Assisted reproduction technology in Australia and New Zealand 2004

The Australian Institute of Health and Welfare (AIHW) is Australia's national health and welfare statistics and information agency. The Institute's mission is *better health and wellbeing for Australians through better health and welfare statistics and information*.

The AIHW National Perinatal Statistics Unit (NPSU) is a collaborating unit of the AIHW, established in 1979. The NPSU aims to improve the health of Australian mothers and babies through the collection, analysis and reporting of information on reproductive, perinatal and maternal health. It maintains national collections on perinatal health, maternal deaths, congenital anomalies and assisted reproduction technology. The NPSU is located at the Sydney Children's Hospital and is part of the School of Women's and Children's Health, Faculty of Medicine, The University of New South Wales.

Please note that as with all statistical reports there is the potential for minor revisions of data in *Assisted reproduction technology in Australia and New Zealand 2004*. Please refer to the online version at <www.npsu.unsw.edu.au>.

AUSTRALIAN INSTITUTE OF HEALTH AND WELFARE
NATIONAL PERINATAL STATISTICS UNIT
AND
FERTILITY SOCIETY OF AUSTRALIA

ASSISTED REPRODUCTION TECHNOLOGY SERIES
Number 10

Assisted reproduction technology in Australia and New Zealand 2004

Yueping Alex Wang
Jishan H Dean
Narelle Grayson
Elizabeth A Sullivan

November 2006

AIHW National Perinatal Statistics Unit
Sydney

AIHW cat. no. PER 39

This publication is part of the AIHW National Perinatal Statistics Unit's (NPSU) Assisted Reproduction Technology Series. A complete list of the NPSU's publications is available from NPSU's website <www.npsu.unsw.edu.au>. A complete list of the Institute's publications is available from the Institute's website <www.aihw.gov.au>.

ISSN 1038-7234

ISBN-10: 1 74024 630 6

ISBN-13: 978 1 74024 630 9

Suggested citation

Wang YA, Dean JH, Grayson N & Sullivan EA 2006. Assisted reproduction technology in Australia and New Zealand 2004. Assisted reproduction technology series no. 10. Cat. no. PER 39. Sydney: AIHW National Perinatal Statistics Unit.

Any enquiries about or comments on this publication should be directed to:

Yueping Alex Wang

AIHW National Perinatal Statistics Unit

Level 2, McNevin Dickson Building — Phone: (02) 9382 1014

Randwick Hospitals Campus — Fax: (02) 9382 1025

Randwick NSW 2031 — Email: npsu@unsw.edu.au

AUSTRALIA — Website: <www.npsu.unsw.edu.au>

Published by the AIHW National Perinatal Statistics Unit

Printed by Elect Printing, Canberra

Foreword

The data presented in the *Assisted reproduction technology in Australia and New Zealand 2004* report continues to reflect very positively on clinical changes implemented by assisted reproduction technology (ART) professionals in Australia and New Zealand. Australia and New Zealand comprehensively review and implement measures to address issues such as multiple pregnancy, low birthweight and preterm delivery associated with ART treatment.

The collection of these data and their collation into the Australian and New Zealand Assisted Reproduction Database (ANZARD) was initiated and continues to be supported by the Fertility Society of Australia (FSA). It has proven invaluable in assessing the standards of care offered to people and implementing procedural changes for those accessing fertility treatment in Australia and New Zealand. These data are audited by the Reproductive Technology Accreditation Committee (RTAC) and used as a quality assurance tool to assess standards of treatment in the field of fertility.

Most notable in this report is the continued decline in the multiple pregnancy rate reflecting the rise in the number of cycles with single or double embryo transfer over recent years. In 2004, one or two embryos were transferred in 96.8% of cycles with embryo transfer compared to 94.0% in 2002. These data strongly confirm the trend to single or two embryo transfers in Australia and New Zealand and reflect changes to the RTAC Guidelines in 2002, emphasising the need to reduce multiple pregnancy rates by decreasing the number of embryos transferred. This has been restricted even further in the 2005 RTAC Code of Practice requiring maximum limits on the number of embryos transferred and education of patients on the risks associated with multiple pregnancies.

The FSA has established a Fertility Preservation Project Group to investigate declining fertility trends and advise the general population, medical professionals and government on the issues associated with reproductive health. The ANZARD data support the trend of delayed pregnancy and the impact of male infertility. The average age of ART mothers in 2004 was 34.5 years. This is 5.0 years older than all Australian women (29.5 years) giving birth in 2003. The average woman who underwent ART treatment in 2004 was aged 35.4 years and the average age of their partners was 37.8 years. In 2004, 16.8% of ART treatment cycles were for male factor infertility alone. When combined with multiple causes, which include male factor along with other causes of infertility, this rate increased to 40.9%. It is essential that all people be made aware of factors that may impact on their future fertility.

Over the years the data collection criteria have been altered to reflect changing technologies and the need to gather information useful in determining treatment modalities. The FSA with the aid of the NPSU staff will continue to revise and utilise these data to assist in providing the highest standards of ART care. The FSA thanks Dr Elizabeth Sullivan and her staff for their tireless efforts in this data collection and presentation. The countless hours required by ART unit staff to collect the raw data must not go unacknowledged and many thanks are offered to ART units and patients for their continued support.

Adrianne Pope, BSc (Hons), PhD

President

Fertility Society of Australia

Contents

Acknowledgments

The Australian and New Zealand Assisted Reproduction Database (ANZARD) is a collaborative effort between the Australian Institute of Health and Welfare's National Perinatal Statistics Unit (NPSU), the Fertility Society of Australia (FSA) and the fertility centres in Australia and New Zealand. We recognise and thank all staff in the fertility centres for their efforts in compiling the data and providing additional information when requested.

We thank Professor Michael Chapman, Professor Robert Jansen, Dr Adrianne Pope and Dr Ossie Petrucco for peer reviewing the report. Cecilia Burke and Ann Parkinson from the AIHW coordinated the printing and publication process.

The NPSU is a formally affiliated institution of the University of New South Wales (UNSW) and is linked to the School of Women's and Children's Health. We would like to acknowledge the support of the NPSU by the School of Women's and Children's Health, UNSW, and the Sydney Children's Hospital.

Following is a list of the fertility centres and their directors who contributed data for this report.

New South Wales

Albury Reproductive Medicine Centre, Albury (Dr Scott Giltrap)

Fertility First, Hurstville (Dr Anne Clark)

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

IVF Australia

- Central Coast, Gosford (Dr Malcolm Tucker)
- Eastern Suburbs, Maroubra (Dr Graeme Hughes)
- North Shore, Chatswood (Dr Frank Quinn)
- Southern Sydney, Kogarah (Dr Andrew Kan)
- Western Sydney, Westmead (Prof. Peter Illingworth)

IVF NSW, Bondi Junction (Dr Trevor Johnson)

Sydney IVF

- City, Sydney (Prof. Robert Jansen)
- Coffs Harbour (Prof. Robert Jansen)
- Illawarra, Wollongong (Dr Chris James)
- Lismore (Prof. Robert Jansen)
- Liverpool (Dr Derek Lok)
- Newcastle (Dr Robert Woolcott)
- Orange (Prof. Robert Jansen)
- Port Macquarie (Dr Robert Woolcott)
- Royal Prince Alfred Hospital, Camperdown (Dr Mark Bowman)
- Tamworth (Prof. Robert Jansen)

Westmead Fertility Centre, Westmead (Dr Howard Smith)

Queensland

City Fertility Centre, Brisbane (Dr Glenn Sterling)
Coastal IVF, Maroochydore (Dr Paul Stokes)
IVF Bundaberg, Bundaberg (Dr James Moir)
IVF Sunshine Coast, Birtinya (Dr James Moir)
Monash IVF
- Gold Coast, Southport (Dr Irving Korman)
- Queensland, Sunnybank (Dr Kevin Forbes)
- Rockhampton (Prof. Gab Kovacs)
- The Wesley/Monash IVF Services, Auchenflower (Dr John Allan)

Queensland Fertility Group
- Cairns (Dr Bob Miller)
- Gold Coast, Benowa (Dr Andrew Cary)
- Mackay (Dr Lance Herron)
- North West, Everton Park (Dr David Molloy)
- Toowoomba IVF, Toowoomba (Dr John Esler)
- Townsville, Hyde Park (Dr Ron Chang)
- Watkins Medical Centre, Brisbane (Dr David Molloy)

Victoria

Ballarat IVF
- Bacchus Marsh (Dr Russell Dalton)
- Wendouree (Dr Russell Dalton)

Melbourne Assisted Conception Centre, Heidelberg (Dr Mac Talbot)
Melbourne IVF
- East Melbourne (Dr Lyndon Hale)
- Reproductive Services, Royal Women's Hospital (Dr Lyndon Hale)

Monash IVF
- Bendigo (Dr Nick Lolatgis)
- Casterton (Prof. David Healy)
- Epworth Hospital, Richmond (Prof. Gab Kovacs)
- Geelong (Prof. Gab Kovacs)
- Monash Surgical Private Hospital, Clayton (Dr Luk Rombauts)
- Northern, Broadmeadows (Dr Luk Rombauts)
- Sale (Dr Mac Talbot)

REPROMED Mildura (Dr Richard Henshaw)

Western Australia

Concept Fertility Centre, Subiaco (Dr Rob Mazzucchelli)

Fertility North, Joondalup (Dr Vince Chapple)
Hollywood IVF, Nedlands (Dr Simon Turner)
PIVET Medical Centre, Leederville (Dr John Yovich)
The Keogh Institute for Medical Research, Nedlands (Dr Bronwyn Stuckey)

South Australia

Flinders Reproductive Medicine, Bedford Park (Dr Enzo Lombardi)
REPROMED Reproductive Medicine Unit, Dulwich (Dr Richard Henshaw)

Tasmania

Sydney IVF, Launceston (Dr Sue James)
Tasmanian IVF, Hobart (Dr Bill Watkins)

Australian Capital Territory

Canberra Fertility Centre, Canberra (Dr Martyn Stafford-Bell)
Sydney IVF, Canberra (Dr Janelle McDonald)

Northern Territory

REPROMED Darwin, Tiwi (Dr Richard Henshaw)

New Zealand

Fertility Associates
- Ascot Integrated Hospital, Auckland (Dr Mary Birdsall)
- Adelaide Clinic, Wellington (Prof. John Hutton)
- Waikato Hospital, Hamilton (Dr Richard Fisher)

Fertility Plus, Auckland (Dr Guy Gudex)
The New Zealand Centre for Reproductive Medicine, Christchurch (Dr Peter Benny)
The Otago Fertility Services, Dunedin (Associate Prof. Wayne Gillett)

Financial support

We gratefully acknowledge financial support from the Fertility Society of Australia. The NPSU is funded by a grant from the AIHW to the UNSW.

Requests for data

Enquiries about data for individual fertility centres should be directed to the centre concerned. Other enquiries should be made to the NPSU.

Abbreviations and symbols

ACT	Australian Capital Territory
AIHW	Australian Institute of Health and Welfare
ANZARD	Australian and New Zealand Assisted Reproduction Database
ART	Assisted reproduction technology
ET	embryo transfer
FSH	follicle-stimulating hormone
GIFT	gamete intrafallopian transfer
g	grams
ICSI	intracytoplasmic sperm injection
IUI	intrauterine insemination
IVF	in-vitro fertilisation
LMP	last menstrual period
NPSU	National Perinatal Statistics Unit
NSW	New South Wales
NT	Northern Territory
NZ	New Zealand
OHSS	ovarian hyperstimulation syndrome
OPU	oocyte pick-up
PESA	percutaneous epididymal sperm aspiration
PGD	preimplantation genetic diagnosis
Qld	Queensland
RTAC	Reproductive Technology Accreditation Committee
SA	South Australia
Tas	Tasmania
UNSW	University of New South Wales
Vic	Victoria
WA	Western Australia
. .	not applicable
–	null cells

Summary

Assisted reproduction technology (ART) treatment characteristics

- During 2004, 41,904 treatment cycles were started in Australia and New Zealand. Of these, 92.6% (38,823) were in Australia and 7.4% (3,081) were in New Zealand.
- In Australia, there were 9.0 treatment cycles per 1,000 women of reproductive age (15–44 years). Correspondingly, in New Zealand, there were 3.5 cycles per 1,000 women of reproductive age (15–44 years).
- For more than half (53.5%) of the ART treatment cycles, non-donor fresh oocytes or embryos were used, for over a third (34.3%) thawed non-donor embryos were used, and for 6.4% oocytes or embryos received from a donor were used.
- In 2004, 40.5% of cycles with embryo transfer involved the transfer of one embryo, and 56.3% involved the transfer of two embryos.
- The average age of women undergoing treatment in 2004 was 35.4 years. Their partners were aged on average 37.8 years.
- The success of non-donor fresh treatment cycles varied by women's age. Women aged 23–24 years had the greatest success, with 33.5% of cycles with oocyte retrieval resulting in a live delivery. Women aged 40–44 years had a success rate of 7.1%.

Pregnancies, deliveries and births from ART

- Overall, 8,794 cycles undertaken in 2004 resulted in a pregnancy. Of these pregnancies, 20.0% were less than 20 weeks gestation and 78.8% resulted in births of 20 weeks or more gestational age or 400 grams or more birthweight. There were 7,913 live births and 119 fetal deaths.
- Fertility centres in Australia reported 89.2% (7,846) of the cycles that resulted in a pregnancy. These resulted in 7,029 live births. Fertility centres in New Zealand reported 10.8% (948) of the cycles that resulted in a pregnancy and these resulted in 884 live births.
- There were 1,114 (16.1%) cycles that resulted in a twin gestation delivery. For most of these cycles two or more embryos were transferred.
- For about half (49.7%, 3,448) of the cycles that resulted in a delivery, the method of birth was caesarean section.
- The average age of women who gave birth was 34.5 years.
- There were 2,028 (25.2%) babies born to women who had ART treatment in 2004 that were preterm. For singletons 10.9% were preterm and for twins 59.9% were preterm.
- The average birthweight of live births was 3,054 grams. The proportion of live births that were low birthweight (<2,500 grams) was 20.0%. The proportion of liveborn singletons that were low birthweight was 7.5% and the proportion for twins was 50.0%.
- There were 155 perinatal deaths reported, of which 36 were neonatal deaths. This represents a perinatal mortality rate of 19.3 deaths per 1,000 births. The perinatal mortality rate for singletons was 16.0 deaths per 1,000 births, and the rate for twins was 26.9 per 1,000 births.

- There were 2,431 babies born to women who had ART treatment in 2004 in which a single embryo was transferred. This was 30.2% of babies born to women who had ART treatment in 2004. Of these babies, 2,338 (96.2%) were singletons and 93 (3.8%) were multiples.

IUI-donor cycles

- In 2004, in Australia and New Zealand, there were 3,170 cycles in which IUI using donated sperm (IUI-donor) was undertaken at fertility centres.
- Of IUI-donor cycles, 12.5% (396) resulted in a pregnancy and 9.7% (307) resulted in a live delivery.
- There were 24 (7.7%) IUI-donor cycles that resulted in a multiple gestation delivery.
- Of babies born to women who had an IUI-donor cycle, 15.5% were preterm (<37 weeks gestation).
- The average birthweight for babies born to women who had an IUI-donor cycle was 3,207 grams.
- The perinatal death rate for babies born to women who had an IUI-donor cycle was 11.7 deaths per 1,000 births.

1 Introduction

Assisted reproduction technology in Australia and New Zealand 2004 is the tenth annual report on the use of assisted reproduction technology (ART) in Australia and New Zealand.

Fertility is defined as the ability of an individual to conceive and bear offspring. Infertility is the state of diminished or impaired capacity to do so. Infertility is not an absolute or irreversible condition but rather a clinical continuum (Carr et al. 2005). Clinicians in Australia and New Zealand have treated couples with infertility by using ART since the early 1980s.

