

Caesarean Birth Trends in South Australia: 1985-2007

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ABSTRACT

The aim of this study was to find the reasons for the increase of caesarean birth in South Australia between 1985 and 2007, during which the caesarean rate increased from 18 per cent to 33 per cent. In South Australia between 1985 and 2007, 108 941 women gave birth by caesarean section, of which 48 056 women delivered a baby by elective caesarean and 60 885 women gave birth by emergency caesarean.

The study database consisted of de-identified birth details of 434 682 women and their babies from the mandatory collection of public and private hospital mothers who gave birth in South Australia between 1985 and 2007. Between 1991 and 2007, 37 376 private patients gave birth by caesarean section (18 227 elective and 18 494 emergency) and 47 916 public patients gave birth by caesarean section (19 149 elective and 45 571 emergency caesarean births). The public patient caesarean birth rate increased from 19 per cent in 1991 to 28 per cent in 2007 and the private patient caesarean birth rate increased from 26 per cent in 1991 to 42 per cent in 2007.

This thesis investigates caesarean birth data under three main areas: place of birth (for example, regional or metropolitan hospitals; public or private hospitals); demographic characteristics of mothers who gave birth (for example, age of mother and occupation of father); and, the relationship between caesarean birth and socio-economic disadvantage (using the Index of Relative Social Disadvantage scores measured from Australian Census data) in the Adelaide Statistical Division.

The caesarean rate has increased in both metropolitan and regional hospitals, with a higher caesarean rate in private compared with public hospitals. A first birth by caesarean was more likely to be an emergency followed by further births which were elective caesareans. The median age of women giving birth by caesarean in private hospitals between 1991 and 2007 has increased from 30 to 33 years of age, and, in public hospitals the median age has increased from 27 to 29 years of age. The father's occupation as tradespersons was associated with the highest rate of caesarean delivery. Women of most socio-economic advantage had a higher rate of caesarean delivery, a lower rate of gestational diabetes and their babies a lower rate of fetal distress, than more disadvantaged women.

Previous reasons given for the increase of caesarean birth rates included the increasing age of mothers, changes in private health insurance policy, malpractice claim fears of medical staff, a shortage of eligible midwives, and, the funding case-mix system for hospitals.

A recent Commonwealth Government Maternity Services Review recommends the training of more eligible midwives to give mothers a greater choice of birth models of care. The Australian Medical Association has asked for the collection of comparable birth data to assess this change in birthing policy direction.

DECLARATION

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in any university or any other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition I certify that no part of this work will, in the future, be used in a submission for any other degree or diploma in any university or other tertiary institution without prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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Judith Coxell

Date

Judith very sadly passed away on May 5 2013. She had been informed about the examination outcome and was in the process of completing some minor corrections to the thesis. These have now been completed and the thesis has been submitted on her behalf so that the award can be made posthumously.

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Thank You All

ACRONYMS

ABC Australian Broadcasting Commission

ABS Australian Bureau of Statistics

AIHW Australian Institute of Health and Welfare

AMA Australian Medical Association

ASD Adelaide Statistical Division

ACHI Australian Classification of Health Interventions (Tabular list of diseases)

DDI Decision to Deliver Interval

FGM Female genital Mutilation

ICD-10-AM International Statistical Classification of Diseases and Related Health

Problems, 10th Revision, Australian Modification (Tabular list of diseases):

ICD-10-AM 16520-02 LSCS (lower section elective caesarean)

ICD-10-AM 16520-03 LSCS (lower section emergency caesarean)

ISAAC Integrated South Australian Activity Collection

NATSEM National Centre for Social and Economic Modelling

NCCH National Centre for Classification in Health

NHHRC National Health and Hospitals Reform Commission

NZMA New Zealand Medical Association

NHMRC National Health and Medical Research Council

NPDC National Perinatal Data Collection

OECD Organisation for Economic Cooperation and Development

POU Pregnancy Outcome Statistical Unit

RANZCOG Royal Australian and New Zealand College of Obstetricians and
Gynaecologists

SLA Statistical Local Area

TFR Total Fertility Rate

VBAC Vaginal Birth After Caesarean

WHO World Health Organisation

CHAPTER ONE

INTRODUCTION

1.1 Background

Operative caesarean birth has increased dramatically during the last several decades in both developed and many developing countries (OECD 2009; POU 2009; ISAAC 2007; AIHW 2007 to 2010; Amnesty International 2010). The often quoted World Health Organisation Fortaleza Declaration extract of 1985 clearly states that:

'There is no justification for any region to have a caesarean section rate higher than 10-15 per cent' (World Health Organisation, in the Lancet 1985: 437)

Of the fifty participants present at the Fortaleza Declaration there were representatives for midwifery, obstetrics, paediatrics, epidemiology, sociology, psychology, economics, health administration and mothers. A careful review of the knowledge of birth technology led to a unanimous adoption of a series of birth recommendations. These recommendations include the right of every woman to prenatal care and that she play a central role in all aspects in the planning and evaluation of her maternity care. Understanding of social, emotional and psychological factors are needed to provide proper perinatal care. Birth should be seen as a natural and normal process and where there are complications intervention is required to obtain proper results. A transformation of the structure of health services and a modification of staff attitudes is required to carry out the following Fortaleza Declaration recommendations:

- Health ministries should establish health policies for the use of appropriate birth technology for the public and private health sectors.
- Technology assessment should involve all medical personnel using technology: health authorities, epidemiologists, social scientists, and women on whom the technology is used.
- Information on birth practices including the rates of caesarean section in all hospitals should be made available to the public.
- Universities, scientific societies and research groups should participate in the assessment of birth technology and should be able to influence the excessive use of caesarean section by publicising negative effects on mother and infant and the results of maternity technology assessment should be widely disseminated (WHO in the Lancet 1985:437)

The Fortaleza Declaration in The Lancet is no more than one page long and does not include references to support the birth recommendations. There is no list of those present and who they represented. No dates for the development of further policy directives for the birthing industry were given. However, the issues presented in the recommendations for the use of appropriate technology for birth in the Fortaleza Declaration has spawned a plethora of journal articles, discussion and policy challenges around the world including the first major Commonwealth of Australia's Department of Health and Ageing, investigation into maternity services, the Maternity Services Review Report (2009) in which the role of the appropriate use of technology for birth is being debated.

The research question for this study is: *'To identify the reasons which best explain the pattern of caesarean birth in South Australia.'*

It examines some of the recommendations of the Fortaleza Declaration in the context of caesarean and other methods of delivery rates for 434 682 women who gave birth in South Australia between 1985 and 2007. Both elective and emergency lower section caesarean section trends in South Australia between 1985 and 2007 are analysed in this study, as defined under the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM). An elective lower section caesarean section (LSCS)(horizontal incision) may be defined as, a caesarean section carried out as a planned procedure before the onset of labour. That is the decision was made before the onset of labour' (ICD-10-AM 16520-02). In contrast, an emergency horizontal lower section caesarean section is defined as a caesarean required because of an emergency situation (obstructed labour, fetal distress) and not have been considered necessary previously (includes after failed trial of scar from a previous caesarean section birth) (ICD-10-AM 16520-03). A caesarean section includes any head-suture to baby or uterine lacerations or tears during the surgical incision and the manual removal of the placenta (Australian Classification of Health Interventions (ACHI) 2008:200). Vaginal birth after caesarean (VBAC) can be an alternative procedure for a subsequent caesarean after a previous caesarean.

Caesarean birth rates in South Australia (POU 2007:67) have increased from 16.9 per cent in 1981 to 32.2 per cent in 2007, almost doubling in 26 years or a generation of birthing women. This study analyses pregnancy, birth and puerperium (first 42 days after birth) data provided by the custodians of the South Australian Integrated Activity Collection (ISAAC 2001-2008) and the Pregnancy Outcome Statistical Unit between 1985 and 2007, both of which are located within the South Australian Department of Health.

1.2 Aims, Objectives and Research questions

The overall aim of this thesis is to broaden and deepen the understanding of the reasons for the escalating incidence of elective and emergency caesarean section delivery of babies in the Adelaide Metropolitan Area in South Australia between 1985 and 2007. More specifically it has the following objectives to:

1. Examine the reasons for the increasing rate of caesarean section births in South Australia.
2. Examine any variation in the rates of caesarean delivery between different areas and hospitals over time in South Australia.
3. Investigate the associations between the mother's demographic characteristics, such as maternal age, status of public or private patient, ethnicity of mother, occupation of the child's father, hospital birth morbidity and mortality rates and parity of mother, in association with the caesarean birth rate.
4. Map and interpret socio-economic trends of all women who gave birth by caesarean delivery across the Adelaide Statistical Division.

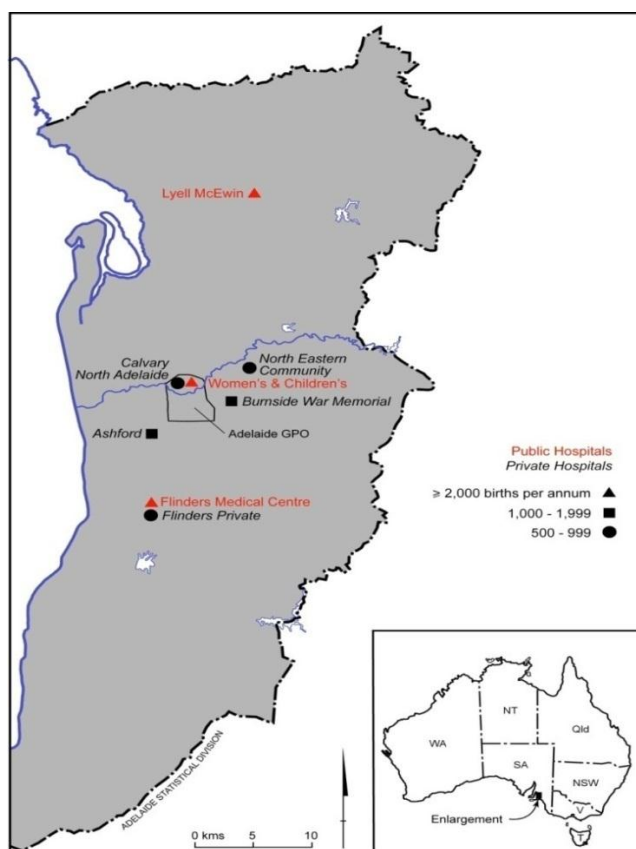
The specific research questions to be addressed are as follows:

1. Is there an increasing number of women delivering their babies by caesarean section in both public and private hospital systems and are there differences in the rate between public and private institutions?
2. Is caesarean section increasing for first births? If so, what are the reasons? What are the implications for further methods of delivery for these women?
3. Does the current case-mix hospital funding system impact on a woman's method of birth?

1.3 The study area

The South Australian total population of 1.57 million people made up 7.3 per cent of the Australian population in 2006. The Adelaide Statistical Division (ASD) (Figure 1.1)) is situated in South Australia on a coastal plain adjacent the Mt Lofty Ranges to the east and the Gulf of St Vincent to the west. In 2006 it was a city of 1.14 million people (ABS 2006a) making up 73 per cent of the total South Australian population. The ASD has a range of maternity hospital services predominantly located towards the centre of the ASD. The largest increases in population have been to the north in Playford (C) and to the south in the Onkaparinga (C) area. Regional South Australia has a population of 423 900 distributed mainly in coastal towns. Rural and remote communities make up a minimal number of the South Australian population.

Figure 1.1: Location of public and private maternity hospitals with obstetric beds in the Adelaide Statistical Division 2006



Source: Adapted from POU 2007:5

Public maternity hospitals include the category 111 teaching hospitals of the Women's and Children's Hospital are located near the city centre, with the Flinders Medical Centre to the south and the Lyell McEwin Hospital to the north of the CBD.

Private maternity hospitals are mainly centric-located also and in the north-east include Calvary North Adelaide, the North Eastern Community Hospital and the Burnside War Memorial Hospital, with Ashford to the south west of the city centre and Flinders Private to the south. Private hospitals are located within a short range of large public teaching hospitals with 24 hour emergency services.

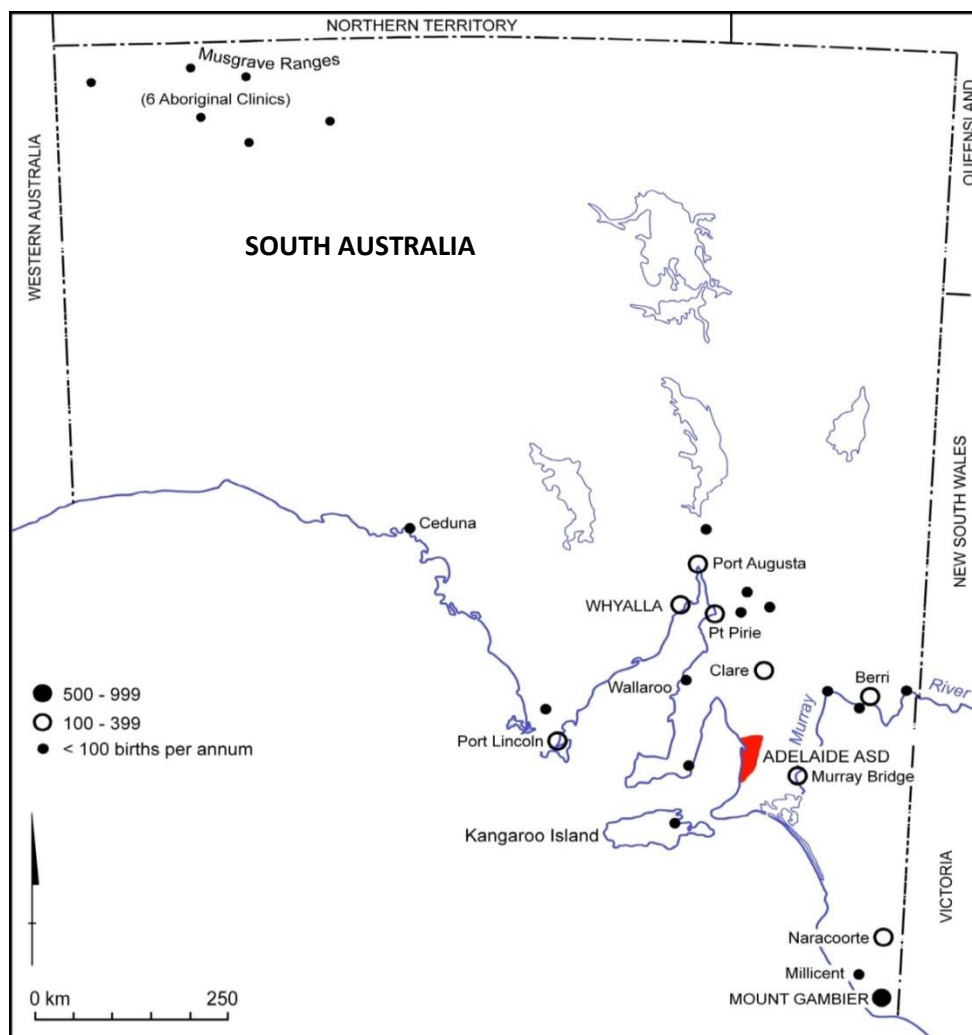
The maternity hospitals which accept over 2 000 births per annum are the three teaching hospitals: the Women's and Children's, Flinders Medical Centre and the Lyell McEwin. The largest private birthing hospital is Ashford delivering between 1000-1999 babies per annum. The smaller private birthing hospitals include Calvary North at Adelaide, the North Eastern Community and the Flinders Private which deliver between 500-999 babies per year (POU 2007:6).

Metropolitan teaching hospitals delivered 53.2 per cent of all babies born in South Australia during 2009. The Women's and Children's Hospital delivered 25.8 per cent of all babies born, followed by the Flinders Medical Centre (13.2 per cent), the Lyell McEwin Hospital (13.9 per cent) and the Modbury Hospital (0.3 per cent). Metropolitan private hospitals delivered a further 26.5 per cent and included Ashford (7.8 per cent), Burnside War Memorial Hospital (6.6 per cent), Calvary (4.5 per cent), Flinders Private (3.8 per cent) and North Eastern Community (3.8 per cent). Metropolitan teaching and metropolitan private hospitals delivered a total of 79.7 per cent of all births in South Australia for 2007 (POU 2007:6).

Figure 1.2 shows the location of most of the regional population of South Australia which was 423 900 in 2006 (ABS 2007) making up 27 per cent of the state's population. A total of 20.3 per cent of babies were born in country South Australian hospitals indicated in Figure 1.2. Of the larger country hospitals in South Australia, Mt Gambier delivered 2.8 per cent, Gawler and Mount Barker both 1.9 per cent, Port Lincoln, Whyalla and Port Augusta all 1.5 per cent. Other smaller country hospitals delivered 9.2 per cent of the 2009 babies (POU 2007:6). The larger country hospitals are Mount Gambier and country Whyalla. Other

smaller country hospitals with maternity beds include Ceduna and Port Lincoln to the west of South Australia on Eyre Peninsula; central South Australia birthing hospitals including Port Augusta, Port Pirie, Wallaroo, Clare, Kangaroo Island and others; and to the east include Berri, Murray Bridge, Naracoorte, Millicent and others. To the far remote northwest there are six Aboriginal health clinics. SA has implemented a culturally competent maternity care program for metropolitan publicly funded maternity services. Aboriginal Health Workers have undertaken specific maternity care education to support the care of aboriginal women during their perinatal experience (National Maternity Services Plan 2010-11).

Figure 1.2: South Australian regional hospitals with obstetric beds in June 2006 and location of the Adelaide Statistical Division

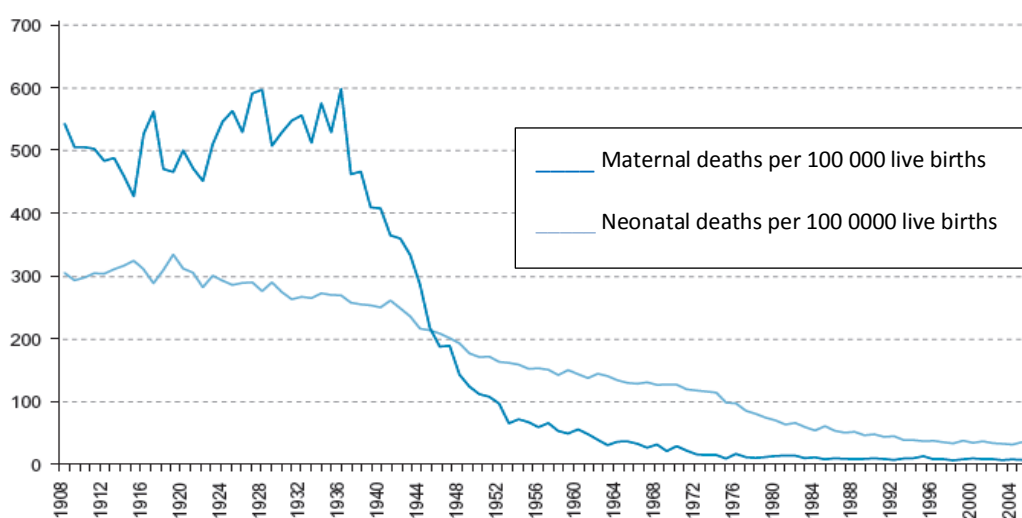


Source: Adapted from POU 2007: 4

1.4 Maternal and neonatal deaths in Australia

Figure 1.3 shows the decrease of maternal deaths in Australia from a peak of 600 per 100 000 live births in 1936 to 40 maternal deaths per 100 000 live births in 2004. Neonatal deaths have decreased from a maximum of 320 per 100 000 live births in 1920 to less than 10 babies per 100 000 in 2004.

Figure 1.3: Maternal deaths per 100 000 live births and neonatal deaths per live births: Australia 1908 to 2004



Source: ABS 3302.0 various issues from 1908 Maternity Services Review 2008:3

Maternal and neonatal mortality has decreased dramatically in Australia post Second World War to 2004. However, for Australian Aboriginal and Torres Strait Islander women, maternal morbidity and mortality rates are so high that they have attracted the attention of the WHO Millennium Goal Number 5 for the reduction of indigenous maternal mortality by 2015 (WHO 2012; Kildea et al 2010) as maternal, neonatal and stillbirth rates are higher than the rest of the Australian population. Very remote, remote and rural women in Australia experience higher rates of maternal and neonatal death than do urban women (National Consensus Framework for Rural Maternity Services 2007).

With Australia's increase in caesarean delivery, maternal mortality is decreasing as compared with the increasing maternal morbidity in the United States, the Netherlands and the United Kingdom (Maternity Services Review Report 2009:9), resulting in Australia being

recognised as one of the safest countries in the world to give birth. If Australian maternal and neonatal morbidity and mortality have been reduced so successfully, one could be forgiven for asking why the current interest in the caesarean section birth rate in Australia?

1.5 Australian comparison with OECD caesarean delivery rates

Part of the answer is that Australia currently has higher levels of medical intervention in hospitals during birth deliveries than many OECD countries. In 2007, Australia's rate of caesarean delivery was 30.3 per cent in 2005 compared with an OECD average of 25.7 per cent (OECD 2009). Private hospital maternity patients in Australia are more likely to give birth by caesarean section than other methods of delivery. The Australian caesarean section delivery rate in both public (28.1 per cent) and private hospitals (41.3 per cent) in 2008 is above the recommended 10-15 per cent rate from the World Health Organisation of 1985 (AIHW 2008:53).

