



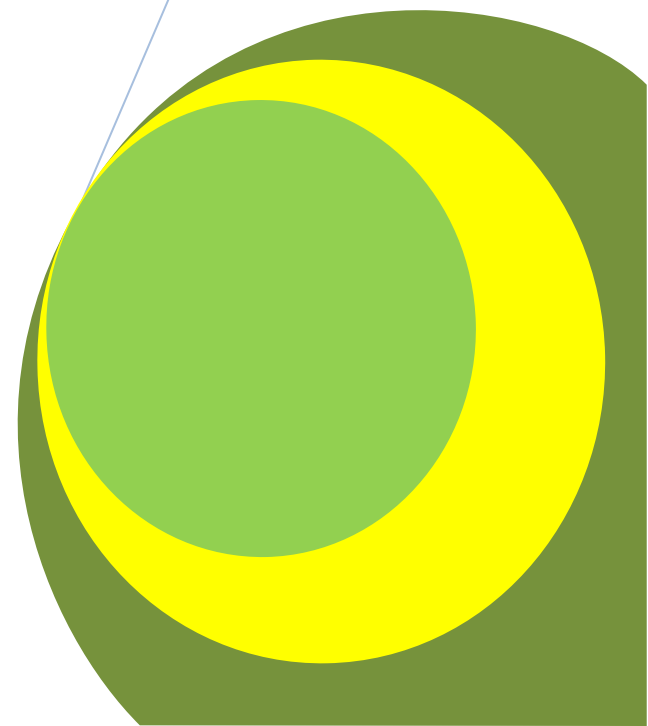
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## **Assisted reproduction technology in Queensland, Australia**

By

**David Achanfuo Yeboah  
Tracey Maree Yeboah**



*Research Article*

# Assisted reproduction technology in Queensland, Australia

**David Achanfuo Yeboah\* and Tracey Maree Yeboah**

Abu Dhabi University, United Arab Emirates, Joe Lapinto Group, Brisbane, Australia.

Corresponding Author's Email: david.yeboah@adu.ac.ae

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## ABSTRACT

This study is aimed at providing further insights into the trends in assisted reproduction technology in the State of Queensland, Australia. The Statistical analysis was undertaken on assisted reproduction technology mothers and other mothers between 1995 and 2007 with a view to establishing patterns and trends in types of assisted reproduction technology, outcomes, plurality, gestation and birth weight. The results from the study showed that, during the period 1995-2007, the number and proportion of assisted reproduction technology mothers increased together with an increase in the proportion of assisted reproduction technology mothers in the older age groups. In terms of outcomes, the study found that assisted reproduction technology resulted in more plural births than non assisted reproduction technology, but that the proportion of non twin multiple births declined during the study period. The study showed also that the proportion of assisted reproduction technology mothers out of all mothers increased. Thus, the increasing popularity of assisted reproduction technology among females wanting to have a baby was enhanced by the inclusion of the procedures in Medicare. The study concluded that, with the pending removal of the Medicare subsidy for assisted reproduction technology and the high costs associated with the procedures, the number of participating females is likely to decline.

**Key words:** Assisted, reproduction, technology, Queensland, Australia.

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## INTRODUCTION

The term assisted reproduction technology, also known as assisted conception, covers a range of medical procedures which manipulate the natural processes of conception to allow females who cannot conceive naturally to become pregnant (Australian Institute of Health and Welfare, 2009). As in many developed countries, Assisted Reproduction Technology (ART) is now widely used across Australia, following its modest introduction in the country in the late 1970s. Many ART service providers exist in Queensland, Australia, but most operate under the umbrella of the City Fertility Centre and the Queensland Fertility Group (Courier Mail, 2010). Nationally, the number of ART mothers increased steadily in the years following the introduction of the technology especially in the 1990s and after 2000 (AIHW, 2009). There is anecdotal evidence to suggest that Queensland experienced similar increases in the use of assisted reproduction technology.