ART treatment is available to couples in fertility centres in Australia and New Zealand. There were 30 fertility centres in Australia and 4 in New Zealand in 2004.

Aim of this report

The main aim of this report is to place in the public domain:

- information on ART treatment cycles and the resulting pregnancy outcomes in Australia and New Zealand
- evidence of quality improvement through monitoring ART treatment practices, success rates and perinatal outcomes
- information to inform standards for accreditation and monitoring of ART centres
- information for national and international comparisons.

This report

Procedures included in this report

Assisted reproduction technology

Assisted reproduction technology encompasses procedures and techniques involving the manipulation of gametes, zygotes and embryos. The main ART procedures included in this report are:

- in-vitro fertilisation (IVF), where eggs and sperm are combined in the laboratory for fertilisation outside the body and replaced in the uterus
- intracytoplasmic sperm injection (ICSI), where a single sperm is injected into an egg for fertilisation outside the body and replaced in the uterus
- gamete intrafallopian transfer (GIFT), where eggs and sperm are placed in the fallopian tubes for fertilisation inside the body.

Embryos arising from IVF and ICSI procedures can be frozen and then used in subsequent ART treatments where they are thawed and transferred to the uterus.

Intrauterine insemination

Intrauterine insemination (IUI), an artificial insemination procedure, is also provided in fertility centres. IUI using donated sperm (IUI-donor) is an alternative treatment to ART procedures for couples with male factor infertility. Information on IUI-donor performed in fertility centres is included in this report.

Structure of this report

The structure of this report is different from the structure of the *Assisted reproduction technology in Australia and New Zealand 2003* report. Information on IUI-donor cycles (Section 4) and trends (Section 5) has been presented in separate sections for the first time.

This section (Section 1) briefly describes the data source.

Section 2 presents data on ART procedures, embryo transfer, the success of ART treatment and complications of ART treatment.

Section 3 presents data on the outcomes of pregnancies and births from ART treatment.

Section 4 presents data on intrauterine insemination with donated sperm and subsequent outcomes of pregnancies and births.

Section 5 presents trends in ART treatment from 2002 to 2004 and trends in the outcomes of ART treatment from 1995 to 2004.

Appendix 1 presents the data items in the Australian and New Zealand Assisted Reproduction Database (ANZARD).

This report and additional data on the Internet

This report is available in PDF format on the NPSU website <www.npsu.unsw.edu.au>. This website also includes supplementary tables (in PDF format) which present data not included in the report.

Data

Data source

The data presented in this report are supplied by fertility centres in Australia and New Zealand. The data are compiled into ANZARD. ANZARD includes information about the ART treatment procedures of IVF, ICSI and GIFT. It also includes information about ART treatment using thawed embryos; treatment involving donated gametes or embryos; the use of techniques such as assisted hatching, preimplantation genetic diagnosis and blastocyst culture; and intrauterine insemination (IUI) using donated sperm (IUI-donor). ANZARD also contains information on pregnancy and on birth outcomes. This includes method of birth, birth status, birthweight, gestational age, plurality, perinatal mortality and selected information on maternal morbidity. ANZARD does not contain information about IUI if the woman's partner's sperm was used.

Cohort

This report presents information on all treatment cycles that took place in fertility centres in Australia and New Zealand in 2004, and the resulting pregnancies and births. The babies included in this report were conceived through the treatment cycles undertaken in 2004 and were born in either 2004 or 2005.

Data validation

Most fertility centres have computerised data management systems and are able to provide the NPSU with high-quality data. The NPSU subjects all data to an extensive process of validation. Inaccuracies are followed up with fertility centre staff. In 2004, information relating to pregnancy and birth outcomes was not stated for less than 0.1% of cycles. The Reproductive Technology Accreditation Committee (RTAC) plays a role in ensuring the quality of ANZARD data by validating selected records against clinic files in their triennial inspections.

Data presentation

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

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, that may not add up to the sum of the percentage for the categories. This is due to rounding.

Data limitations

Follow-up of information on pregnancy and on birth outcomes is limited because the ongoing care of pregnant patients is often carried out by non-ART practitioners. Usually, the fertility centre follows up the pregnancy and the birth outcomes with either the patient or her clinician. 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 a lot of 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.

Terminology

This report categorises ART treatments according to whether the patient used her own oocytes and embryos (non-donor) or oocytes and/or embryos donated by another woman/

couple (donor) and whether the embryos were transferred soon after fertilisation (fresh cycle) or following cryopreservation (thaw cycle).

Cancelled cycle: cycle started but no further procedures undertaken.

Clinical pregnancy: a pregnancy in which at least one of the following criteria is met: (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 laproscopically or by ultrasound.

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

Donor cycle: an ART treatment cycle with donor oocytes/embryos is defined as a cycle in which a woman intends to donate and/or donates oocytes/embryos, or a woman receives donated oocytes/embryos.

Fresh cycle: an ART treatment cycle in which oocytes and sperm are transferred, embryos are transferred 2–3 days or 5–6 days after fertilisation, or oocyte pick-up (OPU) is performed but there is no transfer of oocytes/embryos.

Full-term: gestation of at least 37 weeks.

Gestational age: completed weeks of gestation of the fetus at the time of delivery. This is calculated as follows:

- Fresh and thaw cycles with embryo transfer (cleavage): (pregnancy end date – embryo transfer date) + 16 days
- Fresh and thaw cycles with embryo transfer (blastocyst): (pregnancy end date – embryo transfer date) + 19 days. In this report, for cycles with blastocyst transfer, gestational age was estimated using the calculation that is used for cycles with cleavage transfer
- GIFT cycles: (pregnancy end date – OPU date) + 14 days
- IUI-donor cycles: (pregnancy end date – date of insemination) + 14 days.

GIFT cycle: refers to an ART treatment cycle involving a GIFT procedure. Cycles using GIFT and IVF/ICSI procedures are included.

ICSI cycle: refers to an ART treatment cycle in which embryos are fertilised using an ICSI procedure; mixed IVF–ICSI cycles are included.

Live delivery: a delivery in which one or more baby is a live birth.

IUI-donor: intrauterine insemination using donated sperm.

IVF cycle: refers to an ART treatment cycle in which embryos are fertilised using an IVF procedure; mixed IVF–ICSI cycles are excluded.

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 gestational age or 400 grams or more birthweight.

Low birthweight: birthweight of less than 2,500 grams.

Mixed IVF–ICSI cycle: refers to an ART treatment cycle in which two or more embryos are fertilised and at least one embryo is fertilised using an IVF procedure and another is fertilised using an ICSI procedure. Mixed IVF–ICSI cycles are included in ICSI cycles.

Non-donor cycle: a non-donor cycle is defined as an ART treatment cycle in which the woman's own oocytes/embryos are used.

OPU: oocyte pick-up refers to the procedure in which oocytes are collected from ovaries using ultrasound-guided, fine-needle aspiration.

Preterm: gestation less than 37 weeks.

Thaw cycle: an ART treatment cycle in which cryopreserved (frozen) embryos are thawed with or without transfer.

Thawed embryo: embryo thawed after cryopreservation. Used in thaw cycles.

Treatment cycle: all cycles initiated with the intention to treat a patient. These include cycles with: (1) attempted or successful oocyte retrieval (stimulated or unstimulated); (2) thawing of cryopreserved embryos; (3) intrauterine insemination using donated sperm (IUI-donor); and (4) cancellation where follicle-stimulating hormone (FSH) has been administered.

Unclassified: cycles reported to ANZARD for which the ART procedure cannot be determined.

Very low birthweight: birthweight of less than 1,500 grams.

Very preterm: gestation less than 32 weeks.

The International Committee for the Monitoring of Assisted Reproductive Technologies (ICMART) has published an ART glossary for the terms used in ART data collections (Zegers-Hochschild et al. 2006). However, the terminology used in this report may differ from that in the ICMART glossary.

2 ART treatment in 2004

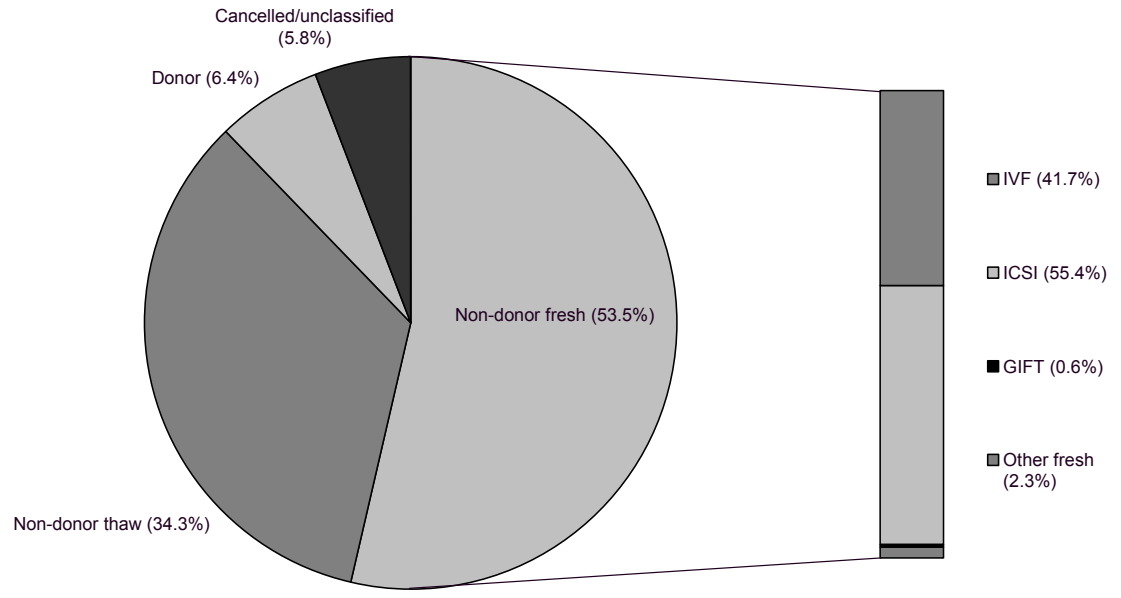
2.1 ART treatment overview

ART treatment cycles

A total of 41,904 ART treatment cycles (including 2,425 cancelled cycles) were undertaken in Australia and New Zealand in 2004. Of these, 92.6% (38,823) were in Australia and 7.4% (3,081) were in New Zealand. In Australia there were 9.0 cycles per 1,000 women of reproductive age (15–44 years) and in New Zealand there were 3.5 cycles per 1,000 women of reproductive age.

What types of ART treatment cycles were undertaken in Australia and New Zealand?

Figure 1 presents the proportions of all types of ART treatment cycles in 2004. The majority of cycles (53.5%; 22,415) were using non-donor fresh oocytes or embryos. For over a third (34.3%; 14,367) of cycles, thawed non-donor embryos were used and for a small proportion (6.4%; 2,692) oocytes or embryos were either donated or received (Table 1).



Note: Other fresh includes cycles in which oocytes were not retrieved or cycles with oocyte retrieval but no fertilisation.

Figure 1: Proportion of ART treatment cycles by ART treatment type and ART procedure, Australia and New Zealand, 2004

Table 1: Number of ART treatment cycles by ART treatment type, Australia and New Zealand, 2004

Treatment type	Number	Per cent
Non-donor	39,212	93.6
Fresh	22,415	53.5
Thaw	14,367	34.3
Cancelled	2,425	5.8
Unclassified	5	0.0
Donor	2,692	6.4
Fresh	1,766	4.2
Thaw	926	2.2
Total	**41,904**	**100.0**

Fresh cycles

More than half (55.4%) of all non-donor fresh cycles were undertaken using an ICSI procedure (12,410) and more than 40% were undertaken using IVF (9,340) (Table 2). GIFT accounted for 0.6% (138) of all non-donor fresh cycles. The remaining 2.3% (527) of non-donor fresh cycles included cycles in which oocytes were not retrieved or cycles with oocyte retrieval but no fertilisation.

Table 2: Number of fresh ART treatment cycles by ART procedure and ART treatment type, Australia and New Zealand, 2004

	Non-donor oocytes/embryos		Donor oocytes/embryos[a]	
Procedure	Number	Per cent	Number	Per cent
IVF	9,340	41.7	299	16.9
ICSI	12,410	55.4	472	26.7
GIFT	138	0.6	—	—
Other	527[b]	2.3	995[c]	56.4
Total	**22,415**	**100.0**	**1,766**	**100.0**

(a) Includes fresh oocyte recipient cycles where no embryo transfer was undertaken.

(b) Includes cycles in which oocytes were not retrieved and cycles with oocyte retrieval but no fertilisation.

(c) Includes cycles with oocyte donation and cycles with failed OPU for oocyte donation.

Thaw cycles

About half (49.7%) of non-donor thaw cycles were undertaken using an ICSI procedure (7,142) and 44.4% were undertaken using an IVF procedure (6,378) (Table 3). There was a higher proportion of cycles undertaken using an IVF procedure for donor thaw cycles compared to non-donor thaw cycles (51.9% and 44.4%, respectively).

Table 3: Number of ART thaw cycles by ART procedure and ART treatment type, Australia and New Zealand, 2004

	Non-donor oocytes/embryos		Donor oocytes/embryos	
Procedure	**Number**	**Per cent**	**Number**	**Per cent**
IVF	6,378	44.4	481	51.9
ICSI	7,142	49.7	424	45.8
Not stated	847	5.9	21	2.3
Total	**14,367**	**100.0**	**926**	**100.0**

How many embryos were transferred per embryo transfer cycle?

In 2004, one or two embryos were transferred in the majority of embryo transfer cycles (96.8%) (Table 4). This proportion is higher than the proportions in 2002 (94.0%) and 2003 (95.7%).

Table 4: Number of embryo transfer cycles by number of embryos transferred and women's age group, Australia and New Zealand, 2004

	Age group (years)							
Number of embryos	**≤ 24**	**25–29**	**30–34**	**35–39**	**≥ 40**	**Total**	**<38**	**≥ 38**
1	201	1,618	5,036	4,656	2,286	13,797	9,871	3,926
2	194	1,898	6,196	7,056	3,861	19,205	12,705	6,500
3	0	31	156	294	518	999	360	639
≥4	0	4	11	32	46	93	35	58
Total	**395**	**3,551**	**11,399**	**12,038**	**6,711**	**34,094**	**22,971**	**11,123**
1	50.9	45.6	44.2	38.7	34.1	40.5	43.0	35.3
2	49.1	53.4	54.3	58.6	57.5	56.3	55.3	58.4
3	0.0	0.9	1.4	2.4	7.7	2.9	1.6	5.8
≥4	0.0	0.1	0.1	0.3	0.7	0.3	0.1	0.5
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

In 2004, women aged 38 years or older had more embryos transferred per cycle than those aged less than 38 years (Table 4; Figures 2 and 3).