The average percentage increase of live caesarean births in OECD countries between 1990 and 2007 was 11 per cent. Reasons for the increase of caesarean deliveries included reductions in the risk of caesarean delivery, malpractice liability concerns, scheduling convenience for both physicians and patients, and changes in the physician-patient relationship. However, caesarean delivery has continued to result in increased morbidity and mortality, and increased complications for subsequent deliveries (Minkoff and Chervenak 2003; Bewley and Cockburn 2002; Villar et al 2006; Machado 2012).

Increasing financial costs of caesarean delivery appears to be the key outcome that is causing governments to question if the costs of caesarean section delivery may be exceeding the benefits (Society of Obstetricians and Gynaecologists of Canada et al 2008). There is a continuing debate about the benefits of caesarean delivery versus normal vaginal delivery for normal uncomplicated pregnancies and deliveries. Professional associations in Canada now voice the promotion of normal childbirth without caesarean section as caesarean delivery is placing excess strain on the healthcare system.

Figure 1.4 shows the variation of caesarean delivery across the OECD countries in 2007, ranging from the low rates of the Netherlands (14 per cent) to Mexico at 40 per cent (OECD

2009). All member countries have experienced a significant increase of caesarean delivery rates by 2007. The OECD caesarean data represents rates of operative delivery which need to be explained. Have OECD women developed such a significant percentage increase of risk factors in one generation which require caesareans? Or, do the OECD caesarean delivery data also represent a change in public policy which supports the high rates of caesarean delivery. It must be pointed out that the OECD caesarean delivery data applies to live births only and therefore does not include stillbirths or babies that die during the puerperium (forty two days after delivery) which is necessary to compare the outcomes of different methods of birth.

Figure 1.4: OECD Caesarean sections per 100 live births 1990, 1997 and 2007

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Source: Adapted from [Health at a Glance 2009: OECD Indicators - OECD © 2009 - ISBN 9789264061538](#)

1.6 Caesarean birth data bases used in study

This study on caesarean delivery rates in South Australia uses two de-identified databases provided by two South Australia Health custodians. Firstly, the Pregnancy Outcome Unit (POU) perinatal data which is collected on all mothers who have given birth in South Australia between 1985 and 2007. These data are collected by hospital and home birth midwives and hospital neonatal nurses on the Supplementary Birth Record (SBR). Perinatal data are provided under South Australian legislation for all births occurring in South Australia, including those women who normally reside interstate, mainly in New South Wales near the South Australian border and in the Northern Territory. Births of South

Australian residents which occur in other states are not included. The POU perinatal data are collated at the national level in the Mothers and Babies Reports for the Australian Institute of Health and Welfare (AIHW). South Australian perinatal data has been collected since 1981 (POU 2007:67).

The second database used in this study is called the Integrated South Australian Activity Collection (ISAAC) and includes mandatory public and private hospital data on pregnancy, birth and the puerperium between 2001 and 2008. ISAAC data are collated nationally by the National Centre for Classification in Health (NCCH) which is used by the Australian Institute of Health and Welfare (AIHW) and the World Health Organisation (WHO) in the collection of global health data. The Australian Modification of the International Classification of Diseases (ICD-10-AM) codes commenced for Australian hospitals and health services in 1998 under the control of the NCCH. The NCCH is responsible for producing and updating ICD-10-AM in Australia under contract from the Australian Department of Health and Ageing which is the holder of the WHO licence to create an Australian version of ICD-10 (Roberts et al 1998: 1-2; 4-5).

This study considers there is a need for the inclusion of maternal and paternal Body Mass Index (BMI) data at conception in the POU and ISAAC bases. Such data would assist an investigation into the relationship between maternal age, parental co-morbidities, baby birth weight and morphology of baby at birth. The mother's obesity level and her baby size are increasingly given as clinical reasons for caesarean sections (Parks and Ziel 1978; Kominiarek et al 2010; O' Dwyer et al 2011).

1.7 Chapter outline

Chapter Two summarises the literature on the reasons for the increasing trend of caesarean delivery rates. Currently, many of the birthing practice protocols which have been accepted for a generation are being revisited both in Australia and internationally in an attempt to reduce the amount of technical medical intervention used in the birthing process.

Chapter Three discusses the methodology and data analysed in this study. The databases used consist of data of mandatory hospital collections of mothers and babies who give birth in South Australia, to establish any caesarean birth trends. Namely, the Pregnancy Outcome

Unit (POU) of all births between 1985 and 2007 and the Integrated South Australia Activity Collection (ISAAC) birth data between 2001 and 2008.

Chapter Four uses the POU cohort of 434 682 mothers and babies within the 1985-2007 to establish trends of elective and emergency caesarean delivery rates across metropolitan and country South Australia. Variables analysed include: Intended place of birth; public and private patient rates in public and private hospitals; models of birth care, maternal and fetal mortality variations and length of hospital stay days.

Chapter Five investigates the relationship of the mother's maternal age, public or private patient status, race and ethnicity, occupation of father and parity of mother of elective and emergency caesarean section births. A suggestion is put forward that there could be an annual public release of all individual named public and private hospital annual caesarean birth rates which would also satisfy WHO obligations.

Chapter Six concentrates on finding any variation in the rate of elective and emergency caesareans in the Statistical Local Areas (SLAs) of the Adelaide Statistical Division according to their levels of socio-economic disadvantage. Any spatial variation of elective and emergency caesarean, public and private health cover, gestational diabetes and fetal distress rates of the most advantaged and the least disadvantaged SLAs in 2006 are examined.

Chapter Seven concludes by giving an overview of the findings for caesarean birth trends in South Australia between 1985 and 2007. Various recommendations are given referring to the results of this study.

CHAPTER TWO

LITERATURE REVIEW: CAESAREAN BIRTH IN AUSTRALIA

Australia has an ad hoc health system of short term born out of political compromise and designed to placate vested interests. Some services area covered by tax funded insurance through Medicare, but at the same time there are large incentives for mainly those on high incomes, to opt out of sharing and into private health insurance. Politicians talk of 'universalism' and a 'commitment to Medicare' while encouraging the development of a two - tier hospital system. Coalition governments speak vaguely about the importance of markets, but there are few areas where there is market competition. Labour politicians sing the praises of bulk billing while supporting high co-payments for pharmaceuticals and maintaining the Medicare safety net, which mainly advantages the wealthy (Menadue 2008:170-171).

2.1 Introduction

The objective here is to summarise the literature on the reasons for the increasing trend of caesarean delivery in Australia. The literature has been classified into three sections: Firstly, the clinical reasons for elective and emergency caesarean sections; Secondly, a description of the fear of litigation and layers of bureaucracy under which obstetricians work which leads to an increase in caesarean sections; Thirdly, a discussion on the impact of the hospitals case-mix funding system on caesarean delivery rates and the professional concern between obstetricians and midwives on the methods of birth care available to Australian women.

2.2 Clinical risk factors for caesarean birth

The POU study database gives clear clinical reasons for emergency and elective caesarean delivery in South Australia as shown in Figures 2.1 and 2.2. Robson et al (2009) introduces the variables of advancing maternal age and maternal obesity augmenting the caesarean rate. Shorten and Shorten (2007) point out the differences in medical intervention between the public and private health system in Australia. They claim that medical intervention also augments the caesarean rate due to the cascade effect of a series of medical interventions culminating in a caesarean birth. In particular, the review of the administration of the

induction of labour drug 'oxytocin' is discussed in the cascade of medical interventions which can result in surgical birth. Clinical policy around a vaginal birth after caesarean shows why many women prefer to have a subsequent caesarean after a first caesarean. Recent studies by Kealy et al (2010) show that women are unable to carry out recuperative guidelines at home after a surgical birth. They suggest that if women were more informed of the clinical outcomes of surgical birth and had the choice of an uncomplicated vaginal birth instead; their model of birth choice may change to a normal spontaneous delivery model of care. Finally, the clinical risk factor of an increasing number of female immigrants arriving in Australia who have various categories of female genital mutilation (FGM) which also impacts on an increased rate of caesarean delivery.

2.2.1 Clinical reasons given for emergency and elective caesarean birth

Clinical reasons for caesarean section can be found in Figures 2.1 and 2.2 on the following page. Two clinical reasons can be given for a caesarean delivery. The main reason for caesarean section results from a previous caesarean delivery.

Figure 2.1 indicates that failure to progress (for example, a slow labour), and fetal distress (for example, an abnormal fetal heart beat) are the two major reasons given for an emergency caesarean.

The main clinical reasons for an elective caesarean delivery (Figure 2.2) were a previous caesarean section delivery, malpresentation (baby may want to birth bottom, leg or face first) and cephalo pelvic disproportion (CPD) (baby cannot fit through mother's pelvis). The lack of fetal distress which was so apparent with emergency caesarean birth is negligible for elective caesarean deliveries.

Other reasons given for a caesarean delivery include: pregnancy hypertension (high blood pressure of mother due to pregnancy) or inter-uterine growth restriction (IUGR) where the unborn baby is small for gestational age and will have a low birth weight of less than 2 500 grams.

Figure 2.1 Clinical reasons for *emergency* caesarean section South Australia

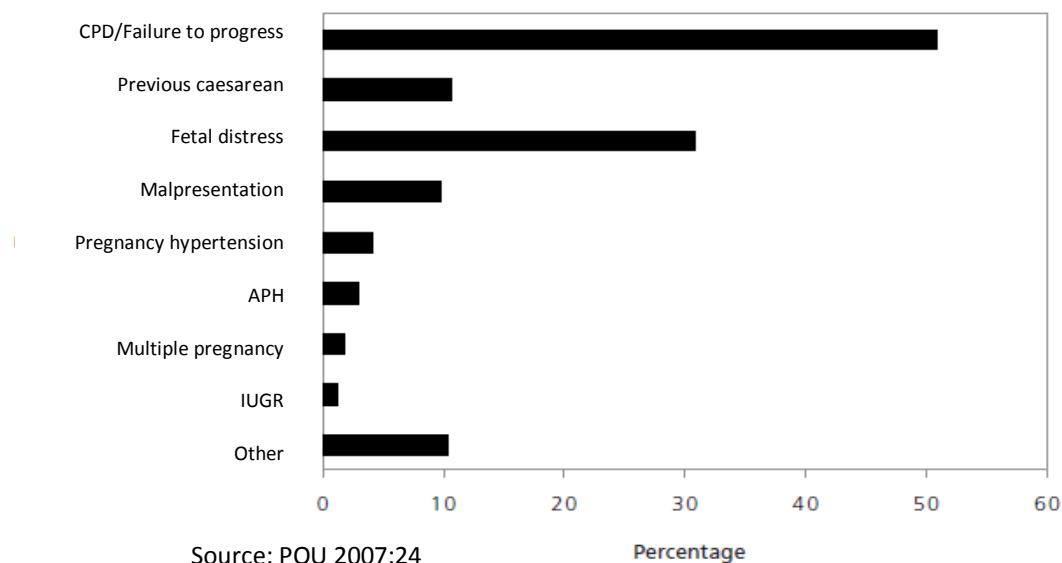
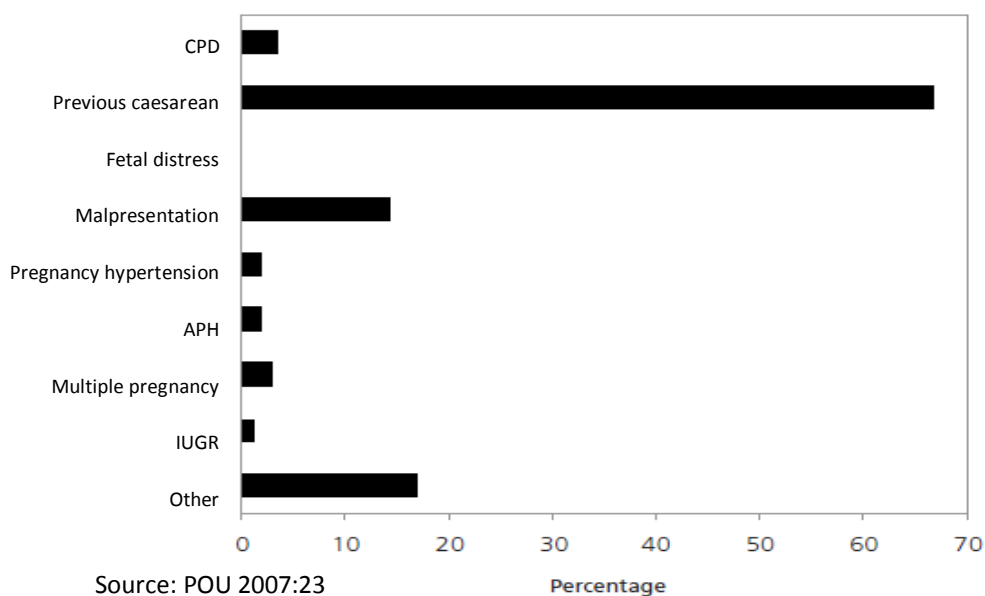


Figure 2.2: Clinical reasons for *elective* caesarean section South Australia



Robson (2009) from the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) wrote that people should not be surprised at the 30 percent Australian caesarean birth rate. He puts the rate of caesarean delivery down to advancing maternal age.

Obesity is being described as an epidemic and is a well-known independent risk factor for caesarean birth (Yakin et al 2009; Wax 2009). The age at first birth continues to rise across

the developed world and there is new evidence that increasing age appears to affect the function of the uterus in labour (Smith et al 2008). Therefore obstetricians are abandoning complex vaginal births and resorting to caesarean delivery in these circumstances (Baird 2009:12).

The Australian Federal Government introduced a series of private health insurance incentives which included a 30 per cent rebate on premiums in 1999, and Lifetime Health Cover (LHC) from July 2000. The aim was to reverse the long-term downward trend in private health insurance cover covered in a Report to the Minister for Health and Ageing under the Private Health Insurance Act 2007 (Private Health Insurance Administration Council 2010).

Throughout Australia between 1994 and 2004 maternity patient care episodes shifted from the public to the private sector hospitals to 'take the pressure off of the public hospital system'. As births in the private maternity system increased, there was a corresponding decrease in the public hospital system. The increase of private births resulted in large increases of more expensive birthing interventions of induction of labour, epidurals and caesarean section delivery which would not have occurred in the public hospital system for these women. The private health system has been very successful in its marketing of their birth intervention policies. Is it time for the public hospitals to market their services as less interventionist to win back their market share? If private maternity hospitals lose part of their current market share, will they lobby government for even higher subsidies to support their birthing sector? (Shorten and Shorten 2007).

Shorten and Shorten (2007) compared the levels of medical intervention between a group of regional NSW public and private patients in a retrospective cohort study of 20 826 live singleton births with a gestation equal to or above 37 weeks from 1997 to 2003. This study found that there is no clinical evidence to support the argument that because women in private hospitals are older, that they have a higher risk profile than women who birth in public hospitals. Privately insured women are generally found to have lower levels of diagnosed maternal and obstetric risk factors (Duckett 2004), presumably due to their positive correlations between education, income and private health insurance status (Phelps 2003).

The cascade effect can be described as a 'flow-on' effect from one intervention to another (Shorten and Shorten 2007:43-55). Privately insured women had higher rates of all interventions: induction of labour (IOL), epidural pain relief and operative mode of birth and were much less likely to experience normal vaginal birth. Only 34.5 per cent of women in this study who had both an induced labour and an epidural in the private hospital went on to experience a normal vaginal birth. The cascade effect of medical intervention was also observed in the public hospital system where once an epidural was combined with induced labour, the normal vaginal birth rate fell to 41.2 per cent. Of the women who did not experience either an epidural or induction of labour, 91.0 per cent of the women delivered their baby by normal vaginal birth. Epidural pain relief adds both cost and risk to a birth procedure as it increases the likelihood of both emergency caesarean and instrumental birth. In this study's public hospitals, women who had an epidural for pain relief went on to have a 61.4 per cent operative birth rate, compared with women who did not have an epidural of 11.9 per cent in the NSW case study (Shorten and Shorten 2007). Tracy and Tracy (2003) claim that there should be a major overhaul relating to the use of epidurals and labour induction in both the public and private health sector.

In an analysis of medical indemnity claims against obstetricians and midwives in Sweden between 1996 and 2003, one of the most common reasons for disciplinary action at 68.5 per cent, was the injudicious use of oxytocins (Johnson 2007). Berglund (2010:1) argues that:

It is possible to improve patient safety during labour by applying educational efforts on fetal surveillance and increasing awareness of risk factors associated with asphyxia*. The main causes of substandard care during labour are related to misinterpretation of cardiotography (CTG)**; not acting timely on abnormal CTG, misinterpretation of guidelines and misuse of oxytocin .. poor outcomes ...can substantially be prevented by avoiding substandard care.
(*extreme decrease of oxygen **electronic fetal heart monitoring with uterine contractions)

Oxytocin is a naturally occurring hormone that stimulates the uterus to contract. Synthetic oxytocin is administered to women to augment their labour process and has been associated with adverse birth outcomes. Too much synthetic oxytocin can cause the mother's labour contractions to be so strong causing the resupply of oxygen and removal of carbon dioxide to the unborn child not to occur as argued by Barnett (2010:3)

The dosage of oxytocin needs to be titrated to just the right amount ... not too much and not too little. Birthing units should have clear guidelines and regular training in the use of synthetic oxytocins. Pressures are mounting for hospitals delivering perinatal care all over the world re the use of oxytocins. Clinicians need to be aware of the risks ... of the harmful use of oxytocins ... and the risk for malpractice in obstetrics ... and have protocols developed to mitigate.

Victoria is now piloting across urban and rural Victoria the Practical Obstetric Multi-Professional Training which consists of lifelike simulation events allowing various clinicians to react and interact together while developing greater emergency management skills in obstetrics, as a result of a 2009 review of clinical skills (Victorian Managed Insurance Authority (VIMA) (2010:3).

2.2.2 The vaginal birth after caesarean delivery (VBAC) dilemma: an attempt to arrest increasing caesarean delivery rates?

The actual and correct rate of VBAC is unknown and rates vary between hospitals and different health jurisdictions (The Australian Council on Healthcare Standards 2008: User's manual version 6). VBAC should only be conducted in a medical facility capable of emergency care which includes access to emergency caesarean section, continuous intra-partum (before birth) monitoring and advanced neonatal resuscitation, onsite blood transfusion, and staff experienced in advanced analgesic techniques. The main risks of repeat caesarean section are maternal operative and anaesthetic complications and future pregnancy complications. The major risks of VBAC are uterine rupture requiring blood transfusion and endometriosis (painful abdominal disease) (Women's Hospital Australasia Clinical Guidelines 2005).

2.2.3 The cultural clash of female genital mutilation (FGM)

Female genital mutilation/cutting (FGMC) is defined as an injury of the external female genitalia undertaken for cultural or non-therapeutic reasons. The term FGMC is now in use by UNICEF and some other international agencies (WHO 2008). FGMC comprises all procedures that involve partial or total removal of the external female genitalia, or other deliberate injury to the female genital organs for non-medical reasons. This includes so-called "nicking" of the external genitalia (<http://www.who.int/mediacentre/factsheets>).

FGM causes significant health risks for women and girls including acute and chronic infection, infertility, childbirth difficulties, sexual relationship difficulties and psychological trauma. FGM is involved in higher rates of caesarean section and increased fetal deaths (Chibber et al 2001:833-6; Merritt 2008:237-48).

Increasing numbers of women are migrating to Australia from countries where FGM is practised and being seen by Australian health professionals. The ABS predicts this number

will increase from an estimated 200 000 women in 2012, to 300 000 women, mainly due to the higher fertility rates of Muslim women who tend to have 3-4 children while other Australian women have 1-2 children (Neighbour 2011).

Former Commonwealth sex discrimination commissioner Pru Goward (2010 ABC News) stated:

This country has had FGM outlawed for 15 years for the very obvious reason that this is a gross invasion of women's rights and a terrible way to treat women. The first thing that should happen is that the Federal Government, which is after all responsible for our immigration program, launches a huge public education campaign particularly in those communities and particularly when it is processing people for migration to Australia. It needs to be made clear that female circumcision is an unacceptable and unlawful practice in Australia that will result in a jail sentence. And, if you don't start education, if you don't start prosecuting - because we all know anecdotally that these children are turning up in hospitals with ruptured bladders and urethras - that FGM will continue.

FGM was legislated against in South Australia in 1935 (Criminal Law Consolidation Act 1935 (SA) s.33A) and takes precedence over common law. Any medical practitioner administering FGM in Australia commits an offence even if the child or adult consents. In 2010, the Royal Women's and Children's Hospital in Melbourne reported seeing 700 women who had suffered FGM. Full FGM called infibulation only leaves a pencil like opening of the vulva to allow urine and menstrual blood to pass through. Infibulated women are 30 per cent more at risk for caesarean delivery and 70 per cent more likely to haemorrhage after childbirth compared with women without FGM (Allan 2012).

