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Assisted reproductive technology in Australia and New Zealand 2007

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Contents

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Abbreviations and symbols

AIHW	Australian Institute of Health and Welfare
ANZARD	Australian and New Zealand Assisted Reproduction Database
ART	assisted reproductive technology
CI	confidence intervals
DET	double embryo transfer

Summary

Assisted reproductive technologies (ART) — such as in vitro fertilisation (IVF) — are a group of procedures used to assist women to become pregnant. ART usually involves removing oocytes (eggs) from a woman's ovaries, fertilising them in the laboratory and then transferring the resulting embryo(s) back into a woman's uterus. Over the last five years, the number of ART procedures has increased on average by over 10% per year in Australia and New Zealand. Latest estimates indicate that 3.1% and 1.8% of babies born in Australia and New Zealand respectively are as a result of ART treatment.

This is the thirteenth annual report on the use of ART in Australia and New Zealand, and presents data on women who underwent ART treatments in 2007, and the resulting pregnancies and baby outcomes.

Increased use of ART treatments

There were 56,817 ART treatment cycles reported in Australia and New Zealand in 2007. number of

1 Introduction

Having a child is not easily achieved for some, and this state of impair ed fertility is a source of much personal suffering to millions of

data collection reflecting the year the treatment was undertaken and does not link successive cycles to a particular woman. Therefore it is possible for an individual woman to undergo more than one treatment cycle in a year or experience more than one pregnancy, but these events are not linked.

Assisted reproductive technology in Australia and New Zealand 2007 is the thirteenth annual report on the use of ART in Australia and New Zealand. 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-year period from 2003 to 2007.

Purpose of this report

The main purpose of this report is to provide:

- information on ART treatment cycles and the

2 Overview of ART treatment in 2007

There were 56,817 ART treatment cycles reported from Australian and New Zealand clinics in 2007 (Table 1). Of these, 92.0% (52,296) were from Australian clinics and 8.0% (4,521) were from New Zealand clinics. In Australia there were 11.7 cycles per 1,000 women of reproductive age (15–44 years) compared to 4.9 cycles per 1,000 women of reproductive age in New Zealand.

About 95% of cycles in 2007 were autologous cycles where a woman intended to use, or used her own oocytes or embryos. Of the 53,696 autologous cycles, 62.5% were fresh cycles and 37.5% were thaw cycles. Other treatment cycles accounted for only a small proportion of cycles, comprising 3.0% oocyte recipient cycles, 0.4% embryo recipient cycles, 1.7% oocyte donation cycles, 0.2% GIFT cycles and 0.1% surrogacy cycles (Table 1).

Of all ART treatments in 2007, 22.6% (12,815) resulted in a clinical pregnancy (Table 1). Of the 12,815 clinical pregnancies, 11,456 (89.4%) were from Australian clinics and 1,359 (10.6%) from New Zealand clinics. There were 10,994 babies (including 10,856 liveborn babies) born following ART treatment in 2007. Of all babies, 9,842 (89.5%) were reported from Australian clinics and 1,152 (10.5%) from New Zealand clinics.

The multiple delivery rate following ART treatment in 2007 was 10.0% (10.3% for Australia and 7.5% for New Zealand).

Table 1: Number of initiated ART treatment cycles by treatment type, Australia and New Zealand, 2007

Treatment type	Number of initiated ART cycles	Per cent of treatment types	Number of clinical pregnancies	Number of live deliveries	Number of liveborn babies
Autologous	53,696	94.8	12,331	9,528	10,468
Fresh	*33,575*	*59.3*	*8,081*	*6,305*	*6,957*
Thaw	*20,121*	*35.5*	*4,250*	*3,223*	*3,511*

3 Autologous and donation/recipient cycles in 2007

This chapter presents data on initiated autologous cycles, oocyte donation cycles and oocyte/embryo recipient cycles. Because GIFT cycles (including intended GIFT cycles) and surrogacy cycles accounted for less than 0.4% of all treatment cycles, they 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 alter 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, or intention to use, either fresh or frozen/thawed embryos. In a small number of cycles undertaken in 2007 frozen/thawed oocytes were used in fertilisation.

3.1 Overview of autologous and recipient cycles

Women's age and partner's age of autologous and recipient cycles

The average age of women undergoing autologous and oocyte/embryo recipient cycles in 2007 was 35.7 years. For women undergoing oocyte/embryo recipient cycles the mean age was 40.5 years, five years older than for autologous cycles (35.5 years). Over one in five cycles (22.8%) were undertaken by women aged 40 years or older (Table 2). The average age of partners was 38.1 years, with 35.7% in partners aged 40 years or older (Table 3).

Table 2: Number of autologous and recipient cycles by women's age group and treatment type, Australia and New Zealand, 2007

Age group (years) [(a)]	Autologous				Oocyte /embryo recipient		All	
	Fresh		Thaw					
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
< 30	3,717	11.1	2,304	11.4	66	3.4	6,087	10.9
30–34	8,945	26.6	6,431	32.0	242	12.3	15,618	28.1
35–39	12,798	38.1	8,001	39.8	480	24.5	21,279	38.2
40–44	7,528	22.4	3,152	15.7	662	33.7	11,342	20.4
45	586	1.7	233	Ta45	52	28.1		

Parity of autologous and recipient cycles

Parity describes a woman in terms of the number of previous pregnancies experienced that reached 20 weeks or more gestation. Nulliparous refers to a woman who has never had a