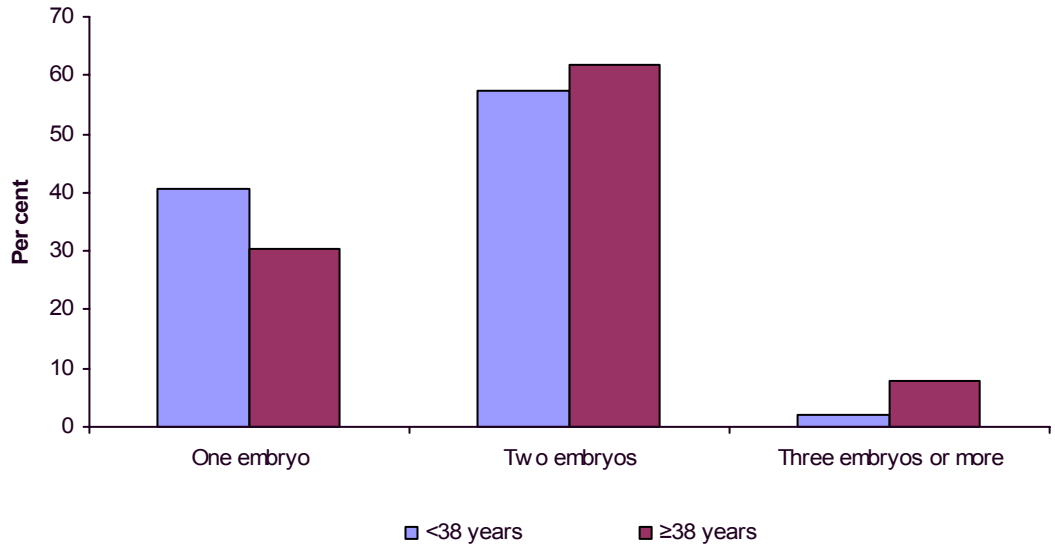


Figure 2: Proportion of fresh embryo transfer cycles by number of embryos transferred and women's age group, Australia and New Zealand, 2004

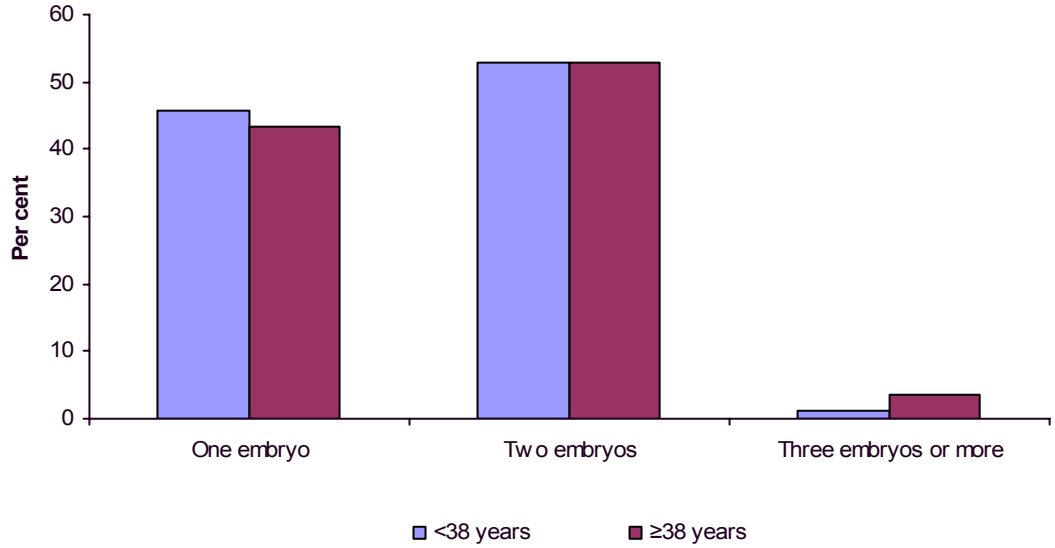


Figure 3: Proportion of thawed embryo transfer cycles by number of embryos transferred and women's age group, Australia and New Zealand, 2004

How many cycles had preimplantation genetic diagnosis (PGD) performed?

PGD was most commonly used to detect genetic disorders. In 2004, PGD was performed in 828 cycles (Table 5). The majority (89.1%) of cycles for which PGD was used were fresh cycles. Of all cycles in which PGD was used, 70.0% had embryos transferred. Of these, 161 cycles resulted in a clinical pregnancy and 119 cycles resulted in a live delivery.

Table 5: Number of ART treatment cycles with preimplantation genetic diagnosis (PGD) by type of embryo, Australia and New Zealand, 2004

Type of embryo	Number of cycles with PGD	Number of cycles with PGD with embryo transfer	Number of cycles with PGD that resulted in a clinical pregnancy	Number of cycles with PGD that resulted in a live delivery
Fresh	738	512	145	106
Thawed	90	68	16	13
Total	**828**	**580**	**161**	**119**

What was the average age of women who underwent ART treatment and the average age of their partners?

The average age of women who underwent ART treatment in 2004 was 35.4 years (Table 6), with 95% of them aged between 26 and 44 years. The partners of the women tended to be older, with an average age of 37.8 years (Table 7), and 95% of them were aged between 27 and 53 years.

Table 6: Number of ART treatment cycles by women's age group, ART treatment type and ART procedure, Australia and New Zealand, 2004

	Non-donor oocytes/embryos						
Age group (years)[a]	Fresh all[b]	Fresh IVF	Fresh ICSI	Thaw	Donor oocytes/ embryos	Cancelled/ unclassified	All
Mean age	*35.4*	*35.5*	*35.1*	*34.6*	*39.3*	*36.2*	*35.4*
				Number			
≤24	278	88	181	183	19	24	504
25–29	2,301	874	1,389	1,644	103	250	4,298
30–34	7,118	2,921	4,088	5,262	346	614	13,340
35–39	7,927	3,443	4,275	5,217	560	818	14,522
≥40	4,791	2,014	2,477	2,061	1,129	724	8,705
Not stated	0	0	0	0	535	0	535
Total	**22,415**	**9,340**	**12,410**	**14,367**	**2,692**	**2,430**	**41,904**
				Per cent			
≤24	1.2	0.9	1.5	1.3	0.7	1.0	1.2
25–29	10.3	9.3	11.2	11.5	3.8	10.3	10.3
30–34	31.7	31.3	32.9	36.6	12.9	25.3	31.8
35–39	35.4	36.9	34.4	36.3	20.8	33.6	34.6
≥40	21.4	21.6	20.0	14.3	41.9	29.8	20.8
Not stated	0.0	0.0	0.0	0.0	19.9	0.0	1.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Age at time of treatment.

(b) Includes cycles in which GIFT was used, cycles in which oocytes were not retrieved and cycles with oocyte retrieval but no fertilisation.

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

Table 7: Number of ART treatment cycles by women's partner's age group, ART treatment type and ART procedure, Australia and New Zealand, 2004

Age group[a] (years)	Non-donor oocytes/embryos				Donor oocytes/ embryos	Cancelled/ unclassified	All
	Fresh all[b]	Fresh IVF	Fresh ICSI	Thaw			
Mean age	*37.8*	*37.0*	*38.3*	*37.4*	*40.6*	*38.4*	*37.8*
				Number			
≤24	96	39	56	39	4	15	154
25–29	1,455	628	790	977	64	184	2,680
30–34	5,603	2,573	2,949	3,862	221	503	10,189
35–39	6,848	3,009	3,655	4,607	420	695	12,570
≥40	7,815	2,847	4,657	4,532	909	933	14,189
Not stated	598	244	303	350	1,074	100	2,122
Total	**22,415**	**9,340**	**12,410**	**14,367**	**2,692**	**2,430**	**41,904**
				Per cent			
≤24	0.4	0.4	0.5	0.3	0.1	0.6	0.4
25–29	6.5	6.7	6.4	6.8	2.4	7.6	6.4
30–34	25.0	27.6	23.8	26.9	8.2	20.7	24.3
35–39	30.6	32.2	29.4	32.1	15.6	28.6	30.0
≥40	34.8	30.5	37.5	31.5	33.8	38.4	33.9
Not stated	2.7	2.6	2.4	2.4	39.9	4.1	5.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Age at time of treatment.

(b) Includes cycles in which GIFT was used, cycles in which oocytes were not retrieved and cycles with oocyte retrieval but no fertilisation.

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

How does single embryo transfer differ according to women's age?

For non-donor ART treatment cycles, the majority of women who had a cycle in which a single embryo was transferred were aged less than 38 years (73.4%). For donor ART treatment cycles, nearly three-quarters (73.4%) of women who had a cycle in which a single embryo was transferred were aged 38 years or older (Table 8).

Table 8: Number of ART treatment cycles with single embryo transfer by ART treatment type and women's age group, Australia and New Zealand, 2004

Treatment type	<38 years		≥ 38 years		All	
	Number	Per cent	Number	Per cent	Number	Per cent
Non-donor fresh	5,239	72.5	1,989	27.5	7,228	100.0
Non-donor thaw	4,484	74.5	1,534	25.5	6,018	100.0
Donor	146	26.6	403	73.4	549	100.0
Total[a]	**9,871**	**71.5**	**3,926**	**28.5**	**13,797**	**100.0**

(a) Includes cycles in which the ART treatment type was unclassified.

Cause of infertility

In 2004, 16.8% of ART treatment cycles had male factor infertility alone reported, 14.5% of cycles had female factor infertility alone reported, and 29.6% had multiple causes reported. Male factor infertility (alone and combined with all other causes—female factor, unexplained, and other factor infertility) was reported for 40.9% of all ART treatment cycles.

How many cases of ovarian hyperstimulation syndrome (OHSS) were reported in 2004?

ANZARD includes morbidity information that is specifically related to ART treatment. Morbidity data are reported by patients and clinicians, and validated with hospital records by fertility centre staff. It is possible there is under-reporting of this information.

Ovarian hyperstimulation syndrome (OHSS) is a complication of ovulation induction therapy which involves the administration of stimulation drugs. OHSS symptoms include abdominal pain and fluid retention. There were 308 OHSS cases reported for women who underwent ART treatment cycles in 2004. Of these, 257 (83.4%) were reported as being admitted to hospital. There were 300 OHSS cases in which OPU was performed. Overall, OHSS occurred in one in 100 (1.3%) cycles that involved OPU (Table 9).

Table 9: Number of ART treatment cycles with OPU that resulted in ovarian hyperstimulation syndrome (OHSS) by number of oocytes collected, Australia and New Zealand, 2004

	Number of oocytes collected							
OPU/OHSS	**1–4**	**5–6**	**7–8**	**9–10**	**11–12**	**13–14**	**≥ 15**	**All**
OPUs with OHSS	5	11	22	27	33	23	179	300
All OPUs	4,887	3,276	3,008	2,825	2,238	1,848	4,772	22,854
OHSS per OPU cycle (%)	*0.1*	*0.3*	*0.7*	*1.0*	*1.5*	*1.2*	*3.8*	*1.3*

2.2 Non-donor ART treatment in 2004

2.2.1 Non-donor ART treatment overview

In this report, non-donor ART treatment is defined as an ART treatment in which the woman's own oocytes/embryos were used.

In 2004, there were 39,212 non-donor ART treatment cycles. More than half (22,415; 57.2%) of these non-donor cycles were fresh cycles. There were 14,367 (36.6%) non-donor thaw and mixed fresh–thaw cycles, and 6.2% (2,430) of non-donor cycles were cancelled or unclassified (Table 1). Of all non-donor ART treatment cycles, 92.7% (36,345) were in Australia and 7.3% (2,867) were in New Zealand.

2.2.2 Non-donor fresh ART treatment cycles

Non-donor fresh ART treatment cycles are cycles in which a woman's own oocytes are transferred, her own embryos are transferred 2–3 days or 5–6 days after fertilisation, or OPU is performed but there is no transfer of oocytes/embryos.

How is success measured for non-donor fresh ART treatment cycles?

The success of non-donor fresh ART treatment can be determined in a number of ways, depending on the stage of treatment and the outcome used. Table 10 presents the various success measures that can be derived. For example, the proportion of cycles with oocyte retrieval that resulted in a clinical pregnancy was 25.8%, and the proportion of cycles with oocyte/embryo transfer that resulted in a clinical pregnancy was 29.3%.

Table 10: Measures of success for non-donor fresh ART treatment cycles, Australia and New Zealand, 2004

Stage of treatment	Cycles that resulted in a clinical pregnancy	Cycles that resulted in a delivery	Cycles that resulted in a live delivery
		Per cent	
Oocyte retrievals	25.8 (5,673/22,035)	20.5 (4,521/22,035)	20.1 (4,421/22,035)
Oocyte/embryo transfers	29.3 (5,673/19,397)	23.3 (4,521/19,397)	22.8 (4,421/19,397)

Note: Cycles in which thawed oocytes were used are not included.

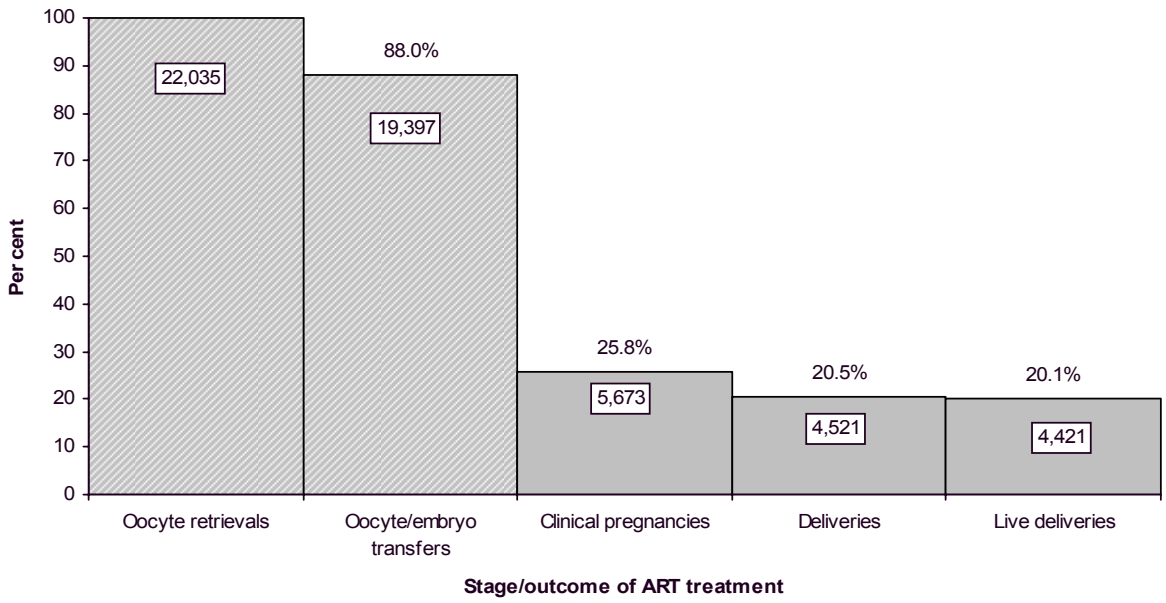
Figure 4 shows:

- the total number of non-donor fresh ART treatment cycles in which oocytes were retrieved
- the number of cycles in which oocytes/embryos were transferred.

It also shows the number of cycles in which oocytes were retrieved that resulted in:

- a clinical pregnancy
- a delivery
- a live delivery.

Treatment can be discontinued for a variety of reasons, including failure of fertilisation of the oocytes, inadequate embryo growth, development of treatment side-effects, patient choice, or failure of the embryo(s) to implant in the uterus.