2.2.4 Do women receive adequate information about post-operative caesarean section challenges?

La Trobe University is the quality control component of the National Centre for Classification in Health Australia. Currently there are no post caesarean or other birth method morbidity codes associated or linked with the ICD-10-AM data collections of pregnancy, birth and the puerperium after about 6 weeks post birth (ISAAC 2007). There is a need to link post birth medical data collected by health professionals for at least 12-18 months of mother for all methods of delivery.

Kealy et al (2010) in a study at La Trobe University investigated the neglected area of the health of mothers after caesarean section. Minor health problems after childbirth are

frequently under-reported to health professionals (Bick and MacArthur 1995). Common postnatal problems after childbirth are not always discussed by primary health care workers with new mothers (Gunn et al 1998). Besides minor health problems after birth, prolonged maternity recovery and restricted mobility after caesarean section have been reported (Glazener et al 1995). There is no solid evidence base that women who have delivered a child by caesarean section can carry out the post-operative clinical instructions to avoid heavy lifting, not drive a vehicle and abstinence from sexual intercourse for between 4 to 6 weeks after delivery so that the new mothers can rest and recuperate (Kealy et al 2010). England (2005) worked with women who had a first caesarean which was undertaken for life-saving reasons; another group of women who described clinical uncertainty as to why they had a caesarean delivery and a third group who actively sought a caesarean section birth (maternal request) in the absence of clinical conditions. Irrespective for the reason for their caesarean, almost all of the women described at least one complication or health problem related to surgical birth.

England (2005) also found women had diverse problems associated with their abdominal wounds, whether or not the caesarean was planned or unplanned. Issues included slight inflammation, wound breaking requiring readmission to hospital, disfiguring scarring after wound infection, unsatisfactory medical explanations as to why their wound created the altered sensations of numbness, itchiness and heightened sensitivity, further surgical intervention to treat the cause of vaginal bleeding and urinary incontinence. Finally, (England 2005; Phoenix and Woollett 1991) found women could not rest and recuperate as they were the only person available to look after the family. When questioned by health professionals, the women denied their physical activity for 'fear of censure' by feeling guilty about requiring further medical attention, and for feeling unable to take care of their new baby.

2.3 Legal and bureaucratic challenges for obstetricians

This section focuses on: Obstetrician fear of litigation as a reason for increase surgical delivery; the South Australian guidelines for obstetricians in practice; obstetrician response to maternal request for caesarean; the reduction of training hours for obstetricians; the

burden of high medical indemnity insurance for obstetricians as reasons for the increased rate of caesarean delivery.

2.3.1 Threatened or actual litigation encourages caesarean section

There is a current lack of data about how Australian obstetricians are coping with their current working conditions. Results of a survey by obstetricians and gynaecologists who were members of the Australian Fellows of the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) conducted by MacLennan and Spencer (2002) were: that the number practising obstetrics would fall over the next 10 years for both public and private practice and across all age groups. The reasons given for ceasing public and private practice were to specialise in gynaecology, fear of litigation, indemnity insurance cost, practice cost, disruption to family and long and late hours. Nearly one third of the obstetricians had received documents from a court formally initiating an obstetric claim. After receipt of documents formally commencing a court action against them, respondents had experienced depression, had considered suicide, and stated that it interfered with their work. Seventy per cent of those currently practising obstetrics, indicated that the present state of litigation encourages higher rates of caesarean section. Only about 35 trainees per year elevated to Fellowship of RANZCOG intended to practise obstetrics leaving a shortfall of obstetric practitioners over the next ten years. The private sector may lose obstetric practitioners more quickly than parts of the public sector in which the employer pays for indemnity insurance. The metropolitan sector must expect to have to service the rural sector with outlying clinics, and there will be an increased transfer of pregnant women to city hospitals. More obstetricians, midwives and anaesthetists will be found from abroad. Obstetric services will inevitably be reduced in the near future. Part of the obstetric crisis solution is the encouraging of team obstetrics and midwifery practice to redress the declining numbers of obstetric practitioners (MacLennan and Spencer 2002:428).

Designing health care systems specifically to compensate for the propensity for error on the part of physicians has, at least until recently, run counter to a powerful medical culture that led physicians: To expect to function without 'errors' and to 'view error as a failure of character' (Leape 1994:1-7). This reluctance to admit error, coupled with advice from insurers that nothing should be said to injured patients, for fear that it be taken as an

admission of liability, led to a conspiracy of silence that inhibited the development of systemic safety approaches and has had a corrosive effect on trust in the medical profession (Runciman et al 2003:975)

The Australian Council for Safety and Quality Health Care has initiated national standards to improve patient safety. Unfortunately, Ipp et al (2002), claim that the reforms are piecemeal 'Band-Aid' solutions. If the fundamental systems remain blame-biased or changes are limited to tort law reform which apportions blame, the result will cause the medical system to be on a collision course with the medical malpractice system (Studdert and Brennan 2001:217-23): Wrongly blaming health care professionals is very damaging. Measures to pre-empt or minimize blame include 'properly informing patients about the risks and benefits of what is being proposed and involving them in the decision to proceed'. If a problem does occur, full early disclosure of all relevant details, an apology, and help with immediate support and getting compensation will mitigate against blame, anger, loss of trust, and litigation.

The tort litigation system of blame applied to medicine in Australia has driven:

... iatrogenic harm (a physician's words or therapy causing a complication resulting from treatment) underground and alienates those practitioners who are best placed to prevent future similar problems from reoccurring' (Runciman 2003:976)

The Australian tort system has apportioned blame, thus inhibiting system-wide improvements, while compensating less than one per cent of the patients harmed in the health care system. Some iatrogenic harm is inevitable and should be regarded as part of the health care system resulting in compensation to the patient. Mediation and transparency would be fairer to both patients and the health care system and there is a need to move away from the tort system in Australia (Runciman 2003:978) to the proposed no-fault compensation, use of mediation, structured settlement, capped awards and open disclosure as in Sweden and Denmark. Squires (2012) suggests a 'Health Court' in Australia to cover 'no fault' compensation cases.

Decreed as necessary in many legal judgments, the decision to deliver interval (DDI) has given rise to the four-grade RANZCOG (2009) endorsed classification system for various types of caesarean section from '*Urgent threat to the life of a woman and fetus*' to '*At a*

time acceptable to both the woman and the caesarean section team, understanding that this can be affected by a number of factors'. The RANZCOG recommends one theatre per 4 000 deliveries to be available at all times and staffed to deal with obstetric emergencies, in line with international standards. Hospitals providing maternity care need to be able to access an emergency theatre. Large teaching hospitals need to dedicate at least one obstetric theatre which is not usually used by non-obstetric cases, to be designated to emergency obstetric cases. Remote location patients should be informed of the limitations of services available for intrapartum (before birth) and postpartum (after birth) care and remote location limited birthing facilities must have access to medical transport for transfer to another hospital if required.

Considering that the caesarean guidelines are updated every three years, this leaves room for a lot of changes to occur both within the maternity community and new knowledge on medical caesarean birth issues, resulting in considerable pressure and responsibility on practising obstetricians and other birthing staff. In other words, it seems that a woman's birth outcome is dependent on the individual experience of the obstetrician she chooses.

2.3.2 South Australian guidelines for obstetric practice

Medical practice for staff comes under a multitude of guidelines prepared by SA Health regarding multidisciplinary obstetric practice in South Australia. The South Australian Perinatal Practice Guidelines (2004-Updated January 2011) have been prepared to standardise birth practice. SA Health does not accept liability to any person for loss or damage incurred as a result of reliance upon the material contained in birth guidelines:

Although clinical material is offered in the SA Health guidelines it does not replace or remove clinical judgment or the professional care and duty necessary for each specific patient case. When care deviates from that indicated in a guideline contemporaneous documentation with explanation should be provided (South Australian Perinatal Guidelines 2004:1-3).

SA Health states the following exclusions from their guideline website: SA health does not accept responsibility for the quality or accuracy of material on websites; SA Health does not accept liability to any person for loss or damage incurred as a result of reliance on the material in the prenatal guideline; and, Guidelines do not address all the elements of guideline practice and assumes that the individual clinicians are responsible to:

1. Discuss care with consumers in an environment that is culturally appropriate and which enables respectful confidential discussion. This includes the use of interpreter services where necessary.
2. Advise consumers of their choice and ensure informed consent is obtained.
3. Provide care within scope of practice, meet all legislative requirements and maintain standards of professional conduct.
4. Document all care in accordance with mandatory and local requirements (South Australian Perinatal Guidelines 2004:1-3).

2.3.3 Does the reduction in training hours for obstetricians lead to an increase in caesarean delivery rates?

Sinha et al (2010) believe that the rate of second stage caesarean section (emergency) are increasing due to a reduction in training hours, lack of senior supervision and fear of litigation of junior obstetricians which has made it difficult for them to achieve a high level of forceps and ventouse proficiency. More additional training (Sinha et al 2010) in the use of forceps should involve training using a simulator under the guidance of a senior obstetrician in the combined use of forceps and the suction cap. Epidurals which administer anaesthetic through a tube in the lower back of the mother and numb the nerves so the mother no longer feels labour contractions have been recognised as responsible for increasing rates of caesarean section delivery.

2.3.4 Maternal request for caesarean section delivery survey by the Royal Australia and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) 2006

The restricted sample of Australian obstetricians who answered the survey was assumed to be representative of all the 1 239 fellows of the RANZCOG in 2006 (RANZCOG 2009). This study concluded that each obstetrician has 10 deliveries by caesarean section from a maternal request which was calculated to be 25 per cent of all pre-labour caesarean sections or 4.7 per cent of all births in Australia in 2006.

Robson et al (2009) aimed to estimate the percentage of caesarean section deliveries by maternal request before labour commences in Australia in 2006, using a survey of 1 239 fellows of the RANZCOG and all 317 trainees resident in Australia in August 2006. Obstetric specialist trainees when asked: *In your future specialist practice, would you undertake elective caesarean delivery at a woman's request, where no obstetric indication exists?* Those who answered 'yes' rose steadily, from 53 per cent in their first year of residency, to 77 per cent

in their final year. Robson et al (2009) concluded that further investigations of obstetricians' and women's decision making on caesarean section are warranted.

Figure 2.3 shows the changes in medical indemnity insurance in real terms by medical specialty from 2003-04 to 2008-09. The indemnity insurance for obstetricians peaked in 2006-07 at A\$58 000 and was at its lowest in 2008-09 at A\$49 000, but was still higher than any other specialty. Indemnity insurance trends show a decrease in all specialty premiums 2008-09 (Medical Indemnity Insurance Report 2009). The reason for including the above information on medical indemnity insurance for obstetricians and associated mother and child medical specialists is to show that in our litigious society the real costs of running an obstetric medical practice in Australia.

Figure 2.3: Medical Indemnity Insurance by specialty costs 2003-2009 in Australia

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Source: Derived from MDD – owned insurers by the ACCC. Insurance rates exclude third party statutory collections such as stamp duty, GST (Goods and Services Tax) and ROCS (Return on Capital Investment).

The question which arises in this study and which cannot be quantitatively answered is: 'How much impact does the threat of litigation have on whether or not a woman ends up with a caesarean section delivery due to the litigious overhead pressure on the obstetrician to provide the best possible birth conditions for a delivery?'

2.4 Who is choosing the key principles of Australia's models of health care?

The Federal Government should outline the principles for the National Health and Hospitals Reform Commission for national policy with continuing community engagement. That is, health care principles must be formed before health care policy is developed (Menadue 2008). Australia does not have a series of citizen juries made up of randomly selected community citizens to develop the principles for health care and develop a health care constitution of lay person's health care values as in Canada and the United Kingdom (Mooney 2008). Tony Abbott, Australia's former Coalition Health Minister believed that they would take power away from politicians and government (ABC 2006), and the Western Australia President of their branch of the Australian Medical Association is not convinced debating focus groups is the way big decisions are made (Sadler 2005:7). However, according to Mooney (2008) the people's voice needs to be heard to drive the principles underpinning the Australian health care system.

The debate over health care continues with the following question: *'What do Australians expect, need and want from their health service at an individual, local and national level? How can we engage citizens effectively to answer these questions? We need a process of informed public consultation, a process that is constructive, efficient and representative, to guide the vision and values that form the basis of our health system (James 2009).*

According to Menadue (2008:170-171) the key principles of the Australian health care system should include:

- Having a universal single-payer system accessible to all. Poor and rich should have access to the same high-quality health care services. Inefficient private health insurance companies should not be subsidised. Medicare could fund both public and private providers. Further, a universal health care system does not imply a 'free' system.
- Designing services around patient's needs, and not the historic needs of health care providers.
- Giving priority to disease prevention and keeping people healthy.
- Achieving technical efficiency so that the maximum benefit is gained from the limited health care dollars.

2.4.1 Case-mix funding in Australian hospitals

The Commonwealth Department of Health and Ageing is responsible for publicly-funded health care in Australia. Case-mix is the funding tool which collects data on hospital events which are paid for out of the public purse. Case-mix was introduced in South Australia between 1994 and 1995 and remains the primary funding model for hospitals (Sherbon 2008).

The introduction of case-mix to the Australian public and private hospital systems is seen by Donellan-Fernandez et al (2008) to have inadvertently increased the rate of caesarean section delivery. Moreover they argue that hospital case-mix emphasises time management for each hospital event and therefore women may not have time to birth in a longer natural manner if necessary for a normal spontaneous delivery.

Hart (1998:51) commented that:

Surgery has become a major focus of all large public hospitals because of its high earning potential. This pressure to maximize funding could influence surgical practice. Efficiency must not take precedence over quality of care and compassion.

However, there are problems with case-mix data. Data manipulation, data fraud and variable interpretation of case-mix reporting requirements means that it is impossible to compare hospital performance among Australian States and Territories (Nocera 2010: 222-224). Disease and procedure codes make up the case-mix recipe, which has meant that disciplined attention must be paid to the reliability and validity of coded health data. Case-mix funding with a reliance on accurate classification of diseases and procedures should allow the health system to collect accurate ICD-10-AM data (Roberts 1998:S32-S35).

The Australian Government ventured outside of the case-mix hospital funding system to gain access to comparative funding costs of caesarean and vaginal birth. Table 2.1 was provided by National Centre for Social and Economic Modelling (NATSEM) (Brown et al 2010:S32-S35) to give an estimate of the comparative costs associated with caesarean and vaginal delivery in Australian hospitals by State between 2006 and 2007. The DRG (Diagnosis Related Group) code for caesarean delivery is O01C and for vaginal birth is O60B. In South Australia, the length of hospital stay days for a caesarean was 4.6 hospital stay days and for a vaginal delivery was 2.9 hospital stay days. South Australia has the highest average cost

per hospital separation of caesarean delivery patient of \$6 775, but the lowest hospital separation costs for vaginal delivery of \$3 449 dollars. That is, caesareans cost double vaginal births.

Table 2.1: Comparison of caesarean and vaginal birth hospital costs in Australia

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2.4.2 Will the Commonwealth Government 2008 Maternity Services Review decisions decrease caesarean delivery rates?

The purpose of the Maternity Services Review (2008) under Minister Roxon was to canvass a wide range of issues including antenatal services, birthing options, postnatal services up to six weeks after birth, and peer and social support for women in the prenatal and postnatal periods. Submissions were received by any group or individuals concerned with the models of birth care available to Australian women. The Department of Health and Ageing formulated a report to the Minister for Health and Ageing, the Hon Nicola Roxon, MP. The maternity services review aimed to identify key gaps in current services and to determine the priorities for national action under a National Maternity Service Plan. State and Territory Governments were asked to review their maternity services under a series of enquiries and more recently consumers have worked with governments and professions to develop frameworks to guide the planning of future maternity services. The maternity services framework endorsed a set of principles to underpin services across Australia which included:

- Women could make informed and timely choices for their maternity care and feel in control of their birthing experience;
- That maternity services are provided in a culturally appropriate manner for each woman;
- Maximize the potential of the midwives, obstetricians, general practitioners, paediatricians, Aboriginal Health Workers to provide a collaborative multidiscipline approach to maternity service delivery;
- Offering a continuity of quality care and high quality and safe evidence-based care (Review@health.gov.au)

2.4.3 Increase in midwife training

As a result of the Maternity Services Review in 2008, the following recommendations occurred for the training of eligible midwives to promote more choice in the models of birth care available for Australian women:

- The Senate passed the Health Legislation Amendment of the *Midwives and Nurse practitioners Bill 2009* early in March 2010. The Amendment aims to give Australian women greater access to affordable, continuity of care with a **known midwife**. Consumers from November 2010 are expected to be able to choose their own midwife for their pregnancy, birth care and postnatal care. Intrapartum hospital care still needs to be worked out with reference to visiting and admitting rights of midwives.
- This Act has the potential for increasing the number of women who can access continuity of care with a known midwife from less than a current five per cent to around eighty per cent (similar to New Zealand). Midwives will have access to the Medical Benefits Scheme, the Pharmaceutical Benefits Scheme, Professional Indemnity Insurance (excluding birth at home) and the government will also pay any insurance claims that exceed \$1 million.
- Of significance, the need for a collaborative arrangement to be in place before a midwife could access this indemnity was dropped in the Bills stage of the legislative process.

<http://www.maternitycoalition.org.au/home/modules/content/?id=1>).

Another result of the Maternity Services Review into models of birth care available to women in Australia was increased funding for the training of midwives (Table 2.2) who are dominantly involved in the less interventionist approaches of less risk pregnant women delivering by normal spontaneous births.

**Table 2.2: Maternity Services Commonwealth Government Budget Increase 2009-2010:
Increased choice maternity model of care**

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Source: Department of Health and Ageing: Budget at a glance extract (2009)

2.4.4 Australian Medical Association (AMA) response to increased midwife training policy

The AMA in their submission to the Maternity Services Review 2008 pointed out that the use of more midwives could jeopardise the current excellent Australian low maternity mortality rates. New Zealand is a comparable country with Australia (Carter 2008), which made significant reforms in birth care in 1995-96, which has resulted in less birthing choice for mothers. The new health legislation made it mandatory for a midwife to be present at a birth and deliver on their own, but a medical doctor could not. This birth model was fiercely resisted by the New Zealand Medical Association (NZMA). Adverse outcomes include most general practitioners no longer providing intrapartum care (during pregnancy); patients have lost their choice to have a GP obstetrician which has had an enormous negative impact in rural communities; and there is no ongoing assessment of the new birthing model to compare morbidity and mortality rates (Carter 2008:1-22).

The AMA believes that importing a similar model of midwifery-led care in Australia is a retrograde step. The AMA believes that state and territory governments should reinvest in rural and regional hospitals which is the key reason why GPs do not stay in the bush, meaning that women will lose the choice of epidural anaesthesia and/or an emergency caesarean section delivery. The AMA believes that a better birthing model would include

more collaboration with the private medical system, medical obstetric care (including fetal monitoring facilities), anaesthetic and paediatric services, and the infrastructure to deal with an emergency caesarean if necessary. If the provision of Australian maternity services depends more on midwife care, then there must be immediate prospective data collection and evaluation for publication of outcomes (AMA Maternity Services Review submission 2008).

A press release by the AMA (2009) stated:

We will keep the Government accountable for any changes that lower the bar on the health of women and their babies. The AMA supports improved access for Indigenous and rural communities to the world class services most Australian women already enjoy. It is not enough to run maternity services on the belief that birth is a natural process. When things go wrong, and they often do, women need immediate access to an obstetrician, and anaesthetist and a paediatrician. This access saves lives. In NZ the midwife model of birth means obstetricians are only called in when the natural birth has become an emergency. NZ saw the virtual abandonment of GP obstetrics in rural areas. <http://ama.com.au/node/4483>

Van Gool (2009) summed up the responses of the maternity Services Review in Australia in Table 2.3 which shows a difference of opinion between current birthing stakeholders and the training of more eligible midwives. Her results suggest that doctor groups are strongly opposed to recommendations of the Maternity Services Review, which has developed policy for the training of further eligible midwives to give Australian women more choice in their models of birth care.

Table 2.3: Stakeholder response to Maternity Services Review in Australia in 2009

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Source: Van Gool (2009) Maternity Services Review: Australia, Centre for Health, Economics Research and Evaluation (CHERE)

Transparent policy and results from both midwives and the medical profession will be the key factors in relation to Australian caesarean birth rates in the future.

2.5 Conclusion

In Australia there is a policy battle in progress between the medical doctors and midwives over the better birthing models to pursue the best outcomes for mothers and babies. There is no doubt that the Commonwealth Government is putting more budget money into the training of midwives and that the amount of collaboration and agreement that eventuates between the two parties over time and the resulting mother and infant morbidity and mortality rates, will determine the birthing models of care in Australia.

Australia's caesarean birth policy is ad hoc in the sense that there is no policy which clearly defines the expected rate of caesarean birth in Australia. The impact of medical indemnity insurance costs and legal malpractice decisions, according to the obstetricians, has shown to have impacted on the increase of caesarean delivery as caesarean delivery is seen as the safer way to birth a child to avoid a complex labour process. There is no population data to give an accurate assessment of maternal request caesarean section delivery.