The purpose of this article is to provide insights into assisted reproduction technology in Queensland by investigating patterns and trends in the number and proportion of assisted reproduction technology mothers by Queensland health service district of usual residence of mother, age of mother, type of technology, gestation and outcomes. Another objective is to draw attention to the potential consequences of the Australian Government's decision to abolish the rebate or subsidy for using ART. ART has enabled a number of women to have children in Queensland, but previously published research on ART in the State is currently unavailable. This is the rationale behind the study. Besides, the Commonwealth Government's announcement of its intention to withdraw the Medicare subsidy for ART has generated debate. This article would provide information on patterns and trends to enhance discussion and decision making, giving the study an added significance.

## Literature Review

Not much research has been undertaken on ART in Queensland in particular and Australia generally. Courier Mail (2010) published an article on the increasing use of ART by Queensland women and the widespread availability of the procedure in the main cities, especially Brisbane. It rued the non-availability of the procedures in semi-urban and rural areas.

Australian Institute of Health and Welfare (AIHW) (2009) carried out a thorough study of ART in Australia and New Zealand. It identified the factors which have resulted in a large increase in the number of women using the system in the two countries and provides statistical information on ART by type and related characteristics. The AIHW study mentioned Queensland and discussed the nature and practice of ART in the State.

The National Collaborating Centre for Women's and Children's Health (2004) examined treated women with fertility problems. The treatment options it discussed included ART and the reasons why more infertile women are adopting ART.

## MATERIALS AND METHODOLOGY

The data used in this study have been obtained from the perinatal databases of Queensland's Health Statistics Centre (HSC). This Centre collects and maintains unit record information on all Queensland mothers including mothers conceiving through ART. The data used in this study covers all the entire population of women using ART during the period and no sample or study site was required, especially as the HSC obtains data from all users of ART in Queensland. There is 100% coverage and thus, the issues of validity and reliability do not apply. However, given the small numbers in some cells, aggregate data are used in this study.

Services are delivered in Government and Private hospitals and all providers are required by law to provide information on the services (type, frequency, location, etc) to Queensland's Health Statistics Centre. Trained and registered health professionals perform the procedures in clinical settings across the State of Queensland.

The methodology involves the statistical analysis of ART data extracted from the pre-natal databases. Statistical computations including percentages and related proportions have been used in this study and the results are subsequently graphed to illustrate the patterns and trends. Comparative analysis was undertaken of the patterns and trends in ART mothers and non ART mothers (that is, mothers who conceive or become pregnant naturally) using proportions and other descriptive statistical techniques. More advanced statistical techniques including correlation and Chi Square were used to investigate the statistical associations between the variables. The statistical analysis is supported by graphs and diagrams.

## RESULTS

Consistent with national trends, the number of ART mothers in Queensland increased between 1995 and 2007. The proportion of ART mothers as a percentage of total mothers in Queensland declined from 2.9% in 1995 to 2.3% in 1998, before increasing steadily from 2.9% in 1999 to 3.1% in 2003 and 3.6% in 2007 (Figure 1).

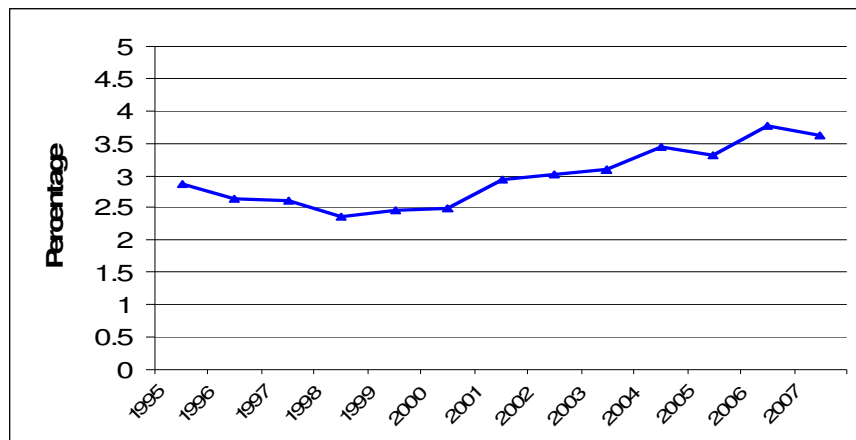


Figure i: Percentage of Assisted Reproduction Technology mothers, Queensland, 1995-2007, Source: Queensland Health Perinatal Statistics Databases

With regards to types of ART, the period from 1995 to 2000 was dominated by Ovulation Induction while *in Vitro* Fertilisation was used by the largest proportion of mothers from 2001 to 2007 (Figure 2). In Queensland, the proportion of mothers who conceived through Ovulation Induction was 30.3, 39.6 and 42.0% in 1995, 1997 and 1998 respectively, while the proportion for *in Vitro* Fertilisation increased from 40.1% in 2001 to 50.7% in 2004, 58.3% in 2006 and 58.3% in 2007.

