh cycle (excluding *freeze-all* cycles) between 1 January 2012 and 31 December 2012, Australia and New Zealand

Cycle number[a]	Number of women starting cycle	Number of women who had a live delivery[b]	Cycle-specific live delivery rate (%)[c]	Number of women who did not progress to next treatment	Non-progression rate (%)[d]
One	15,055	3,430	22.8	1,966	16.9
Two	9,659	1,933	20.0	1,639	21.2
Three	6,087	1,070	17.6	1,141	22.7
Four	3,876	605	15.6	785	24.0
Five	2,486	395	15.9	530	25.3
Six	1,561	252	16.1	338	25.8
Seven	971	142	14.6	243	29.3
Eight	586	54	9.2	172	32.3
Nine	360	31	8.6	91	27.7
Ten	238	21	8.8	73	33.6

(a) Cycle one represents a woman's first autologous (non *freeze-all*) fresh ART treatment cycle between 1 January 2012 and 31 December 2012. Cycles two to ten could be either a fresh or thaw cycle (excluding *freeze-all* cycles) undertaken by a woman until 31 December 2014 or delivery of a liveborn baby up to 31 October 2015.

(b) A live delivery is the delivery of one or more liveborn infants, with the birth of twins or higher order multiples counted as one live delivery.

(c) The cycle-specific live delivery rate for a specific cycle is calculated as the number of live deliveries in that specific cycle divided by the number of women who commenced ART treatment at that cycle.

(d) The non-progression rate for a specific cycle is calculated as the number of women who did not return for further ART treatment cycles before 31 December 2014 divided by the number of women who did not have a live delivery in that cycle. Reasons that a woman did not progress to the next treatment, such as poor prognosis, spontaneous pregnancy, migration, financial, psychological and other unrelated reasons, are not collected in ANZARD.

Note: Further treatment cycles after the tenth cycle and resulting live deliveries are not presented in this table due to small numbers. Data should be interpreted with caution due to small numbers in certain cells.

Table 51: Cycle-specific live delivery rates for women aged less than 30 who started their first autologous fresh cycle (excluding *freeze-all* cycles) between 1 January 2012 and 31 December 2012, Australia and New Zealand

Cycle number[a]	Number of women starting cycle	Number of women who had a live delivery[b]	Cycle-specific live delivery rate (%)[c]	Number of women who did not progress to next treatment	Non-progression rate (%)[d]
One	2,353	723	30.7	223	13.7
Two	1,407	392	27.9	185	18.2
Three	830	225	27.1	134	22.1
Four	471	124	26.3	78	22.5
Five	269	58	21.6	53	25.1
Six	158	38	24.1	24	20.0
Seven	96	21	21.9	19	25.3
Eight	56	11	19.6	17	37.8
Nine	28	3	10.7	7	28.0
Ten	18	4	22.2	2	14.3

(a) Cycle one represents a woman's first autologous (non *freeze-all*) fresh ART treatment cycle between 1 January 2012 and 31 December 2012. Cycles two to ten could be either a fresh or thaw cycle (excluding *freeze-all* cycles) undertaken by a woman until 31 December 2014 or delivery of a liveborn baby up to 31 October 2015.

(b) A live delivery is the delivery of one or more liveborn infants, with the birth of twins or higher order multiples counted as one live delivery.

(c) The cycle-specific live delivery rate for a specific cycle is calculated as the number of live deliveries in that specific cycle divided by the number of women who commenced ART treatment at that cycle.

(d) The non-progression rate for a specific cycle is calculated as the number of women who did not return for further ART treatment cycles before 31 December 2014 divided by the number of women who did not have a live delivery in that cycle. Reasons that a woman did not progress to the next treatment, such as poor prognosis, spontaneous pregnancy, migration, financial, psychological and other unrelated reasons, are not collected in ANZARD.

Note: Further treatment cycles after the tenth cycle and resulting live deliveries are not presented in this table due to small numbers. Data should be interpreted with caution due to small numbers in certain cells.

Table 52: Cycle-specific live delivery rates for women aged 30–34 who started their first autologous fresh cycle (excluding *freeze-all* cycles) between 1 January 2012 and 31 December 2012, Australia and New Zealand

Cycle number[(a)]	Number of women starting cycle	Number of women who had a live delivery[(b)]	Cycle-specific live delivery rate (%)[(c)]	Number of women who did not progress to next treatment	Non-progression rate (%)[(d)]
One	4,705	1,413	30.0	451	13.7
Two	2,841	771	27.1	334	16.1
Three	1,736	396	22.8	262	19.6
Four	1,078	223	20.7	186	21.8
Five	669	151	22.6	120	23.2
Six	398	85	21.4	78	24.9
Seven	235	60	25.5	49	28.0
Eight	126	22	17.5	28	26.9
Nine	76	13	17.1	18	28.6
Ten	45	5	11.1	15	37.5

(a) Cycle one represents a woman's first autologous (non *freeze-all*) fresh ART treatment cycle between 1 January 2012 and 31 December 2012. Cycles two to ten could be either a fresh or thaw cycle (excluding *freeze-all* cycles) undertaken by a woman until 31 December 2014 or delivery of a liveborn baby up to 31 October 2015.