Number of embryos transferred in autologous and recipient cycles

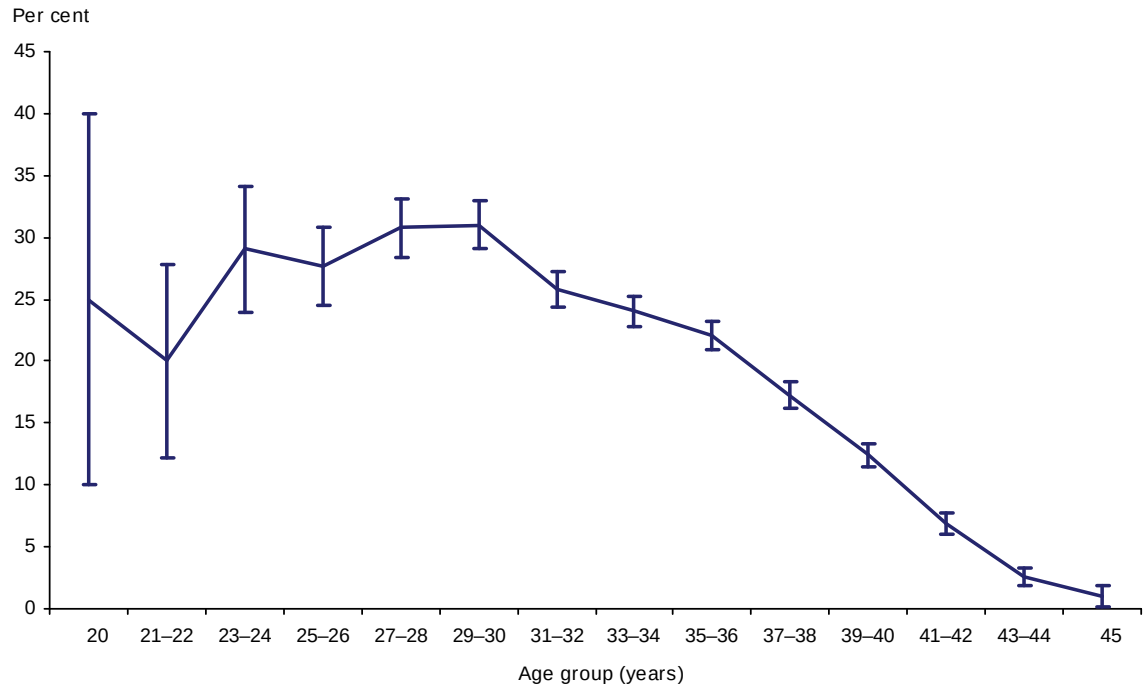
Of the 46,464 embryo transfer cycles, 63.7% were single embryo transfer (SET) cycles and 35.7% were double embryo transfer (DET) cycles. In women aged less than 35 years, 72.5% of cycles were SET cycles and 27.4% were DET cycles. In women aged 35 years or older, 57.8% of cycles were SET cycles and 41.2% were DET cycles (Table 6).

Table 6: Number of embryo transfer cycles by number of embryos transferred per cycle and women's age group, Australia and New Zealand, 2007

3.2 Autologous fresh cycles

Figure 2 shows women's age-specific live delivery rates per initiated autologous fresh cycle by two-year age groups. The highest live delivery rates were for women aged between 23 and 30 years. The live delivery rate declined steadily for women older than 30 years. For women aged 45 years or older, only one live delivery resulted from every 100 initiated cycles (95% confidence intervals (CI): 0.2% to 1.8%).

The lower live delivery rates in women in th eir early 20s possibly relate to concurrent underlying medical conditions.



Note: The bars on the graph represent the 95% confidence intervals of the live delivery rates, with the narrower bars representing more reliable estimates.

Figure 2: Live delivery rate per initiated autologous fresh cycle and 95% CI by women's age group, Australia and New Zealand, 2007

Clinical pregnancies and live deliveries from autologous fresh cycles by number of embryos transferred

Cycles with three or more embryos transferred only accounted for 0.1% and 1.4% of embryos transfer cycles in women aged younger than 35 years and in women aged 35 years or older respectively. Overall, 60.1% of embryo transfer cycles were SET cycles and 39.1% were DET cycles.

For women aged less than 35 years the difference in the live delivery rates between SET and DET cycles was 1.5 percentage points (32.7% and 34.2% respectively). For women aged 35 years and older the difference was only 0.4 percentage points (18.0% and 18.4% respectively). Overall, the live delivery rate was 25.0% for SET and 22.6% for DET (Table 10).

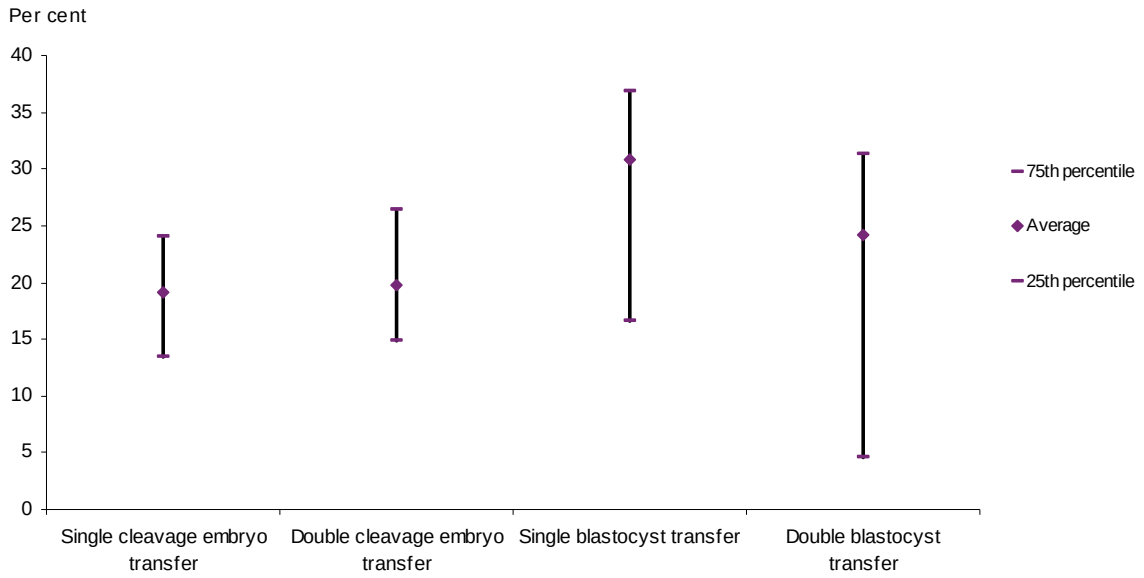
Table 10: Outcomes of autologous fresh embryo transfer cycles by women's age and number of embryos transferred, Australia and New Zealand, 2007

	Age group (years) [(a)]								
	< 35			• 35			All		
Stage/outcome of treatment	One embryo	Two embryos	Three or more embryos	One embryo	Two embryos	Three or more embryos	One embryo	Two embryos	Three or more embryos
Embryo transfers	7,558	2,712	11	8,259	7,572	225	15,817	10,284	236
Clinical pregnancies	2,997	1,108	6	2,017	1,912	41	5,014	3,020	47
Live deliveries	2,471	927	3	1,484	1,394	26	3,955	2,321	29
Clinical pregnancies per embryo transfer cycle (%)	*39.7*	*40.9*	*54.5*	*24.4*	*25.3*	*18.2*	*31.7*	*29.4*	*19.9*
Live deliveries per embryo transfer cycle (%)	*32.7*	*34.2*	*27.3*	*18.0*	*18.4*	*11.6*	*25.0*	*22.6*	*12.3*

(a) Age at time of treatment.