Figure 3 shows that metro Health Service Districts accounted for the largest proportion of both ART and non ART mothers in Queensland in 2007. Queensland's Metro North Health Service District accounted for 29.6% of ART mothers compared with 18.7% for naturally conceiving mothers. The proportions for Metro South Health Service District were 29.4% and 24.5% for ART mothers and naturally conceiving mothers respectively. Over 9.0% of ART mothers and 10.6% of non ART mothers lived in the Sunshine Coast-Wide Bay Health Service District in 2007, while 9.0% and 12.3% of ART and non ART mothers respectively, lived in the Darling Downs-West Moreton Health Service District. As indicated in Figure 3, non metro Health Service Districts accounted for comparatively smaller proportions on ART mothers.

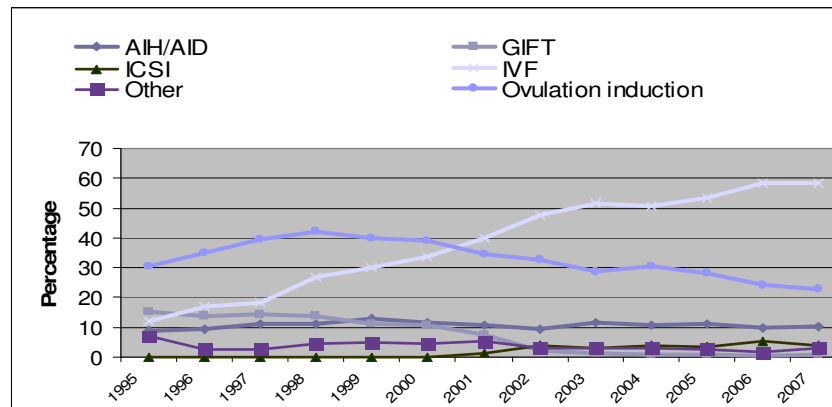


Figure ii . Assisted Reproduction Technology by method, Queensland, 1995-2007, Source: : Queensland Health Perinatal Statistics Databases

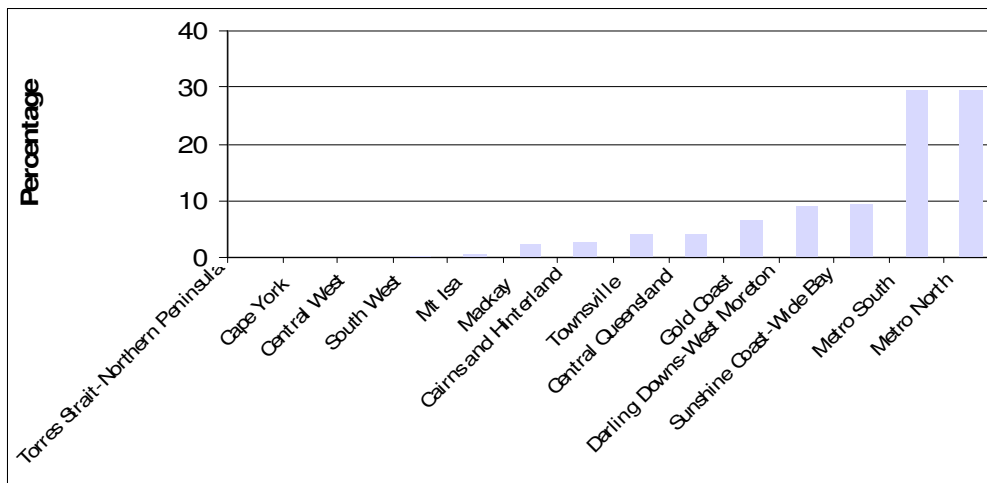


Figure iii. Assisted Reproduction Technology by Health Service District of usual residence of mother, Queensland, 1995-2007, Source: Queensland Health Perinatal Statistics Database