(b) A live delivery is the delivery of one or more liveborn infants, with the birth of twins or higher order multiples counted as one live delivery.

(c) The cycle-specific live delivery rate for a specific cycle is calculated as the number of live deliveries in that specific cycle divided by the number of women who commenced ART treatment at that cycle.

(d) The non-progression rate for a specific cycle is calculated as the number of women who did not return for further ART treatment cycles before 31 December 2014 divided by the number of women who did not have a live delivery in that cycle. Reasons that a woman did not progress to the next treatment, such as poor prognosis, spontaneous pregnancy, migration, financial, psychological and other unrelated reasons, are not collected in ANZARD.

Note: Further treatment cycles after the tenth cycle and resulting live deliveries are not presented in this table due to small numbers. Data should be interpreted with caution due to small numbers in certain cells.

Table 53: Cycle-specific live delivery rates for women aged 35–39 who started their first autologous fresh cycle(excluding *freeze-all* cycles) between 1 January 2012 and 31 December 2012, Australia and New Zealand

Cycle number[a]	Number of women starting cycle	Number of women who had a live delivery[b]	Cycle-specific live delivery rate (%)[c]	Number of women who did not progress to next treatment	Non-progression rate (%)[d]
One	5,061	1,080	21.3	606	15.2
Two	3,375	615	18.2	551	20.0
Three	2,209	366	16.6	417	22.6
Four	1,426	212	14.9	269	22.2
Five	945	148	15.7	199	25.0
Six	598	104	17.4	120	24.3
Seven	374	48	12.8	90	27.6
Eight	236	16	6.8	70	31.8
Nine	150	13	8.7	36	26.3
Ten	101	9	8.9	36	39.1

(a) Cycle one represents a woman's first autologous (non-*freeze-all*) fresh ART treatment cycle between 1 January 2012 and 31 December 2012. Cycles two to ten could be either a fresh or thaw cycle (excluding *freeze-all* cycles) undertaken by a woman until 31 December 2014 or delivery of a liveborn baby up to 31 October 2015.

(b) A live delivery is the delivery of one or more liveborn infants, with the birth of twins or higher order multiples counted as one live delivery.

(c) The cycle-specific live delivery rate for a specific cycle is calculated as the number of live deliveries in that specific cycle divided by the number of women who commenced ART treatment at that cycle.

(d) The non-progression rate for a specific cycle is calculated as the number of women who did not return for further ART treatment cycles before 31 December 2014 divided by the number of women who did not have a live delivery in that cycle. Reasons that a woman did not progress to the next treatment, such as poor prognosis, spontaneous pregnancy, migration, financial, psychological and other unrelated reasons, are not collected in ANZARD.

Note: Further treatment cycles after the tenth cycle and resulting live deliveries are not presented in this table due to small numbers. Data should be interpreted with caution due to small numbers in certain cells.

Table 54: Cycle-specific live delivery rates for women aged 40–44 who started their first autologous fresh cycle (excluding *freeze-all* cycles) between 1 January 2012 and 31 December 2012, Australia and New Zealand

Cycle number[a]	Number of women starting cycle	Number of women who had a live delivery[b]	Cycle-specific live delivery rate (%)[c]	Number of women who did not progress to next treatment	Non-progression rate (%)[d]
One	2,784	213	7.7	615	23.9
Two	1,956	154	7.9	530	29.4
Three	1,272	83	6.5	315	26.5
Four	874	46	5.3	240	29.0
Five	588	38	6.5	153	27.8
Six	397	24	6.0	113	30.3
Seven	260	13	5.0	82	33.2
Eight	165	5	3.0	54	33.8
Nine	106	2	1.9	30	28.8
Ten	74	3	4.1	20	28.2

(a) Cycle one represents a woman's first autologous (non *freeze-all*) fresh ART treatment cycle between 1 January 2012 and 31 December 2012. Cycles two to ten could be either a fresh or thaw cycle (excluding *freeze-all* cycles) undertaken by a woman until 31 December 2014 or delivery of a liveborn baby up to 31 October 2015.

