

It is clearly apparent now within the Australian context that since the 1970's women have been gradually escalating the age when they commence childbearing, for varying social and economic reasons. However, an increasing number of women appear to be unaware that fertility decreases with increasing maternal age, and that infertility can occur as a result of increased age. Women may have unrealistic expectations that reproductive technology will be able to guarantee them a baby if they delay their childbearing. These women then delay their childbearing and some of these women are unable to achieve a pregnancy without medical intervention. Women accessing reproductive technology for assistance in achieving a pregnancy will not be guaranteed of a pregnancy, even with the use of the most sophisticated technology. Unfortunately, for some of these women they will remain childless as they are unable to achieve a pregnancy, or maintain a pregnancy due to age related complications. It is my hypothesis that women's implicit expectations regarding the potential of reproductive technology are part of, and influence, their childbearing decisions.

Increasing maternal age correlates with a decline in fertility and live birth rates (Jansen, 2003; Tietze, 1957). In Australia in 1979 almost one in four births was to women aged 30 years and over and by 1999 this had increased to almost one in every two births (Australian Bureau of Statistics, 2003a). Within the context of assisted reproductive services, women who present at such services may learn for the first time that fertility declines from the age of 34 years, peaks at 39 and is unlikely aged 44 or older (Jansen, 2003). From the age of 35 years, women may become perimenopausal, which is a period of gradual decline in fertility until menopause occurs. This perimenopausal period is associated with decreased fertility, diminished ovarian reserve, and an increase in chromosomal abnormalities in any fertilised embryos. The actual menopause occurs approximately 10 years after fertility ends, and the age of 41 years is widely considered to be the age at which fertility stops and sterility starts (Tarlantzis & Zepridis, 2003). This is supported by numerous research studies (Klein & Sauer, 2001; Lim & Tsakok, 1997).

Women aged over 35, who access reproductive technology, may have age-related infertility although many may be unaware that their fertility starts declining around the age of 35. Some women are under the misapprehension that as long as

menstruation occurs, there is no decline in their fertility and conception is possible (Kimberley-Smith 2003). Unfortunately this is not the case. Women accessing reproductive technology for age-related problems may in fact have been able to conceive unassisted had they done so before they reached the age of 35. Lack of awareness of these issues, coupled with expectations of the power of reproductive technologies, may be strong factors in delayed childbearing and then experiencing age-related infertility, and ultimately, involuntary childlessness. There appears to be limited knowledge for women, including young women, regarding the issue of the potentially profound implications of delaying childbirth and the limitations of assisted reproductive technologies in these instances.

It appears to be increasingly acceptable in the current Australian context that women may delay their childbearing for a range of social, economic and educational reasons. Factors which influence decisions to delay childbearing include improved education levels of women, decreasing attachment to religion, later age of marriage, career aspirations and increasing numbers of women in the workforce (Barber, 2001; Weston & Qu, 2001). Women are more likely to enter into de-facto relationships or short-term relationships prior to entering into long term relationships later (Australian Parliament 1998, 1998).

There is now substantive evidence that, as a result of these factors, an increasing number of women are delaying their childbearing until they are aged 35 years or over. A growing number of women in Western cultures are delaying their childbearing and having their first babies at the age of 40 or older. Australian data indicates that women are having their first child later in life. In 1993 6.8% of women aged 35 and older had their first child compared to an increase to 9.9% of women in 1999 (Australian Bureau of Statistics, 2003a). Demographic data from the USA indicated that in 1975 the rate of first births for women aged over 30 rose from 5% to 22% twenty years later in 1995. The National Centre for Health Statistics had shown that the birth rate for women aged 40-45 had risen 74% from 1981 to 1995, which supported the suggestion that women are having their first child later in life (Ventura, Martin, Curtin, & Matthews, 1995).