The middle age groups of the reproductive period (25 to 29, 30 to 34 and 35 to 39 years) recorded high proportions of both ART and non ART mothers between 1995 and 2007. Table 1 shows that in 1995, 39.0% of ART mothers were found in the 30 to 34 years age group and another 32.0% in the 25 to 29 years age group. In 2007, the largest proportion of ART mothers (38.0%) and non ART mothers (29.0%) were aged 30 to 34 years. The proportions of ART mothers aged 45 years and over increased by 2 percentage points during the period 1995 to 2007. The Proportion of ART mothers aged 35 to 39 years increased from 16.0% in 1995 to 33.0% in 2007. For ART mothers aged 40 to 44 years, the proportion increased from 3.0% in 1995 to 8.0% in 2007 (Table 1).

Figure 4 shows that, in 1995 the median age of ART mothers was 30 years compared with 28 years for non ART mothers. The median age increased to 34 and 29 years for ART mothers and non ART mothers respectively, in 2007.

Table i: Distribution of mothers by Assisted Reproduction Technology status and age, Queensland, 1995-2007

| <b>Assisted Conception</b> | <b>Age of mother (years)</b> | <b>1995</b> | <b>1999</b> | <b>2003</b> | <b>2007</b> |
|----------------------------|------------------------------|-------------|-------------|-------------|-------------|
| No Assisted Conception     | Under 15                     | 0           | 0           | 0           | 0           |
|                            | 15-19                        | 7           | 7           | 6           | 6           |
|                            | 20-24                        | 22          | 19          | 18          | 18          |
|                            | 25-29                        | 32          | 33          | 29          | 28          |
|                            | 30-34                        | 27          | 27          | 31          | 29          |
|                            | 35-39                        | 10          | 12          | 13          | 16          |
|                            | 40-44                        | 1           | 2           | 3           | 3           |
|                            | 45 and over                  | 0           | 0           | 0           | 0           |
|                            | Not Stated                   | -           | 0           | -           | -           |
|                            | <b>TOTAL %</b>               | <b>100</b>  | <b>100</b>  | <b>100</b>  | <b>100</b>  |
| Assisted Conception        | 15-19                        | -           | 0           | -           | -           |
|                            | 20-24                        | 11          | 5           | 3           | 2           |
|                            | 25-29                        | 31          | 27          | 21          | 16          |
|                            | 30-34                        | 39          | 39          | 41          | 38          |
|                            | 35-39                        | 16          | 24          | 27          | 33          |
|                            | 40-44                        | 3           | 4           | 7           | 8           |
|                            | 45 and over                  | 0           | 0           | 1           | 2           |
|                            | <b>TOTAL %</b>               | <b>100</b>  | <b>100</b>  | <b>100</b>  | <b>100</b>  |

Source: Queensland Health Perinatal Database

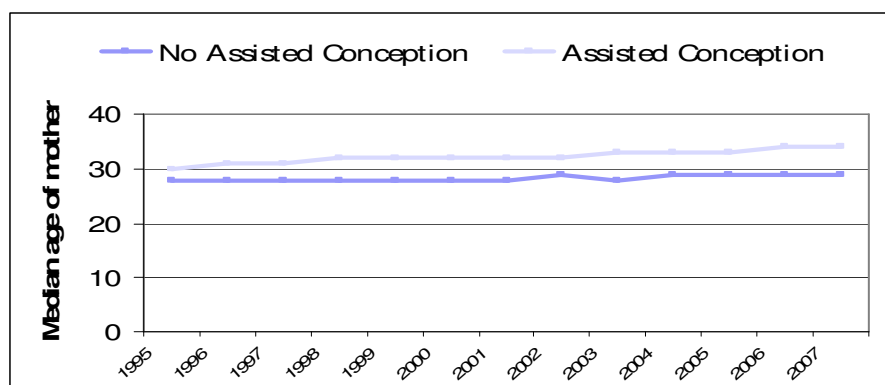


Figure iv: Median age of mothers by Assisted Reproduction (assisted conception) status, Queensland, 1995-2007, Source: Queensland Health Perinatal Statistics Databases

The proportion of live births out of all births was 99.3% for ART mothers and 99.2% for non ART mothers in 1995 and 99.3% for each type of conception in 2007. The proportion of stillbirths was low for both types of conception, but the proportions for ART mothers was slightly higher during the 1995 to 2007 period (Figure 5). In addition, the study found that the proportion of singleton live births was 99.3% or higher for women who used the technology during the study period.