There was also variation in the outcomes of autologous fresh cycles by number of embryos transferred and stage of embryo development. Figure 3 shows the average live delivery rate and interquartile range among fertility centres. Single blastocyst transfers achieved the highest rate (30.8%) of live deliveries per embryo transfer cycle. Half of the fertility centres that carried out single blastocyst transfers achieved a live delivery rate between 16.7% and 36.8%. Single cleavage stage transfers achieved a live delivery rate of 19.2% per embryo transfer cycle, with half of the fertility centres that carried out single cleavage stage embryo transfers achieving a live delivery rate between 13.5% and 24.0%. The greatest variation in live delivery rates among fertility centres was in the transfer of blastocyst embryos. The rates are unadjusted for women's age and parity which may vary between centres.

These data should be interpreted with caution because of small numbers and potential variability of other factors which may influence the live delivery rate of an individual centre.



3.3 Autologous thaw cycles

There were 12,121 autologous thaw cycles reported in 2007. Of these, 92.5% (18,606) were from Australian clinics and 7.5% (1,515) from 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 20,121 initiated thaw cycles, 91.0% had embryos transferred, 21.1% resulted in a clinical pregnancy and 16.0% resulted in a live delivery (Figure 4). Almost one in eleven 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 lower for autologous thaw cycles than for autologous fresh cycles in 2007 (16.0% and 18.8% respectively) (Figures 1 and 4).

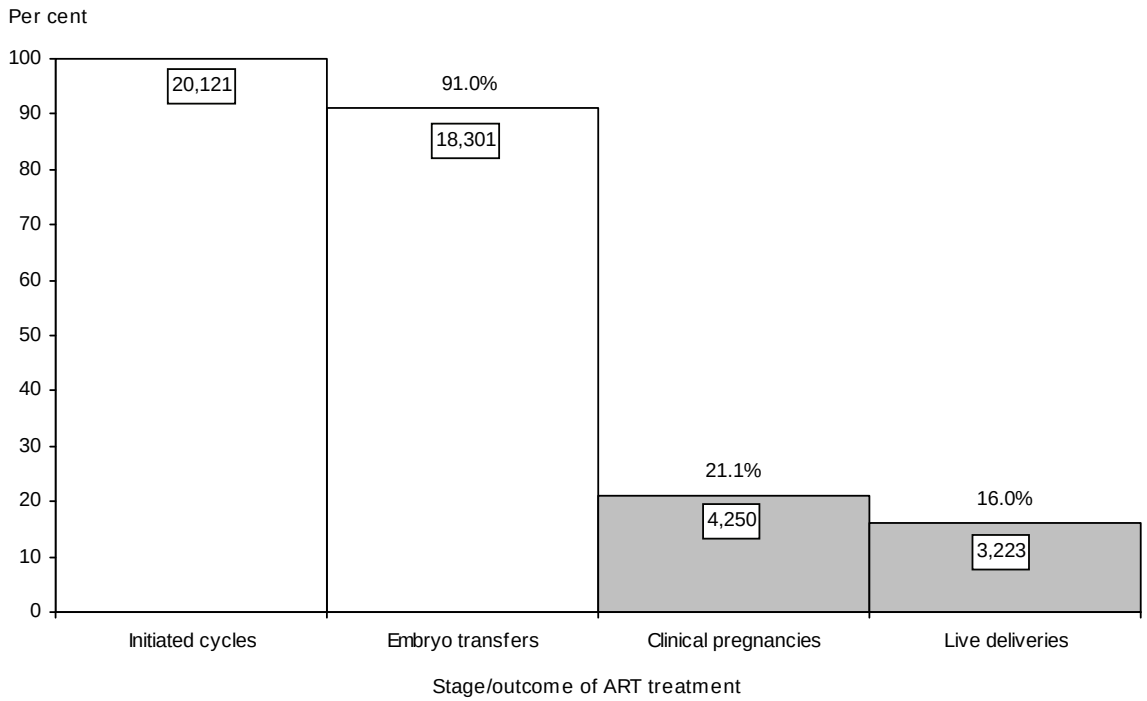


Figure 4: Progression of autologous thaw cycles, Australia and New Zealand, 2007

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

Similar to women undergoing autologous fresh cycles, the live delivery rate per embryo transfer cycle declined with advancing women's age. The highest live delivery rate per embryo transfer cycle was in women aged 30–34years (Table 13). However, the maternal age of the embryo relates to the age at which a women undertook her initial autologous fresh cycle, therefore the physiological age of the embryo may be younger than the age of the woman when she underwent her thaw cycle.

Table 13: Outcomes of autologous thaw cycles by women's age group, Australia and New Zealand, 2007

	Age group (years) [(a)]					
Stage/outcome of treatment	< 30	30–34	35–39	40–44	• 45	All
Initiated cycles	2,304	6,431	8,001	3,152	233	20,121
Embryo transfers	2,142	5,873	7,307	2,781	198	18,301
Clinical pregnancies	555	1,568	1,694	407	26	4,250
Live deliveries	421	1,264	1,271	252	15	3,223
Live deliveries per initiated cycle (%)	18.3	19.7	15.9	8.0	6.4	16.0
Live deliveries per embryo transfer cycle (%)	19.7	21.5	17.4	9.1	7.6	17.6
Live deliveries per clinical pregnancy (%)	75.9	80.6	75.0	61.9	57.7	75.8

(a) Age at time of treatment.

Clinical pregnancies and live deliveries from autologous thaw cycles by cause of infertility

Cycles reported with male factor as the only cause of infertility had the highest rates of clinical pregnancies and live deliveries per initiated cycle (24.9% and 17.7% respectively) (Table 14). The live delivery rate was significantly higher for cycles with male factor only infertility than for cycles with female factor only infertility (RR 1.18, 95% CI 1.09 to 1.28).