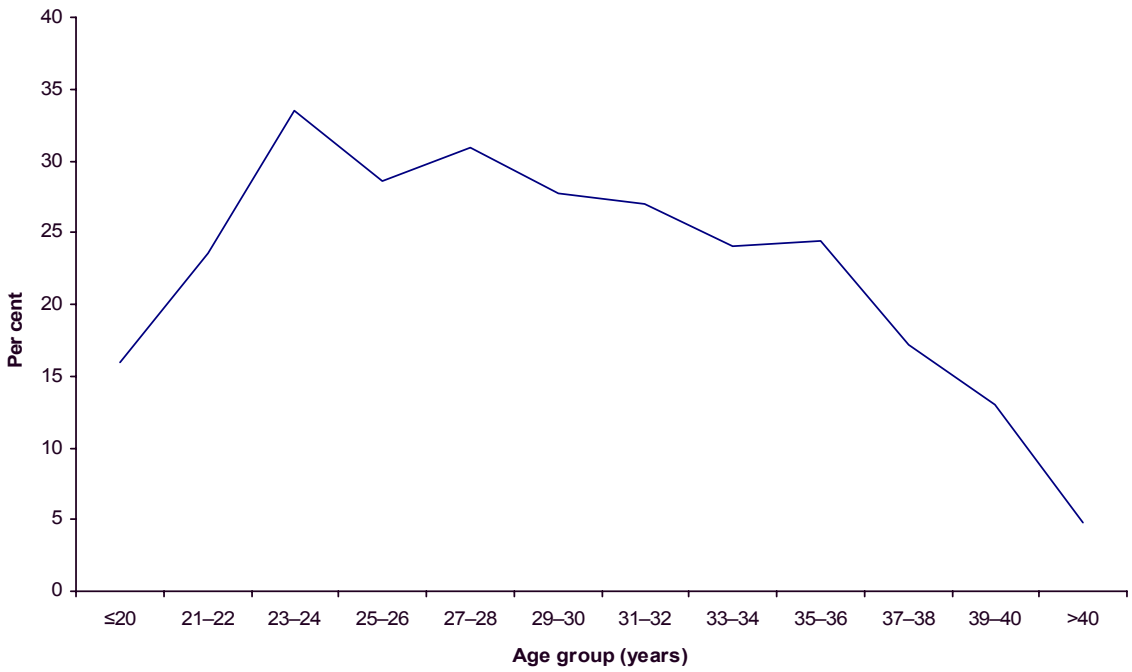


Note: Cycles in which thawed oocytes were used are not included.

Figure 4: Progression of non-donor fresh ART treatment cycles, Australia and New Zealand, 2004

Did the success of non-donor fresh ART treatment cycles vary by women's age?

Women's ovarian or reproductive age is one of the key factors associated with success from ART treatment when women use their own oocytes. For non-donor fresh cycles in 2004, the success rate (measured as the proportion of these cycles with oocyte retrieval that resulted in a live delivery) was high for women aged in their mid-20s to mid-30s but declined steadily for women aged 35–36 years or more. For women aged over 40 years the success rate was less than 5% (Figure 5).



Note: Owing to small numbers, values for women aged ≤ 20 years were combined and values for women aged > 40 years were combined. Cycles in which thawed oocytes were used are not included.

Figure 5: Proportion of non-donor fresh ART treatment cycles with oocyte retrieval that resulted in a live delivery by women's age group, Australia and New Zealand, 2004

Table 11: Success of non-donor fresh ART treatment cycles by stage/outcome of treatment and women's age group, Australia and New Zealand, 2004

	Age group (years)					
Stage/outcome of treatment	**≤ 24**	**25–29**	**30–34**	**35–39**	**≥ 40**	**All**
Oocyte retrievals	276	2,279	7,070	7,805	4,605	22,035
Oocyte/embryo transfers	224	1,954	6,320	6,943	3,956	19,397
Clinical pregnancies	96	802	2,201	2,039	535	5,673
Live deliveries	83	678	1,808	1,545	307	4,421
Live deliveries per oocyte retrieval cycle (%)	*30.1*	*29.7*	*25.6*	*19.8*	6.7	*20.1*
Live deliveries per transfer cycle (%)	*37.1*	*34.7*	*28.6*	*22.3*	7.8	*22.8*
Live deliveries per clinical pregnancy (%)	*86.5*	*84.5*	*82.1*	*75.8*	57.4	*77.9*

Note: Cycles in which thawed oocytes were used are not included.

Did the success of non-donor fresh ART treatment cycles vary by ART procedure?

For non-donor fresh cycles undertaken in 2004, success rates were similar for cycles in which IVF and ICSI procedures were used (Table 12). Of cycles with oocyte retrieval in which IVF was used, 26.6% resulted in a clinical pregnancy and 20.6% resulted in a live delivery. Of cycles with oocyte retrieval in which ICSI was used, 25.4% resulted in a clinical pregnancy and 20.0% resulted in a live delivery. Of the 138 GIFT cycles, 19.6% resulted in a clinical pregnancy and 17.4% resulted in a live delivery. The success rates for GIFT should be interpreted with caution because of the small number of GIFT cycles.

Table 12: Success of non-donor fresh ART treatment cycles by stage/outcome of treatment and ART procedure, Australia and New Zealand, 2004

Stage/outcome of treatment	**IVF**	**ICSI**	**GIFT**
Oocyte retrievals	9,338	12,410	138
Oocyte/embryo transfers	8,129	11,130	138
Clinical pregnancies	2,488	3,158	27
Live deliveries	1,920	2,477	24
Clinical pregnancies per oocyte retrieval cycle (%)	*26.6*	*25.4*	*19.6*
Clinical pregnancies per transfer cycle (%)	*30.6*	*28.4*	*19.6*
Live deliveries per oocyte retrieval cycle (%)	*20.6*	*20.0*	*17.4*
Live deliveries per transfer cycle (%)	*23.6*	*22.3*	*17.4*

Note: Cycles in which thawed oocytes were used are not included.

Did the success of non-donor fresh ART treatment cycles vary by cause of infertility?

Causes of infertility are based on clinical diagnosis. However, the diagnostic definitions may vary among fertility centres. Some fertility centres did not report infertility information to ANZARD for ART treatment cycles in 2004. Couples for which male factor infertility was reported as the only cause of infertility had the highest success rate. For them, the proportion of non-donor fresh cycles with oocyte retrieval that resulted in a live delivery was 23.2% (Table 13). Those with female factors of infertility had comparatively less success (19.0%).

Table 13: Number of non-donor fresh ART treatment cycles with oocyte retrieval that resulted in a live delivery by cause of infertility, Australia and New Zealand, 2004

Cause of infertility	Number of cycles with oocyte retrieval	Number of cycles with oocyte retrieval that resulted in a live delivery	Cycles with oocyte retrieval that resulted in a live delivery (%)
Male factor only	3,856	893	23.2
Female factor	3,044	578	19.0
Tubal disease only	1,659	283	17.1
Endometriosis only	1,115	249	22.3
Tubal disease and endometriosis	270	46	17.0
Multiple causes[(a)]	6,770	1,216	18.0
Unexplained	3,531	694	19.7
Other[(b)]	2,091	401	19.2
No cause/not stated[(c)]	2,743	639	23.3
Total	**22,035**	**4,421**	**20.1**

(a) Includes combined male factor, tubal disease, endometriosis, unexplained and/or others.

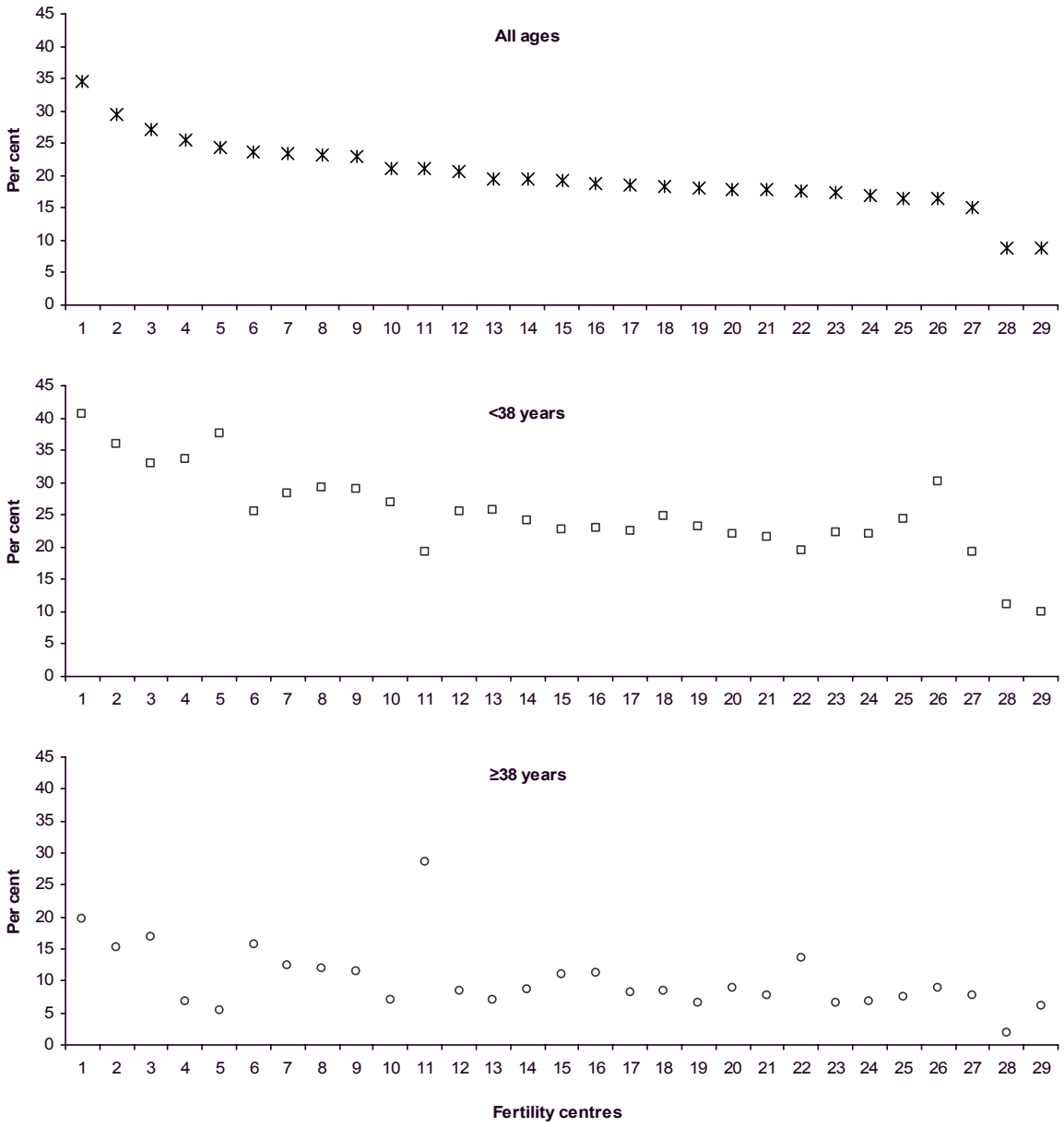
(b) Includes fibroids, ovulation disorders, premature ovarian failure.

(c) Includes data for clinics that did not report infertility information.

Note: Cycles in which thawed oocytes were used are not included.

How did the success of non-donor fresh ART treatment cycles vary among fertility centres in Australia and New Zealand?

The success of non-donor fresh ART treatment varied among the fertility centres in Australia and New Zealand (Figure 6). In 2004, the centre with the highest success rate (measured as the proportion of non-donor fresh cycles with oocyte retrieval that resulted in a live delivery) was 34.7%. The rate for the centre with the lowest success rate was 8.8%.



Note: Cycles in which thawed oocytes were used are not included.

Figure 6: Proportion of non-donor fresh ART treatment cycles with oocyte retrieval that resulted in a live delivery by fertility centre and women's age group, Australia and New Zealand, 2004

Overall, the proportion of non-donor fresh cycles with oocyte retrieval that resulted in a live delivery was lower for women aged 38 years or more (9.9%) compared with women aged less than 38 years (25.4%) (Table 14). This was the case for most fertility centres.

Variation in success among fertility centres is best measured using quartiles which rank individual centre success rates with the success of the top and bottom 25% of centres.

For non-donor fresh cycles with oocyte retrieval in 2004, the top 25% (first quartile) of fertility centres had at least 23.2% of cycles that resulted in a live delivery. The bottom 25% (fourth quartile) of fertility centres had less than 17.6% of cycles that resulted in a live delivery. The remaining 50% of fertility centres had success rates between 17.6% and 23.1% (Table 14).

Table 14: Success of non-donor fresh ART treatment cycles by women's age group and quartiles of success, fertility centres, Australia and New Zealand, 2004

Age group (years)	Live delivery per oocyte retrieval cycle (%)				
	Average	First quartile	Second quartile	Third quartile	Fourth quartile
< 38	25.4	29.1–40.6	24.5–29.0	22.2–24.4	9.9–22.1
≥ 38	9.9	12.0–28.6	8.5–11.9	7.2–8.4	1.9–7.1
All	**20.1**	**23.2–34.7**	**19.3–23.1**	**17.6–19.2**	**8.8–17.5**

2.2.3 Non-donor thaw ART treatment cycles

Non-donor thaw ART treatment cycles are cycles in which a woman's own cryopreserved (frozen) embryos are thawed with or without transfer. The embryos were fertilised from previous ART treatment cycle(s) and frozen according to human embryo cryopreservation protocols.

How is success measured for non-donor thaw ART treatment cycles?

Figure 7 shows:

- the number of cycles in which embryos were transferred.

It also shows the number of cycles in which embryos were transferred that resulted in:

- a clinical pregnancy
- a delivery
- a live delivery.

Of non-donor thaw cycles in 2004, 15.6% resulted in a live delivery. This is lower than the success rate of non-donor fresh cycles in which 22.8% of oocyte/embryo transfers resulted in a live delivery (Tables 10 and 15).

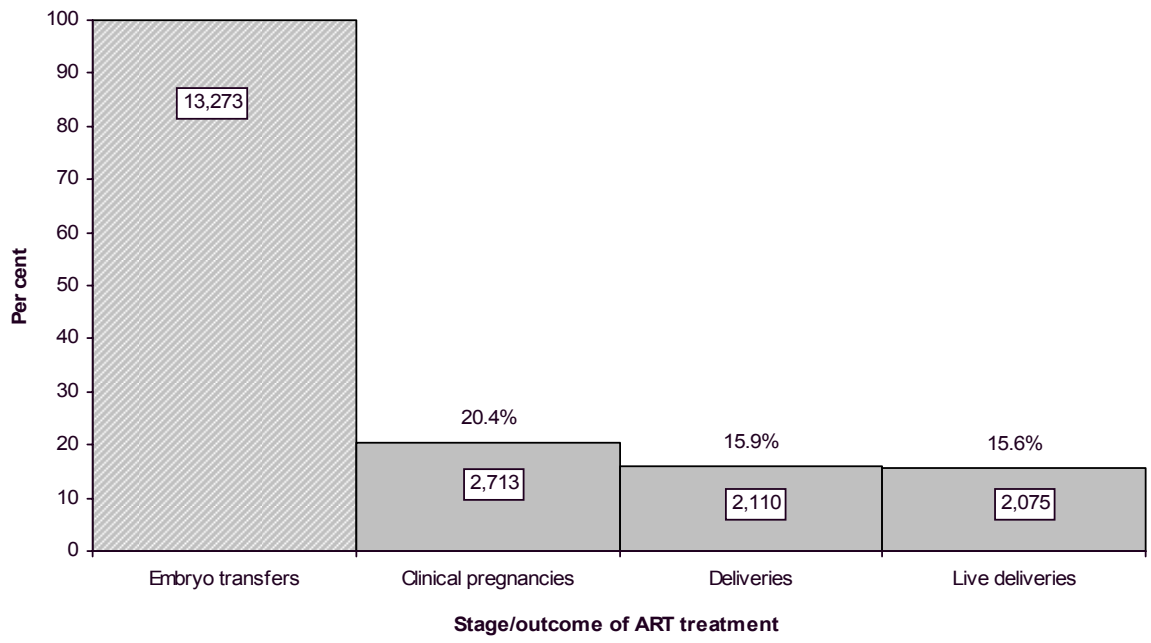


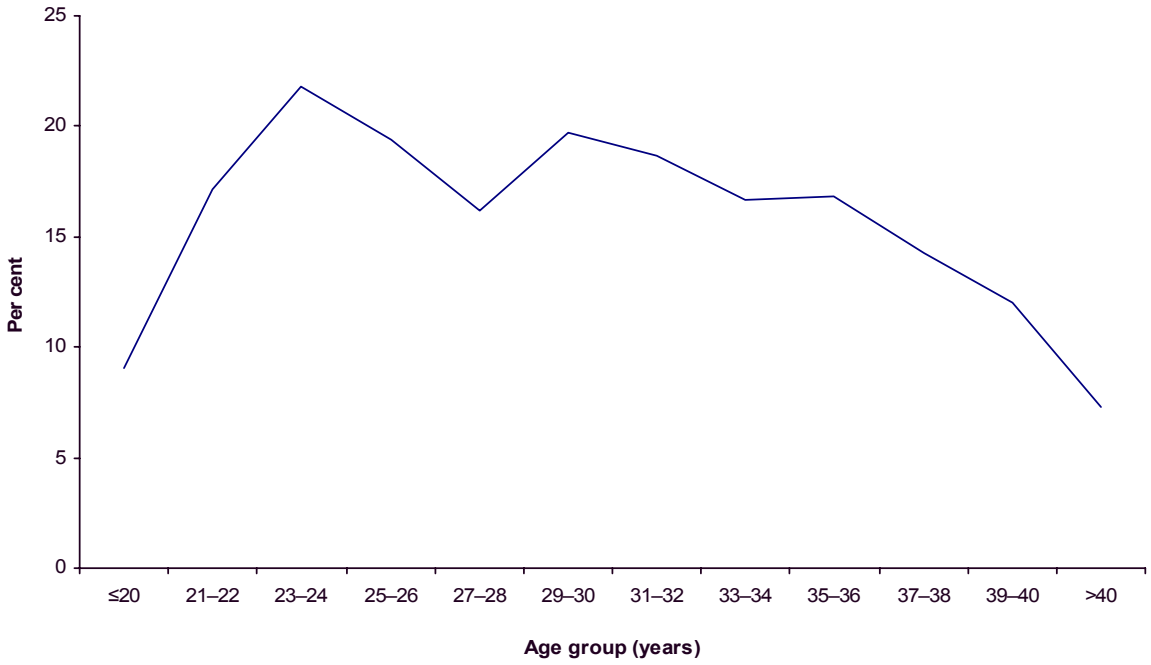
Figure 7: Progression of non-donor thaw ART treatment cycles, Australia and New Zealand, 2004

Did the success of non-donor thaw ART treatment cycles vary by women's age?