Figure 6 shows that the proportion of twin births as a proportion of all ART live births increased by 4 percentage points from 9.6% in 1995 to 13.6% in 2007, compared with a marginal increase from 1.0% in 1995 to 1.2% in 2007 for non ART live births. The proportion of twin births reached a peak of 15.2% in 2002, an increase of 5.6% points over the 1995 proportion of 9.6%. Figure 6 shows further that the proportion of other multiple births for non ART stayed at 0.0% between 1995 and 2007, compared with a decline from 1.7% in 1995 to 0.3% in 2007 for women using the procedures.

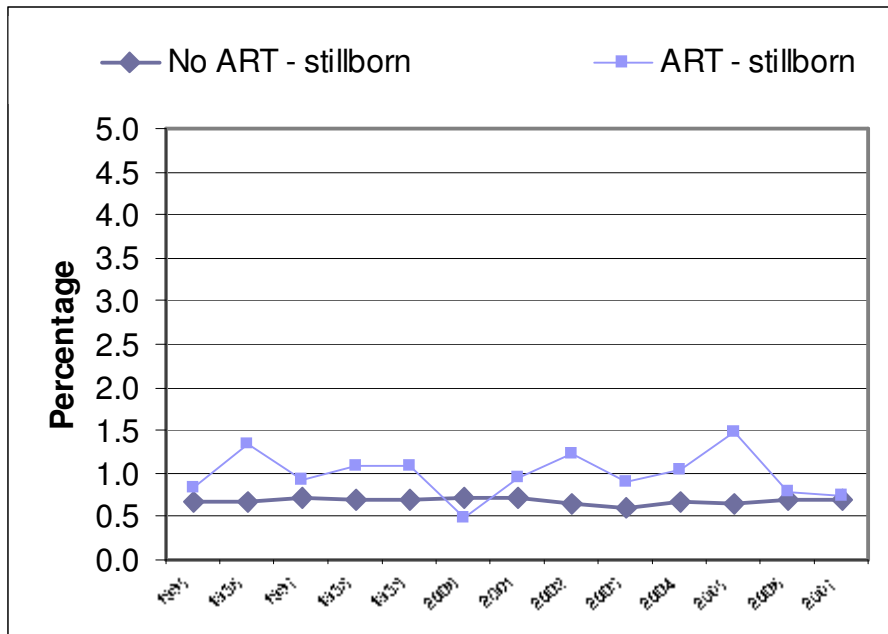


Figure v: Assisted Reproduction Technology by stillbirths, Queensland, 1995-2007, Source: Queensland Health Perinatal Statistics Databases