Table 14: Outcomes of autologous thaw cycles by cause of infertility, Australia and New Zealand, 2007

Clinical pregnancies and live deliveries from autologous thaw cycles by number of embryos transferred

The rates of clinical pregnancy and live delivery were lower for single embryo transfer (SET) than double embryo transfer (DET) regardless of a women's age. Overall, the difference in live delivery rates for SET and DET in autologous thaw cycles was 3.4 percentage points (16.6% and 20.0% respectively) (Table 15).

Table 15: Outcomes of autologous thaw embryo transfer cycles by women's age and number of embryos transferred, Australia and New Zealand, 2007

	Age group (years) [(a)]								
	< 35			• 35			All		
Stage/outcome of treatment	One embryo	Two embryos	Three or more embryos	One embryo	Two embryos	Three or more embryos	One embryo	Two embryos	Three or more embryos
Embryo transfers	5,751	2,256	8	6,992	3,247	47	12,743	5,503	55
Clinical pregnancies	1,450	671	2	1,304	811	12	2,754	1,482	14
Live deliveries	1,142	541	2	969	561	8	2,111	1,102	10
Clinical pregnancies per embryo transfer cycle (%)	*25.2*	*29.7*	*25.0*	*18.6*	*25.0*	*25.5*	*21.6*	*26.9*	*25.5*
Live deliveries per embryo transfer cycle (%)	*19.9*	*24.0*	*25.0*	*13.9*	*17.3*	*17.0*	*16.6*	*20.0*	*18.2*

(a) Age at time of treatment.

Live deliveries from autologous thaw cycles among fertility centres

The live delivery rate per initiated autologous thaw cycle varied among 31 fertility centres in Australia and New Zealand. This variation in live delivery rates is measured using quartiles which rank an individual centre's live delivery rate.

The live delivery rates per initiated autologous thaw cycle ranged from 5.7% to 33.3% among fertility centres. The top 25% (first quartile) of fertility centres had live delivery rates from 19.1% to 33.3%. The bottom 25% (fourth quartile) of fertility centres had live delivery rates between 5.7% and 13.4%. The remaining 50% of fertility centres achieved rates between 13.5% and 19.0%. Overall the live delivery rate was 16.0% for autologous thaw cycles in all centres in Australia and New Zealand. Women aged less than 35 years (19.3%) had higher rates than those aged 35 years and older (13.5%) (Table 17).

Table 17: Live delivery rate of autologous thaw cycles by women's age group among fertility centres, Australia and New Zealand, 2007

Age group (years) [(a)]	Live deliveries per initiated autologous fresh cycle (%)				
	Mean	First quartile	Second quartile	Third quartile	Fourth quartile

There was also variation in the outcomes of autologous thaw cycles by number and type of embryos transferred among the fertility centres. Figure 6 shows the average live delivery rate for autologous thaw embryo transfer cycles and the interquartile range by number of embryos transferred and stage of embryo development among fertility centres. Double blastocyst transfers achieved the highest live delivery rate (20.9%) followed by double cleavage stage embryo transfers (19.7%). These rates are unadjusted for the women's age and parity which may vary between centres.

These data should be interpreted with caution because of small numbers and potential variability of other factors which may influence the live delivery rate of an individual centre

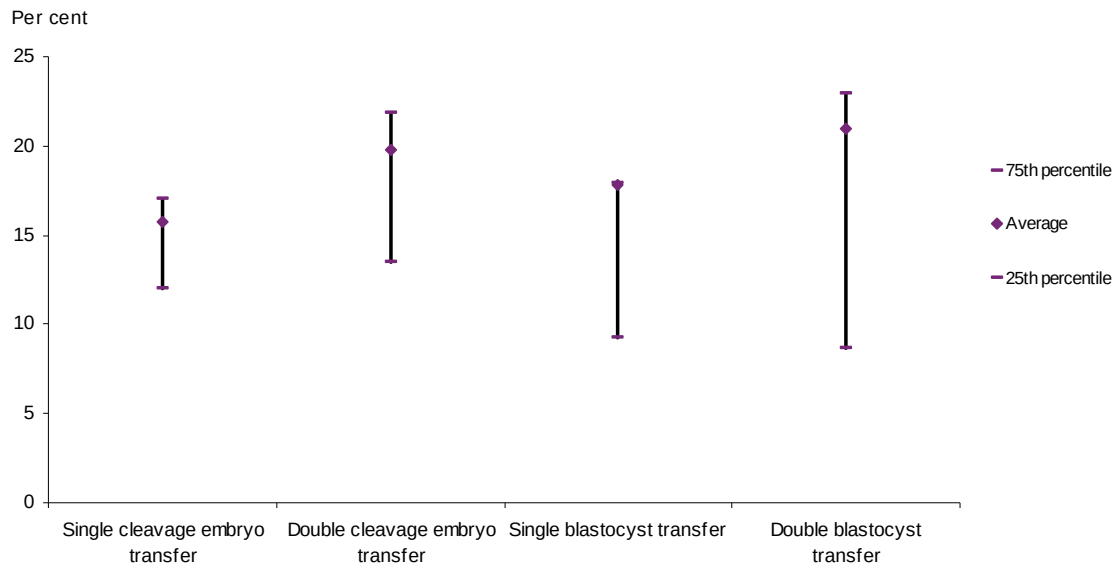


Figure 6: Live delivery rate of autologous thaw embryo transfer cycles by number of embryos transferred and stage of embryo development among fertility centres, Australia and New Zealand, 2007

3.4 Donation and recipient cycles

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

In 2007, donation and recipient cycles accounted for 5.1% (2,914) of all treatment cycles in Australia and New Zealand, including 952 (32.7%) oocyte donation cycles and 1,962 (67.3%) oocyte/embryo recipient cycles (Table 1). All oocyte donation cycles were undertaken as fresh cycles.

3.4.1 Oocyte donation cycles

In 2007, there were 952 cycles in Australia and New Zealand where the intention was to donate fresh oocytes to a recipient. Forty-nine of these cycles were cancelled before oocyte pick-up (OPU).

Of the 952 oocyte donation cycles, 47.5% were in women aged 35 years or older. The average age of women donating oocytes was 33.6 years. Nearly 94% of the initiated oocyte donation cycles resulted in donations (Table 18).