The success rate (measured as the proportion of non-donor thaw cycles with embryo transfer that resulted in a live delivery) varied by women's age group (Table 15; Figure 8). Women aged 23–24 years had the highest success rate (21.8%), and the lowest rate (7.3%) was among women aged over 40 years (Figure 8).

Table 15: Success of non-donor thaw ART treatment cycles by stage/outcome of treatment and women's age group, Australia and New Zealand, 2004

	Age group (years)					
Stage/outcome of treatment	**≤ 24**	**25–29**	**30–34**	**35–39**	**≥ 40**	**All**
Embryo transfers	170	1,545	4,919	4,763	1,876	13,273
Clinical pregnancies	43	358	1,108	957	247	2,713
Live deliveries	34	279	877	720	165	2,075
Live deliveries per transfer cycle (%)	*20.0*	*18.1*	*17.8*	*15.1*	8.8	*15.6*
Live deliveries per clinical pregnancy (%)	*79.1*	*77.9*	*79.2*	*75.2*	66.8	*76.5*



Note: Owing to small numbers, values for women aged ≤ 20 years were combined and values for women aged >40 years were combined.

Figure 8: Proportion of non-donor thaw ART treatment cycles with embryo transfer that resulted in a live delivery by women's age group, Australia and New Zealand, 2004

Did the success of non-donor thaw ART treatment cycles vary by ART procedure?

For non-donor thaw cycles with embryo transfer in 2004, the success rate (measured as the proportion of non-donor thaw cycles in which embryos were transferred that resulted in a clinical pregnancy) was slightly higher for IVF cycles (20.9%) than ICSI cycles (19.8%). The success rate (measured as the proportion of non-donor thaw cycles in which embryos were transferred that resulted in a live delivery) was similar for IVF cycles (15.8%) and ICSI cycles (15.3%) (Table 16).

Table 16: Success of non-donor thaw ART treatment cycles by stage/outcome of treatment and ART procedure, Australia and New Zealand, 2004

Stage/outcome of treatment	IVF	ICSI	Unknown
Embryo transfers	5,999	6,771	503
Clinical pregnancies	1,251	1,338	124
Live deliveries	945	1,033	97
Clinical pregnancies per transfer cycle (%)	*20.9*	*19.8*	*24.7*
Live deliveries per transfer cycle (%)	*15.8*	*15.3*	*19.3*

Did the success of non-donor thaw ART treatment cycles vary by cause of infertility?

For non-donor thaw ART treatment cycles with embryo transfer in 2004, couples who reported their cause of infertility as male factor only had a higher proportion of cycles that resulted in a live delivery (16.8%) compared to couples who reported female factor, multiple causes or unexplained causes of infertility respectively (Table 17).

Table 17: Number of non-donor thaw ART treatment cycles with embryo transfer that resulted in a live delivery by cause of infertility, Australia and New Zealand, 2004

Cause of infertility	Number of cycles with thawed embryo transfer	Number of cycles with thawed embryo transfer that resulted in a live delivery	Cycles with thawed embryo transfer that resulted in a live delivery (%)
Male factor only	2,446	412	16.8
Female factor	2,198	333	15.2
Tubal disease only	1,214	182	15.0
Endometriosis only	788	117	14.8
Tubal disease and endometriosis	196	34	17.3
Multiple causes[(a)]	3,933	583	14.8
Unexplained	1,903	290	15.2
Other[(b)]	1,522	211	13.9
No cause/not stated[(c)]	1,271	246	19.4
Total	**13,273**	**2,075**	**15.6**

(a) Includes combined male factor, tubal disease, endometriosis, unexplained and/or others.

(b) Includes fibroids, ovulation disorders, premature ovarian failure.

(c) Includes data for clinics that did not report infertility information.

How did the success of non-donor thaw ART treatment cycles vary among fertility centres in Australia and New Zealand?

For non-donor thaw ART treatment cycles in 2004, the success rate (measured as the proportion of non-donor thaw cycles with embryo transfer that resulted in a live delivery) among fertility centres ranged from 5.0% to 23.3% (Figure 9). As with non-donor fresh cycles, the success rate was higher for women aged less than 38 years compared to women aged 38 years or more.

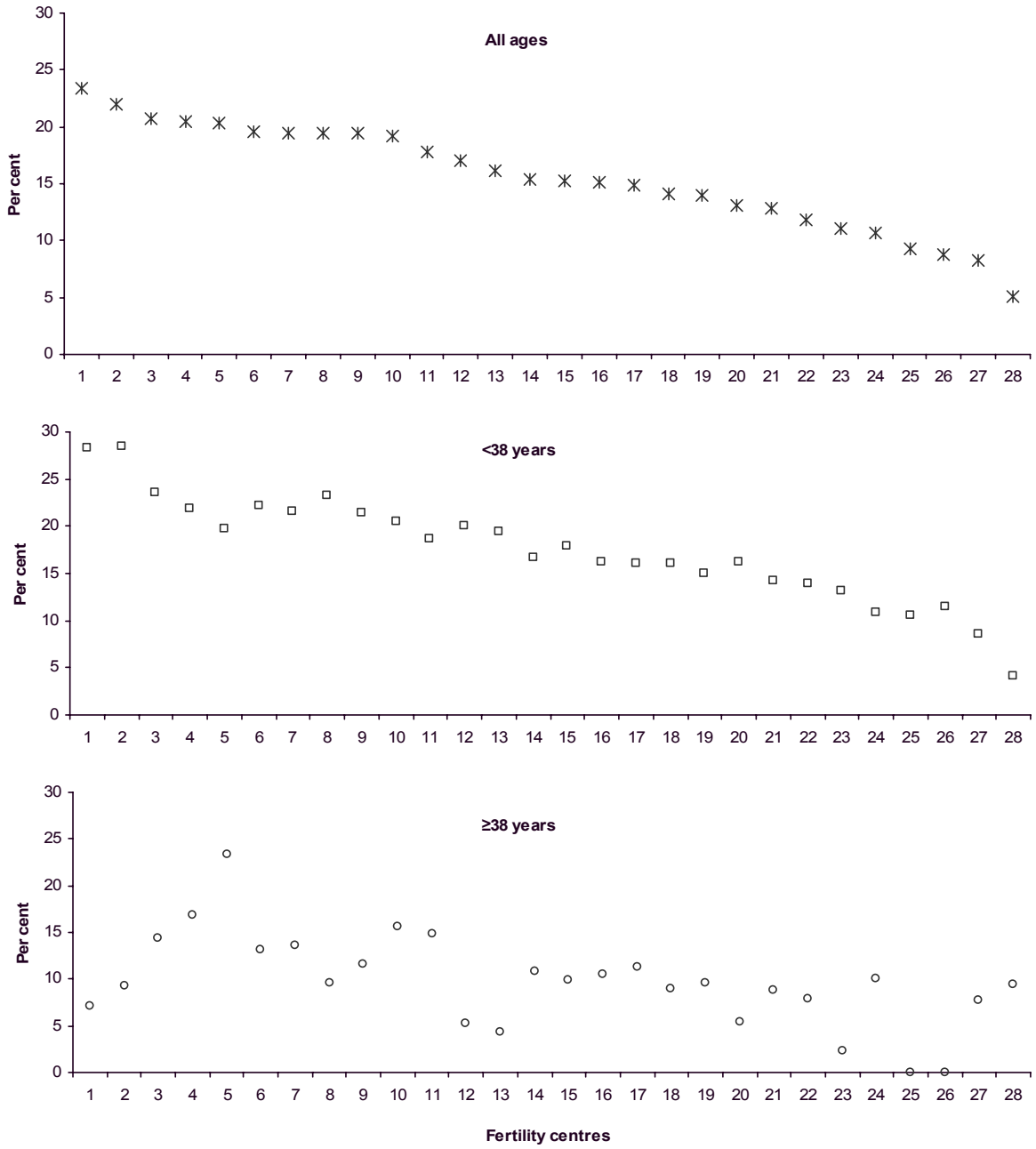


Figure 9: Proportion of non-donor thaw ART treatment cycles with embryo transfer that resulted in a live delivery by fertility centre and women's age group, Australia and New Zealand, 2004

For the top 25% (first quartile) of fertility centres, at least 19.6% of non-donor thaw cycles with embryo transfer resulted in a live delivery. The bottom 25% (fourth quartile) of fertility centres had a success rate of less than 12.6% and the remaining 50% of fertility centres had success rates between 12.6% and 19.5% (Table 18).

Table 18: Success of non-donor thaw ART treatment cycles by women's age group and quartiles of success, fertility centres, Australia and New Zealand, 2004

	Live deliveries per thaw embryo transfer cycle (%)				
Age group (years)	**Average**	**First quartile**	**Second quartile**	**Third quartile**	**Fourth quartile**
<38	17.5	21.6–28.5	17.4–21.5	14.2–17.3	4.2–14.1
≥ 38	10.5	12.1–23.3	9.7–12.0	7.7–9.6	0.0–7.6
Total	**15.6**	**19.6–23.3**	**15.4–19.5**	**12.6–15.3**	**5.0–12.5**

2.3 Donor ART treatment in 2004

ART treatment cycles with donor oocytes/embryos are defined as cycles in which a woman intended to donate and/or donated oocytes/embryos, or in which a woman received donated oocytes/embryos.

2.3.1 Donor ART treatment cycles

In 2004, 2,692 (6.4%) cycles involved the donation or receipt of oocytes/embryos. This included 1,766 (65.6%) fresh cycles and 926 (34.4%) thaw cycles (Table 1). There were 1,557 donor cycles with embryo transfer in 2004 (Table 19). Of these, 1,399 (89.9%) cycles involved receipt of donated oocytes and 158 (10.1%) cycles involved receipt of donated embryos. The average age of recipients who had embryo transfer was 40.4 years.

Table 19: Success of donor ART treatment cycles by stage/outcome of treatment and recipient's age group, Australia and New Zealand, 2004

	Age group (years)					
Stage/outcome of treatment	**≤ 24**	**25–29**	**30–34**	**35–39**	**≥ 40**	**All**
Embryo transfers	2	55	184	361	955	1,557
Clinical pregnancies	0	14	55	98	238	405
Live deliveries	0	10	42	69	174	295
Live deliveries per transfer cycle (%)	*0.0*	*18.2*	*22.8*	*19.1*	18.2	*18.9*
Live deliveries per clinical pregnancy (%)	*. .*	*71.4*	*76.4*	*70.4*	73.1	*72.8*

. . Not applicable.

How is success measured for donor ART treatment cycles?

Figure 10 shows:

- the number of donor cycles in which embryos were transferred.

It also shows the number of cycles in which embryos were transferred that resulted in:

- a clinical pregnancy
- a delivery
- a live delivery.

Overall 18.9% of donor cycles (295 of 1,557) resulted in a live delivery (Table 19).

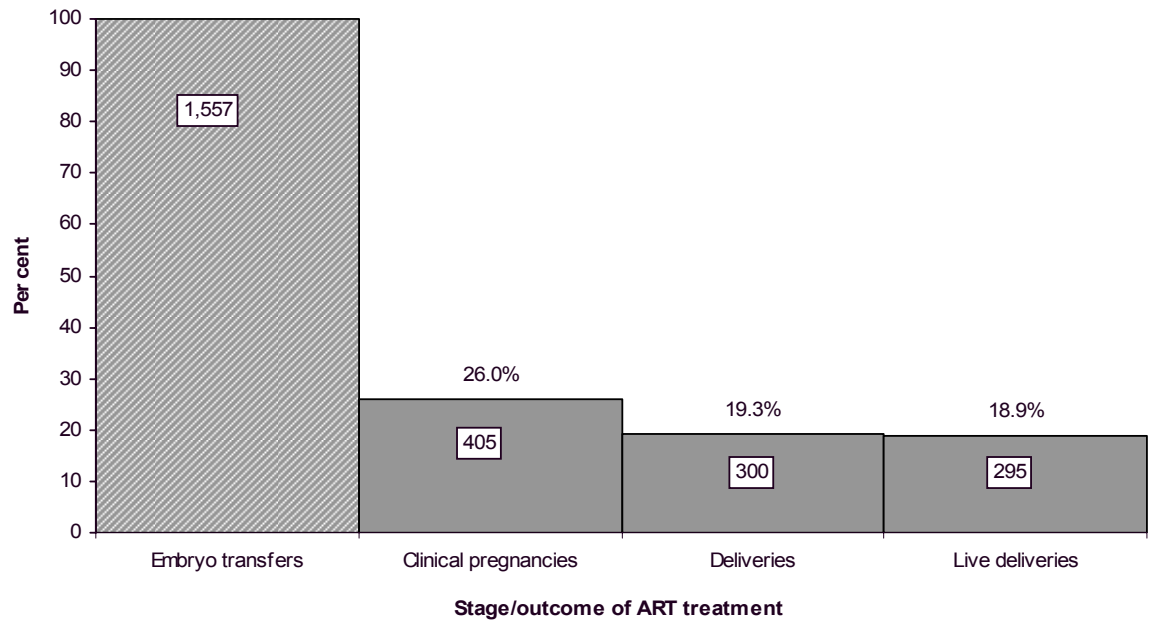
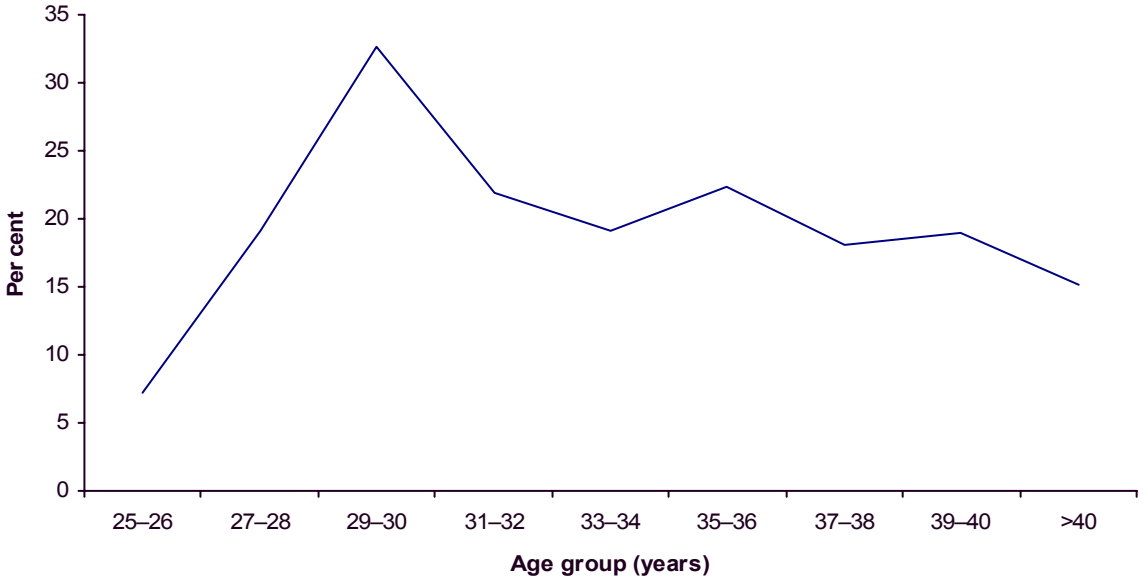


Figure 10: Progression of donor ART treatment cycles, Australia and New Zealand, 2004

Did the success of donor ART treatment cycles vary by recipient's age?