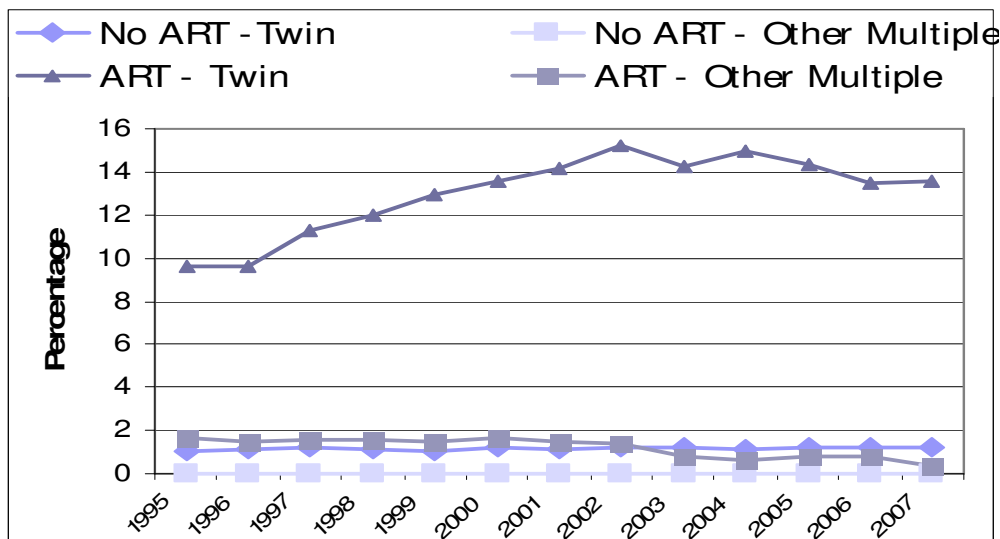


Figure vi: Assisted Reproduction Technology births by plurality, Queensland, 1995-2007, Source: Queensland Health Perinatal Statistics Databases

The study found a positive linear relationship between gestation and birth weight. The study shows that, irrespective of the method of conception, the longer the gestation, the higher the birth weight. Figure 7 points to a higher concentration of live births of less than 500g in the gestation of less than 22 to 24 weeks. In contrast, Figure 8 shows that, in both 1995 and 2007, the highest concentration of live births of over 2500g was found in the 37 to 41 weeks gestation. In 1995, 87.9% of all live births in Queensland weighing less than 500g occurred during a gestation of less than 24 weeks, and this increased by 5.1% to 92.4% in 2007. With regards to live births greater than 2500g in weight, the proportion in the 37 to 41 weeks gestation was 95.9% in 1995 and 96.2% in 2007.

Figure 7 shows further that, in 1995, 37.5% of ART births weighing less than 500g occurred within 22 weeks of gestation, and this increased by 100% to 75.0% in 2007. For non ART births of less than 500g, 46.2% occurred within 22 weeks of gestation in 1995, increasing to 63.2% in 2007, an increase of 34.8%. For gestation of 25 weeks or more, the proportion of ART and non ART births weighing 500g or less was very small and tapered off as gestation increases in length.

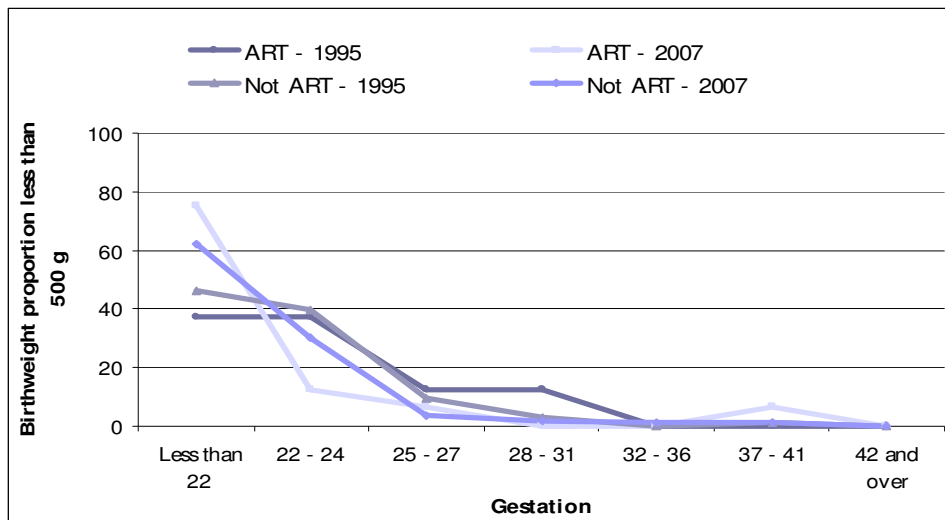


Figure vii: Total births under 500 grams by gestation and Assisted Reproduction Status, Queensland, 1995-2007, Source: Queensland Health Perinatal Statistics Databases