Table 18: Number of oocyte donation cycles by donor's age group, Australia and New Zealand, 2007

Age group (years) [(a)]

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

Regardless of women's age, the live delivery rate per oocyte/embryo recipient cycle with embryos transferred was lower for SET cycles than for DET cycles. Overall, the difference in the live delivery rate between SET cycles and DET cycles was 4.6 percentage points (15.9% and 20.5% respectively) (Table 21).

Table 21: Outcomes of oocyte/embryo recipient cycles by recipient's age and number of embryos transferred, Australia and New Zealand, 2007

	Age group (years) [(a)]								
	< 35			• 35			All		
Stage/outcome of treatment	One embryo	Two embryos	Three or more embryos	One embryo	Two embryos	Three or more embryos	One embryo	Two embryos	Three or more embryos
Embryo transfers	169	120	0	860	669	8	1,029	789	8
Clinical pregnancies	41	29	0	197	183	1	238	212	1
Live deliveries	24	24	0	140	138	0	164	162	0
Clinical pregnancies per embryo transfer cycle (%)	*24.3*	*24.2*	*. .*	*22.9*	*27.4*	*12.5*	*23.1*	*26.9*	*12.5*
Live deliveries per embryo transfer cycle (%)	*14.2*	*20.0*	*. .*	*16.3*	*20.6*	*0.0*	*15.9*	*20.5*	*0.0*

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

Regardless of women's age, the live delivery rate per oocyte/embryo recipient cycle with embryos transferred was similar between cleavage stage embryo transfer cycles and blastocyst transfer cycles. Overall, the difference in live delivery rates for cleavage stage embryos and blastocysts was only 0.2 percentage points (17.9% and 17.7% respectively) (p=0.90, Chi-square test) (Table 22).

Table 22: Outcomes of oocyte/embryo recipient cycles by recipient's age and stage of embryo development, Australia and New Zealand, 2007

	Age group (years) [(a)]					
	< 35		• 35		All	
Stage/outcome of treatment	Cleavage stage embryo	Blastocyst	Cleavage stage embryo	Blastocyst	Cleavage stage embryo	Blastocyst
Embryo transfers	223	66	1,150	387	1,373	453
Clinical pregnancies	53	17	288	93	341	110
Live deliveries	37	11	209	69	246	80
Clinical pregnancies per embryo transfer cycle (%)	*23.8*	*25.8*	*25.0*	*24.0*	*24.8*	*24.3*
Live deliveries per embryo transfer cycle (%)	*16.6*	*16.7*	*18.2*	*17.8*	*17.9*	*17.7*

(a) Age at time of treatment.

4 Pregnancy and birth outcomes following embryo transfer cycles in 2007

4.1 Clinical pregnancies

Clinical pregnancies overview

Of the 46,464 autologous and recipient embryo transfer cycles undertaken in Australian and New Zealand fertility centres, 12,782 resulted in a clinical pregnancy. Of these, 11,430 (89.4%) were from fertility centres in Australia and 1,352 (10.6%) from New Zealand centres. The 33 clinical pregnancies that resulted from GIFT and surrogacy cycles are described in Chapter 5.

Almost four in five clinical pregnancies (78.0%) resulted in a delivery and 20.3% resulted in early pregnancy loss (less than 20 weeks gestation and less than 400 grams birthweight). The outcomes of 223 (1.7%) clinical pregnancies were not known because women were unable to be followed up or contacted by fertility centres.

The majority of clinical pregnancies followed SET (62.6%) and DET (36.9%). Only 0.5% of clinical pregnancies followed the transfer of more than two embryos.

Early pregnancy loss

There were 2,596 early pregnancy losses (less than 20 weeks gestation and less than 400 grams birthweight) following embryo transfers in 2007, representing 20.3% of clinical pregnancies. Of these, 89.6% were miscarriages, 6.6% were ectopic or heterotopic pregnancies and 3.8% were due to fetal reduction or termination of pregnancy (Table 24).

Table 24: Clinical pregnancies of < 20 weeks gestation by pregnancy outcome and treatment type, Australia and New Zealand, 2007

Pregnancy outcome	Autologous				Oocyte /embryo recipient		All	
	Fresh		Thaw					
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Miscarriage	1,399	90.2	827	88.9	100	87.0	2,326	89.6
Reduction or termination	62	4.0	34	3.7	2	1.7	98	3.8
Ectopic or heterotopic pregnancy	90	5.8	69	7.4	13	11.3	172	6.6
Total	1,551	100.0	930	100.0	115	100.0	2,596	100.0

Deliveries by maternal age

The average age of women at the time of delivery was 34.8 years. This is five years older than the average age (29.8 years) of women who gave birth in Australia in 2006 (Laws et al. 2008).

Women aged less than 35 years had a marginally higher proportion of multiple gestation deliveries compared with women aged 35 years or older (10.4% and 9.6% respectively) (Table 27).

Table 27: Deliveries by gestation and maternal age group, Australia and New Zealand, 2007

	Age group (years) [(a)]

Caesarean section

Almost half (48.4%, 95% CI 47.5% to 49.4%) of deliveries following embryo transfer cycles in 2007 were by caesarean section (Table 28). This is a markedly higher rate than for all deliveries in Australia in 2006 (30.8%) (Laws et al. 2008).

The caesarean section rate increased with advancing women's age at delivery—37.3% of women aged less than 30 years had a caesarean section compared to 77.3% of women aged 45 years or older (Table 28).

4.3 Perinatal outcomes of babies conceived following embryo transfer cycles

Figure 8 shows the distribution of gestational age for singletons and twins born to women who had embryo transfer cycles in 2007. The proportions of preterm singletons (10.5%) and twins (64.9%) born to women who had embryo transfer cycles in 2007 were higher than the proportions of preterm singletons and twins born in Australia in 2006 (6.5% and 55.5% respectively) (Laws et al. 2008).