Although there are strong social and economic reasons to support such decisions, from a biological and reproductive perspective however, such delays are potentially very problematic as infertility and related problems significantly increase after this age. Many women however may not be aware of this. In addition, there appears to be a widespread expectation within society generally as well as by women themselves, that if unable to achieve a pregnancy on their own, medical and assisted reproductive technologies will be able to come to the rescue and help them achieve pregnancy. In Australia in 1979, almost one in four births was to women aged 30 years and over and by 1999 this had increased to almost one in every two births (Australian Bureau of Statistics, 2003a). Thus in Australia, the number of women having children after the age of 35 has increased as well as the number of women over 35 years who achieved pregnancies with the use of reproductive technology. An increase in pregnancies achieved with reproductive technology from 29% in 1990 to 41.1% in 1997, and in this time the number of assisted conceptions in Australia doubled (Australian Bureau of Statistics, 2003a). Figures from America indicate that 2.7 million women sought assistance for infertility and this represents a 2-fold increase since 1987 (Klein & Sauer, 2001).

Infertility in medical terms is the inability of a couple to achieve a pregnancy after a year of unprotected intercourse during the woman's ovulation period. It is estimated that 90% of couples under such circumstances will achieve a pregnancy in the first year, which leaves approximately 10% of couples with an infertility problem (WHO, 1992). Other research suggests that infertility affects 15% of the population of childbearing age, and that 20% of infertility is due to male factor problems (Glover, Gannon, Sherr, & Abel, 1996). For men and women there are many causes of infertility. The focus of this research is upon age related female infertility.-

Women are born with their complete ovarian reserve of oocytes (eggs) whereas males constantly produce gametes (sperm) throughout their life. From the age of puberty until menopause, there is a gradual decrease in the ovarian reserve. In general, except for women who have premature ovarian failure, the primary reason that a woman's fertility decreases after 35 years is due to diminished ovarian reserve. So, women who delay their childbearing until after 35 years have a decreased chance of conception.

Furthermore, older mothers have an increased risk of a foetus with a chromosome abnormality, an ectopic pregnancy, a miscarriage or a stillbirth (Freeman-Wang & Beski, 2002)

Fertility rates are also declining with 26% of Australian women remaining childless at the end of their reproductive lives (Australian Bureau of Statistics, 2000). It may not be that the rates of infertility are increasing but the rates of involuntary childlessness are increasing with older women unable to conceive. A 35 year old woman seeking advice about her inability to conceive may not have had problems if she had attempted a pregnancy when she was younger. Furthermore the incidence of age-related conditions that affect infertility such as uterine polyps, fibroids and oocyte abnormalities are more likely to affect conception in the older woman (Dawson, 1994).

This problem is significant as perimenopausal women who have delayed their childbearing may not understand age related infertility. These women may also may not be informed about the limitations of reproductive technology. These women may also be unaware of an increase in health complications for older mothers. The main problems with delayed childbearing are infertility, preterm births , placenta previa, and an increase in the number of deliveries by LCSC. Delivery complications such as instrument vaginal deliveries and caesarean sections occur in greater numbers in older compared to younger women (Dulitzki et al., 1998).

The problem also has implications for health policy and health funding. Prior to 1991, all reproductive technology treatment costs were born by the consumer. Up to 1999 the Federal Government placed a six cycle lifetime limit on funding to cover stimulated cycles. After lobbying by interested bodies the six cycle limit was lifted so that women now have access to an indefinite number of cycles in their lifetime. Currently therefore, all Australian citizens receive a Government rebate for each stimulated cycle (you will need to have a brief bit that explains IVF, cycles etc) which covers all aspects of a basic treatment cycle including hormones and counselling. More sophisticated technology such as ICSI (microinjection of sperm into an oocyte)

or PGD (pre-implantation genetic diagnosis), are an additional cost for the patient and are not covered by the Government rebate (Johnson, 1999). Thus, if women have unlimited access to Federal funding for reproductive technology, and they are accessing reproductive technology for age-related technology, such expenditure has the potential to place a significant but arguably unnecessary, burden on public health funds that are already stretched and limited (Hancock, 1999).