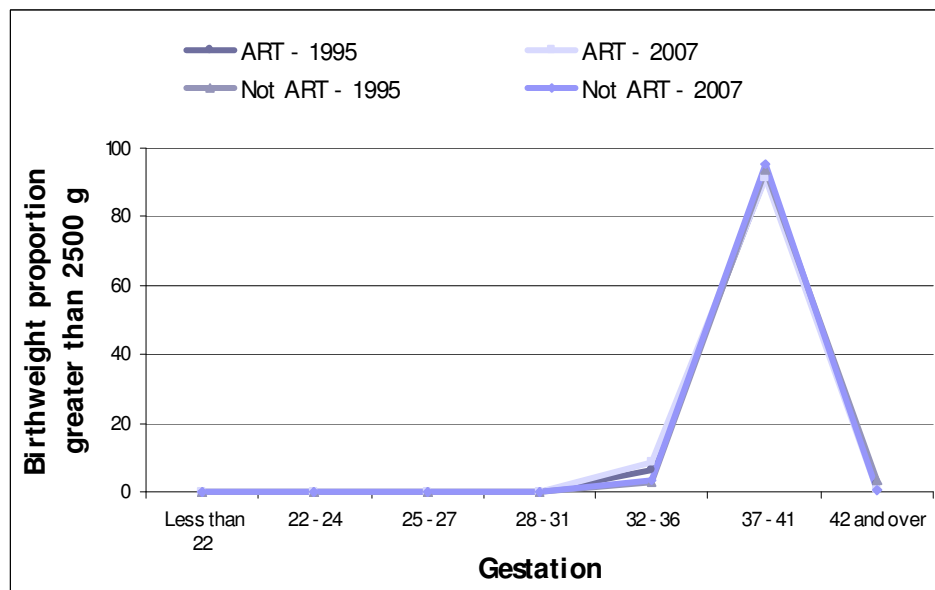


Figure viii Total births greater than 2500 grams by gestation and Assisted Reproduction Status, Queensland, 1995-2007, Source Queensland Health Perinatal Statistics Databases

Figure 8 shows that the proportion of live births weighing 2500g and over peaked in the 37 to 41 weeks gestation for both ART and non ART. In 1995, 91.6% of ART live births and 93.5% of non ART live births of 2500g or higher weight resulted after 37 to 41 weeks gestation. The 1995 ART proportion declined to 91.2% in 2007, compared with an increase of 2.1 percentage points for non ART.

The study found further that most ART live births of between 500g and 2500g were concentrated in the 32 to 41 weeks gestation group. In 1995, 60.7% of assisted reproduction technology live births of between 500g and 2500g were found in the 32 to 41 weeks gestation, compared with 49.7% for non ART. The proportions increased to 65.9% and 52.4% for the two methods respectively in 2007.

The rapid increase in the number of Queensland mothers availing themselves of ART is attributable to the widespread availability of the facility across the State, as well as the Commonwealth Government's introduction of Medicare rebate (National Collaborating Centre for Women's and Children's Health, 2004; Courier Mail, 2010; AIHW, 2009). The rebate made ART more affordable resulting in more women who could not conceive naturally using the procedures. With the exception of remote areas, access to ART services in Queensland has been enhanced with facilities in urban and semi-urban areas across the State. Courier Mail (2010) reported further that not only were the services available, but also women were very much aware of ART.

## DISCUSSION

ART is now endemic in Australian reproductive health care and many Queensland females, who otherwise would not be in a position to conceive, are availing themselves of the technology unabated. The 24.1% increase in the proportion of ART mothers between 1995 and 2007 was partly due to the increasing availability of services across the State and the increasing awareness of the technology. It is also due to the inclusion of the procedures in Australia's national Medical Benefits Scheme (Medicare), funded and administered by the Commonwealth/Federal Government of Australia (AIHW, 2009; Courier Mail, 2010). The decision to include the procedures in Medicare made ART affordable to many in the female population of Queensland and resulted in an increasing number of ART mothers in the last decade (National Collaborating Centre for Women's and Children's Health, 2004).

As noted in the public health research literature, the cost of ART is high (Collins, 2002). The Commonwealth Government has signaled its decision to remove or drastically reduce the Medicare subsidy for ART. This decision has the potential to derail the increasing use of the technology witnessed during the last decade or so. Many interested women would not be able to afford the high cost of the procedures on their own (National Collaborating Centre for Women's and Children's Health, 2004), and would need the financial support of the Commonwealth Government to achieve their dreams of conception through ART. The need for the Commonwealth Government to reconsider its decision can therefore not be overemphasised.