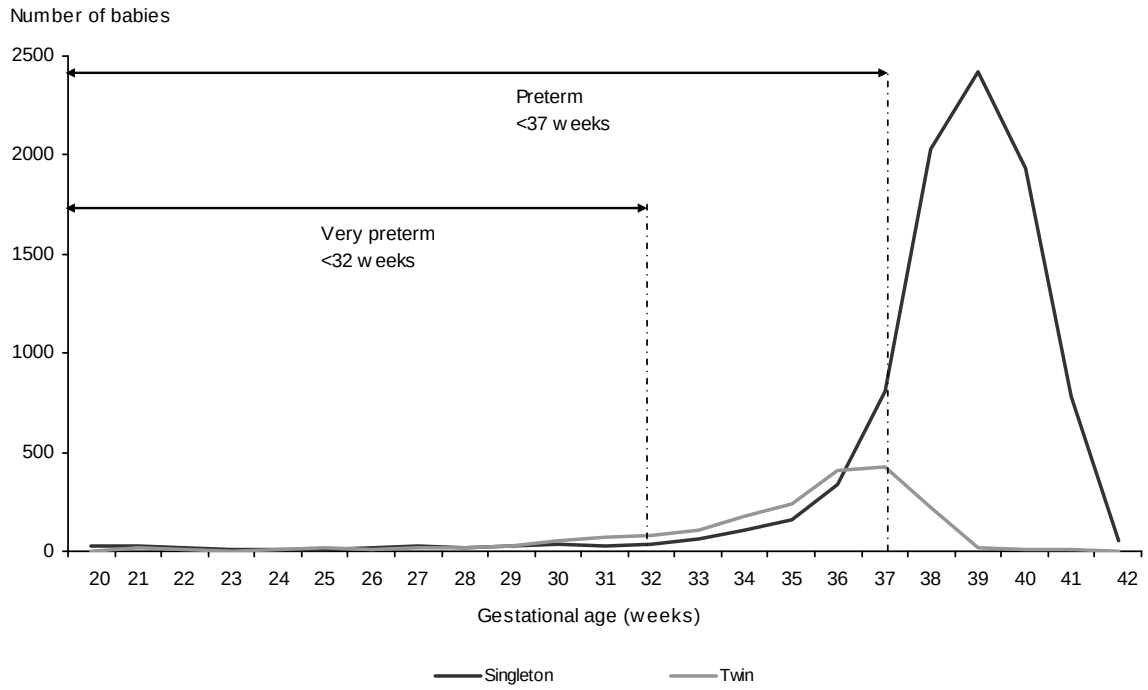


Figure 8: Number of babies by gestational age, Australia and New Zealand, 2007

Birthweight of liveborn babies

The average birthweight for liveborn babies to women who had embryo transfer cycles in 2007 was 3,152 grams. Just over 15% of these babies were low birthweight (< 2,500 grams) (Table 30).

As with gestational age, the high proportion of low birthweight babies mainly reflects the high proportion of multiple births among babies conceived after ART treatment.

Singletons had an average birthweight of 3,326 grams, compared with 2,370 grams for twins. Just on 7% of ART singletons were low birthweight (Table 30), which is markedly higher than the proportion of low birthweight singletons (4.8%) born in Australia in 2006 (Laws et al. 2008). Of ART twins, 52.1% were low birthweight, which is similar to the proportion of low birthweight twins (51.5%) born in Australia in 2006 (Laws et al. 2008).

Table 30: Liveborn babies by birthweight group and plurality, Australia and New Zealand, 2007

	Singletons		Twins		Triplets		Total	
Birthweight (g)	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Mean (g)	*3,326*		*2,370*		*1,737*		*3,152*	
< 1,000	59	0.7	48	2.5	8	16.7	115	1.1
1,000–1,499	70	0.8	122	6.4	3	6.3	195	1.8
1,500–1,999	129	1.5	264	13.8	19	39.6	412	3.8
2,000–2,499	360	4.1	565	29.5	13	27.1	938	8.7
2,500–2,999	1,299	14.6	632	33.0	3	6.3	1,934	17.8
3,000–3,499	3,391	38.2	226	11.8	0	0.0	3,617	33.4
3,500–3,999	2,550	28.7	18	0.9	0	0.0	2,568	23.7
4,000	942	10.6	6	0.3	0	0.0	948	8.7
Not stated	71	0.8	35	1.8	2	4.2	108	1.0
Total	8,871	100.0	1,916	100.0	48	100.0	10,835	100.0
< 2,500	*618*	*7.0*	*999*	*52.1*	*43*	*89.6*	*1,660*	*15.3*

Perinatal mortality

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

There were 159 reported perinatal deaths, representing 1.4% of all babies born following embryo transfer cycles in 2007. Of these, 126 were fetal deaths and 33 were neonatal deaths. The perinatal death rate in 2007 was 14.5 deaths per 1,000 births (Table 31). Although, the reported perinatal mortality rate in 2007 was lower than the rate of 17.5 deaths per 1,000 births reported in 2006 (Wang et al. 2008), it remains higher than the perinatal mortality rate of 10.3 per 1,000 births to all women who gave birth in Australia 2006 (Laws et al. 2008).

Singletons had a lower perinatal mortality rate of 12.6 deaths per 1,000 births compared to twins (23.5 deaths per 1,000 births) (Table 31). There were no perinatal deaths among triplets.

These data should be interpreted with caution because of the small numbers and potential variability in case reporting. Data are limited by the self-reported nature of the information, especially on pregnancy complications and infant morbidity and mortality. In 2007, information relating to birth outcomes was not stated for less than 1.7% of clinical pregnancies.

Table 31: Perinatal mortality of babies by type of death and plurality, Australia and New Zealand, 2007

Type of death	Singletons	Twins	Total
		Number	
Fetal deaths	90	36	126
Neonatal deaths	23	10	33
Perinatal deaths [(a)]	113	46	159
		Rate per 1,000 births	
Fetal deaths per 1,000 births	*10.0*	*18.4*	*11.5*
Neonatal deaths per 1,000 live births	*2.6*	*5.2*	*3.0*
Perinatal deaths per 1,000 births[(b)]	*12.6*	*23.5*	*14.5*

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

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

5 GIFT cycles, surrogacy cycles, other procedures and complications in 2007

5.1 GIFT cycles

Gamete intrafallopian transfer (GIFT) is an ART treatment where mature oocytes and sperm are placed directly into a woman's fallopian tubes so that in vivo fertilisation may take place. The use of GIFT has been declining in Australia and New Zealand in recent years. In 2007, there were 133 GIFT cycles or intended GIFT cycles reported to ANZARD. Of these cycles, 107 (80.5%) had oocytes transferred, of which 17.8% (19) resulted in a clinical pregnancy, 13.1% (14) resulted in a delivery (including one twin delivery) and 12.2% (13) resulted in a live delivery.