The success rate of donor cycles (measured as the proportion of donor cycles with embryo transfer that resulted in a live delivery) among recipients varied by age group (Figure 11). Recipients aged 29 to 30 years had the highest success rate (32.6%).



Note: Owing to small numbers, values for women aged < 25 years were not presented and values for women aged > 40 years were combined.

Figure 11: Proportion of donor ART treatment cycles with embryo transfer that resulted in a live delivery by recipient's age group, Australia and New Zealand, 2004

Did the success of donor ART treatment cycles vary by ART procedure?

The success rate (measured as the proportion of cycles with embryo transfer that resulted in a live delivery) for donor fresh IVF cycles was 26.5%. This was slightly higher than the rate for ICSI cycles (25.3%). For donor thaw cycles, the success rate for IVF cycles was markedly higher than that for ICSI cycles (16.2% and 10.0% respectively) (Table 20).

Table 20: Success of donor ART treatment cycles by ART treatment type and ART procedure, Australia and New Zealand, 2004

	Fresh		Thaw	
Stage/outcome of treatment	**IVF**	**ICSI**	**IVF**	**ICSI**
Embryo transfers	268	419	444	410
Clinical pregnancies	100	143	100	57
Live deliveries	71	106	72	41
Clinical pregnancies per transfer cycle (%)	*37.3*	*34.1*	*22.5*	*13.9*
Live deliveries per transfer cycle (%)	*26.5*	*25.3*	*16.2*	*10.0*

3 ART treatment cycles in 2004 resulting in clinical pregnancies, deliveries and births

3.1 ART treatment cycles in 2004 resulting in clinical pregnancies and deliveries

Clinical pregnancies overview

There were 8,794 ART treatment cycles in 2004 in Australia and New Zealand that resulted in a clinical pregnancy (including 1.1% (100) of clinical pregnancies in which gestational age was unknown). Of these, 7,846 (89.2%) cycles were in fertility centres in Australia, and 948 (10.8%) cycles were in New Zealand.

Early pregnancy loss

Of the 8,794 clinical pregnancies that resulted from ART treatment cycles in 2004, 20.0% (1,762) ended before 20 weeks gestation. Of these early pregnancy losses, 89.2% were miscarriages, 8.0% were ectopic or heterotopic pregnancies and 2.8% were due to fetal reduction or termination of pregnancy (Table 21).

Table 21: Number of ART treatment cycles that resulted in a clinical pregnancy of <20 weeks gestation by pregnancy outcome, ART treatment type and ART procedure, Australia and New Zealand, 2004

Pregnancy outcome	Non-donor oocytes/embryos				Donor oocytes/embryos	All
	Fresh all[(a)]	Fresh IVF	Fresh ICSI	Thaw		
			Number			
Miscarriage	961	431	528	515	95	1,571
Reduction or termination	39	24	15	7	3	49
Ectopic or heterotopic pregnancy	94	51	42	44	4	142
Total	1,094	506	585	566	102	1,762
			Per cent			
Miscarriage	87.8	85.2	90.2	91.0	93.1	89.2
Reduction or termination	3.6	4.7	2.6	1.2	3.0	2.8
Ectopic or heterotopic pregnancy	8.6	10.1	7.2	7.8	3.9	8.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Includes cycles in which GIFT was used.

Deliveries

More than three quarters (6,932; 78.8%) of ART clinical pregnancies that resulted from ART treatment cycles in 2004 resulted in a delivery. Of these deliveries, 98.0% were live deliveries and 1.2% were fetal death(s) (Table 22). For donor oocyte cycles that resulted in a delivery, 278 (98.2%) resulted in a live delivery. For donor embryo cycles that resulted in a delivery, all 17 (100.0%) resulted in a live delivery.

Table 22: Number of ART treatment cycles that resulted in a delivery by delivery outcome, ART treatment type and ART procedure, Australia and New Zealand, 2004

Delivery outcome	Non-donor oocytes/embryos				Donor oocytes/embryos	All
	Fresh all[(a)]	Fresh IVF	Fresh ICSI	Thaw		
			Number			
Live delivery	4,422	1,921	2,477	2,075	295	6,792
Fetal death[(b)]	60	25	35	18	3	81
Not stated	40	15	25	17	2	59
Total	**4,522**	**1,961**	**2,537**	**2,110**	**300**	**6,932**
			Per cent			
Live delivery	97.8	97.9	97.6	98.3	98.3	98.0
Fetal death[(b)]	1.3	1.3	1.4	0.9	1.0	1.2
Not stated	0.9	0.8	1.0	0.8	0.7	0.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) Includes cycles in which GIFT was used.

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

What was the risk of multiple gestation pregnancies in relation to the number of embryos transferred?

Table 23 shows the number of fetal hearts detected in pregnancies that resulted from ART treatment by the number of embryos transferred. Of cycles in which two embryos were transferred that resulted in a pregnancy, two fetal hearts were detected in 21.7%. This is markedly higher than the proportion of single embryo transfer cycles that resulted in a pregnancy in which two fetal hearts were detected (2.1%).

Table 23: Number of ART treatment cycles that resulted in a clinical pregnancy in which fetal hearts were detected by number of fetal hearts and number of embryos transferred, Australia and New Zealand, 2004

Number of fetal hearts	One		Two		Three or more		Total	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
0	224	7.4	399	7.3	31	11.1	654	7.5
1	2,628	86.6	3,564	65.4	168	60.4	6,360	72.5
2	64	2.1	1,184	21.7	48	17.3	1,296	14.8
≥3	3	0.1	24	0.4	10	3.6	37	0.4
Not stated	117	3.8	281	5.2	21	7.6	419	4.8
Total	**3,036**	**100.0**	**5,452**	**100.0**	**278**	**100.0**	**8,766**	**100.0**

What was the risk of multiple gestation delivery in relation to the number of embryos transferred?

For cycles in which two embryos were transferred, 23.7% resulted in a delivery of twins. For cycles in which a single embryo was transferred, this was 1.9% (Table 24).

Table 24: Number of ART treatment cycles that resulted in a delivery by gestation and number of embryos transferred, Australia and New Zealand, 2004

	One		Two		Three or more		Total	
Gestation	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Singleton	2,338	96.8	3,257	75.5	127	71.8	5,722	82.9
Twin	45	1.9	1,023	23.7	40	22.6	1,108	16.0
Higher order multiple	1	0.0	14	0.3	8	4.5	23	0.3
Not stated	32	1.3	21	0.5	2	1.1	55	0.8
Total	**2,416**	**100.0**	**4,315**	**100.0**	**177**	**100.0**	**6,908**	**100.0**

Did multiple gestation delivery vary by maternal age?

The average age (at delivery) of women who had ART treatment in 2004 was 34.5 years, 5.0 years older than the average age (29.5 years) of all women who gave birth in Australia in 2003 (AIHW: Laws & Sullivan 2005).

Of the 6,932 deliveries, 16.4 % (1,137) were twin or higher order multiple gestation deliveries (Table 25). This is higher than the proportion of women who gave birth in Australia in 2003 who had multiple gestation deliveries (1.7%) (AIHW: Laws & Sullivan 2005).

Women aged less than 38 years had a higher proportion of multiple gestation deliveries compared to older women (17.6% and 12.4% respectively).

Table 25: Number of ART treatment cycles that resulted in a delivery by gestation and maternal age group, Australia and New Zealand, 2004

	Age group (years)[a]					
	<38		≥ 38		Total[b]	
Gestation	Number	Per cent	Number	Per cent	Number	Per cent
Singleton	4,302	81.6	1,437	86.7	5,740	82.8
Multiple	928	17.6	207	12.4	1,137	16.4
Twin	909	17.2	203	12.2	1,114	16.1
Higher order multiple	19	0.4	4	0.2	23	0.3
Not stated	41	0.8	14	0.9	55	0.8
Total	**5,271**	**100.0**	**1,658**	**100.0**	**6,932**	**100.0**

(a) At time of delivery.

(b) Includes less than 0.1% of deliveries in which maternal age was unknown.

Caesarean sections

In 2004, about half (3,448; 49.7%) of deliveries following ART treatment were by caesarean section (Table 26). This is higher than the rate of caesarean section reported in Australia in 2003 (28.5%) (AIHW: Laws & Sullivan 2005).

The high proportion of caesarean sections is likely influenced by the high number of multiple gestation pregnancies that resulted from ART treatment. There was a marked difference in the caesarean section rate for singleton deliveries (44.9%) compared to twin deliveries (76.0%) (Table 26).

Table 26: Number of ART treatment cycles that resulted in a delivery by gestation and method of delivery, Australia and New Zealand, 2004

Method of delivery	Singleton		Twin		Higher order multiple		Total[(a)]	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Caesarean section	2,578	44.9	847	76.0	23	100.0	3,448	49.7
Other	3,152	54.9	265	23.8	0	0.0	3,417	49.3
Not stated	10	0.2	2	0.2	0	0.0	67	1.0
Total	**5,740**	**100.0**	**1,114**	**100.0**	**23**	**100.0**	**6,932**	**100.0**

(a) Includes cycles in which gestation was unknown.

The rate of caesarean section deliveries for women aged less than 38 years who had ART treatment in 2004 was 46.6%. For women aged 38 years or more, the rate was 59.7% (Table 27).

Table 27: Number of ART treatment cycles that resulted in a delivery by method of delivery and maternal age group, Australia and New Zealand, 2004

	Age group (years)[(a)]							
Method of delivery	**≤ 24**	**25–29**	**30–34**	**35–39**	**≥ 40**	**Total[(b)]**	**<38**	**≥ 38**
				Number				
Caesarean section	24	319	1,186	1,371	547	3,448	2,457	990
Other	47	462	1,362	1,215	330	3,417	2,764	652
Not stated	1	7	28	20	10	67	50	16
Total	**72**	**788**	**2,576**	**2,606**	**887**	**6,932**	**5,271**	**1,658**
				Per cent				
Caesarean section	33.3	40.5	46.0	52.6	61.7	49.7	46.6	59.7
Other	65.3	58.6	52.9	46.6	37.2	49.3	52.4	39.3
Not stated	1.4	0.9	1.1	0.8	1.1	1.0	1.0	1.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) At time of delivery.

(b) Includes less than 0.1% of deliveries in which maternal age was unknown.

3.2 Babies conceived from ART treatment in 2004

Babies in this section were born of 20 weeks or more gestational age or 400 grams or more birthweight.

3.2.1 Baby outcomes

There were 8,038 babies born to women who had ART treatment in 2004 (Table 28). Of these babies, 88.9% (7,143) were conceived at fertility centres in Australia and 11.1% (895) in New Zealand. In 2003, 256,925 babies were born in Australia (AIHW: Laws & Sullivan 2005).

Of babies born to women who had ART treatment in 2004, 71.4% (5,740) were singletons, 27.7% (2,228) were twins; and 0.9% (70) were higher order multiples. There were 7,913 live births, representing 98.4% of these babies.

What was the risk of preterm birth for babies born to women who had ART treatment?

The average gestational age of babies born to women who had ART treatment in 2004 was 37.4 weeks (Table 28). This is less than the average gestational age of 38.9 weeks for all babies born in Australia in 2003 (AIHW: Laws & Sullivan 2005).

Table 28: Number of babies born to women who had ART treatment by gestational age and plurality, Australia and New Zealand, 2004

Gestational age (weeks)	Singleton		Twin		Higher order multiple		Total	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Mean	*38.3*		*35.2*		*32.2*		*37.4*	
20–27	99	1.7	80	3.6	3	4.3	182	2.3
28–31	73	1.3	144	6.5	21	30.0	238	2.9
32–36	452	7.9	1,110	49.8	46	65.7	1,608	20.0
≥37	5,115	89.1	888	39.9	0	0.0	6,003	74.7
Not stated	1	0.0	6	0.3	0	0.0	7	0.1
Total	**5,740**	**100.0**	**2,228**	**100.0**	**70**	**100.0**	**8,038**	**100.0**
20–36	*624*	*10.9*	*1,334*	*59.9*	*70*	*100.0*	*2,028*	*25.2*

About a quarter (25.2%) of babies born to women who had ART treatment in 2004 were preterm (born at less than 37 weeks gestation), which is markedly higher than the proportion of preterm babies (7.9%) born in Australia in 2003 (AIHW: Laws & Sullivan 2005). The high proportion of babies born preterm is likely to be related to the higher proportion of multiple births among babies born to women who had ART treatment.

The average gestational age of singletons born to women who had ART treatment in 2004 was 38.3 weeks, for twins it was 35.2 weeks and 32.2 weeks for higher order multiples. One in ten singletons was preterm. Three in ten twins were preterm and all higher order multiples were preterm (Table 28).

Figure 12 shows the distribution of gestational age for babies born to women who had ART treatment in 2004. Most (74.7%, 6,003) were full-term. This is slightly higher than the proportion (73.4%) of full-term babies born to women who had ART treatment in 2003.

(AIHW: Waters et al. 2006). Of babies born to women who had ART treatment in 2004, 20.0% (1,608) were born at 32–36 weeks and a further 5.2% (420) were born at 20–31 weeks (Table 28).