The point is that, for most of the women using ART, there is no other option and if the procedures are not subsidised, they may be very disadvantaged as they may not be able to have babies (Carr et al., 2005). A number of ART methods are available and include Gamete Intrafallopian Transfer (GIFT), Intracytoplasmic Sperm Injection (ICSI) and Artificial Insemination using husband's sperm (AIH) and Artificial Insemination using donor sperm (AID). The most popular methods remain Ovulation induction (OI) and *in-Vitro* Fertilisation (IVF). It is usual practice for women undergoing ART treatment to be provided with more than one procedure, hence the need for caution.

There is evidence in the research literature to suggest a rise in the number of women aged 45 years and over accessing ART (AIHW, 2009), albeit the success rate is very low (Ron-El et al., 2000; Sullivan et al., 2008). In Queensland, during the period 1995 to 2007, there appeared to be a shift in the age profiles of ART mothers. The study showed an increasing proportion of ART mothers in the older age groups. This point is corroborated by the finding that the median age of ART mothers was higher than that of non assisted reproduction technology mothers throughout the period 1995 to 2007.

The point must further be made that the difference in median age actually widened from 2 years in 1995 to 5 years in 2007. A related issue is the high failure rate of older ART mothers as previously stated. More research is needed to establish the causes of the high failure rate among women aged 45 years and over who use ART procedures in Queensland. Information from such a research activity may allow for effective policies, legislation and strategies to be developed to address the high failure rate.

The skewed concentration of ART mothers in Queensland's Metro Health Service Districts is expected and understandable, as the services are located mainly in urban areas. However, the point must be made that a number of ART mothers resided in non urban areas during the study period and that the number could rise if more non urban resident women become aware of the availability of the ART services and how to access them. A key strategy to improve access to ART services as well as other health services is for services to be located in semi urban and regional centres. Services located in those areas could attract interested women resident in the adjoining hinterland (Yeboah, 2005).

One area where there appeared to be a convergence of the two approaches to conceiving during 1995 to 2007 was outcomes. For both methods of conception, the largest outcomes were live births, but that is where the similarity ends. ART resulted in higher numbers of twin and other multiple births (3 or more) than not ART. Even so the study found that the proportion of other multiple births from ART declined by 82.4% between 1995 and 2007 and this may be attributed to the legislative changes which prohibited insemination of multiple fertilised eggs in one attempt or episode.

Another interesting issue relates to gestation and birth weights. For both modes of conception, there appears to be a statistically positive linear relationship between gestation and birth weight, the longer the gestation, the higher the birth weight. For ART births, the correlation was 0.6118, sig at 0.01 while the corresponding figure for non ART births was 0.7110, sig at 0.01. The relationship between birth weight and gestation was collaborated by Chi Square of 0.114, sig at 0.1 for ART and Chi Square of 0.102, sig at 0.1 for non ART.

## CONCLUSION

It is clear that ART is now widely available in Queensland and that the number and proportion of ART mothers increased during the 1995 to 2007 period. The study concludes that the introduction of Medicare subsidy for ART



was partly responsible for the large increase in the number and proportion of ART mothers in Queensland. The introduction of Medicare subsidy has witnessed a sharp increase in the number of ART mothers as a proportion of all mothers.

The Federal Government has served notice of its intention to remove or substantially reduce this Medicare subsidy, and this would have implications for the provision, access to and affordability of ART services in Queensland. The steady increase in the proportion of ART mothers witnessed in the last decade or so could be abated as a result of the withdrawal of or reduction in the Medicare subsidy for ART.

The standpoint taken in this article is that many women who cannot conceive naturally would have to rely on ART to achieve their dreams of motherhood, but may not be able to afford it. The study urges the Australian Commonwealth Government to reconsider its decision, and to tighten the regulations and legislation to reduce the number of successful repeat users of the technology. Taking this approach has the potential to release funds which can then be targeted at first time needy users of the procedures. In addition, the savings thus achieved, could reduce the overall Commonwealth Government funding outlay while ensuring that needy Queensland women are not unduly disadvantaged when they access the procedures.

## ACKNOWLEDGEMENT

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