Of the 15 babies born to women who had GIFT cycles in 2007, 20% were born preterm (<37 weeks gestation) and 26.7% were low birthweight (<2,500 grams). One of the 15 babies was reported as a fetal death (stillbirth).

5.2 Surrogacy cycles

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

There were 74 surrogacy cycles reported to ANZARD in 2007, including 52, 6.8ha00007.i]TJ p.3T2[05.6(no)]

5.3 Preimplantation genetic diagnosis

Preimplantation genetic diagnosis (PGD) is a procedure whereby embryonic cells are removed and screened for chromosomal disorders or genetic diseases before embryo transfer. In 2007, PGD was performed in 906 cycles, representing 1.8% of cycles in which embryos were created or thawed. Most PGD cycles (762/906) were fresh cycles (Table 32).

Of the 906 PGD cycles, 72.4% (656) had embryos transferred, 23.4% (212) resulted in a clinical pregnancy and 17.8% (161) resulted in a live delivery.

Table 32: Number of cycles with PGD by type of embryo, Australia and New Zealand, 2007

	Stage of treatment		
Type of embryo	Number of cycles with embryo fertilised/thawed	Number of cycles with PGD	PGD per cycle with embryo fertilised/thawed (%)
Fresh	29,133	762	2.6
Thaw	20,991	144	0.7
Total	50,124	906	1.8

5.4 Ovarian hyperstimulation syndrome

ANZARD includes morbidity information that is specifically related to ART treatment. Ovarian hyperstimulation syndrome (OHSS) is a complication of ovarian stimulation, which involves the administration of fertility drugs to stimulate follicular development and oocyte maturation.

OHSS and other morbidity data are reported by patients and clinicians, and validated with hospital records by fertility centre staff. It is possible this information is under-reported as there is no nationally-agreed definition for OHSS.

There were 248 OHSS cases reported in 2007. Of these, 234 (94.4%) were reported as being admitted to hospital. There were 244 OHSS cases in which OPUs were performed. Overall, OHSS occurred in 0.8% of cycles that involved an OPU with the incidence of OHSS increasing with the number of oocytes collected (Table 33).

Table 33: Number of cycles with OPU performed and OHSS by number of oocytes collected, Australia and New Zealand, 2007

	Number of oocytes collected						
	None	1–4	5–9	10–14	15–19	• 20	All
Cycles with OHSS	1	7	31	53	67	85	244
Cycles with OPU	568	7,199	10,773	7,174	3,464	2,312	31,490
OHSS per OPU cycle (%)	*0.2*	*0.1*	*0.3*	*0.7*	*1.9*	*3.7*	*0.8*

6 Donor sperm insemination cycles in 2007

Donor sperm insemination (DI) covers a range of techniques of placing sperm into the female genital tract using donated sperm from a man other than the woman's partner. The information reported to ANZARD and presented in this section only describes DI cycles undertaken in fertility centres in Australia and New Zealand, and does not include DI undertaken in hospitals or private clinics.

Number and outcomes of DI cycles

In 2007, there were 2,458 DI cycles reported to ANZARD, which included 16.5% (406) undertaken with controlled ovarian hyperstimulation and 83.5% (2,052) undertaken in unstimulated cycles. The average age of women who had a DI cycle in 2007 was 35.3 years. Of all DI cycles, 14.1% resulted in a clinical pregnancy and 11.2% resulted in a live delivery (Table 34).

Over two-thirds (69.0%) of DI cycles were in women aged between 30 and 39 years. The clinical pregnancy rate and live delivery rate decreased with advancing women's age. About 16% of DI cycles in women aged less than 30 years resulted in a live delivery, compared to only 3% of DI cycles in women aged 40 years or older (Table 34).

Table 34: Number of DI cycles by women's age group, Australia and New Zealand, 2007

	Age group (years) [(a)]				
Stage/outcome of treatment	< 30	30–34	35–39	• 40	Total
DI cycles	303	687	1,009	459	2,458
Clinical pregnancies	54	117	144	32	347
Live deliveries	48	102	111	14	275
Clinical pregnancies per DI cycle (%)	*17.8*	*17.0*	*14.3*	*7.0*	*14.1*
Live deliveries per DI cycle (%)	*15.8*	*14.8*	*11.0*	*3.1*	*11.2*
Live deliveries per clinical pregnancy (%)	*88.9*	*87.2*	*77.1*	*43.8*	*79.3*

(a) Age at time of treatment.

Clinical pregnancies following DI cycles

There were 347 clinical pregnancies following DI cycles in 2007 (Table 34). Of these, 0.6%

7 Trends in ART treatment and outcomes: 2003–2007

This section includes autologous cycles, donation/recipient cycles, GIFT cycles and surrogacy cycles undertaken in Australia and New Zealand from 2003 to 2007.

ART treatment and outcomes

In 2007, 56,817 initiated ART treatment cycles were undertaken in Australia and New Zealand. This is an increase of 12.5% in ART treatment cycles undertaken in 2006 and an increase of 53.7% in ART treatment cycles undertaken in 2003 (Table 35).

There has also been a steady increase in the number of clinical pregnancies and live deliveries resulting from ART treatment between 2003 and 2007. This increase resulted mainly from the increase in the number of ART treatments undertaken. In 2007, there were 9,874 live deliveries, 1.6 times the 6,022 live deliveries in 2003 (Table 35). This increase represents a growth of 1,260 clinical pregnancies per year ($p<0.01$) and 991 live deliveries per year ($p<0.01$) between 2003 and 2007.

Between 2003 and 2007, the live delivery rate per initiated cycle ranged from 16.2% to 17.8% (Table 35). During this period there was a voluntary shift in clinical practice to SET in Australia and New Zealand, with the proportion of SET cycles increasing from 32.0% to 63.7% (Figure 9). During the same period there was a fall in the multiple delivery rate from 18.7% to 10.0% (Table 36).