My interest in the increased use of medical technology involves women trying to achieve a pregnancy, who are aged 35 or older, and may have delayed their childbearing. Although some women aged over 35 are able to achieve a pregnancy “naturally”, many women need to assess reproductive technology as the only way to bypass their barriers to conception. There are varied causes of infertility in women, however for the purposes of this research the focus will be on women aged over 35 who have reduced fertility due to their age.

Infertility

Sex is no longer the only means of conceiving a baby. Since the first successes of artificial insemination, technology has been able to assist women to conceive children that they would otherwise be unable to have. Reproductive technology is used in the specialist area of reproductive medicine to assist women to achieve a pregnancy. These women who access this technology are generally unable to achieve a pregnancy without the use of assisted reproductive technology. The discipline of science and medicine associated with assisted reproduction has progressed rapidly and diversified since the birth of the first child, Louise Brown, who was born in 1978. Louise was the first child to have been conceived using the assisted reproduction technology of *in-vitro fertilization* (IVF), and marked the beginning of an era of hope for couples who were unable to conceive.

Louise's mother had a blockage in her fallopian tubes which prevented the passage of an egg to the uterus. Louise's parents had unsuccessfully tried to achieve a pregnancy for many years. The conception of Louise could not have been achieved without the development of the technology of assisted reproductive medicine. She was conceived with the expertise of gynaecologist Patrick Steptoe and the

embryologist Robert Edwards. Edwards and Steptoe pioneered this technique which has been established as an effective treatment to alleviate female infertility (Edwards, Steptoe, & Purdy, 1980; Steptoe & Edwards, 1978). Since the birth of Louise Brown, the number of conceptions from reproductive technology (RT) is escalating worldwide. In spite of controversy in the early years, it has become less controversial and is now accepted by many individuals and clinicians as a conventional treatment. To illustrate this, in 1999 nearly 1% of British and 0.2% of American babies are conceived with the use of IVF techniques (Roger Gosden, 1999). There are estimated to be thousands of children conceived by Assisted Reproductive Technology (ART) to date. ART is now considered an alternative for conception rather than a last resort to achieve a pregnancy.

Conception in older women

The profile of women trying to achieve a pregnancy who is considered to have delayed childbearing is aged 35 or older. The age-specific fertility rate in Australia in 1999 for women aged 35-39 is 47.0 per 1000 women and 8.5 per 1000 for women aged 40-44 (Ford, Nassar, Sullivan, Chambers, & Lancaster, 2003). Women often refer to their "biological clock running out" when relating to childbearing after 35. This refers to the concept that they believe that their time when they are not able to conceive a pregnancy may be rapidly approaching. Although a woman feels she is in the prime of her life, she may be entering the end of her reproductive period when fertility and fecundity are decreasing.

As the onset of menopause approaches for women the decline in fecundity increases and during the period of perimenopause fertility steadily declines. Menopause occurs when the number of oocytes falls below a certain threshold and is manifested by the absence of menstruation (Kline, Kinney, Levin, & Warburton, 2000). The actual menopause occurs 10 years after fertility ends, and the age of 41 is considered to be the age when fertility stops and sterility starts (Klein & Sauer, 2001; Tarlatzis & Zepridis, 2003).

Women are born with their lifetime supply of eggs, and the number of these steadily declines with increasing age. Women have 2 ovaries which contain fluid filled follicles which enlarge at ovulation to release a mature egg (oocyte). Oocytes are

encased in follicles which mature through the cycle. Only one egg per month is released from either ovary, if both are functioning normally. Advanced maternal age relates to a reduction in ovarian follicles and reduced capacity for gametogenesis and endocrine function. This theory was initially posed in 1921 (Pearl & Schoppe, 1921) cited in (Johnson, Canning, Kaneko, Oru, & Tilly, 2004) when they posed the biological doctrine that *“during the lifetime of an individual there neither is nor can be any increase in the number of primary oocytes beyond those originally laid down when the ovary was formed”*