The inability to compare case-mix data between hospitals is an issue that needs resolution. The recent Commonwealth Government Maternity Services Review has injected substantial funds into the training of Australian Midwives. Midwives claim that there is too much medical intervention in the birthing process which can lead to an increased caesarean delivery rate. The Commonwealth Government has also completed financial comparisons of the differences in costs between caesarean delivery and normal spontaneous delivery which suggests that the training of midwives is also about budgetary restraints as well as reducing the caesarean delivery rate in both urban and rural areas. The literature shows there is a need for life-course maternal and maternal morbidity data for mothers who deliver babies by all methods of birth so that birthing policy can be more carefully constructed.

The following questions have emerged from the literature review:

1. Age of a pregnant woman is given as a major reason for the higher rate of caesarean birth in the private hospital system. How much older are private health care women than public health care women?
2. Would a different indemnity insurance system for medical staff, where 'blame' was not the legal issue, reduce the caesarean birth rate?

3. Will the revision of Induction of Birth (IOB) procedures, for example, a different approach to the use of oxytocins, reduce the caesarean birth rate?
4. If more midwives become better trained as 'specialist midwives' who will pay for their indemnity insurance?
5. Will the training of specialist midwives reduce the caesarean delivery rate in the future? And, will the use of midwives mean an increase in the episiotomy and forceps rates of earlier years?
6. Female genital mutilation is banned in Australia. However, that does not mean that the procedure may have been driven underground or women go overseas to have the procedure performed, where it may be more dangerous. Therefore, should there be recognition of FGM as an ICD-10-AM medical code in Australian hospitals to cover a baby born by caesarean section, due to previous FGM events performed overseas or in Australia?
7. Has the *cost of the caesarean model of birth care* become the central force in the Commonwealth Government's training of midwives in anticipation that the midwives will reduce the overall cost of birthing by moving back to more normal spontaneous deliveries?
8. Has the maternal aggregate life-course cost of different models of birth and associated maternal birth morbidities (for example caesarean and normal spontaneous delivery) been determined?

CHAPTER 3

METHODOLOGY

3.1 Introduction

The quantitative research design, data collection and analysis of this study is a melding of hospitals data and social science techniques to find reasons for the increasing rate of elective and emergency caesarean birth in South Australia. Geographical tools of computer analysis applied to spatial data have made this study possible.

This chapter firstly examines the purposes of the historical paradigm shifts which act as a background to the contemporary ability for vast amounts of data to be analysed in a geographical manner. The previous study of spatial analysis of caesarean birth in South Australia is acknowledged (Glover et al 2006).

An overview of the ethics process is given for the sourcing of data attributes. A conceptual frame work for this study is put forward indicating the relationships between the databases used and the thematic approach of this study on caesarean birth. The linkage of the major study dataset with other Australian datasets is described. Strengths and weaknesses of the quantitative study datasets are discussed.

MacLeod-Clerk and Hockey (1989:4) defined research as:

An attempt to increase the sum of what is known, usually referred to as a body of knowledge, by the discovery of new facts or relationships through a process of systematic scientific enquiry, the research process.

Blanche et al (2006:39-48) add to the definition of research design as follows, for:

Open inductive objectives of the study which leave room for data discovery of finding important interrelationships within a database. The four dimensions a researcher must decide on include the:

Purpose of the research
Theoretical paradigm informing the research
Context or situation within which the research is carried out
Research techniques employed to collect and analyse the data to maximise the validity of the findings.

3.2 Development of conceptual framework

Key points have been drawn from the research paradigms of medical geography, public health, evidence based medicine, epidemiology, knowledge discovery in databases, and the 'critical theory paradigm' to develop the conceptual framework for this study.

The paradigm of 'medical geography' as defined by Moon and Jones (1994:2) is as follows:

The intersection of health and health care research with the geographical must retain a concern with differences between and within locations and with distance, mobility and spread, but it must also concern itself with the structure of meaning and understanding in the place where people live, experience sickness and use health services.

The future of medical geography lies between modernism and postmodernism (Berg 1993). Disease and illness command cautious interpretation of progress that underlies medical science. Geographers will continue to map the implications of disease control and health care provision in space and place.

Whereas, the 'public health' paradigm of Bowling (2002:14) uses the health-related quality of life (QALY) index as a measured outcome of a medical intervention which she describes as a more subjective, patient led baseline against which the effects of medical interventions can be evaluated. Disease specific quality of life scales are needed, to ensure sensitivity to a medical intervention on a patient's continued life-course. Health research methodology must include the biomedical model of health care as well as the role of epidemiology, demography, health economics, social situations and geographical comparisons of patients.

Shared clinical decision making between the medical expert and the patient of 'evidence-based medicine' Sackett et al (1996) has pointed out that evidence based medicine (EBM) is partially driven by consumers in medicine resulting in a move towards shared clinical decision making. Information technology has made access to the best and most up to date evidence. EBM seeks to clarify those parts of medical practice which use scientific methods to ensure the best prediction of patient outcomes in medical treatment, even as debate about which outcomes are desirable continues. Elstein (2004) defines EBM as evidence from the scientific method to medical practice which assesses the relevant risks (risk factor analysis) and benefits of treatments (including lack of benefits). Akobeng (2005) defines the

practice of EBM as evidence based practice which aims to improve patient care through the identification and promotion of workable practices and at the same time the elimination of inefficient and prejudicial ones, thus minimising the gap between the generation of evidence and its application in patient care.

Epidemiology is a branch of public health (Lilienfeld 1982:140-149). Pearce (1996:679) writes that the study of epidemiology must reintegrate itself into public health and must rediscover the population perspective instead of the individual perspective with methods of data analysis and methods of exposure measurement.

The key issue in epidemiology has been the shift in the level of analysis from the population to the individual. The reductionist approach while focusing on the individual, blames the patient, and produces interventions that can be harmful. We see more and more technology to study more and more trivial issues (Pearce 1996:678).

The research paradigm of knowledge discovery in databases (KDD) uses information retrieval from large data collections is not enough anymore for good decision making choices (Zaïane 1999). There is a need for the discovery of patterns in raw data collections to make better health choices. Flat data files (data files in text or binary format) are usually used at a research level. These files can consist of scientific measurements and time series data for the study of trends and correlations between different variables. Advanced files can exist as spatial databases. Spatial databases can store geographical information for uses such as the choropleth maps used in this study. The two main data mining tasks are descriptive data mining that describes the general properties or attributes or characteristics of a data set and predictive data mining tasks that attempt to do predictions based on inference on available data in the dataset.

During the 1980s and 1990s researchers and theorists realised that their assumptions from using earlier paradigms did not adequately address the issues of social justice which has led to the development of the ideologically-orientated enquiry or social theory paradigm (Creswell 2008). In other words, as well as getting research results on an issue, it had become important to apply the new knowledge to those in the community who needed this information.

The critical theory paradigm uses an ontology that can be equated with a taxonomic hierarchy of classes which have their own set of concept definitions (Gruber 1993). Critical theory tries to dissolve the gap between abstract theory and empirical experiences to make changes in the world.

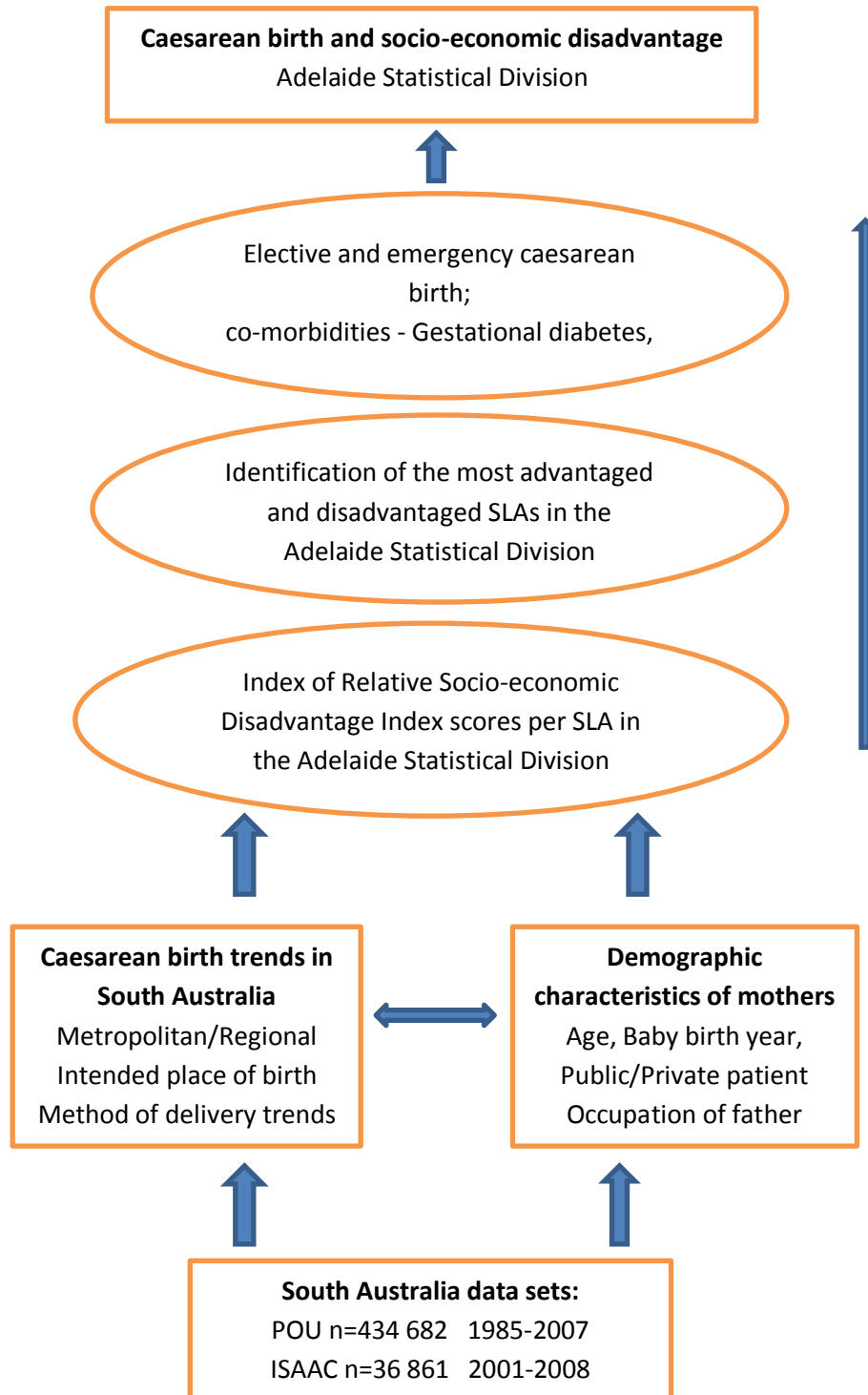
The social science paradigm used in this study has many facets of other traditional paradigms including medical geography where the concept spatial dimension is core; public health examines the quality of life of individuals within a population; the medical profession is currently emphasising evidence-based medicine and where risk factor analysis is a determining factor for treatment, epidemiology analyses the trends of risk factors and the **critical theory paradigm examines social justice and equity.**

With the advent of large capacity data storage silos such as the POU and ISAAC used in this study, and computer programs which can analyse medical data, such as Excel, SPSS and Arc View, large volumes of demographic data can be welded to large volumes of hospitals data and spatial systems. The concept of social inequity using the Index of Relative Socio-Economic Disadvantage (ABS 2010a) is researched in detail to assist in explaining any spatial variation of caesarean birth rates across the Adelaide Metropolitan Area.

3.2.1 Conceptual framework for study

Figure 3.1 demonstrates the caesarean data analysis classification key: Elective and emergency caesarean births by either public or private patients across South Australia. The key was expanded to include an analysis of the methods of delivery in metropolitan and regional South Australia using hospital classification, maternal characteristics of age, race and occupation of father. In order to further explain the pattern of caesarean birth in the Adelaide Statistical Division, IRSD scores per SLA were used to establish any variation of caesarean delivery associated with levels of advantage and disadvantage in relation to public and private health cover, maternal pre-existing and gestational diabetes, and fetal distress of infant.

Figure 3.1: Conceptual framework for exploring caesarean birth and socio-economic disadvantage: South Australia 1985-2007



3.3 Previous study

The South Australian Health Atlas (Glover et al 2006) was the first publication to show the spatial distribution of the demographic characteristics and various types of hospital mortality and procedure data both in the Adelaide Statistical Division (ASD) and Country South Australia. The mapping at Statistical Local Area (SLA) of caesarean birth and private health cover for families who had given birth to a child by caesarean section (Appendix 5), is of most relevance to this study. It is proposed to map in a similar way, both elective and emergency caesarean births rather than aggregate caesarean sections, to find any variation between the two basic types of caesarean section delivery across a socio-economic gradient within the Adelaide Statistical Division.

3.4 Ethics approvals

Ethics approvals from the University of Adelaide (Appendices 1 and 2), the South Australian Aboriginal Health Commission and South Australia Health (Appendices 3 and 4) were required to gain access to unidentified non-experimental retrospective data from the Pregnancy Outcome Unit (POU) and Integrated South Australian Activity Collection (ISAAC) as South Australia Health custodians of pregnancy, birth and the puerperium of women who had birthed in South Australia between 1985 and 2007. The University of Adelaide Ethics Approval was gained through the Human Research Ethics Committee on the structure of the unidentified caesarean birth study using Pregnancy Outcome Unit and Integrated South Australian Activity Collection hospitals data.

A Deed of Confidentiality was signed by all parties involved in the analysis of the SA Health data so that: It was only used for this study of caesarean births from both public and private hospitals (not named), for elective and emergency caesarean sections under the ICD-10-AM classification system and a series of other fields, including age of mother and Indigenous status. All results published do not identify individual persons or hospitals. Data could not be removed off-site from the University before, during or after the completion of the project. All work on the datasets was to be stored on a designated personal computer and kept in a password protected file. All copies of the released data must be deleted in such a way to guarantee non-recoverability after the project is completed.

3.5 Study databases

There were three reasons for using the South Australia Health databases in this study: Firstly, the databases cover every woman who gave birth in South Australia each year; Secondly, the WHO definitions of caesarean section procedures are given in both of the South Australian data sets; Thirdly, the data are unit records which are spatially referenced which facilitates ecological analysis of caesarean birth outcomes.

After a series of discussions with SA Health staff on the objectives and number of attributes requested from their datasets, ethics proposals were requested from the South Australian Human Research Ethics Committee and the Aboriginal Health Research Ethics Committee release of the requested data was negotiated with the data custodians (Tables 3.2 and 3.3).

3.5.1 Pregnancy Outcome Statistical Unit (POU) database 1985-2007 (n=434 682)

The POU is part of the Epidemiology Branch of the South Australian Department of Health Unit on pregnancy outcome in South Australia and provides statistics mainly derived from the South Australian perinatal data collection of births which are notified by hospital and homebirth midwives and neonatal nurses. Pregnancy outcome data includes statistics from the abortion statistics collection, congenital abnormalities resulting in termination of pregnancy, the Department of Cytogenetics (chromosomes and DNA) and Molecular Genetics, the Births, Deaths and Marriages Registration Division for data and perinatal death certificates, the Coroner's Office for Coroner's findings and the provision of perinatal data to the National Perinatal Statistics Unit at the University of New South Wales (POU 2007:87).

The POU study database is a mandatory collection of all births in South Australia at a Statistical Local Area level between 1985 and 2007. The total number of women who gave birth in **South Australia between 1985 and 2007** was **434 682** of which **108 941** gave birth by **caesarean section** delivery (**48 056** by **elective** caesarean and **60 995** by **emergency** caesarean). The average annual number of births in South Australia between 1985 and 2007 was 18 899 with a maximum in 1992 of 19 975 and a minimum in 2004 of 17 389 births.

Table 3.1 is an overview of the POU method of birth data released of caesarean delivery and spontaneous births. Spontaneous birth was used a surrogate control to compare other

methods of delivery with. The range of deliveries per annum varied between 4.0 per cent in 2001, 2002 and 2004 and the higher birth rate of 4.6 per cent in 1990, 1992, and 1993. Both elective and emergency caesarean delivery rates have increased between 1985 and 2007. Normal spontaneous, forceps and other methods of delivery including breech have decreased between 1985 and 2007.

Table 3.1: Pregnancy Outcome Unit Method of Delivery South Australia 1985-2007

<i>Baby birth year</i>	<i>Normal spontaneous</i>	<i>Lower section Caesarean section (elective)</i>	<i>Lower section Caesarean section (emergency)</i>	<i>Forceps</i>	<i>Ventouse</i>	<i>Breech/ Other</i>	<i>Total</i>	<i>%</i>
1985	12 644	1 808	1 780	2 902	301	254	19 689	4.5
1986	12 345	1 787	1 982	2 927	381	233	19 655	4.5
1987	12 145	1 687	2 116	2 744	334	207	19 233	4.4
1988	12 260	1 709	2 257	2 619	360	192	19 397	4.5
1989	12 192	1 821	2 392	2 561	457	229	19 652	4.5
1990	12 339	1 868	2 442	2 508	441	198	19 796	4.6
1991	12 286	1 957	2 442	2 212	512	186	19 595	4.5
1992	12 596	1 892	2 573	2 188	533	193	19 975	4.6
1993	12 486	1 994	2 539	2 173	466	156	19 814	4.6
1994	12 184	2 001	2 734	2 034	512	168	19 633	4.5
1995	12 244	2 027	2 574	1 786	661	177	19 469	4.5
1996	11 903	1 874	2 591	1 675	759	149	18 951	4.4
1997	11 477	1 921	2 516	1 724	749	161	18 548	4.3
1998	11 564	1 905	2 646	1 525	875	107	18 622	4.3
1999	11 339	1 937	2 723	1 298	963	119	18 379	4.2
2000	10 817	1 871	2 695	1 135	1116	115	17 749	4.1
2001	10 334	2 145	2 829	1 070	1102	89	17 569	4.0
2002	10 195	2 274	2 969	1 025	1027	90	17 580	4.0
2003	10 092	2 415	3 028	849	1216	92	17 692	4.1
2004	9 607	2 487	3 109	874	1228	84	17 389	4.0
2005	9 968	2 685	3 233	762	1308	82	18 038	4.1
2006	10 324	2 952	3 316	692	1298	71	18 653	4.3
2007	10 895	3 039	3 399	802	1391	78	19 604	4.5
<i>Total</i>	264 236	48 056	60 885	40085	17990	3430	434 682	100.00

Source: Adapted from Pregnancy Outcome Unit n=434 682

3.5.1.1 Pregnancy Outcome Unit Attributes examined during study

Pregnancy Outcome Unit mother and baby attributes were sourced from Appendix 2: Supplementary Birth Record Form (POU 2007:86). Data released from the POU consisted of all the requested data consisting of data relating to elective and caesarean section birth and all other births. Chosen POU data was classified into categories for this study: geographical area by SLA: classification of hospitals, intended place of birth, birthing facility; age of mother; father's occupation; mother's use of medical specialists: existing co morbidities of

gestational diabetes, asthma, epilepsy and hypertension; baby fetal distress; mother's method of birth; mother's parity; and mother and baby mortality outcomes (Table 3.2).

The spatial geography unit used by the POU and for the purpose of this study is the Statistical Local Area which is also used every year by the Australian Bureau of Statistics (ABS 2006a). Although the mother's address, postcode and place of birth of infant are entered on the POU dataset, only the mother's residential SLA was made available for this study. The SLAs in this study make up the Adelaide Statistical Division (ASD) representing the Adelaide Metropolitan Area (Appendix 5:133-4). All chosen variables within the POU dataset could be cross tabulated with the SLAs. The SLA as a geographical area unit, works well when visually comparing the variation of elective and emergency caesarean birth distribution over time.

Place of birth (public or private) and intended place of birth were compared at a Metropolitan and Regional level as were the elective, emergency caesarean and normal spontaneous method of delivery (POU data). Public and private hospital time of birth data was compared between 1985 and 2007 to see how the introduction of case-mix funding had influenced hospital schedules.

Maternal age is from the POU data was examined in detail. The mother's age was divided into cohorts of five years and cross tabulated with baby birth years between 1975 and 2007 to establish the increasing and decreasing age cohorts of mothers over time. Firstly, the trend of maternal age was examined for all births. Then, maternal ages for those women who gave birth by caesarean section were examined according to their place of birth (whether metropolitan or regional); type of patient (public or private) and method of birth (elective or emergency c-section).