(b) A live delivery is the delivery of one or more liveborn infants, with the birth of twins or higher order multiples counted as one live delivery.

(c) The cycle-specific live delivery rate for a specific cycle is calculated as the number of live deliveries in that specific cycle divided by the number of women who commenced ART treatment at that cycle.

(d) The non-progression rate for a specific cycle is calculated as the number of women who did not return for further ART treatment cycles before 31 December 2014 divided by the number of women who did not have a live delivery in that cycle. Reasons that a woman did not progress to the next treatment, such as poor prognosis, spontaneous pregnancy, migration, financial, psychological and other unrelated reasons, are not collected in ANZARD.

Note: Further treatment cycles after the tenth cycle and resulting live deliveries are not presented in this table due to small numbers. Data should be interpreted with caution due to small numbers in certain cells.

Appendix A: Contributing fertility clinics

Australian Capital Territory

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

Genea—Canberra, Deakin (Associate Professor Mark Bowman)

ISIS Fertility, Barton (Dr Nicole Sides)

New South Wales

Bump IVF, Mosman (Dr Bronwyn Devine)

City Fertility Centre, Liverpool (Dr Andrew Davidson)

Demeter Laboratories, Liverpool (Dr David Knight)

Fertility East, Bondi Junction (Dr Joel Bernstein)

Fertility First, Hurstville (Dr Anne Clark)

Genea, Sydney (Associate Professor Mark Bowman)

Genea—Coffs Harbour, Coffs Harbour (Associate Professor Mark Bowman)

Genea—Illawarra, Wollongong (Associate Professor Mark Bowman)

Genea—Lismore, Lismore (Associate Professor Mark Bowman)

Genea—Liverpool, Liverpool (Associate Professor Mark Bowman)

Genea—Newcastle, Merewether (Associate Professor Mark Bowman)

Genea—Northwest, Baulkham Hills (Associate Professor Mark Bowman)

Genea—Orange, Orange (Associate Professor Mark Bowman)

Genea—RPAH, Camperdown (Associate Professor Mark Bowman)

Hunter IVF (IVF Australia), New Lambton Heights (Associate Professor Peter Illingworth)

IVF Australia—Central Coast, Gosford (Associate Professor Peter Illingworth)

IVF Australia—Eastern Sydney, Maroubra (Associate Professor Peter Illingworth)

IVF Australia—North Shore, Greenwich (Associate Professor Peter Illingworth)

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

Next Generation Fertility, Parramatta (Dr Peter Benny)

Primary IVF, Sydney CBD (Dr Janelle McDonald)

Primary IVF, Darlinghurst (Dr Janelle McDonald)

Reproductive Medicine Albury, Albury (Dr Scott Giltrap)

Royal Hospital for Women, Randwick (Prof William Ledger)

The Fertility Centre – Liverpool, Liverpool (Associate Professor Peter Illingworth)

Westmead Fertility Centre, Westmead (Dr Howard Smith)

Northern Territory

Repromed Darwin, Tiwi (Dr Richard Henshaw)

Queensland

Affordable IVF, Buderim (Dr James Orford)

CARE Fertility, Greenslopes (Dr Clare Boothroyd)

Cairns Fertility Centre, Cairns (Dr John Yovich)

City Fertility Centre – Brisbane, Brisbane (Dr Ashish Das)

City Fertility Centre - Gold Coast, Robina (Dr Andrew Davidson)

City Fertility Centre – Sunnybank, Sunnybank (Dr Neil Astil)

Coastal IVF, Maroochydore (Dr Paul Stokes)

Fertility Solutions Sunshine Coast, Nambour (Dr James Orford)

Life Fertility Centre, Spring Hill (Dr Glenn Sterling)

Monash IVF Auchenflower, Auchenflower (Dr John Chenoweth)

Monash IVF Gold Coast, Southport (Dr Irving Korman)

Monash IVF Queensland, Sunnybank (Dr Bruce Dunphy)

Monash IVF Rockhampton, Rockhampton (Dr Mark Leydon)

Monash IVF Townsville, Townsville (Dr Mark Leydon)

MyIVF, North Lakes, (Dr John Chenoweth)

QFG Cairns, Cairns (Dr David Molloy)

QFG North Brisbane, Everton Park (Dr David Molloy)

QFG Gold Coast, Benowa (Dr David Molloy)

QFG Mackay, North Mackay (Dr David Molloy)

QFG Sunshine Coast, Bunderim (Dr David Molloy)

QFG Toowoomba IVF, Toowoomba (Dr David Molloy)