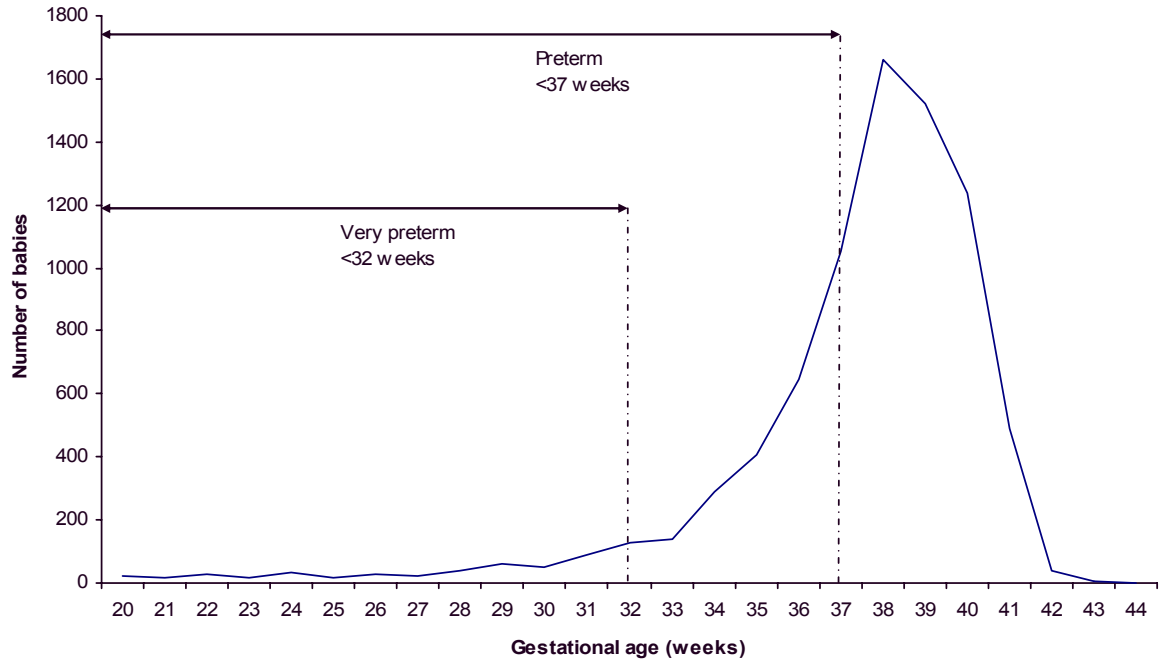


Figure 12: Number of babies born to women who had ART treatment by gestational age, Australia and New Zealand, 2004

What was the risk of low birthweight for live births to women who had ART treatment?

The average birthweight for live births to women who had ART treatment in 2004 was 3,054 grams. This is less than the average birthweight of 3,372 grams for all live births born in Australia in 2003 (AIHW: Laws & Sullivan 2005). One fifth of live births to women who had ART treatment in 2004 were classified as being low birthweight (<2,500 grams) and 3.7% were very low birthweight (<1,500 grams) (Table 29).

As with gestational age, the high proportion of low birthweight among babies born to women who had ART treatment is possibly related to the high proportion of multiple births.

Table 29: Number of live births to women who had ART treatment by birthweight group and plurality, Australia and New Zealand, 2004

	Singleton		Twin		Higher order multiple		Total	
Birthweight (g)	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Mean	*3,311*		*2,422*		*1,713*		*3,054*	
<1,000	50	0.9	49	2.2	5	7.4	104	1.3
1,000–1,499	57	1.0	120	5.5	13	19.4	190	2.4
1,500–1,999	76	1.3	271	12.4	32	47.8	379	4.8
2,000–2,499	244	4.3	648	29.8	14	20.9	906	11.5
2,500–2,999	950	16.8	721	33.1	3	4.5	1,674	21.2
3,000–3,499	2,037	35.9	293	13.5	0	0.0	2,330	29.4
3,500–3,999	1,592	28.1	41	1.9	0	0.0	1,633	20.6
≥4,000	619	10.9	5	0.2	0	0.0	624	7.9
Not stated	43	0.8	30	1.4	0	0.0	73	0.9
Total	**5,668**	**100.0**	**2,178**	**100.0**	**67**	**100.0**	**7,913**	**100.0**
<2,500	*427*	*7.5*	*1,088*	*50.0*	*64*	*95.5*	*1,579*	*20.0*

Figure 13 shows the distribution of birthweights for live births to women who had ART treatment in 2004 by plurality. It also shows the difference in the average birthweights of liveborn singletons and liveborn twins. Singletons had an average birthweight of 3,311 grams compared with 2,422 grams for twins (average birthweights indicated by vertical lines). Of singleton live births, 7.5% were low birthweight and of twin live births 50% were low birthweight (Table 29).

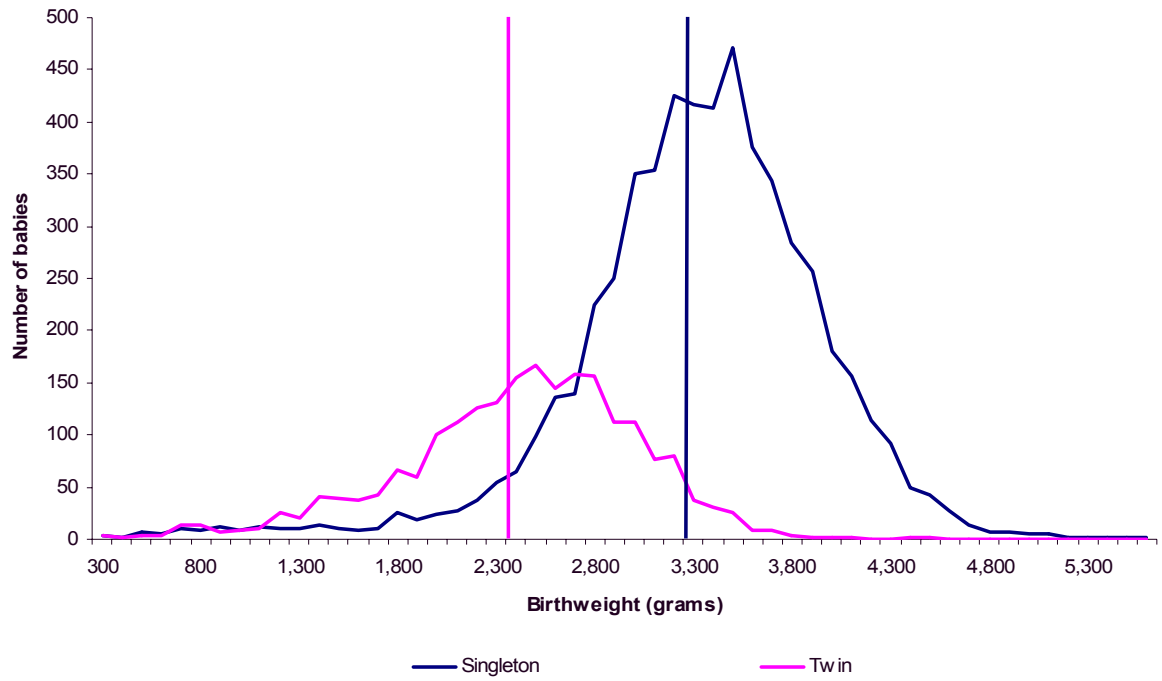


Figure 13: Number of live births to women who had ART treatment by birthweight and plurality, Australia and New Zealand, 2004

What was the sex distribution for live births born to women who had ART treatment?

For live births to women who had ART treatment in 2004, there were 103.5 male babies for every 100 female babies. For live births to women who had non-donor fresh IVF cycles in 2004, the ratio was 115.2 males for every 100 females. For live births to women who had non-donor fresh ICSI cycles in 2004, the ratio was 94.3 males to 100 females (Table 30).

Table 30: Number of live births to women who had ART treatment by sex, ART treatment type and ART procedure, Australia and New Zealand, 2004

Sex	Non-donor oocytes/embryos				Donor oocytes/embryos	All
	Fresh all[(a)]	Fresh IVF	Fresh ICSI	Thaw		
			Number			
Male	2,641	1,212	1,412	1,201	180	4,022
Female	2,581	1,054	1,514	1,133	173	3,887
Not stated	1	1	0	2	1	4
Total	**5,223**	**2,267**	**2,926**	**2,336**	**354**	**7,913**
			Per cent			
Male	50.6	53.5	48.3	51.4	50.8	50.8
Female	49.1	46.4	51.2	48.5	48.9	49.1
Ratio[(b)]	*103.0*	*115.2*	*94.3*	*106.0*	*104.0*	*103.5*

(a) Includes live births to women who had GIFT cycles.

(b) Male to female.

What was the risk of perinatal mortality among babies born to women who had ART treatment?

Perinatal mortality refers to fetal deaths (stillbirths) and the deaths of liveborn babies occurring within 28 days of birth (neonatal deaths). Of babies born to women who had ART treatment in 2004, 155 were perinatal deaths. Of these, 119 were fetal deaths and 36 were neonatal deaths. This represents a perinatal death rate of 19.3 deaths per 1,000 births to women who had ART treatment in Australia and New Zealand in 2004 (Table 31). This rate is markedly higher than the rate of 10.1 deaths per 1,000 births to women who gave birth in Australia in 2003 (AIHW: Laws & Sullivan 2005). Also it is slightly higher than the rate of 18.7 deaths per 1,000 births to women who had ART treatment in 2003.

Table 31: Perinatal mortality of babies born to women who had ART treatment by type of death and plurality, Australia and New Zealand, 2004

Type of death	Singleton	Twin	Total[(a)]
		Number	
Fetal deaths	70	46	119
Neonatal deaths	22	14	36
Perinatal deaths[(b)]	92	60	155
		Rate per 1,000 births[(c)]	
Fetal deaths per 1,000 births	*12.2*	*20.6*	*14.8*
Neonatal deaths per 1,000 live births	*3.9*	*6.4*	*4.5*
Perinatal deaths per 1,000 births[(c)]	*16.0*	*26.9*	*19.3*

(a) Includes higher order multiples.

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

(c) Fetal and perinatal death rates were calculated using all births (live births and fetal deaths) to women who had ART treatment in 2004. Neonatal death rates were calculated using all live births to women who had ART treatment in 2004.

For babies born to women who had ART treatment in 2004, singletons had the lowest perinatal mortality rate of 16.0 deaths per 1,000 births and twins had a higher rate of 26.9 deaths per 1,000 births (Table 31).

Data on perinatal mortality should be interpreted with caution because of the small numbers and potential variability in case reporting.

3.2.2 Baby outcomes—single embryo transfer

There were 2,431 babies born to women who had ART treatment in 2004, in which a single embryo was transferred (Table 32). This was 30.2% of babies born to women who had ART treatment in 2004. Of these babies, 2,338 (96.2%) were singletons and 93 (3.8%) were multiples.

What was the risk of preterm birth, low birthweight and perinatal death for babies born to women who had single embryo transfer?

The number of preterm babies born to women who had single embryo transfer cycles in 2004 was 299 (12.3%). This is half the proportion of 25.2% (2,028) for all babies born to women who had ART treatment in 2004 (Tables 28 and 32).

Similarly, only 8.4% of live births to women who had single embryo transfer cycles in 2004 were low birthweight, compared to 20.0% of all live births to women who had ART

treatment in 2004 (Tables 29 and 32). Live births to women who had single embryo transfer cycles in 2004 on average had a birthweight of 3,299 grams. This is similar to the average birthweight of 3,372 grams of babies born in Australia in 2003 (AIHW: Laws & Sullivan 2005).

Babies born to women who had single embryo transfer cycles in 2004 had a slightly lower perinatal death rate compared to all babies born to women who had ART treatment in 2004 (17.7 deaths and 19.3 deaths per 1,000 births, respectively) (Tables 31 and 32).

Babies born to women who had single embryo transfer cycles in 2004 had better perinatal outcomes compared to babies born to all women who had ART treatment in 2004.

Table 32: Perinatal outcomes of babies born to women who had single embryo transfer cycles by plurality, Australia and New Zealand, 2004

	Singleton		Multiple		Total[a]	
Perinatal outcome	**Number**	**Per cent**	**Number**	**Per cent**	**Number**	**Per cent**
Gestational age (weeks)						
≥ 37	2,092	89.5	38	40.9	2,130	87.6
20–36	246	10.5	53	57.0	299	12.3
Not stated	0	0.0	2	2.1	2	0.1
Total	**2,338**	**100.0**	**93**	**100.0**	**2,431**	**100.0**
Birthweight of live births (grams)						
≥ 2500	2,125	92.0	48	54.5	2,173	90.7
<2500	162	7.0	40	45.5	202	8.4
Not stated	22	1.0	0	0.0	22	0.9
Total	**2,309**	**100.0**	**88**	**100.0**	**2,397**	**100.0**
Baby outcome						
Live birth–survived	2,299	98.3	88	94.6	2,387	98.2
Live birth–neonatal death	10	0.4	0	0.0	10	0.4
Fetal death	28	1.2	5	5.4	33	1.4
Not stated	1	0.1	0	0.0	1	0.0
Total	**2,338**	**100.0**	**93**	**100.0**	**2,431**	**100.0**
Perinatal deaths per 1,000 births[b][c]	*16.3*		*53.8*		*17.7*	

(a) Includes higher order multiples.

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

(c) Perinatal death rates were calculated using all births (live births and fetal deaths) to women who had ART treatment in 2004.

4 Intrauterine insemination with donated sperm (IUI-donor) in 2004

4.1 IUI-donor cycles performed in 2004

Cycles in which intrauterine insemination using donated sperm (IUI-donor) from an anonymous or known donor was undertaken in fertility centres in Australia and New Zealand are included in this section. The information presented here does not included IUI-donor cycles undertaken in hospitals or private clinics that are not fertility centres.

In an IUI cycle, oocytes are not retrieved from the body. Instead, sperm is placed in the uterus and fertilisation occurs inside the body. IUI using donated sperm is an alternative treatment to ART procedures.

The success of IUI-donor cycles is measured as the proportion of IUI-donor cycles that resulted in a clinical pregnancy or the proportion of IUI-donor cycles that resulted in a live delivery. In 2004, there were 3,170 IUI-donor cycles. Of these, 12.5% (396) resulted in a clinical pregnancy and 9.7% (307) resulted in a live delivery (Table 33). The average age of women who had an IUI–donor cycle in 2004 was 35 years.

Table 33: Success of IUI-donor cycles by stage/outcome of treatment and women's age group, Australia and New Zealand, 2004

	Age group (years)					
Stage/outcome of treatment	**≤ 24**	**25–29**	**30–34**	**35–39**	**≥ 40**	**Total[(a)]**
IUI-donor	46	358	859	1,292	614	3,170
Clinical pregnancies	7	63	140	149	37	396
Live deliveries	6	55	115	112	19	307
Clinical pregnancies per IUI-donor cycle (%)	*15.2*	*17.6*	*16.3*	*11.5*	6.0	*12.5*
Live deliveries per IUI-donor cycle (%)	*13.0*	*15.4*	*13.4*	*8.7*	3.1	*9.7*
Live deliveries per clinical pregnancy (%)	*85.7*	*87.3*	*82.1*	*75.2*	51.4	*77.5*

(a) Includes less than 0.1% of cycles in which woman's age was unknown.

Did the success of IUI-donor cycles vary by women's age?

Table 33 shows that women aged 25–29 years had the highest proportions of IUI-donor cycles that resulted in a clinical pregnancy (17.6%) and a live delivery (15.4%) in 2004. For women aged 40 years or older, 6.0% IUI-donor cycles resulted in a clinical pregnancy.

4.2 IUI-donor cycles in 2004 resulting in clinical pregnancies

In 2004, 396 IUI-donor cycles resulted in a clinical pregnancy (Table 33). Ectopic or heterotopic pregnancies occurred in 1.5% and terminations due to various pregnancy

complications occurred in about 0.8%. More than three-quarters of pregnancies resulted in a delivery. The majority (307 of 311) of deliveries were live deliveries (Table 33). Multiple gestation deliveries accounted for 7.7% (24 of 311) of all deliveries.

4.3 Babies conceived through IUI-donor cycles in 2004

There were 341 babies born to women who had IUI-donor cycles in Australia and New Zealand in 2004. Of these, 15.5% (53) were born preterm. For live births to women who had IUI-donor cycles in 2004, the mean birthweight was 3,207 grams. The proportion of live births that were low birthweight was 14.5% (49). The perinatal death rate was 11.7 per 1,000 births to women who had IUI-donor cycles in 2004.

5 Trends in ART treatment and outcomes of ART treatment

5.1 Trends in ART treatment—2002 to 2004

Has the use of ART changed since 2002?