Table 35: Number of ART treatment cycles by stage/outcome of treatment, Australia and New Zealand, 2003 to 2007

Appendix 1: Data used in this report

The data presented in this report are supplied 35 fertility centres in Australia and New Zealand and are compiled into ANZARD. ANZARD includes information about the ART treatment procedures of IVF and GIFT. It also includes information about ART treatment using fresh and cryopreserved/thawed embryos, treatment involving donated oocytes or embryos, and treatment involving surrogacy

Data limitations

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

Appendix 2: ANZARD data items

Variable	Data domain
Unit identifier	3-digit code for clinics provided by NPSU.
Site of main treatment	For centres with multiple sites, this identifies location of most significant part of the treatment.
Unit patient ID/medical record number	Unique ID for patient.
Woman's date of birth	Day/month/year.
Husband/male partner DOB	Day/month/year.
Oocyte/embryo donor's age	Completed years at time of donation.
Previous Medicare item 13200s	The number of billed Australian Medicare item 13200. New Zealand units leave this field blank.
Cause of infertility: tubal disease	Yes—in the opinion of the treating clinician or clinic there is significant tubal disease present.
	No—other.
Cause of infertility: endometriosis	Yes—in the opinion of the treating clinician or clinic there is significant endometriosis contributing to this couple's subfertility.
	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: other factors	Yes—in the opinion of the treating clinician or clinic there is subfertility due to any other factors apart from female age, tubal disease, male factor or endometriosis. Possible examples are fibroids, ovulation disorders or premature ovarian failure. There is no clinical subfertility (e.g. egg donor, preimplantation genetic diagnosis or other non-fertility reason for ART).
	No—other.
Cause of infertility: idiopathic	Yes—in the opinion of the treating clinician or clinic there is clinical subfertility without any apparent explanation.
	No—other, including case of PGD for genetic disease.
Previous pregnancies < 20 weeks	Number of known pregnancies less than 20 weeks in the female partner regardless of whether by ART or by a different partner.
Previous pregnancies 20 weeks	Number of known pregnancies reaching 20 weeks or more in the female partner regardless of whether by ART or by a different partner.
Cycle ID	Unique cycle identifier.
Cycle date	For treatment cycles this is according to the Medicare definition and is the date of LMP for unstimulated cycles or, where FSH is used, the first day of FSH administration. For cycles where the only process is movement or disposal of embryos, this is the date of embryo movement. This date defines the year in which a cycle is reported to NPSU.
Surrogacy	Yes—the procedure is part of a surrogate arrangement.
	No—the procedure is not part of a surrogate arrangement.
Injectable FSH stimulation given	Yes—FSH administered. Does not include clomiphene or hCG alone unless FSH was also given.
	No—other.
DI date	Date of first insemination with donor sperm.
OPU date	Date of oocyte retrieval.
Number of eggs retrieved	Number of eggs retrieved at OPU. Include any immature oocytes that are identified.
Number of eggs donated	Number of eggs donated to someone else.
Number of eggs received	Number of eggs received from someone else.

Variable	Data domain
Number of eggs GIFT	Number of eggs replaced in a GIFT procedure.
Number of eggs IVF	Number of eggs treated 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 from which sperm derives	Husband/partner (h), known donor (k), anonymous donor (a), embryo received or embryo transferred is a donated embryo (e).
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 received from someone else or imported into the unit	To minimise the number of required fields in the data collection, this field serves two purposes: 1. Records the number of embryos to be received from donation (recipient cycle); or 2. Records the number of embryos to be imported into the current unit from another unit.
Number of cleavage embryos thawed	Number of zygotes or cleavage stage embryos (up to 4 days) thawed with intention of performing an embryo transfer if they survive.
Number of blastocysts thawed	Number of blastocysts (i.e. greater than 4 days culture from fertilisation) thawed with intention of performing an embryo transfer if they survive.
ET date	Embryo transfer date.
Number of early embryos transferred	Number of zygote or cleavage stage embryos (i.e. up to 4 days since fertilisation) transferred.
Number of blastocysts transferred	Number of blastocyst embryos (i.e. > 4 days since fertilisation) transferred.
Any embryos ICSI?	Yes—any embryos transferred were fertilised by ICSI.
	No—no transferred embryos were fertilised by ICSI.
Number of zygotes/cleavage stage embryos frozen	Number of zygote or cleavage stage embryos (i.e. up to 4 days since fertilisation) frozen.
Number of blastocysts frozen	Number of blastocyst embryos (i.e. > 4 days since fertilisation) frozen.
Number of embryos donated to someone else or exported from the unit of treatment	To minimise the number of required fields in the data collection, this field serves two purposes: 1. Records the number of embryos to be donated to someone else (donor cycle); or 2. Records the number of embryos to be exported from the current unit to another unit.
Number of potentially usable frozen embryos discarded	Potentially usable embryos disposed of in accordance with patient or government request.
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; or 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	Yes—pregnancy is an ectopic pregnancy, or a combined ectopic and uterine (heterotopic) pregnancy.
	No—pregnancy not ectopic or heterotopic.
Elective termination of pregnancy	Yes—pregnancy is terminated.
	No—pregnancy not terminated.
Selective reduction performed	Yes—selective reduction was performed owing to fetal abnormality.
	No—selective reduction not performed.

Variable	Data domain
Fetal abnormality in a pregnancy ending < 20 weeks or in a fetus removed by selective reduction	Details of elective terminations of pregnancy and fetal reductions due to fetal abnormality.
Maternal complications of pregnancy	Describes morbidity related to pregnancy.
Number of babies delivered	Include all liveborn and stillborn babies.
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.
Baby 3 abnormality	Describes any known congenital malformation.
Baby 3 date of neonatal death	Date of neonatal death.
Baby 4 outcome	Liveborn, stillborn or neonatal death.
Baby 4 sex	Male or female.
Baby 4 weight	Weight in grams.
Baby 4 abnormality	Describes any known congenital malformation.
Baby 4 date of neonatal death	Date of neonatal death.
Admitted with ART morbidity	Yes—woman is admitted to hospital with any condition (excluding any pregnancy-related issues, such as ectopic pregnancy) that could be in any way related to fertility treatment.
OHSS	Yes—admission to hospital is due to symptoms of OHSS.
Morbidity detail	Describes symptoms of treatment-8ieal death.
Baby 4 outcome	Liveborn, stillborn or -l death.

Terminology used in this report

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

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

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

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 approximately 100 cells usually developed by 5 or 6 days after fertilisation.

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

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

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

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

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

Cryopreservation: freezing embryos for potential future ART treatment.

Delivery: a birth event in which one or more babies of 20 weeks or more of gestation or of 400 grams or more in 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

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

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

Fresh cycle: an ART treatment cycle which 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: (pregnanc

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

Perinatal death:

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