QFG Townsville, Hyde Park (Dr David Molloy)

QFG Spring Hill, Spring Hill (Dr David Molloy)

The Fertility Centre, Springwood (Dr David Molloy)

The Fertility Centre, Sunshine Coast (Dr David Molloy)

South Australia

City Fertility Centre—Adelaide, Henly Beach (Dr Marcin Stankiewicz)

Fertility SA, Adelaide (Professor Robert Norman)

Flinders Fertility, Bedford Park (Dr Michael McEvoy)

Repromed, Dulwich (Dr Christine Kirby)

Tasmania

TasIVF, Hobart (Dr Bill Watkins)

Victoria

Ballarat IVF, Wendouree (Dr Russell Dalton)

City Fertility Centre Melbourne, Melbourne (Dr David Wilkinson)

City Fertility Centre Bundoora, Melbourne (Dr David Wilkinson)

Melbourne IVF, East Melbourne (Dr Lyndon Hale)

Melbourne IVF—Mount Waverley, Mount Waverley (Dr Lyndon Hale)

Melbourne IVF – Werribee, Werribee (Dr Lyndon Hale)

Monash IVF—Clayton, Clayton (Dr Nicole Hope)

Monash IVF—Bendigo, Bendigo (Dr Mark Jalland)

Monash IVF—Frankston, Frankston (Dr Alon Talmor)

Monash IVF—Geelong, Geelong (Professor Gab Kovacs)

Monash IVF – Hawthorn, Hawthorn (Dr Lynn Burmeister)

Monash IVF—Richmond, Richmond (Dr Lynn Burmeister)

Monash IVF—Sale, Sale (Dr Gareth Weston)

Monash IVF—Sunshine, St Albans (Dr Gareth Weston)

Reproductive Services, Parkville (Dr Lyndon Hale)

Western Australia

Concept Fertility Centre, Subiaco (Dr Rob Mazzucchelli)

Fertility Great Southern, Denmark (Dr Jay Natalwala)

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 Simon Kelly)

Fertility Associates Christchurch, Christchurch (Dr Sarah Wakeman)

Fertility Associates Hamilton, Hamilton (Dr VP Singh)

Fertility Associates Otago, Dunedin (Associate Professor Wayne Gillett)

Fertility Associates Wellington, Wellington (Dr Andrew Murray)

Fertility Plus, Auckland (Dr Neil Johnson)

Genea Oxford Women's Health, Christchurch (Dr Robert Woolcott)

Repromed Auckland, Auckland (Dr Guy Gudex)

Appendix B: Data used in this report

The data presented in this report are supplied by 40 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 on artificial insemination cycles using donated sperm (DI) from fertility centres. 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.

Data validation

Most fertility centres have computerised data information management systems and are able to provide NPESU with high-quality data. All data processed by NPESU undergo a validation process, with data queries being followed up with fertility centre staff. In 2014, information relating to pregnancy and birth outcomes was not provided for 1.0% of clinical pregnancies.

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

Data presentation

Chapters 2 to 7 of this report present information on ART and DI treatment cycles that took place in fertility clinics in Australia and New Zealand in 2014, and the resulting pregnancies and births. The babies included in this report were conceived following treatment cycles undertaken in 2014, and were born in either 2014 or 2015. Data presented in Chapters 2 to 7 are for treatment cycles and not women. 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 in Chapters 2 to 7, 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 calculated per embryo transfer cycle.

Chapter 8 presents information on women undergoing ART treatment cycles in 2014.

Chapter 9 presents longitudinal information on the cohort of women who were identified as starting their first autologous (non *freeze-all*) fresh ART cycle in 2012.

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 centres 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 great effort in validating such information by obtaining medical records from clinicians or hospitals.

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: otherfemale 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 hashad 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.

Variable	Data domain
Number of cleavage embryos slow frozen	Number of cleavage embryos frozen by slow freezing method in this cycle.
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	Answer yes if OHSS occurred.
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 or embryos were donated by another woman or couple, and whether the embryos were transferred soon after fertilisation or following cryopreservation.

Artificial insemination: a range of techniques for 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 around 100 cells usually developed by five or sixdays after fertilisation.

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

Cleavage stage embryo: an embryo comprising abouteight cells usually developed by two or threedays 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.

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

***Freeze-all* cycle:** a fresh cycle where all oocytes or embryos are cryopreserved for potential future use.

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-rapidcryopreservation 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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There were 73,598 ART treatment cycles reported from Australian and New Zealand clinics in 2014. Of these 23.7% resulted in a clinical pregnancy and 18.2% in a live delivery. There were 14,016 liveborn babies following ART treatment in 2014.