Medical complications associated with conception in older women

The rate of miscarriage in older women is significantly higher than in younger women. Women added over 35 are more likely to lose a pregnancy due to a chromosomal aneuploidy abnormality than a younger woman. Although, not all miscarriages are detected, as some miscarriages may be interpreted as late menstrual periods. A study of detected miscarriage loss in Denmark found that about 13.5% of recognised pregnancies ended with fetal loss. The age related loss was higher in women aged 42, where half the pregnancies ended in loss. Whereas, women aged 20-24 had a loss rate of 8.9% and women aged 45 or more had a loss of 74.7% of the pregnancies (Anderson, 2000). Corroborating studies indicate that women aged over 40 are three times more likely to miscarry a pregnancy than a woman aged 25 or younger. So, as a result of a higher miscarriage rate, women aged over 35 were less likely than a woman aged less than 35 to achieve a live birth 72% compared to 60%.25% see table?)(Lancaster et al., 1985). In conclusion, fetal loss is higher in women aged over 30, regardless of their reproductive history (Fretts, Schmittiel, Mclean, Usher, & Goldman, 1995).

Other birth complications associated with older mothers have public health concerns. Health care providers should be aware that there is an impact on the use of health care resources by women aged 35 or older who delay their childbearing. The findings of various international and Australian studies of birth weights and preterm delivery indicated that women who delayed their childbearing had infants with higher levels of these problems. there was an increase in low birth weight babies by 11% and preterm delivery by 14% in this group. These figures indicate a significant increase in the LBW group and 78% of this was due to women who had delayed their childbearing.

Delayed childbearing accounted for 15% of the twin increase and 69% of the triplet increase. So taking into account that some of these births were to women accessing ART, the percentage of multiple births dropped but there was 100% of the low birth weight infants born to women aged over 35. These figures suggest population health issues.(Tough et al., 2002).

Women delaying childbearing

Australia, as in other Western countries, has a declining birth rate. In 1999 it was the lowest recorded rate at 13.1 births per 1,000 head of population. The steady decline from 1971 when 21.7 births per 1,000 were registered, places our population below the replacement rate (Ford et al., 2003). A growing number of women in Western cultures are delaying their childbearing and having their first babies at the age of 40 or older(Damario, Davis, & Rosenwaks, 1999; R Gosden & Rutherford, 1995). The National Centre for Health Statistics had shown that the birth rate for women aged 40-45 had risen 74% in the years from 1981 to 1995, which supports the suggestion that women are having their first child later in life (Ventura et al., 1995). Other figures to support this rising trend indicate that between 1970 and 1990 the proportion of first births has increased >100% among women aged 30 to 39 years, and 50% among women aged 40 to 44 years of age(Tough et al., 2002). With fertility rates declining, current estimates of childlessness estimate that 25% of Australian women of childbearing age will remain childless (Australian Bureau of Statistics, 2003b).

Reasons for delaying childbearing

Women in the early 20th century lived in a different society from women today. Women were generally less educated and few were in the workplace after marriage, there was more close kin in small towns, so women tended to marry at a younger age and have children early in the marriage , obviously due to the lack of efficient contraception. However, in the second half of the 20th century, women became better educated and had opportunities to participate in the workplace. People often moved to larger towns and did not have the support of extended families to care for children. Women had later marriages , less stable marriages and consequently later childbearing. The timing for a first birth is a significant event and may involve planning for a pregnancy and be influenced by varying social factors.

Parental socioeconomic status, education level, religion are background factors which influence the timing of the first birth. Adolescent factors such as whether the mother had a two parent family and educational attainment and social factors such as educational attainment and career aspirations influence first time motherhood(Rindfuss & St.John, 1983). Some of the social reasons for delaying childbearing have been suggested by various authors(Barber, 2000, 2001; Damario et al., 1999; Rindfuss & St.John, 1983). Financial security, wanting to have economic security such as housing stability is also suggested as a reason. In addition, the desire to have achieved educational and career goals and stability before they started a family.