Table 3.2 Mother, Father and Infant Pregnancy Outcome Unit attributes used in study

Attribute classification	Name of attribute	Description
Pregnancy Outcome Unit 1985-2007		
Geographical area	Statistical Local Area (SLA)	All metropolitan and non-metropolitan patients
Mother's method of birth	Delivery method	Normal spontaneous n=264 236 or 61% LSCS (elective) n=48 056 or 11% LSCS (emergency) n=60 885 or 14% Total n=434,682
Hospital classification	Hospital	Metropolitan public and private, Mt Gambier and Whyalla, Other country hospitals
	Intended place of birth	Hospital, Birth Centre, Home
Mother's demographic characteristics	Age of mother	Age of mother at birth of child
	Baby birth year	Year baby born between 1985-2007
	Type of patient	Public or private
	Mother's country of birth	Australia, Aboriginal & Torres Strait Islander Asia, Other
	Mother's race	Caucasian, Aboriginal & Torres Strait Islander, Other
	Parity of mother	0-2 births (First to third birth)
Outcome of mother	Discharged, Died	
Demography of Father	Occupation baby's father	Managers and administrators ... Labourers and related workers
Mother's use of medical specialists	Obstetrician in private practice	Visit by pregnant woman
	General practitioner	Visit during pregnancy
	GP/shared midwife	Shared pregnancy care
	Eligible midwife	Shared care within hospital system
Mother's diagnosed co-morbidities	Existing hypertension	Diagnosed high blood pressure
	Diabetes (pre-existing)	Type not given but present in pregnancy
	Asthma	Diagnosed asthma
	Pregnancy hypertension	All types of pregnancy high blood pressure
	Gestational diabetes	Diabetes during pregnancy
	Epilepsy	Present in pregnancy
Baby outcomes	Fetal distress	Yes n=55 159 or 12.7% , No n=379 523 87.3% Total n=434 682 Complete data set
	Birth weight	Mean birth weight 3001-3500 grams
	Neonatal Intensive	Yes n=11 074 or 2.5 percent No n=423 608 or 97.5 percent Complete dataset n=434 682
	Outcome of baby at birth	Fetal death, In hospital at 28 days, Discharged
ABS 2006 and other years	Index of Relative Social Disadvantage	Scores calculated for socio-economic status from Censuses of Population and Housing

Source: Adapted from Pregnancy Outcome Unit 1985-2007 2006:83

3.5.1.2 The National Perinatal Statistics Unit (NPSU)

The mothers and babies birth data collected by the POU in South Australia is collated into the National Perinatal Collection which releases a bi-annual report titled 'Mothers and Babies' data which is then forwarded to the Australian Institute of Health and Welfare (AIHW 2005:2-4). The National Perinatal Statistics Unit (NPSU) which was established in 1979 as Australia's agency for the collection for perinatal health and statistics. It is a collaborating unit of the AIHW and is currently based at the University of New South Wales and located at the Sydney Children's Hospital. It is difficult to compare elective and caesarean rates between states and territories because there are currently variations in caesarean definitions between jurisdictions in the NPSU.

The main objectives of the NPSU include:

- coordinate, monitor and interpret national data in reproductive and perinatal morbidity and mortality;
- enhance national reproductive and perinatal health data systems; and
- publish national reports on reproductive and perinatal health which cover pregnancy outcomes, maternal morbidity and mortality, assisted reproduction and birth defects (NPSU 2005:2-4).

Membership of the NPSU consists of the following permanent stakeholder representatives from the following organisations that are signatories to the National Health Information Agreement, the:

- National Perinatal Statistics Unit;
- Australian Institute of Health and Welfare (AIHW);
- Australian Bureau of Statistics;
- Department of Health and Ageing;
- Each State and Territory government health authority which includes the Pregnancy Outcome Statistical Unit in South Australia (POU).

Additional skilled members may be invited on a transitory basis from the following stakeholders and others:

- Women's Hospitals Australasia;
- National Centre for Classification in Health;
- Royal Australasian College of Physicians, Paediatrics and Child Health Division;
- Royal Australian College of Obstetricians and Gynaecologists;
- Australian College of Midwives;
- National Maternity Data Collaboration Project;
- Rural Doctor's Network

Source: AIHW National Perinatal Statistics Unit (2005: 2-4).

3.5.2 Integrated South Australian Activity Collection (ISAAC) (n=36 861)

The South Australian Integrated Activity Collection (ISAAC) is an admitted patient morbidity and mortality database of both public and private patients designed to evaluate, organise and plan the necessary health resources for South Australia under the *Health Care Act 2007 (Commonwealth)* (ISAAC 2009). ISAAC data are based on the hospital codes of the International Classification of Disease and Procedures (ICD) for pregnancy, birth and the puerperium (42 days after birth) version which was established in 1979 in South Australia as a result of Australia's original collaboration with the WHO. ISAAC provides:

- Patient information activity on all patients in public and private hospitals in South Australia which assists in the planning and development of an equitable distribution of health services;
- Provides the information to develop and maintain the SA Health budgeting and payment system;
- Statistical information to monitor the utilisation of SA Health services;
- Hospital management with information for efficient hospital resource planning.

The first edition of the ICD-10-AM (International Classification of Diseases and procedures Version 10 Australian Modification) codes was established in July 1989. The current ICD-10-AM (6th edition) became available in 2009 and contains pregnancy, birth and puerperium definitions and codes for part of this study (ISAAC 2009:175). ISAAC data collected in South Australia streams into the AIHW data collection in Canberra and onto the WHO for international collaboration of global birthing mother and baby health outcomes. The great strength of the ICD codes is the standardisation of hospitals procedures and disease codes around the world and between Australian States and Territories. There are no randomised control trials to support pregnancy and birth procedures. Therefore the reliance of standardised protocols, definitions and the collection of accurate clinical data is most valuable and gives confidence to the researcher when comparing elective, emergency and all other methods of birth of mother and baby outcomes in this study.

Another ISAAC (2009:2) strength as a research database is that all live births, as defined by the WHO, born in both public and private South Australian hospitals must be reported to ISAAC under the National Health Information Agreement (NHIA), and private sector

hospitals must provide birth data to the Australian Bureau of Statistics for inclusion in their national data collection for private hospitals.

The AIHW defines a live birth as (Glossary Item 327 248:2005):

A "live birth" is a complete expulsion or extraction from the mother of a baby, irrespective of the duration of the pregnancy which, 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 live born. (Perinatal Source: *International Classification of Diseases and Related Health Problems*, 10th Revision, Vol. 1, World Health Organization, 1992).

The POU data collection dominates the analysis in this study because it is larger (n=434 682) and had been collected over a longer time frame of 22 years between 1985 and 2007, compared with the newer ISAAC time frame of seven years between 2001 and 2008 (n=36 961). ISAAC gives principal diagnosis definitions and codes for the terms elective and emergency caesarean delivery. The terms elective caesarean and emergency caesarean are also used by the POU dataset. Attributes of interest from ISAAC for this study are found in Table 3.3, and include geographical area for usual residence of patient (SLA), definitions principal diagnosis for elective and emergency caesarean events, funding source for event and occupied bed days.

Table 3.3 Integrated South Australian Activity Collection (ISAAC) attributes of interest

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held by the University of Adelaide Library.

(Adapted from*Open Architecture Clinical Information System (OACIS) Source: Non-clinical and clinical data items of interest 2001 – 2008 (Version 6 Effective 1 July 2011)

OACIS (SA Health) supports more than 12,000 clinician-users in eight hospitals covering 75 percent of South Australia's population of 1.5 million (www.accenture.com/.../success-south-australian-health-department-clinical-information-systems-summary.aspx).

3.5.2.1 Key attributes of the ISAAC collection

Principal diagnosis is the keystone of the ISAAC data collection. It is recognised by an ICD-10-AM data-code and gives the definition of elective and emergency caesarean procedures which are used in this study. Principal diagnosis also is attached to a funding code used in the case-mix funding for hospitals.

All Australian citizens have access to publicly funded Medicare which covers method of birth costs and hospital intensive care for mother and infant. Private health care insurance does not completely cover birth expenses as it leaves a gap fee to pay. This study compared the maternal length of stay days of public and private caesarean birth patients. Maternal length of stay is defined as the days between the admission and discharge of a principal diagnosis event.

The OACIS (Open Architecture Clinical Information System) data system links South Australian hospitals. At the beginning of this study, questions were asked if there was a way to link maternal pre and after birth data of mother and baby to the POU and ISAAC collections to find life-course maternal morbidity after caesarean delivery. The South Australian datasets of OACIS, POU and ISAAC are not linked to general practitioners, obstetricians and other midwife public or private data collections. There is no life-course maternal data collection in South Australia. This means for example, that the study could not compare maternal and infant morbidity for caesarean delivery with other methods of birth over a significant length of time.

3.5.3 Strengths and weaknesses of POU and ISAAC study databases

The key advantages of both the POU and ISAAC databases are that:

- Normal place of residence is collected by Statistical Local Area.
- Mandatory collections in South Australia which can be compared with other similar State and Territory hospital data collections.
- Skilled maternity medical staff complete the birth data forms after each delivery; trained coders clean and tabulate the hospital data at SA Health level.

- Both datasets have been running for a considerable time which allows for strength in data analysis and trend results.
- The population data collection is large.
- The datasets contain unidentified patient lists.

Disadvantages of the datasets include the:

- Lack of Body Mass Index Data of both father and mother (at the time of study). This study believes that BMI data of the mother at conception and birth would lead to avenues of preventive morbidity and caesarean research.
- Maternal and infant risk factor for caesarean (and all other pregnancies) could be not only collected as a pre-existing factor, but also categorised in developing during the first, second and third trimester, as well as during labour and the actual birth and after birth during the seven weeks after birth.
- Reason for caesarean should include both clinical and non-clinical events. Non-clinical events should include availability of theatre and availability of chosen obstetrician.
- Maternal request for caesarean needs to be identified as ICD-10-AM codes listing the reasons for request, such as fear of birth due to, for example, urinary incontinence, and availability of theatre and/or obstetrician.
- There is a requirement for an ICD-10-AM code to cover the various degrees of female genital mutilation and how it affects the need for caesarean birth in Australia
- The linkage of maternity datasets to other general practice datasets such as OACIS (would help clarify maternal and infant afterbirth morbidity (for example obesity) during the life course. This would mean a common computer programs would need to be used by general practitioners, obstetricians and midwives which used the ICD-10- AM coding system
- Elective and emergency caesarean delivery rates should be released annually by all named public and private hospitals in South Australia in hospital annual reports and on the internet for maternity consumers.

3.6 Index of Relative Socio-economic Disadvantage (IRSD)

The IRSD Index has been developed by the ABS, and is used here to examine the strength of the association between advantaged and disadvantaged levels of socio-economic status of SLAs in the Adelaide Statistical Division for caesarean birth between 1985 and 2007. The IRSD is collected at the SLA spatial level by the ABS from Australian Census data. The IRSD score is one of four indexes which make up the ABS SEIFA (Socio-Economic Indexes for Areas) and are measures which summarise a range of socio-economic issues associated with levels of disadvantage. The IRSD Index can be used to show how communities compare with one another. Australian geographical areas can be ranked using a summary measure of relative disadvantage (ABS 2006b) using a score. For all the indexes in SEIFA, including the IRSD used in this study, relative disadvantage is associated with a low number (ABS 2006c).

The four indexes in SEIFA 2006 are all derived from the Census: Firstly, the Index of Relative Socio-economic Disadvantage which focuses primarily on disadvantage, is derived from Census variables like low educational attainment, unemployment, dwellings without motor vehicles and low income; Secondly, the Index of relative Socio-economic Advantage and Disadvantage is a continuum of advantage (high scores) and disadvantage (low scores); Thirdly, the Index of Economic resources focuses on financial aspects of advantage and disadvantage using Census variables; and Fourthly, the Index of Education and Occupation includes Census variables relating to educational attainment, employment and vocational skills. SEIFA is a broad definition of relative socio-economic disadvantage of people's access to material and social resources which determines their ability to participate in society. SEIFA does not represent the individual situation of each person, but rather represents an average of all people living in an area (ABS 2006c).

Studies have indicated for over 20 years that babies from disadvantaged areas (low IRSD scores) are likely to have a delay in onset of regular breathing of 5 minutes or more, low birth weight under 2,500 grams, need for special nursery care and neonatal death (Jonas et al 1992); low utilisation pre-natal screening, low baby birth weight (Koller 2009); child development delays (Najam et al 1992); and, are at higher risk of autism spectrum disorders (ASD) in (Rai et al 2012). Further pressure on lower socio-economic people is the likelihood

of limited access to primary health care (Wilkinson and Symon 2000) and not having a ready vehicle (Townshend 1987).

Hetzel et al (2004) point out that the socio-economic environment has a potential for modification, and public policy is a key instrument to improve this environment, particularly in areas such as housing, work environments, urban design, pollution control, educational achievements and early childhood development. Glover (2004:1-10) writes that despite extra funding for public health over recent decades and medical advances, lower socio-economic communities still suffer an unequal burden of illness.

3.6.1 IRSD application to study area

Firstly, the Pearson Correlation Co-efficient 'r' was used to calculate the association between the IRSD score and normal spontaneous, elective and emergency caesarean, forceps, and ventouse methods of birth, and, the risk factors of fetal distress, asthma and gestational diabetes to establish any trends across the Adelaide Statistical Division (ASD) according to socio-economic status between 1986 and 2006. Higher the 'r' values indicted significant relationships while lower 'r' values indicated weaker relationships between the variables indicated.

Secondly, the IRSD scores were used to rank the ten most advantaged and disadvantaged SLAs in ASD for 2006 as shown in Table 3.4 which lists caesarean birth as a percentage of all births in each SLA in 2006. The table indicates the variation of caesarean delivery between the most advantaged and most disadvantaged SLAs in the ASD representing the Adelaide Metropolitan Area.

The third step in the process of establishing caesarean birth socio-economic trends across Adelaide was to map the percentage of caesarean births of every SLA in the ASD.

Besides caesarean birth, gestational diabetes, fetal distress, public and private health cover, elective and emergency caesarean delivery rates were analysed in this way to establish pattern variation and trends across the ASD in relation to socio-economic advantage or disadvantage.

Table 3.4: Variation in caesarean birth rates in the ten most disadvantaged and advantaged SLAs in the Adelaide Statistical Division 2006

Caesarean birth rate of ten ranked most disadvantaged SLAs in the Adelaide Statistical Division 2006			
Rank	SLA code	Name of SLA	Caesarean births as a percentage all births in SLA 2006
1	5683	Playford Elizabeth	26.4
2	5688	Playford West Central	29.0
3	5896	Port Adelaide Enfield Port	26.8
4	5891	Port Adelaide Enfield East	33.1
5	5894	Port Adelaide Enfield Inner	31.8
6	5344	Onkaparinga North Coast	25.6
7	7143	Salisbury Inner North	32.1
8	7141	Salisbury Central	26.6
9	5686	Playford West	35.2
10	1068	Charles Sturt North East	29.9
		Average	29.7
Caesarean birth rate of ten ranked most advantaged SLAs in the Adelaide Statistical Division 2006			
1	0704	Burnside South West	41.9
2	0121	Adelaide Hills (DC) Central	39.9
3	0701	Burnside North East	41.4
4	4344	Mitcham North West	36.9
5	0124	Adelaide Hills (DC) Ranges	34.7
6	8260	Walkerville	51.9
7	4341	Mitcham Hills	45.9
8	7981	Unley East	34.6
9	5294	Norwood Payneham St Peters West	38.3
10	5345	Onkaparinga Reservoir	42.2
		Average	40.8

Source: POU Unpublished data and ABS (2006)

Spatial analysis using small scale areas in relation to socio-economic status of a variable such as caesarean birth in the ASD gives policy makers clear areas to customise preventive health interventions rather than using the same policy across the whole of the ASD. Isolating data at a small scale level gives policy makers clearer targets to establish the efficacy and adaptation of any preventive interventions.

3.7 Thematic research design

The following three themes are addressed in the analysis of the POU and ISAAC maternity data sets:

- **Caesarean birth trends in South Australia**

This theme compares caesarean trends in both metropolitan and regional public and private hospitals. Models of birth care are examined under the case-mix hospital system which concentrates on hospital efficiency of medical events (Results are discussed in Chapter 4).

- **Demographic characteristics of mothers**

The age of mothers and their occupational status are factors which influence caesarean birth trends. Maternal and fetal mortality outcomes of caesarean and other methods of birth are discussed. The impact of caesarean delivery on parity is also analysed (Results are discussed in Chapter 5).

- **Caesarean birth and socio-economic advantage**

The Index of Relative Social Disadvantage scores by SLA are correlated with caesarean and other methods of birth with the maternal co-morbidities of gestational diabetes, asthma and fetal distress to examine the impact of any socio-economic gradient which may affect birth method outcomes (Results are discussed in Chapter 6).

The retrospective quantitative analysis (Creswell 2008:238) of mother and baby data can be described as a:

... means of examining the relationship among variables. These variables, in turn can be measured, typically on instruments, so that numbered data can be analysed using statistical procedures. Those who engage in this form of enquiry have assumptions about testing theories deductively, building in protections against bias, controlling for alternative explanations, and being able to generalise and replace the findings.

3.8 Conclusion

The strength of this study on caesarean birth trends is the mandatory collection of birth data by medical staff, the coded definition of elective and caesarean delivery, and the considerable length of time data have been collected. The research paradigm used for this study has its basis in geographical spatial systems associated with the Index of Relative Social Disadvantage scores calculated from data collected in the five yearly Australian Population and Housing Censuses.

This chapter has put forward the conceptual framework which indicates the thematic research design for each of the three quantitative research chapters to increase the body of knowledge on caesarean birth in South Australia.

CHAPTER FOUR

CAESAREAN BIRTH TRENDS IN SOUTH AUSTRALIA

4.1 Introduction

This chapter focuses upon elective and emergency caesarean delivery trends in South Australia between 1985 and 2007 and examines any variation in rates between areas and hospitals in South Australia over 22 years. Of the 289 496 babies born in Australia in 2007, 89 371 caesarean sections were performed accounting for 30 per cent of women who gave birth. Tasmania had the lowest rate of caesarean delivery at 28 per cent and Queensland the highest at 33 per cent. South Australia, Western Australia and Queensland recorded caesarean delivery rates above 32 per cent (AIHW 2007:38).

4.2 Caesarean section birth trends in South Australia

Table 4.1 shows that in South Australia in 2007, 32.2 per cent of babies were born by caesarean section with 15.4 per cent delivered by elective caesarean and 16.8 per cent by emergency caesarean (a total of 6 438 caesarean births in 2007). In 1981, the caesarean rate in South Australia was 16.9 per cent (8.2 per cent elective and 8.7 per cent emergency) out of 19 604 births or some 3 313 caesarean births (POU 2007:67).

In South Australia between 1991 and 2007, out of a total 317 260 births, 85 292 babies were delivered by caesarean section delivery of which 48 571 babies were born in public hospitals and 36 721 were delivered in private hospitals. The Table indicates that there were 19 149 elective deliveries in public hospitals (an increase from 5.7 per cent in 1991 to 7.6 per cent in 2007) and 18 227 in private hospitals (an increase from 4.3 per cent in 1991 to 7.9 per cent in 2007). Elective caesarean delivery in South Australia increased from 10.0 per cent in 1991 to 15.5 per cent in 2007 with the bigger increase in public than private hospitals.