In 2004, 41,904 ART treatment cycles (includes fresh cycles, thaw cycles, cancelled cycles, failed OPU cycles, cycles with oocyte retrieval but no fertilisation, cycles with failed embryo thawing (none of the embryos survived after the thawing process) and unclassified cycles) were started in Australia and New Zealand. This is 22.3% more than the 34,267 cycles started in 2002.

The number of ART treatment cycles in Australia and New Zealand in 2004 that resulted in a clinical pregnancy was 8,794. This is 20.8% more than the 7,279 cycles that resulted in a clinical pregnancy in 2002 (Table 34).

Table 34: Success of ART treatment, Australia and New Zealand, 2002 to 2004

Stage/outcome of treatment	2002	2003	2004
Cycles started[(a)]	34,267	36,966	41,904
Oocyte retrievals	18,592	19,856	22,854
Oocyte/embryo transfers	28,036	30,184	34,232
Clinical pregnancies	7,279	7,977	8,794
Live deliveries	5,552	6,022	6,792
Clinical pregnancies per cycles started (%)	*21.2*	*21.6*	*21.0*
Live deliveries per cycles started (%)	*16.2*	*16.3*	*16.2*

(a) Includes all ART treatment (fresh, thaw, donor, cancelled and unclassified cycles).

Has the use of different types of ART treatment changed since 2002?

For non-donor fresh ART treatment cycles, the use of IVF (24%) and ICSI (32%) procedures did not change between 2002 and 2004. The proportion of GIFT cycles decreased from 0.7% in 2002 to 0.4% in 2004 (Table 35).

Table 35: Number of ART treatment cycles with oocyte/embryo transfer by ART treatment type and ART procedure, Australia and New Zealand, 2002 to 2004

	2002		2003		2004	
Treatment type/procedure	**Number**	**Per cent**	**Number**	**Per cent**	**Number**	**Per cent**
Non-donor	26,960	96.2	28,794	95.4	32,675	95.5
Fresh IVF	6,694	23.9	7,155	23.7	8,131[(a)]	23.8
Fresh ICSI	9,116	32.5	9,702	32.2	11,130	32.5
Fresh GIFT	190	0.7	183	0.6	138	0.4
Thaw	10,938	39.0	11,743	38.9	13,273	38.8
Unclassified	22	0.1	11	0.0	3	0.0
Donor	1,076	3.8	1,390	4.6	1,557	4.5
Total	**28,036**	**100.0**	**30,184**	**100.0**	**34,232**	**100.0**

(a) Includes cycles in which thawed oocytes were used.

Has the number of embryos transferred per treatment cycle changed since 2002?

For the majority of ART treatment cycles in 2002 to 2004, one or two embryos were transferred. In 2002, three or more embryos were transferred in 6.0% of cycles. In 2004, three or more embryos were transferred in 3.2% of cycles (Figure 14 and Table 36). The transfer of one or two embryos has become usual practice in Australia and New Zealand.

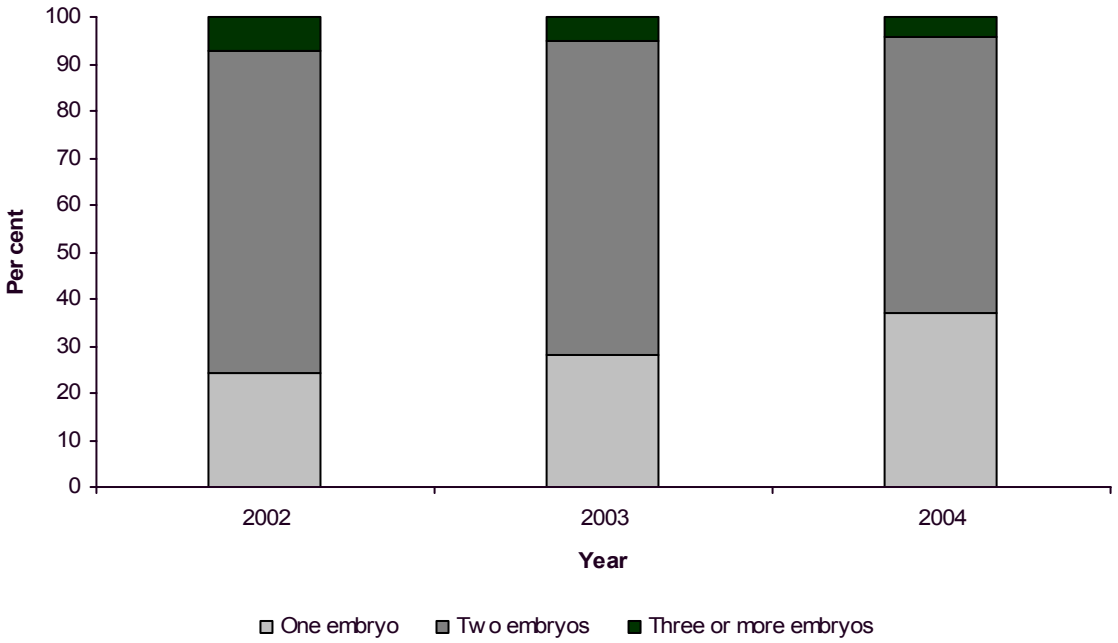


Figure 14: Proportion of embryo transfer cycles by number of embryos transferred, Australia and New Zealand, 2002 to 2004

Table 36: Proportion of embryo transfer cycles by number of embryos transferred and ART treatment type, Australia and New Zealand, 2002 to 2004

Number of embryos	2002			2003			2004		
	Fresh	Thaw	All	Fresh	Thaw	All	Fresh	Thaw	All
					Per cent				
1	24.4	34.1	28.4	28.1	37.5	32.0	37.1	45.1	40.5
2	68.6	61.5	65.6	66.8	59.3	63.7	58.8	52.9	56.3
≥ 3	7.0	4.5	6.0	5.1	3.2	4.3	4.1	2.0	3.2
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Has the success of ART treatment improved since 2002?

The proportion of fresh ART treatment cycles with embryo transfer in 2004 that resulted in a clinical pregnancy was 29.5%. The proportions in 2002 and 2003 were 30.3% and 30.9% respectively. For thaw ART cycles with embryo transfer in 2004, 20.3% resulted in a clinical pregnancy. This was slightly higher than the proportion for thaw ART cycles in 2002 (19.8%) and the same to the proportion for thaw ART cycles in 2003 (20.3%) (Table 37 and Figure 15).

Table 37: Number of ART treatment cycles with embryo transfer by stage/outcome of treatment and ART treatment type, Australia and New Zealand, 2002 to 2004

	Fresh			Thaw		
Stage/outcome of treatment	**2002**	**2003**	**2004**	**2002**	**2003**	**2004**
Embryo transfers	16,257	17,441	19,950	11,575	12,557	14,141
Clinical pregnancies	4,931	5,385	5,891	2,297	2,555	2,875
Clinical pregnancies per transfer cycle (%)	*30.3*	*30.9*	*29.5*	*19.8*	*20.3*	*20.3*

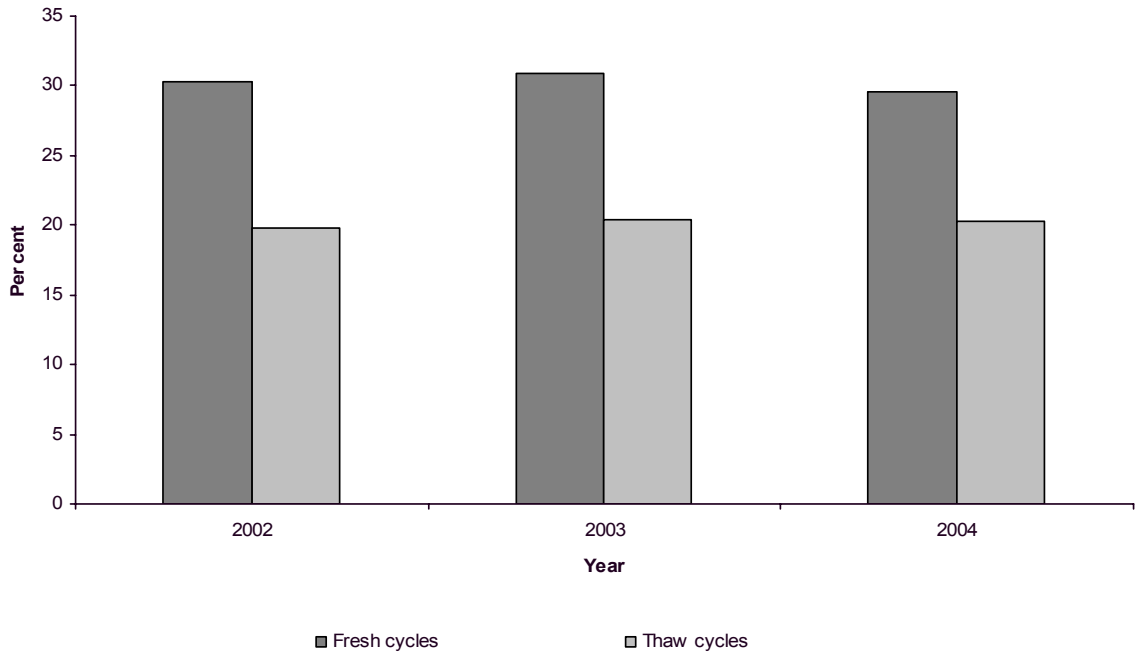
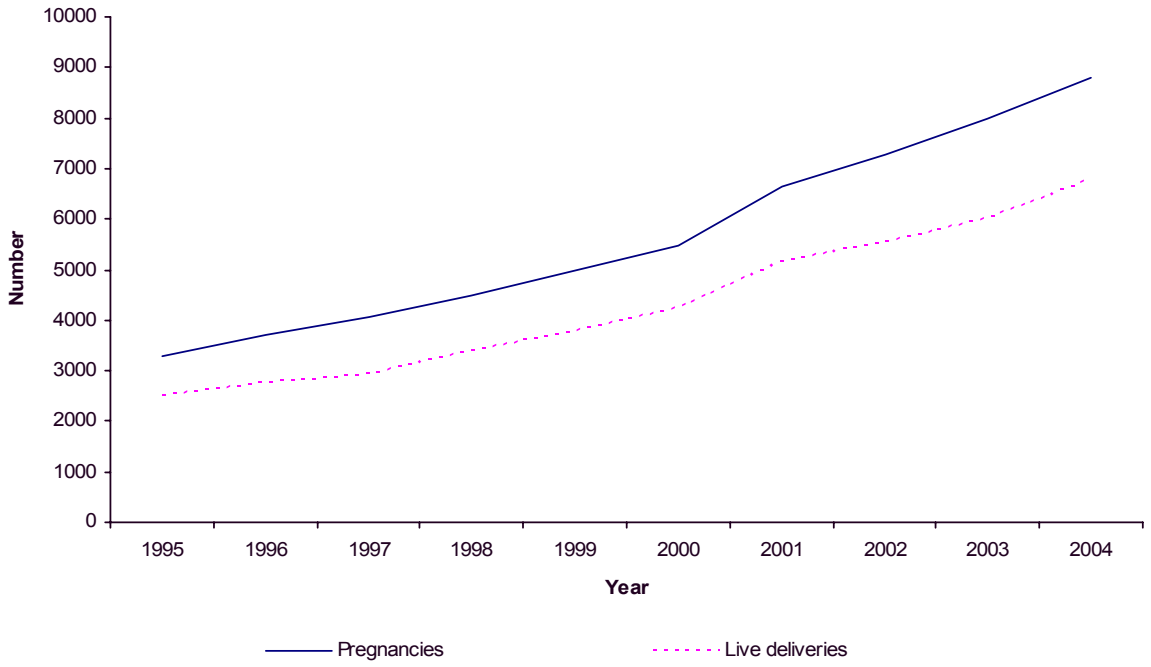


Figure 15: Proportion of ART treatment cycles that resulted in a clinical pregnancy by ART treatment type, Australia and New Zealand, 2002 to 2004

5.2 Trends in the outcomes of ART treatment—1995 to 2004

How many ART treatment cycles resulted in a clinical pregnancy and a live delivery between 1995 and 2004?

The number of ART treatment cycles that resulted in a clinical pregnancy and a live delivery has steadily increased between 1995 and 2004 (Figure 16). In 2004, there were 6,792 ART treatment cycles in Australia and New Zealand that resulted in a live delivery. This is 2.7 times the 2,515 ART treatment cycles in 1995 that resulted in a live delivery.



Note: 1995–2001 data are from the Assisted Conception Data Collection.

Figure 16: Number of ART treatment cycles that resulted in a clinical pregnancy and a live delivery, Australia and New Zealand, 1995 to 2004

Has the proportion of multiple gestation deliveries changed between 1995 and 2004?

Between 1995 and 2004, there was a decrease in the number of triplet or higher order multiple gestation deliveries that resulted from ART treatment. In 1995, 1.9% of deliveries were triplet or higher order multiple compared with 0.3% in 2004. Of all deliveries that resulted from ART treatment in 2004, the proportion of twin deliveries was 16.1%, the lowest proportion since 1995 (Table 38).

Table 38: Number of ART treatment cycles that resulted in a delivery by plurality, Australia and New Zealand, 1995 to 2004

	Singleton		Twin		Higher order multiple		
Year	Number	Per cent	Number	Per cent	Number	Per cent	Total
1995	2,043	79.9	465	18.2	49	1.9	2,557
1996	2,250	80.1	508	18.1	52	1.9	2,810
1997	2,480	79.4	591	18.9	51	1.6	3,122
1998	2,748	79.9	645	18.8	47	1.4	3,440
1999	3,014	78.2	789	20.5	50	1.3	3,853
2000	3,335	78.0	901	21.1	42	1.0	4,278
2001	4,087	78.3	1,097	21.0	35	0.7	5,219
2002	4,536	80.0	1,068	18.8	33	0.6	5,671[(a)]
2003	4,951	80.9	1,124	18.4	21	0.3	6,123[(a)]
2004	5,740	82.8	1,114	16.1	23	0.3	6,932[(a)]

(a) Includes cycles in which plurality was unknown.

Note: 1995–2001 data are from the Assisted Conception Data Collection.

Appendix 1: 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 ID/Medical record number	Unique ID for patient.
Woman's date of birth	Day/month/year.
Husband/male partner DOB	Day/month/year.
Egg/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	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.
Number of eggs GIFT	Number of eggs replaced in a GIFT procedure.

Variable	Data domain
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, known donor, or anonymous donor.
Number of eggs fertilised normally	The number of eggs fertilised normally in the opinion of the treating embryologist.
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.
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.

Variable	Data domain
Maternal complications of pregnancy	Describes morbidity related to pregnancy.
Number of babies delivered after 20 weeks	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-related morbidity.

References

AIHW (Australia Institute of Health and Welfare): Bryant J, Sullivan E & Dean J 2004. Assisted reproductive technology in Australia and New Zealand 2002. Assisted reproductive technology series no. 8. Cat. no. PER 26. Sydney: AIHW National Perinatal Statistics Unit.

AIHW: Laws PJ & Sullivan EA 2005. Australia's mothers and babies 2003. Perinatal statistics series no. 16. Cat. no. PER 29. Canberra: AIHW National Perinatal Statistics Unit.

AIHW: Waters A-M, Dean JH & Sullivan EA 2006. Assisted reproduction technology in Australia and New Zealand 2003. Assisted reproductive technology series no. 9. Cat. no. PER 31. Sydney: AIHW National Perinatal Statistics Unit.

Carr BR, Black EB & Azziz R 2005. Essential reproductive medicine. McGraw-Hill Companies, Inc.

Zegers-Hochschild F, Nygren K-G, Adamson GD, de Mouzon J, Lancaster P, Mansour R & Sullivan E 2006. The ICMART glossary on ART terminology. Human Reproduction 21(8): 1968–70.

List of tables

Supplementary tables

The supplentary tables are available on the Internet at <www.npsu.unsw.edu.au/art10high.htm>.

List of figures