Expectations of reproductive technology

In the scope of my research , my hypothesis suggests that one of the influences for women delaying their childbearing is that they have unrealistic expectations of reproductive technology. I propose that the higher the level of technology, the higher the aspirations about its potential and ability. Reproductive technology and the ability to manipulate conception is the ultimate medical technology.

There appears to be a perception that that older women can achieve a pregnancy through medical technology. This perception appears to be supported in the media where older women who may be perceived as role models have children later in life. However, no information is given through the media whether these older women have conceived without the use of technology, or even if they have conceived with their own oocytes, or with those from a younger woman. Looking at reproductive technology from a cultural aspect, (Becker, 2000) sees technology as a cultural tool, where these technologies may take power over people's lives but only because society gives them that power. The consumer consumption of reproductive technology is seen as a response to the cultural priority of parenthood, so consumers are partially responsible to the expansion and promotion of RT.

Decision making to have a child

Decision making and the expectations of a birth outcome may shape an individual's decision to utilize reproductive technology Miller (W. Miller, 1994) as cited in (K.

Miller, 2004) discusses reproductive decision making. He suggests that initially there is a desire for a result, even though this result may not be to have a child. These desires can be counterfactual in that an infertile women may desire to have a child. These desires are converted to intentions to achieve an outcome. Intentions then lead to action towards the intended outcome, which may be to intend to have a child , to have fertility treatment, to have a pregnancy termination or to use contraception. Finally, using instrumental behaviours such as births, averted births or averted conceptions the reproductive outcome is achieved. This suggests that the desire to have a baby focuses the intention to achieve that outcome.

Miller(K. Miller, 2004) uses this proposal and implies that the overwhelming media attention to ART, and the impression that ART has control over infertility, may have changed women's reproductive intentions . Other factors which change decision making are the geographical accessibility of the service, the effectiveness, and the affordability. As reproductive technology has developed ,access has become easier with all states in Australia having at least one reproductive technology clinic. In Australia, access to reproductive technology is mainly through private infertility clinics. No public access is available to Queensland consumers, and little is available in other states. Despite the improvement in success rates , many couples require multiple cycles to achieve a pregnancy. The costs can consequently be a major component of decision making.

Can the future of reproduction become more dependent on technology and less dependence on natural conception? The banking of ovarian tissue from young women in order to utilize when older, is an example of the ability of reproductive technology . Ovarian banking is the ultimate triumph over aging ovarian reserves , and allows the women the ability to choose childbearing when she desires, rather than planning her desires around her plans for a family. Although, this may be seen as the ultimate feminist ideal, women have placed themselves back in the control of others to monitor and control motherhood. Women delaying childbearing and utilising reproductive technology to do so, are assessing public health funding and taking resources from other areas of health expenditure.

Bibliography

- Anderson, A. N. (2000). Maternal age and fetal loss : population based register linkage study. *British Medical Journal*, 320(June,24).
- Australian Bureau of Statistics. (2000). *Annual report 1999-2000*. (No. Cat. No. 1001.0). Canberra: ABS.
- Australian Bureau of Statistics. (2003a). *Australian Social Trends 2001* (No. 4102.0). Canberra.
- Australian Bureau of Statistics. (2003b). *Australian Social Trends 2002* (No. 4102.0). Canberra.
- Australian Parliament 1998. (1998). *To have and to hold, a report of the inquiry into aspects of family services*. House of Representatives Standing Committee on Legal and Constitutional Affairs. (Parliamentary Paper 95). Canberra.
- Barber, J. (2000). Intergenerational influences on the entry into parenthood : mothers' preferences for family and nonfamily behavior. *Social Forces*, 79(1), 319-348.
- Barber, J. (2001). Ideational influences on the transition to parenthood: attitudes toward childbearing and competing alternatives. *Social Psychology Quarterly*, 2, 101-127.
- Becker, G. (2000). *The elusive embryo ; how men and women approach new reproductive technologies*. Berkley, California: University of California Press.
- Damario, M. A., Davis, O. K., & Rosenwaks, Z. (1999). The role of maternal age in the assisted reproductive technologies. *Reproductive Medicine Review*, 7(1), 41-60.
- Edwards, R. G., Steptoe, P. C., & Purdy, J. M. (1980). Establishing full-term pregnancies using cleaving embryos frown in vitro. *British Journal of Obstetrics and Gynaecology*, 87, 737-756.
- Ford, J., Nassar, N., Sullivan, E. A., Chambers, G., & Lancaster, P. (2003). *Reproductive health indicators Australia 2002* (No. Cat No PER 20): Australian Institute of Health and Welfare.
- Fretts, R., Schmittiel, J., Mclean, F., Usher, R., & Goldman, M. (1995). Increased maternal age and the risk of fetal death. *The New England Journal of Medicine*, 333(15), 953-957.
- Gosden, R. (1999). *Designer Babies*. London: Phoenix.