Table 4.1: Elective and emergency caesarean in South Australia 1991-2007

		Public	Private	Total elective	Total birth year	% Private	% Public	Total SA %
Elective	1991	837	1 120	1 957	19 595	4.3	5.7	10.0
	1992	798	1 094	1 892	19 975	4.0	5.5	9.5
	1993	891	1 103	1 994	19 814	4.5	5.6	10.1
	1994	933	1 068	2 001	19 633	4.8	5.4	10.2
	1995	987	1 040	2 027	19 469	5.1	5.3	10.4
	1996	988	886	1 874	18 951	5.2	4.7	9.9
	1997	1 018	903	1 921	18 548	5.5	4.9	10.4
	1998	1 094	811	1 905	18 622	5.9	4.4	10.2
	1999	1 128	809	1 937	18 379	6.1	4.4	10.5
	2000	1 081	790	1 871	17 749	6.1	4.5	10.5
	2001	1 170	975	2 145	17 569	6.7	5.5	12.2
	2002	1 173	1 101	2 274	17 580	6.7	6.3	12.9
	2003	1 250	1 165	2 415	17 692	7.1	6.6	13.7
	2004	1 266	1 221	2 487	17 389	7.3	7.0	14.3
	2005	1 383	1 302	2 685	18 038	7.7	7.2	14.9
	2006	1 604	1 348	2 952	18 653	8.6	7.2	15.8
	2007	1 548	1 491	3 039	19 604	7.9	7.6	15.5
						Difference		
Total	19 149	18 227	37 376	317 260		1991-2007		5.5
Emergency	1991	1 161	1 281	2 442	19 595	5.9	6.5	12.5
	1992	1 335	1 238	2 573	19 975	6.7	6.2	12.9
	1993	1 376	1 163	2 539	19 814	6.9	5.9	12.8
	1994	1 582	1 152	2 734	19 633	8.1	5.9	13.9
	1995	1 540	1 034	2 574	19 469	7.9	5.3	13.2
	1996	1 662	929	2 591	18 951	8.8	4.9	13.7
	1997	1 640	876	2 516	18 548	8.8	4.7	13.6
	1998	1 813	833	2 646	18 622	9.7	4.5	14.2
	1999	1 908	815	2 723	18 379	10.4	4.4	14.8
	2000	1 838	857	2 695	17 749	10.4	4.8	15.2
	2001	1 856	973	2 829	17 569	10.6	5.5	16.1
	2002	1 793	1 176	2 969	17 580	10.2	6.7	16.9
	2003	1 793	1 235	3 028	17 692	10.1	7.0	17.1
	2004	1 886	1 223	3 109	17 389	10.8	7.0	17.9
	2005	2 019	1 214	3 233	18 038	11.2	6.7	17.9
	2006	2 049	1 267	3 316	18 653	11.0	6.8	17.8
	2007	2 171	1 228	3 399	19 604	11.1	6.3	17.3
						Difference		
Total	29 422	18 494	47 916	317 260		1991-2007		4.8

Source: POU unpublished data

All elective and caesarean births South Australia 1991-2007 n=317 260

*SA caesarean 1991-2007 = (37 376 elective + 47 916 emergency) = 85 292 caesarean deliveries

** Total public caesarean 1991-2007 = (19 149 elective + 29 422 emergency) = 48 571

*** Total private caesarean 1991-2007 = (18 227 elective + 18 494 emergency) = 36 721

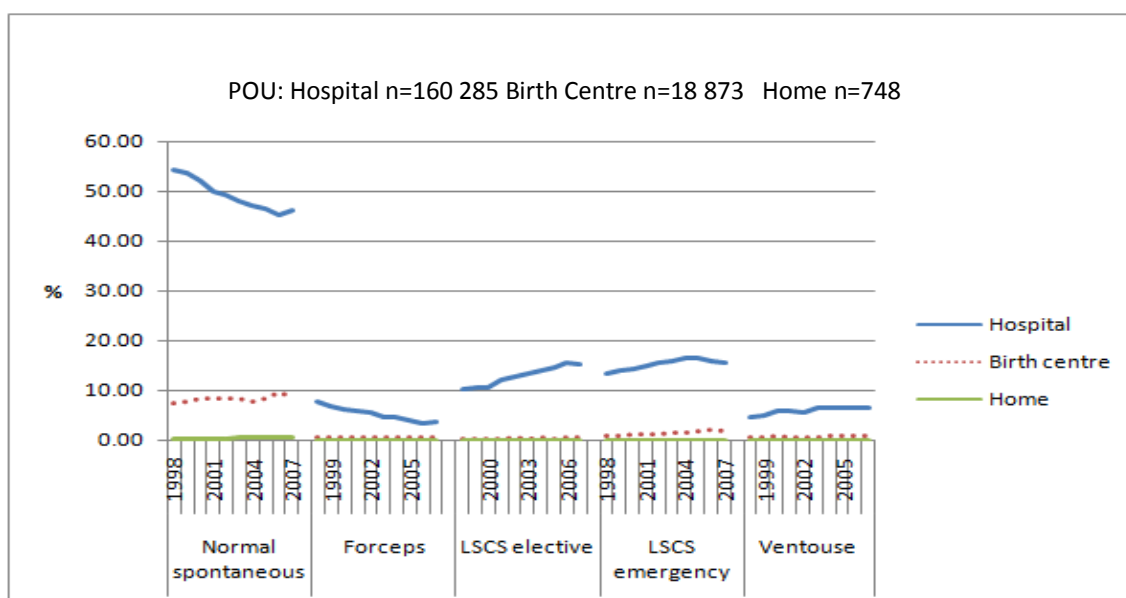
**** Total elective caesarean 1991-2007 = (18 227 private + 19 149 public) = 37 376

*****Total emergency caesarean 1991-2007 = (18 494 private + 29 422 public) = 47 916

4.2.1 Intended place of birth in South Australia 1985-2007

Figure 4.1 shows that, one of the reasons for the decrease in normal spontaneous delivery in hospitals is due to the gradual increase of very low risk pregnant women choosing a midwife at call working in a birth centre, rather than being admitted straight into a delivery ward at the start of labour. There are three midwife managed birth centres in South Australia: the Flinders Medical Centre, the Lyell McEwin Health Service and the Women’s and Children’s Hospital. The birth centres cater for both public and private maternity patients. There are no birth centres in any of the private hospitals which provide maternity care. Country South Australia maternity patients requiring more specialized services are referred to a larger hospital which may account for part of the increasing percentage of caesarean births (Managed Birth Centres 2012).

**Figure 4.1: Intended place of birth for all methods of delivery
(As percentage South Australian annual births 1985-2007)**



Source: POU unpublished data

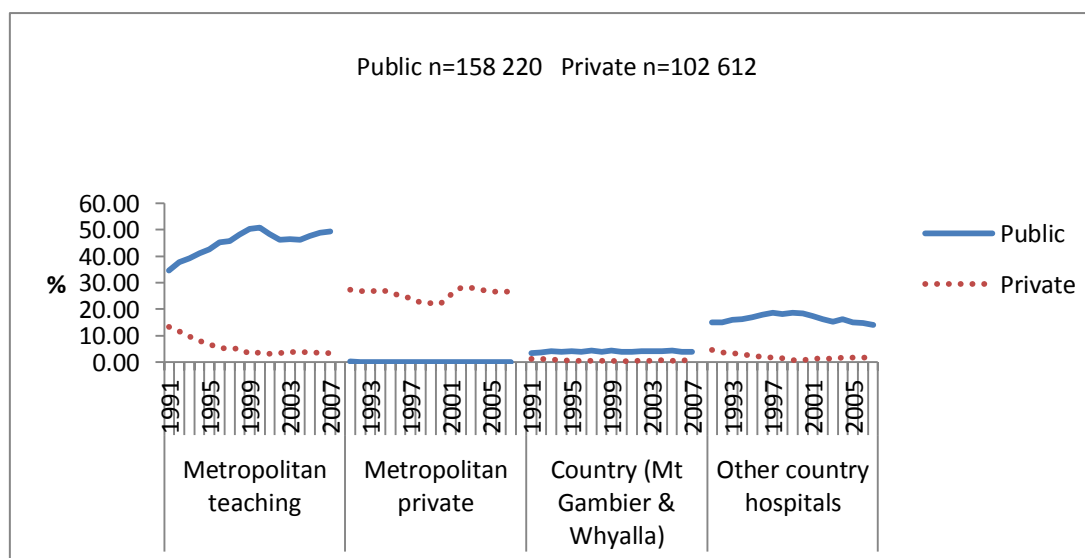
4.2.2 Public and private birth trends in metropolitan and regional South Australia 1991-2007

Figure 4.2 compares public and private mothers by category of hospital as a percentage of annual births in South Australia between 1991 and 2007. Mothers who are public patients have increased significantly in public metropolitan teaching hospitals, but remained very

minimal in metropolitan private hospitals, increasing very slightly in Mt Gambier and Whyalla and by 2007 decreased to the 1991 number. **Mothers in private hospitals** showed a steep decline to 1999 and since then have **remained constant** in metropolitan teaching hospitals; and in private hospitals have averaged out near 28 per cent; remaining very low in Mt Gambier and Whyalla and decreasing in other country areas in South Australia between 1991 and 2008.

Public metropolitan teaching hospital births have increased due to the intake of country South Australia maternity patients requiring more specialized services which are referred to a larger teaching hospital. Secondly, the rate of private maternity patients has decreased in rural areas and remained fairly static in metropolitan Adelaide. Maybe maternity patients are concerned about the gap fees of the private health system both for the birth of a baby and any recurrent costs if either the mother or baby has ongoing medical problems which require lengthy stays in a private hospital.

Figure 4.2: Public/Private births Metropolitan/Regional South Australia 1991-2007



Source: POU unpublished data

4.2.2.1 Rural maternity services

Rural and remote women face higher rates of maternal deaths and experience higher rates of neonatal deaths compared to metropolitan women (Department of Health and Ageing 2010:1). Outer regional Australia accounted for 10 per cent of the population, 10 per cent of the births and 16 per cent of maternal deaths. Remote and very remote areas account for 3

per cent of the population, 3 per cent of the births and 7 per cent of the deaths. Rural women have poorer access to maternity units, GPs and obstetricians (Department of Health and Ageing 2010). Many remote communities have become 'de-skilled in maternity services' due to a lack of exposure to birthing women (Council of Remote Area Nurses 2004).

Sant (2009:1) representing the Rural Doctors Association of Australia had the following to say about the centralisation of birthing services:

Maternity services in rural areas have been under increasing pressure over the past decade with at least 50 per cent of rural maternity units having been closed down in the past decade alone. It is very safe for low risk mothers to give birth in rural centres, in fact, actually safer than in the large metropolitan hospitals. A strong commitment from federal and state governments is needed to reopen and support maternity units in rural Australia. Pregnant rural women are increasingly having to travel great distances to give birth as more rural birthing units are closed by the state governments. Indigenous women continue to have much worse birthing outcomes. Unfortunately there is no sign that the situation is improving.

Rischbieth (2009:1) says that: More attention is needed in the development and implementation of measures to entice more GPs and specialist obstetricians and surgeons and midwives to the rewarding work of rural practice.

The closure of local birthing units means that there is a cost shift to the patient (fuel, childcare, takeaway food, mobile phone) who are travelling further for maternity care (Dietsch et al 2008). Some women are risking dangerous road travel and babies born on the side of the road (Dietsch et al 2010).

There is little published work to guide the maternity planning process to re-establish rural birthing services where the vast distances of remote Australia is regarded in a 4th world context* for remote Aboriginal and Torres Strait Islander communities. The Canadian Rural Birth Index which measures birthing numbers, population vulnerability and distance to surgical services to estimate the appropriate necessary maternity services for any population under 25 000 has been introduced as a planning recommendation in the Australian setting (Kildea et al 2010).

*4th World: A term used to designate any oppressed or underprivileged victim of a state (Grigg (1992). Groups which maintain a distinct political culture but are internationally unrecognised. 4th World attributes include a low level of political integration and economic integration in the state system resulting in an inferior status, and an under-privileged economic position (Bugajski 1991).

The critical time known as the 'decision to incision/delivery interval' is from when a caesarean section is recognised as necessary to save the mother and/or infant, to when it occurs, is thought to be 75 minutes, but this evidence is based on a tertiary teaching hospital setting in an urban area (Thomas et al 2004). Due to community pressure for primary level birthing facilities policy makers are now re-establishing small birth units. The National Health and Medical Research Council funded a study to determine the outcomes and costs of providing such primary care in small maternity units in Australia (Tracy et al 2006). The re-establishment of smaller regional birthing health care services would take some pressure off of metropolitan teaching hospitals.

Little is known about the performance of small rural maternity units, including stand-alone midwife units (Tucker 2010), where the model of maternity care is decided according to mother and fetus/infant risk factors present. Tucker (2010) found that caesarean section rates appeared lower and neonatal unit admissions higher for women from midwife stand-alone units. Also, that specialist care referrals were appropriate. Pregnancy care before birth was provided for about one-third of rural women who remained without complications. Further evidence about mother and infant birth outcomes is needed to develop staffing models of stand-alone midwife care in rural areas.

4.2.2.2 Aboriginal and Torres Strait Islander birthing services

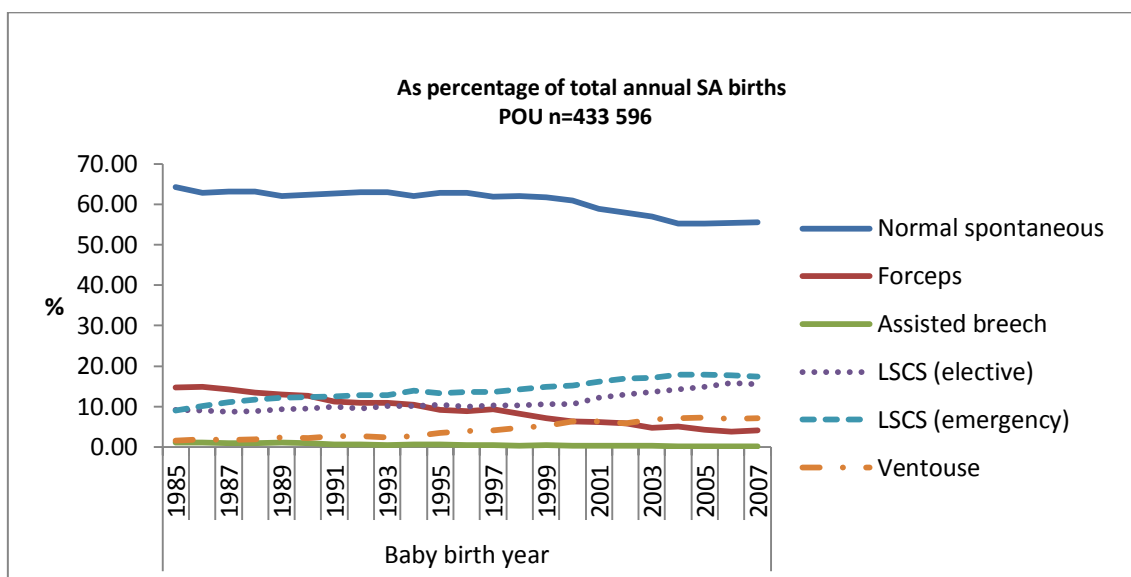
Aboriginal and Torres Strait Islander women are 5.5 times more likely to die in childbirth than non-indigenous and Torres Strait Islander women and make up 3.6 per cent of the total birthing population (AIHW 2004). Even after much consultation with Aboriginal women little improvement has resulted in maternal health and after birth health outcomes (Hirst 2005). There are anecdotal reports of increasing numbers of women in rural areas 'free-birthing' which consists of women birthing at home without a midwife or doctor in an attempt to stay close to home to give birth (Australian College of Midwives 2008).

Rural birthing infrastructure in Australia (Roxon 2008) will need to be flexible enough to support a range of models responsive to the needs and circumstances of local communities.

4.2.3 Method of delivery trends in South Australia 1985-2007

Figure 4.3 indicates the method of birth of 433 596 South Australian babies between 1985 and 2007 as an average percentage of total annual births. The dominant method of birth is normal spontaneous (60.7 per cent), followed by emergency caesarean (14.1 per cent); elective caesarean (11.1 per cent); forceps (9.1 per cent); ventouse (4.2 per cent) and assisted breech (0.5 per cent). A small number of babies (1 080) were delivered by breech extraction and breech spontaneous methods. Elective and emergency caesarean delivery methods are constantly compared with normal spontaneous births because they are the dominant birth method and it is assumed that it is a birthing method requiring less technological intervention in all South Australia Health jurisdictions. Spontaneous vaginal delivery implies that a birth occurred without the need for forceps, vacuum, or any other instrumentation. Medical care includes pain relief and the repair of lacerations (Healthline 2012).

Figure 4.3: Delivery method trends South Australia 1985-2007



Source: POU unpublished data

4.2.4 Implications of low birth weight on birth method

The **association between low birth weight and low socio-economic status** has been known since 1910 (Newsholme 1910). Children of low birth weights are more likely to have disabilities (Bendel et al 1989), hospitalisations (Overpeck et al 1989), brain damage (Scottish low birth study 1922), and poorer language developments (Hille et al 1994), be placed in special education classes (Roussounis et al 1993), and display more intellectual impairments (Valdez et al 1994). Low birth-weight is the single most important factor affecting infant morbidity and mortality and there is growing evidence that the adverse consequences of low birth weight continue throughout the life cycle (Kogan 1995). Low social support and stress among lower income women are associated with a greater risk of smoking (McCormick et al 1990). Smoking has been estimated to account for 21-39 per cent of low birth weight cases (Floyd et al 1991). Australian Indigenous infants have lower birth weight (Titmuss et al 2008), a greater risk of preterm birth and higher infant mortality compared with other Australian infants. A NSW study using the SEIFA Index was used to rank mothers according to socio-economic status of their suburb of residence. Indigenous status, reduced birth weight, mother's single-parent status, smoking and residence in disadvantaged suburbs (Titmuss et al 2008: 495-8).

Low birth-weight babies are at increased risk of hospitalisation and neonatal death, are more likely to suffer from physical and neurological complications than babies born with a normal birth weight. Children born with an extremely low birth weight of less than 1000 grams have also been found to have more psycho-social problems. These children are at risk of having difficulties at school. Teenagers who had very low birth weight were less likely to achieve well on intellectual measures, in particular reading (Samuelsson 2006) and special educational assistance and /or repeated a grade (Saigal 2003:943-50).

The baby birth weight pattern has remained constant between 1985 and 2007. According to the UNO definitions of low baby birth weight, an analysis of the South Australian baby birth weight data found 29 417 or 6.8 per cent of the babies born between 1985 and 2007 fall into the low baby birth weight categories (Table 4.2). The number of babies born in South Australia between 1985 and 2007 with a low birth weight under 2 500 grams was 6.8 per cent. The age cohorts of mothers with the highest percentage of low birth weights were

the youngest and oldest mothers. The age cohorts with the lowest percentage of low birth weights were the 20-24-29 years of age (6.2 per cent and 6.4 per cent). Over three-quarters of fetal deaths were babies with low birth weight in 2002 (AIHW 2004:14).

Table 4.2: Low birth weight by age of mother for all births in South Australia, 1985-2007

Birth weight (grams)	Age of mother									Total
	12-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	
0-500	60	166	268	267	126	36	2	0	0	925
501-1 000	184	396	621	594	285	44	3	0	0	2127
1001-1500	210	528	850	805	386	55	1	0	0	2835
1501-2000	406	1074	1849	1534	764	130	6	2	0	5763
2001-2500	1301	3616	5560	4774	2109	386	15	4	0	17761
2501-3000	4570	14241	22799	18512	7360	1327	53	5	1	68868
3001-3500	9144	30466	54515	44963	16896	2739	117	2	0	158842
3501-4000	6173	23483	44793	38445	14600	2188	81	2	0	129765
4001-4500	1660	6872	13975	12523	5036	823	28	0	0	40917
4501-5000	237	971	2001	2018	817	124	5	0	0	6173
5001-5500	23	97	200	212	75	18	0	0	0	625
5501-6000	1	7	18	15	13	2	0	0	0	56
6001-6380	0	0	2	2	1	2	0	0	0	7
Total	23969	81917	147451	124664	48468	7874	311	15	1	434670
Total<2500gms	2 161	5 780	9 148	7 974	3 670	651	27	6	1	
% low birth weight	9.0	7.1	6.2	6.4	7.6	8.3	8.7	40.0		

Source: POU unpublished data

Low birth-weight is defined by the World Health Organization as follows: *low birth-weight—babies weighing less than 2500 grams **very low birth-weight—babies weighing less than 1500 grams *** extremely low birth weight <1000 grams

Low birth weight is shown in Table 4.3 as a significant risk factor for both elective (5.6 per cent) and emergency caesarean delivery (16.7 per cent). The total caesarean rate for low birth weight babies was 11.8 per cent. Breech (assisted, extraction and spontaneous) deliveries show the highest rate of low birth weight as a percentage of each category of breech birth. The lowest percentages of low baby birth weight were found for normal spontaneous, forceps and ventouse methods of delivery.

Table 4.3: Low birth weight and method of delivery in South Australia 1985-2007

Method of delivery	Total births 1985-2007 n=434 676	Low birth weight < 2500 grams	Percentage low birth babies for each method of birth
Normal spontaneous	262 236	12 357	4.7
Forceps	40 085	1 987	5.0
Assisted breech	2 344	958	40.9
Ventouse	17 990	602	3.3
Breech extraction	490	263	53.7
Breech spontaneous	590	391	66.3
Elective caesarean	48 056	2 670	5.6
Emergency caesarean	60 885	10 186	16.7
Total caesarean	108 941	12 856	11.8

Source: POU unpublished data

4.2.5 Caesarean by model of birth care

In Australia, there has been a perception that elective caesarean is safer and less risky for both mother and baby (Gallego 2008). Further study has noted concerns about the rising number of babies admitted to intensive care after caesarean birth for no indicated risk factor before birth, in particular those babies delivered too early resulting in an increased neonatal mortality rate than for vaginal birth (MacDorman et al 2006). Recent evidence about the increase of respiratory morbidity in babies born by caesarean section before labour (elective) is also a key factor in the Maternity Services Review (Callaghan et al 2006; Zanardo et al 2004). In response to the new evidence about intensive care and breathing difficulties in babies born too early, the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) has endorsed that the timing of elective and pre-labour caesarean section in women, without additional risks, should be carried out at approximately 39 weeks of gestation (RANZCOG 2006; NSW Health 2007).

Dahlen and Kruske (2012) found the increase of caesarean section seems largely driven by the recommendations of doctors, particularly in Queensland's private hospitals, because women are older and more likely to be overweight which increases the chance of complications – but caesareans are rising among all groups, regardless of age, other risk factors and weight. There is a higher correlation between postcode and private insurance status and the caesarean section rate, than being older, overweight, sick or asking for it. The

healthiest, wealthiest women who are least likely to be obese, smoke or have poor health (women giving birth in private hospitals with private obstetricians) are nearly twice as likely to have a caesarean section. Dahen (2012) representing the Queensland Centre for Mothers and Babies has concluded that it is time to rethink the reasons for caesarean birth and look beyond the mother and baby risk factors.

The Australian College of Midwives is a member of the International College of Midwives and is committed to reducing inequality through greater access to essential midwifery care worldwide, including the Australian maternal and perinatal mortality rates in the Indigenous population which continue to be worse than the non-Indigenous population (Martin 2011). The inequity of maternal services in Australia is due to a deficit of 2000 midwives. The push to overcome the deficit of midwives in Australia is part of the international aim of the 2015 WHO Millennium Development Goals 4 (reduce under five mortality rate), 5 (reduce infant mortality ratio), and 6 (combat HIV and other diseases) to improve maternal and newborn health globally by 2015 (WHO 2002).

From November 2010 women and midwives welcomed in a new era in Australian maternity legislative reform which has given access to midwives of the Medicare Benefits Schedule and the Pharmaceutical Benefits Scheme. This allows women to choose their own midwife for pregnancy, birth in a hospital and for the postnatal period, and to access Medicare rebates for care from the midwife of their choice. The midwife model of care for mother and baby in a hospital has 30 (thirty) midwives who are classified as Eligible Midwives in Australia which is far short from the 2000 required to fill the Australian midwife current deficit. 'The Australian College of Midwives hopes to see their model of care expand significantly in the next few years (Maimann 2011:1).

An interview by Trenwith (Sydney Morning Herald 2010:1) with the Australian Medical Association Queensland President Dr Richard Kidd said:

The research from Queensland Health showed that private obstetricians were better at identifying when a woman required a caesarean. In the public system 60 per cent of the caesareans are not planned (emergency caesareans). Women needed to be better informed about the differences in maternity care in private and public hospitals. Private hospital care is just not better quality of the same care model, it is actually a different approach. Obstetricians, general practitioners and midwives took different approaches to birth.

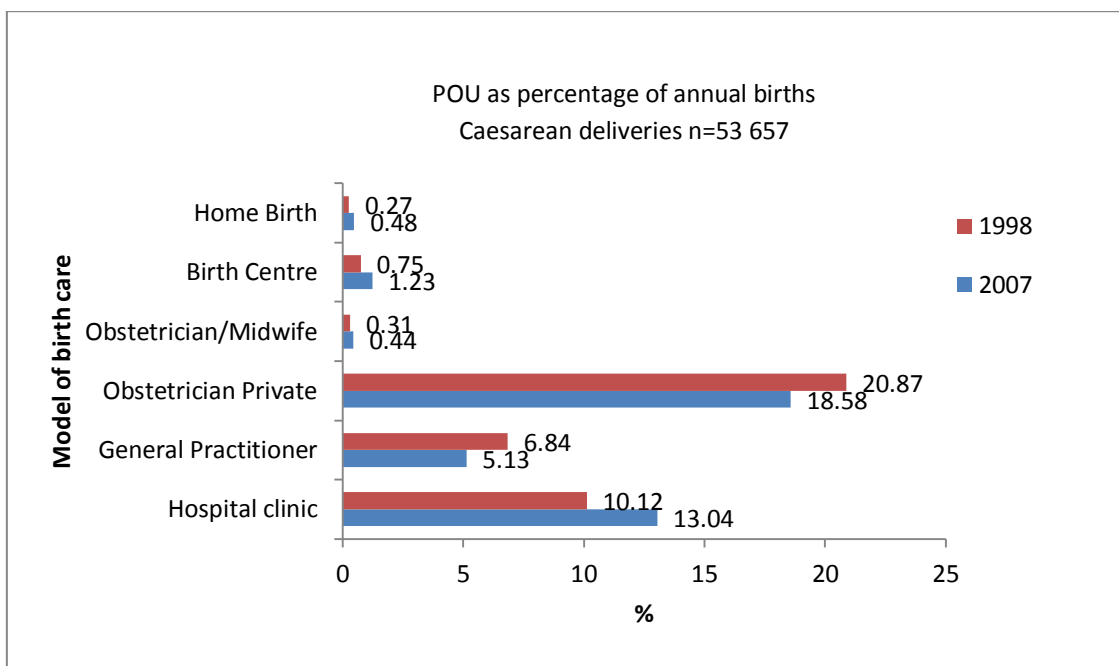
Queensland Health (Johnson and Coory 2005) in an attempt to find a clearer picture of the reasons for caesarean birth found that by using the ICD.10.4 AM (International Classification of Diseases and Procedures Australian Modification use for case-mix funding of public and private hospitals) reason code for *no classifiable* (medical, labour or delivery-related) condition (082), that private hospitals in Queensland used this code for 16.9 per cent of their primary caesarean deliveries compared with the public hospital use of this code at 4.4 per cent. Public hospitals had a higher failure to progress in labour (ICD 061-063) (25.6 per cent) and fetal distress (ICD 068) (21.3 per cent) than the private hospitals system (16.8 per cent and 11.8 per cent). It is the failure to progress in labour situation that can lead to interventions of induction of labour which in turn can result in a succession of medical interventions resulting in a higher emergency caesarean section delivery rate.

In South Australia, the Flinders Medical Centre, the Lyell McEwin Hospital and the Women's and Children's Hospital offer midwifery led models of birth care. Shared care is provided mainly by the women's own general practitioner with accessory visits to an obstetrician. The GP must be accredited with the South Australia State Wide Shared Care Program (2012).

Figure 4.4 shows the changes in rates of the different models of birth care available in South Australia where caesarean delivery has been performed between 1998 and 2007. Private obstetric caesarean delivery has dropped from 20.9 to 18.6 per cent; in the hospital clinics caesarean deliveries have increased from 10.1 to 13 per cent, general practitioner caesarean delivery has decreased from 6.8 down to 5.1 per cent, birth centre caesarean rates have increased from 0.8 to 1.2 per cent and home birth caesarean rates have increased from 0.3 to 0.5 per cent.

The decrease in private health obstetrician led caesarean births could be due to less trained obstetricians, the cost of private health care and gap fees, and the development of collaboration models of birth care between obstetricians and midwives in birth centres and hospital clinics. Home birth advocates strongly support less medical intervention in their model of birth care.

Figure 4.4: Change in caesarean delivery by model of birth care South Australia 1998 and 2007



Source: POU unpublished data

4.2.6 Home Birth and caesarean section

Home birth makes up a very small number of deliveries within the total POU 1985-2007 dataset of 634 out of 43 682 or 0.15 per cent. However homebirth as a place of delivery has received much attention within the last few years. Home birth publicity may in itself have acted as a tool for women becoming more educated and asking more questions about pregnancy together with the access to medical journal articles on the internet (Barrett 2010).

Out of 634 homebirth deliveries between 1998 and 2007 in South Australia 87.1 per cent were born by normal spontaneous delivery; 6.8 per cent and 2.1 per cent by LSCS emergency.

The Coroner (Sharley 2012) urged changes to laws on homebirths after investigating deaths of three newborns in South Australia, namely: midwives must be registered; better education for people considering home births; and for home birth practitioners to notify

health authorities of patients intending to have homebirths in case a caesarean section is required.

The Coroner's findings have been viewed by Homebirth Australia/Maternity Coalition represented by Meares (2012:1-2) who had the following to say about the judgment:

Women make the choice to give birth outside a hospital with identified risk factors due to their profound dissatisfaction with the current maternity care system and in some cases because of previous hospital experiences that have left them deeply traumatised.

Any law reform around homebirth must recognise that all women (including pregnant women) have a fundamental right to bodily autonomy and a legal right to refuse medical care.

What was missing from the Coroner's findings was any real consideration of the reasons why women choose homebirth. Lack of access to quality maternity care options and sensitive providers forces many women to turn their back on hospital care.

No doubt, the homebirth debate will continue, and hopefully Homebirth Australia will give women the facts in South Australia that between 1998 and 2007, that 8.8 per cent of women gave birth by caesarean after a planned homebirth. Any person planning a home birth must take account of access to emergency hospital care if required. This would include notification of the hospital of an intending homebirth and the ready access of transport.

4.3 Will the Commonwealth Government Maternity Services Review give women more 'model of birth care' choice in the future?

Council of Australian Governments (COAG 2008) approved Commonwealth Government finance for the training of more midwives in an attempt to give birthing women *more choice in a birthing model of care* to reduce the caesarean birth rate and service rural and remote communities. That indirectly means that the medical profession and midwives will need to work collaboratively in an attempt to reduce the caesarean delivery birth rate. The question emerges here as to whether the autonomous and powerful medical professions who pay heavy hefty medical indemnity insurance and are under the constant glare of medical malpractice suites, will be willing to participate in the recommendations of the Maternity Services Review recommendations? For the purpose of this study, the Maternity Services Review is aware that access to maternity services across Australia is not equitable and that there is a need for a national data collection which monitors maternal methods of delivery and associated morbidity (Maternity Services Review 2008:14):

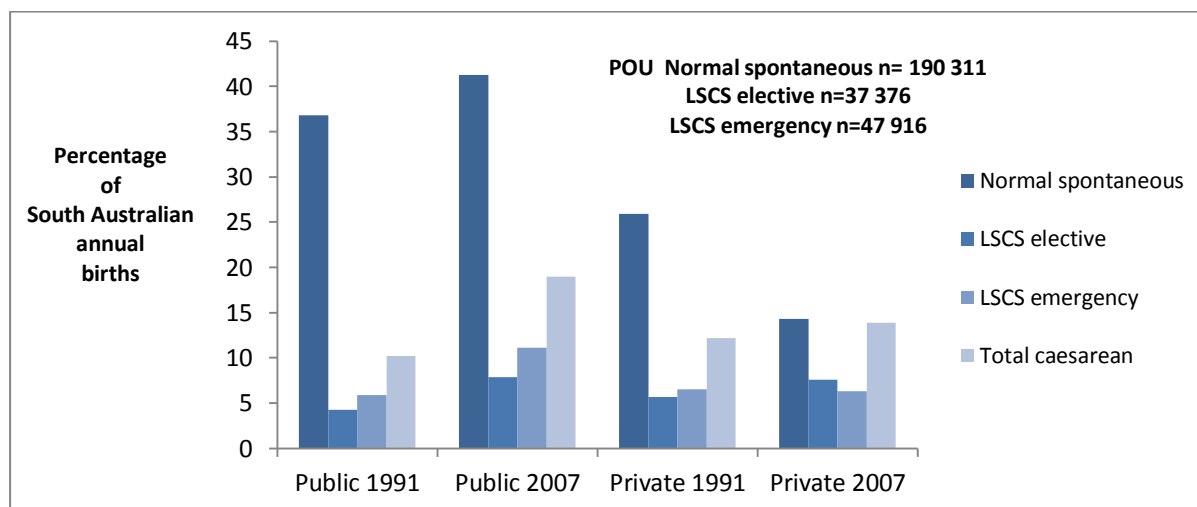
That the Australian Government, in consultation with States and Territories and key stakeholders, initiate targeted research aimed at improving the quality and safety of maternity services in key priority areas, such as evidence around interventions, **particularly caesarean sections**, and maternal experience and outcomes, including postnatal care, including the impact of caesarean delivery on available medical resources.

That the Australian Government, in consultation with States and Territories and key stakeholders, agree and implement arrangements for consistent, **comprehensive national data collection**, monitoring and review, for maternal perinatal mortality and morbidity.

4.4 Difference in elective and emergency caesarean delivery rates in South Australia 1991- 2007

Figure 4.5 shows the differences between normal spontaneous, LSCS elective and LSCS emergency delivery for 1991 and 2007. There is an increase of public normal spontaneous birth from 36.8 to 41.3 per cent in 2007 with a corresponding drop from 25.9 per cent private spontaneous birth in 1991 to 14.3 per cent in 2007.

Figure 4.5: Normal spontaneous elective and emergency caesarean birth trends South Australia 1991-2007



Source: POU unpublished data

Public elective caesarean delivery increased in 2007 while private elective deliveries increased a smaller amount in 2007. It is important to note the private elective caesareans were higher in 1991 than public elective deliveries. Public emergency caesareans increased significantly compared with private emergency deliveries between 1991 and 2007.

4.4.1 Public and private hospital length of stay days for women who birth by elective and emergency caesarean section 2001-2008

The Integrated South Australian Activity Collection has collected the length of public and private hospital stay days of a mother for each birth in South Australia between 2001 and 2008. Figure 4.6 indicates both elective and emergency private caesarean deliveries have longer length of stay days than do public maternity patients. Private elective women have a peak stay of five days compared with four days for public elective caesarean women. Public mothers who deliver their babies by emergency caesarean section have a peak length of five hospital stay days compared with private emergency mothers with a peak hospital stay of 6-7 days.

Figure 4.6: Public and private length of hospital stay days South Australia 2001-2008

Length hospital stay days South Australia 2001-2008

ISAAC as percentage total caesarean births n= 36 861

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Source: ISAAC unpublished data

What does the longer stay say for private women maternity patients who deliver their babies by caesarean section than for those women who deliver their babies by caesarean section in the public hospital system? Does it mean that private women are not as healthy as public women? Or, does it mean that public women do not receive the necessary health services before they leave hospital? Or, is it that in Australia's maternity system there is a socio-economic gradient which provides more care for wealthier women? This assumption leads to a further question which may be of considerable value for life course health of birthing women and that is: 'If a woman has the chance to rest more after the birth of a

baby by caesarean section will she have less life course morbidity as a result of her pregnancy and birth? Or, should case-mix funding recognise that longer lengths of stay are necessary for women who have delivered a child by caesarean section, no matter whether the mother is a private or a public patient?

Largely unexpected maternal morbidity after a caesarean delivery contributes to a gap in knowledge about the lived reality for mothers not to always be able to rest after caesarean section (Kealy et al 2010). Maternal health and recovery issues need to be taken more seriously and underlies the importance of efforts to reduce the number of caesareans performed without identified clinical indications. After caesarean morbidity included urinary incontinence, wound infection, endometriosis, pain and reduced mobility for a longer time than advised pre-birth. The advice women receive prior to discharge from hospital after caesarean section needs to be revised to consider the context of the birth mother and family's lived reality (Kealy et al 2010).

Caesarean birth is associated with increasing rates of severe maternal morbidity (Kuklina et al 2009), including potentially fatal complications, including sepsis, thromboembolic events, anaesthetic complications (Kouroukian 2004) and hospital readmission (Belfort et al 2010). After adjusting for maternal age, demographic factors and pre-existing medical complications, emergency caesarean section has been shown to quadruple the risk of having a life threatening event; treble the risk of severe haemorrhage, and represents almost twelve times greater risk for severe sepsis (Waterstone et al 2001).

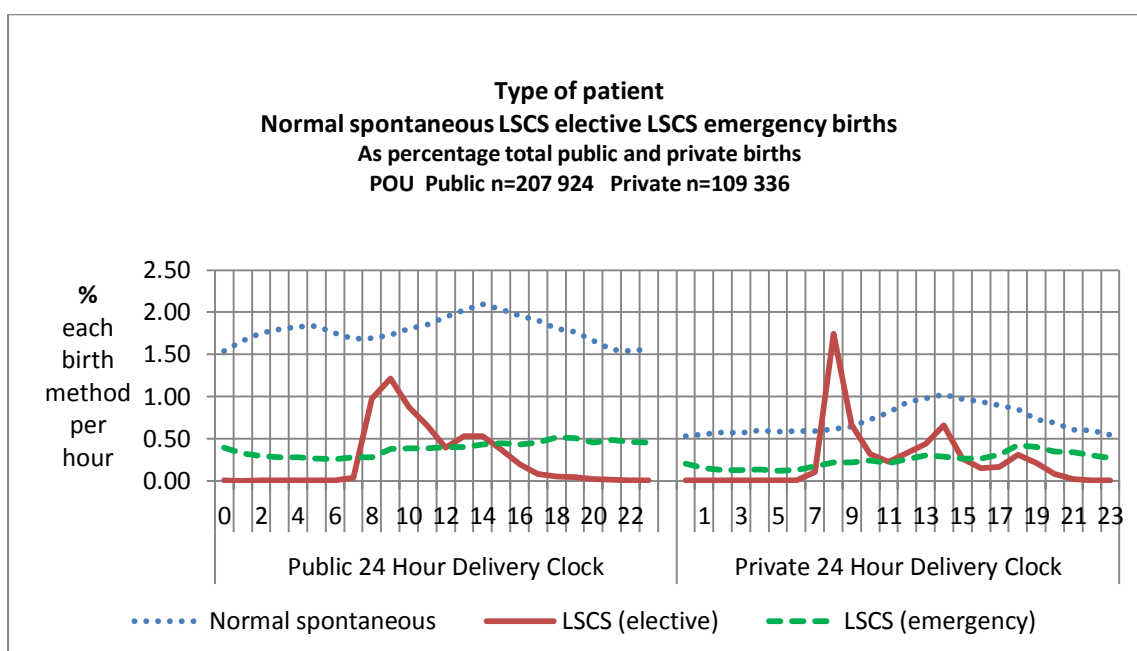
4.5 Human resources and case-mix funding as causes of increased caesarean birth rates

There is now concern that rising rates of caesarean delivery may divert human and financial resources from other priority medical interventions (Wagner 2001), as well as the indiscriminate use of caesarean section on maternal and neonatal health (Hall and Bewley 1999; Wagner 2000; Thomas and Paranjothy 2001; Villar et al 2006). On the other hand, it has also been argued that reducing the caesarean delivery rates would impact on the mother's and infant's health and patient choices must be considered (Sachs and Castro 2003).

Figure 4.7 compares normal spontaneous, elective and emergency deliveries for all babies born by normal spontaneous and caesarean birth as a percentage of births per hour per day in South Australia between 1985 and 2007. Over the 22 years hospital administration regarding the elective, emergency and spontaneous deliveries have remained more or less the same.

Standout points between the public and private hospital system include the peak elective caesarean births in the private sector at 10am and the higher percentage of normal spontaneous deliveries which peak about 2pm and emergency caesarean deliveries which run throughout the 24 hour clock but tend to be higher in the afternoon and evening.

Figure 4.7: 24 Hour delivery clock South Australia 1991-2007



Source: POU unpublished data

Lauer et al (2010:1-22) completed an international study for the WHO to seek determinants of caesarean section rates in developed countries including Australia, New Zealand, Canada and the United States by analysing longitudinal cross-country data. Their results found that the health system factors (human resources such as obstetricians and midwives), and in the case of Australia, the case-mix financing profile, are important aggregate-level determinants of the use of caesarean section which have been overlooked in caesarean section rate

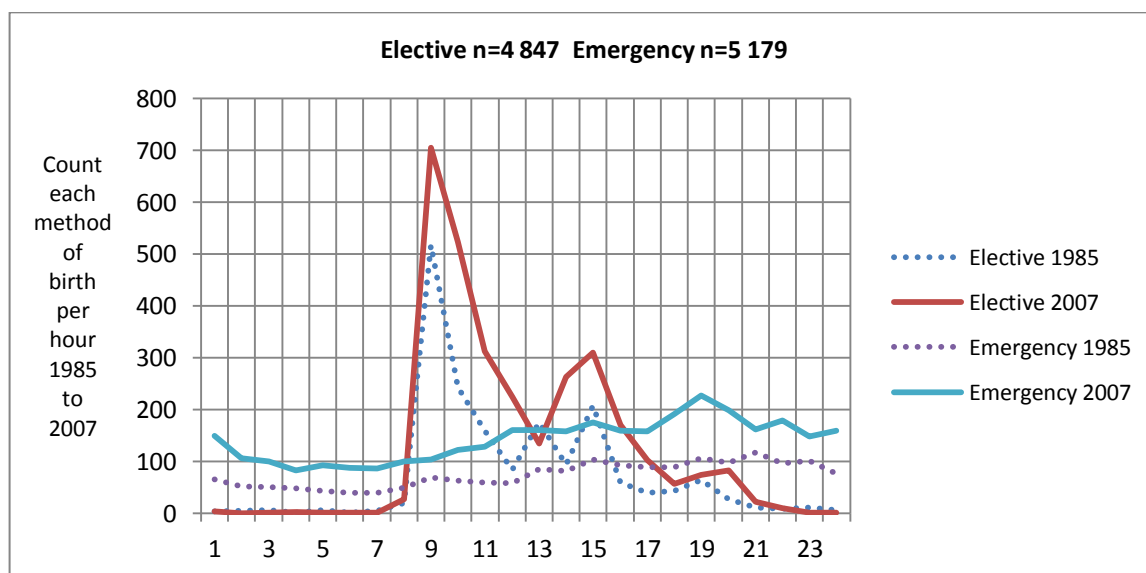
debates. This is different to most other studies on caesarean birth trends which concentrate on income of the patient (Belizan et al 1999).

Health system factors are related to the legal environment in which health-care decisions are made. The results of this WHO study suggests that at a population level it is not the older arguments that the medical doctors who do have a large influence as the suppliers of caesarean delivery or the patients' demands that are the main determinants of the increasing caesarean delivery rates in a country.

Health system factors such as the human resources and the financing profile were found to have the largest impact on caesarean delivery rates. Therefore, caesarean delivery rates might be amenable to control through policy instruments acting at the health system level of a developed country such as Australia's (Lauer et al 2010:1-22).

Figure 4.8 showing the 1985 and 2007 delivery clock for all elective and emergency births in 1985 and 2007 indicate a similar pattern of hospital management. The peak time for elective caesareans is 9am – 12noon with a decreasing series of elective delivery waves moving through to about 9.00pm in the evening. Emergency caesarean deliveries also follow a similar path in both 1985 and 2007 with fewer deliveries during the early hours of the morning picking up to maximum deliveries as the elective delivery rate decreases in the afternoon and continuing onto midnight.

Figure 4.8: Elective/Emergency 24 hour delivery clock South Australia 1985-2007



Source: POU unpublished data

Case-mix funding was first introduced in Victoria in 1993-1994 and South Australia followed in 1994-95. The role of case-mix funding is to reduce expenditure and improve efficiency by budgeting for a hospital based on the number and type of patients treated in the hospital resulting in the performance of a hospital being determined on performance (Alford 1994; Armstrong 1998).