- Gosden, R., & Rutherford, A. (1995). Delayed childbearing. *British Medical Journal*, *311*, 1585-1586.
- Jansen, R. (2003). The effect of female age on the likelihood of a live birth from one in-vitro fertilisation treatment. *Medical Journal of Australia*, *178*(6), 258-261.
- Johnson, J., Canning, J., Kaneko, T., Oru, J., & Tilly, J. (2004). Germline stem cells and follicular renewal in the postnatal mammalian ovary. *Nature*, *428*(11 March), 145-150.
- Kimberley-Smith, J. (2003). *Young people delaying having children have false expectations of future pregnancy*. Paper presented at the Fertility Society of Australia, Perth.
- Klein, J., & Sauer, M. V. (2001). Assessing fertility in women of advanced reproductive age. *American Journal of Obstetrics and Gynecology*, *185*(3), 758-770.
- Kline, J., Kinney, A., Levin, B., & Warburton, D. (2000). Trisomic pregnancy and earlier age at menopause. *American Journal of Human Genetics*, *67*, 395-404.
- Lancaster, P., Johnston, W. I. H., Jones, W. R., Wood, C., Yovich, J. L., & Saunders, D. (1985). *In-vitro fertilization pregnancies in Australia and New Zealand, 1979-1985*. Sydney: National Perinatal Statistics Unit, University of Sydney.
- Miller, K. (2004). Assisted reproduction may change birth intentions. *Fertility and Sterility*, *81*(3), 572-581.
- Miller, W. (1994). Reproductive decisions : how we make them and how they make us. *Advances in Population*, *2*, 1-27.
- Pearl, R., & Schoppe, W. F. (1921). Studies on the physiology of reproduction in the domestic fowl. *Journal of Experimental Zoology*, *34*, 101-118.
- Rijinders, P. M., Vereld, M., Piederiet, M. H., Bras, M., Lens, J. W., & Zeilmaker, G. H. (1996). *Laboratory aspects of in-vitro fertilization*: N.V.Organon.
- Stephens, P. C., & Edwards, R. G. (1978). Birth after the reimplantation of a human embryo. *Lancet*, *11*, 366.
- Tarlatzis, B. C., & Zepridis, L. (2003). Perimenopausal conception. *Annals of the New York Academy of Sciences*, *997*, 93-104.
- Tietze, C. (1957). Reproductive span and age of reproduction amongst Hutterite women. *Fertility and Sterility*, *8*, 89-97.

- Tough, S. C., Newburn-Cook, C., Johnston, D. W., Svenson, L. W., Rose, S., & Belik, J. (2002). Delayed childbearing and its impact on population rate changes in lower birth weight, multiple birth, and preterm delivery. *Pediatrics*, *109*(3), 399-403.
- Ventura, S. J., Martin, J. A., Curtin, S. C., & Matthews, T. J. (1995). *Report of Final Natality Statistics*.: National Centre for Health Statistics.
- Weston, R., & Qu, L. (2001). Men's and women's reasons for not having children. *Family Matters*, *58*(Autumn), 10-15.