A serious question arises: 'Due to the case-mix management approach to hospital funding and the constant need for efficiency in the use of staff and resources, does this in turn create a demand for the induction of labour and the use of oxytocins which speed up labour, which are being thought of as reasons for the increasing rate of emergency caesarean section?'

4.6 Conclusion

Caesarean birth rates in South Australia have increased from 22.5 per cent in 1985 to 32.8 per cent in 2007. At the same time, the maternal place of birth choice in South Australia remains dominated by the hospital facility and under control of the medical profession made up of general practitioners, obstetricians and gynaecologists. The recent Maternity Services Review led by midwives has made it clear that there is a severe shortfall of eligible midwives to use new federal health legislation which empowers them to prescribe drugs and work in collaboration with the medical profession.

There is a continuing debate between midwives and obstetricians over the increasing rate of caesarean delivery with both parties claiming their model of birth care is better. There is increasing awareness of maternal morbidity after caesarean delivery and the need for post-operative care protocols to be revised. There is no generic caesarean birth information document available for mothers who choose caesarean birth for reasons other than lifesaving for mother and infant as to the complications which may occur.

The elective caesarean rate was higher in private hospitals and the emergency caesarean delivery rate was higher in public hospitals. The length of patient hospital stay days was higher for women who delivered by caesarean section in private hospitals. A suggested reason for the number of elective caesarean deliveries in private hospitals may be explained in the case-mix funding process of the hospital system. Private hospitals are smaller than

public hospitals and therefore there may be an urgency to 'book more women for elective caesarean section' to gain the most efficient use of staff available.

Recent case-mix interpretation of hospital birth data shows that in South Australia the schedules for methods of delivery including elective and emergency were firmly established in 1985 and have continued till 2007, and it has been suggested that the funding of the hospital case-mix system itself may be another cause of the increasing caesarean birth rate.

Recent Commonwealth Government policy intends public health women to have access to the same maternity services as private mothers. Under the current hospital and staff case-mix protocols, this suggests a change from the increasing rate of public emergency caesareans to an increase of public elective caesarean births.

CHAPTER FIVE

DEMOGRAPHIC CHARACTERISTICS OF MOTHERS

5.1 Introduction

This chapter examines the demographic characteristics of mothers who have given birth by caesarean section in South Australia. The bulk of this chapter analyses demographic material released from the South Australia Health Pregnancy Outcome Unit, custodians for a period of 22 years between 1985 and 2007, from which the relationship between the age of mother and caesarean birth rates in South Australia is analysed at three levels: Firstly, at an aggregate state level, secondly, at the hospital classification level, thirdly, by comparing the rates of elective and emergency caesarean delivery as a percentage within the public and private hospital systems of South Australia. The remainder of this chapter compares the association of age of mother with race and ethnicity of mother, occupation of father, maternal mortality and morbidity, and mortality status of infant at birth and parity of mother. Parity of mother is increasingly being researched as a birth indicator for population projection and infrastructure planning reasons (Corr and Kippen 2006). Attention is given to the analysis of pregnancy data collection at the hospital level for the application of public government social planning and information for mothers and fathers about their chosen birth facility.

5.2 Caesarean birth in Australia

5.2.1 Maternal age as a reason for caesarean section birth

Advanced maternal age is an important clinical risk factor for caesarean birth (Bayrampour and Hearman 2010; Aghamohammadi and Nooritajer 2011). Adverse outcomes are more likely to occur in younger and older mothers (Gortzak-Uzan et al 2001; Joseph et al 2005). The average age of birthing women in Australia has increased from 28.9 years in 1998 to

29.9 years in 2007. In 2007, 27.6 per cent of women who had delivered babies had a history of previous caesarean section/s birth/s. Of those women who had a history of previous caesarean section, 22.9 per cent had the procedure more than once (AIHW 2010:20). Declerq et al (2006) has pointed out that older women can develop medical conditions, and have more multiple births and elevated rates of caesarean section. Caesarean section rates are increasing for all groups of birthing women, regardless of age, the number of health problems they are having, the extent of health problems and their race/ethnicity.

5.2.2 Reasons for older women giving birth

This trend in delayed childbearing has been attributed to social, educational, economic and increased access to reproduction technology (Carolan 2003; Cleary-Goldman et al 2005). Studies by Jun (2003) found there is considerable pressure for white-collar women at the crossroads of their career to delay childbearing. The decision to carry a baby is often made difficult by employees who require new staff not be pregnant within a certain amount of time, usually five years. Some companies (Jun 2003) assign pregnancy quotas to a manageable number because the cost to an employer is large when a critical staff member takes several months off on maternity leave.

Mirowsky (2012) , a sociologist, found that a delay in family creation and delivery of a first born interferes with educational attainment and pre-disposes a woman to single parenthood, unemployment and poverty. After 35 years of age a woman treats her health more carefully with less risky behaviour with age and usually has a permanent sexual partner. Social and economic advantages of a 34 year old mother compensates for the process of ageing. Yet, Luke (2007) claims that older mothers over the age of 35 are more likely than younger mothers to experience complications during pregnancy and delivery including caesarean section.

5.2.3 Caesarean birth in Australia 2007

There were 98 371 caesarean sections performed in Australia in 2007 accounting for 30.9 per cent of all Australian women who gave birth. This rate has remained stable in both 2006 and 2007. Of all the women who delivered their baby by caesarean section, 18.1 per cent

had a caesarean section without labour (elective caesarean section) and 12.8 per cent delivered their baby with labour (emergency caesarean section).

The Australian results shown in Table 5.1 indicate that as the age of both public and private patients increase so does the percentage of mothers who give birth by caesarean section. Moreover, the percentage difference between the public and private sector hospitals shows generally higher rates in private hospitals with the largest differential for the 20-24 age group of some 43 per cent.

Table 5.1: Australian women who gave birth by caesarean section by maternal age and hospital sector 2007 (percentage)

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Source: Adapted from Table A4, Laws et al 2007:98

Kidd (2010) claimed that private obstetricians were better at identifying the need for caesarean section and that is why private hospitals have a higher rate of section births and the public hospital system has a much higher rate of emergency caesarean deliveries. Kruske (2012) found that only half of the women who had a planned caesarean (elective) believed they had had all the risks and benefits explained to them. Many women who seek care during pregnancy are passive and they defer the birth decision making to their health provider. Kruske (2012) suspects the trend of older mothers causing some of the caesarean increase is due to doctors being afraid of litigation. Caesarean delivery is being recommended and the mothers think this process will be straight forward without realizing that the caesarean recovery period can be quite complicated.

I think there is a belief in the health sector that women are actually driving the high rates of caesarean birth because they want control for whatever reason. Our data dispels this myth and shows that the vast majority of women are having caesareans because their health provider actually recommends that (Kruske 2012:1).

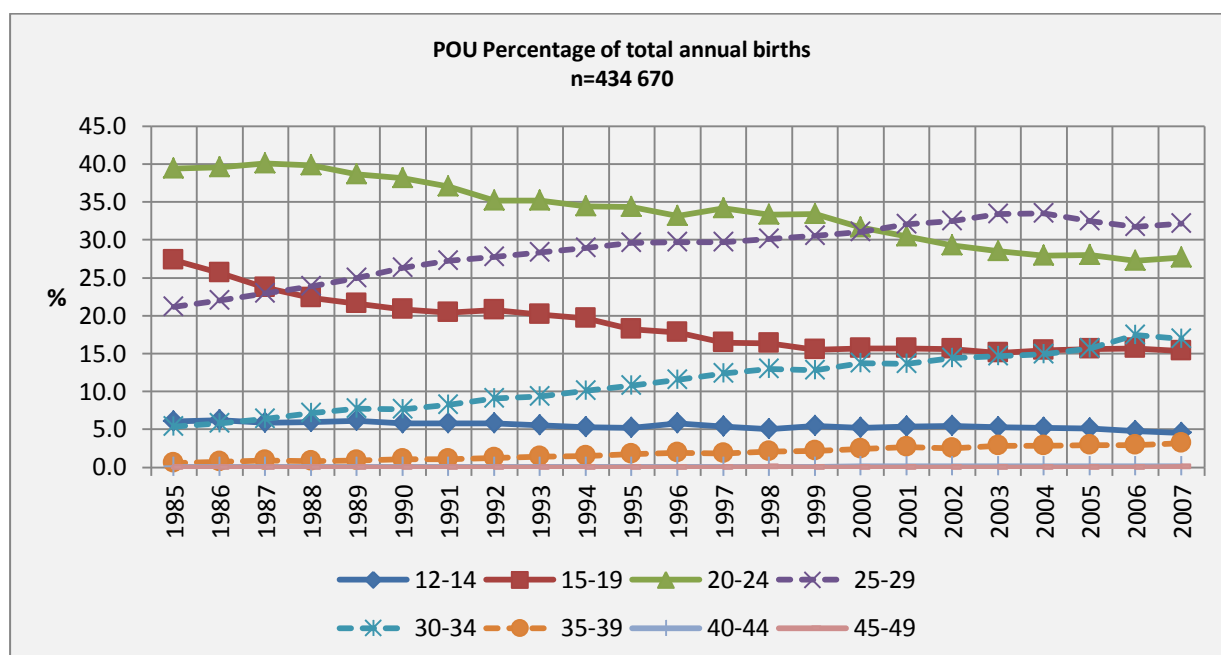
5.3 Maternal age for birth in South Australia 1985-2007

5.3.1 Maternal age trends of all births South Australia 1985-2007

In South Australia the median age for all mothers who gave birth increased from 26 to 30 years of age. The average age for women giving birth in South Australia has changed from 26.6 years of age in 1985 to 30.1 years of age in 2007 and the total fertility rate has changed from 1.75 in 1985 to 1.91 in 2007. Total births have ranged from 17 389 in 2004 to 19 814 in 1993. This study looks at the total cohort of 434 682 mothers who gave birth in South Australia between 1985 and 2007 to determine any variations in their age at which they gave birth by all methods of delivery (normal spontaneous, caesarean, forceps, ventouse and breech).

Figure 5.1 shows that there are two distinct age of mother trends between 1985 and 2007 in South Australia. There is a very significant decrease of births in the three younger age cohorts of mothers 12-14; 15-19; and 20-24 years and a very significant increase in mothers between the ages 25-39 years of age. Mothers aged 40 years and onwards who give birth are almost negligible.

Figure 5.1: Age of all mothers who gave birth in South Australia 1985-2007

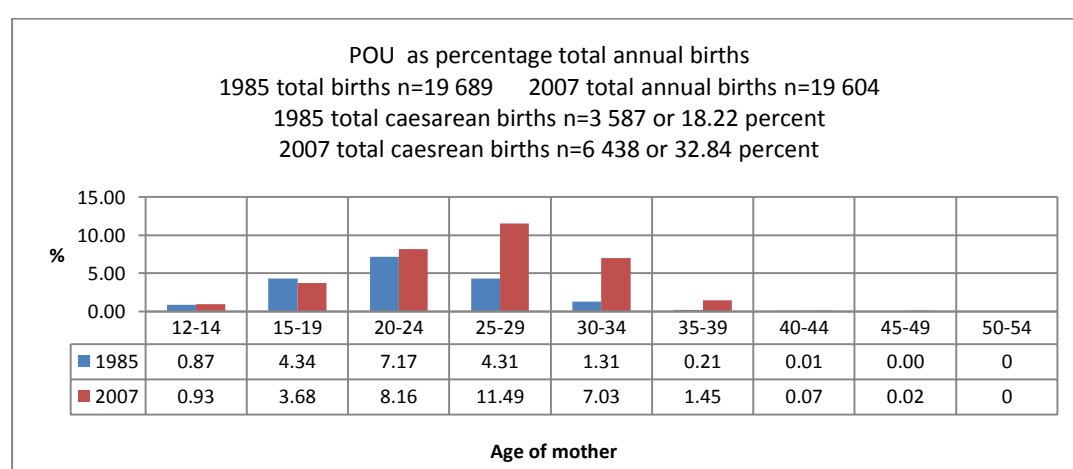


Source: POU unpublished data

5.3.2 Maternal age trends of caesarean section birth mothers in South Australia 1985-2007

The total number of births in 1985 was 19,689 and in 2007 was 19 604. In 1985 the total caesarean rate was 18.2 per cent and in 2007 was 32.8 per cent (Figure 5.2). The peak age of mother in 1985 was 20-24 years and the largest increase in caesarean section occurred in the 25-29 age of mother cohort with an increase of caesarean birth from 4.3 per cent (849 women) in 1985 to 11.5 per cent (2 253 women) in 2007 resulting in an increase of 7.2 percentage points in caesarean delivery.

Figure 5.2: Comparison of age of mother for caesarean 1985-2007



Source: POU unpublished data

Table 5.2 relates to the difference in the number of caesareans between 1985 and 2007. Over a period of 22 years the number of caesareans in South Australia increased by 79.5 per cent. The age cohorts of 25-29 and 30-34 years had the greatest increases of caesarean delivery. The younger 15-19 age cohort was the only group to experience a decrease in caesarean birth.

Table 5.2: Caesarean births by age of mother South Australia, 1985-2007

	12-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	Total
1985	171	855	1 411	849	258	41	2	0	3 587
2007	183	722	1 599	2 253	1 379	285	13	4	6 438
Difference	12	-133	188	1 404	1 121	244	11	4	2 851

Source: POU unpublished data: POU 1985 annual caesarean births n=3 587; 2007 annual caesarean births n=6 438

Table 5.3 shows the median age for caesarean birth increased for all caesareans between 1985 and 2007, with elective mothers being two years older than emergency mothers. The median age of public elective mothers increased by three years to 30 years of age compared with private mothers with an increase of four years to 34 years of age between 1991 and 2007. Emergency caesarean median ages for both public and private women were two years younger.

Table 5.3: Comparison of median age of caesarean births South Australia 1985-2007

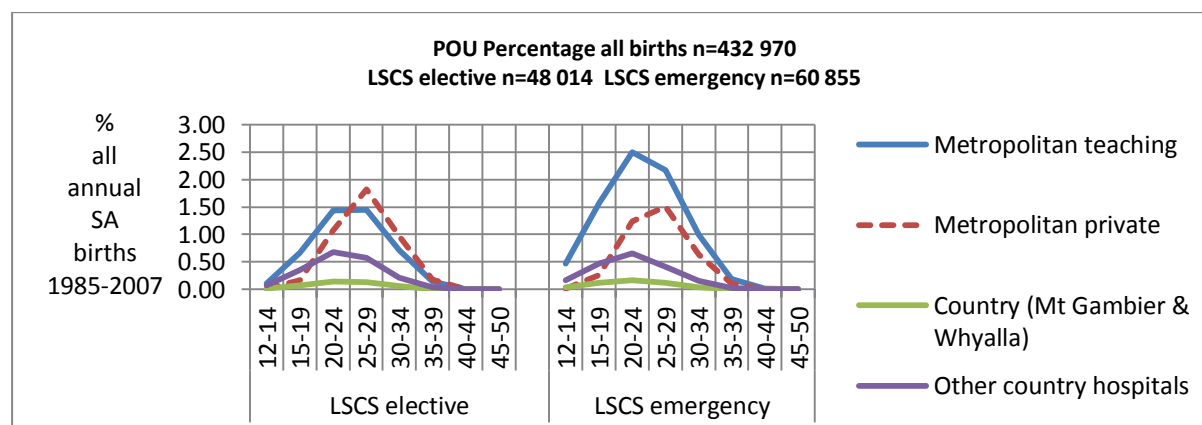
Method of birth	All caesareans	Elective caesarean	Emergency caesarean
1985	27	28	26
2007	31	32	30
Public 1991	27	27	26
Public 2007	29	30	28
Private 1991	30	30	29
Private 2007	33	34	32

Source: POU unpublished data

5.3.3 Comparison of caesarean births by hospital classification and age of mother

Figure 5.3 shows that for elective and emergency births the peak age cohort of mothers in private hospitals has become older compared with the metropolitan teaching hospitals. There is a similar pattern for all country caesarean births which show a peak age cohort for all elective and emergency births of 20-24 years with a trend towards the older age mothers for other births.

Figure 5.3: Comparison of age of mother for elective and emergency caesarean in Metropolitan and Regional hospitals in South Australia 1985-2007



Source: POU unpublished data

5.4 Comparison of public and private caesarean birth 1991 to 2007 in South Australia

The public and private patient attribute in the POU data collection commenced in 1991, six years after the POU collection was initiated by the South Australian government. This study now delves into the differences in caesarean birth rates between the public and private hospital system between 1991 and 2007 (Table 5.4). All public births including caesarean births between 1991 and 2007 totalled 207 922 births and all private births including caesarean totalled 109 336 births. Of the total public births, 19 149 (9.2 per cent) were elective caesarean and 29 422 were emergency caesarean (14.2 per cent) resulting in a public caesarean birth rate between 1991 and 2007 of 23.4 per cent.

In comparison, of the total private births including caesarean deliveries between 1991 and 2007, there were 109 336 births of which 18 227 or 16.7 per cent were elective deliveries and 36 721 or 16.9 emergency caesareans. The total private caesarean birth rate between 1991 and 2007 was 33.6 per cent. The difference between public and private caesarean delivery rates in South Australia between 1985 and 2007 was 10 percentage points in favour of the private patient system. Many scenarios can be put forward to explain why this is so, but as yet there is no non-clinical section in either the ISAAC or POU databases to confirm suggestions.

Table 5.4 Comparison public and private elective and emergency caesarean births in South Australia 1991-2007 POU Total all births n=317 258

Type of patient	Elective caesarean	Emergency caesarean	Total Caesarean births	Total births	Elective caesarean difference	Emergency caesarean difference	Total %
Public	19 149	29 422	48 571	207 922	9.2	14.2	Public 23.4
Private	18 227	18 494	36 721	109 336	16.7	16.9	Private 33.6
Total	37 376	47 916	85 292	317 258	7.5	2.8	Difference 10.2

Source: POU unpublished data

Sinha et al (2010) believe that the rate of second stage of labour caesarean sections (emergency caesareans) are increasing due to a reduction in training hours for junior obstetricians, lack of senior supervision and fear of litigation in the skills of the application of high level forceps and ventouse proficiency for complicated births. More additional

training in the use of forceps (Sinha 2011) should involve using a simulator, under the guidance of a senior obstetrician in the combined use of forceps and the suction cap (ventouse) as one way of reducing the rate of emergency caesarean delivery.

Aboriginal women had a higher spontaneous delivery compared with both Caucasian and Asian women in both 1991 and 2007. Elective c-sections for Caucasian women doubled, compared with lower rates for Aboriginal and Asian women in the same time frame. Caucasian women had a higher increase of emergency c-section births. In rank order, Caucasian women delivered more babies by caesarean, followed by Asian and Indigenous mothers.

Mothers from other countries, had an increase in normal spontaneous birth, in particular Afghani, Indian, Malayan, Philippine, Sudanese and Thai mothers. Elective caesarean deliveries increased for Indian, Malaysian and Vietnamese country of birth mothers, and there was no increase of elective deliveries for Afghani mothers. In addition, emergency deliveries increased for Afghani, Chinese, Indian, Philippine, Sudanese, and Vietnamese country of birth mothers.

5.5 Maternal mortality and baby birth morbidity and mortality outcomes in South Australia 1985-2007

The very low maternal mortality ratio in South Australia is shown in Appendix 6:135. For a new born baby, there are four classifications used in Australian hospitals data for the birth outcome in both public and private hospitals: discharged at birth; fetal death; newborn in hospital at 28 days and neonatal deaths (babies who die in the first 28 days after birth).

Neonatal deaths are registered first as a birth and then as a death and therefore fall in the scope of both ABS births and deaths collections (ABS 2010a). The AIHW publish perinatal death data is collected by midwives and other hospital staff in clinical records systems, such as the POU from each state and territory on an annual basis in the 'Australia's Mothers and Babies' report. In 2009 for example, there were 2 671 perinatal deaths recorded in Australia. Disorders relating to length of gestation and fetal growth accounted for 31.3 per cent (837 deaths); congenital malformations and chromosomal abnormalities (16.7 per cent); respiratory and cardiovascular disorders specific to the perinatal period (6.6 per cent) and 54.2 per cent of all fetal deaths registered in 2009 reported no specific cause (ABS 2010b):

Fetal death is death ... prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy. The death is indicated by the fact that after such a separation the foetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles. Fetal death is subdivided into two categories of early fetal death (miscarriage) and late fetal death (stillbirth) (POU 2007:84).

Table 5.5 shows 2 517 fetal deaths (new born babies) by type of delivery in South Australia between 1985 and 2007: 1468 deaths in normal spontaneous delivery; a total breech (assisted, extraction and spontaneous) numbering 614 births; LSCS emergency fetal deaths totalling 230; in 134 forceps deliveries; 58 in elective caesarean deliveries; and 23 deaths in ventouse births. There was a modest fetal death decrease in trend for normal spontaneous, total breech and forceps births and a very weak increase in trend for ventouse and elective and emergency caesarean delivery fetal deaths.

Table 5.5: Fetal death trends in South Australia 1985-2007

FETAL DEATH POU n=2 527	Methods of birth	Rank	Count	Variation	Range annual % 1985-2007	
	Normal spontaneous	1	1 468	Decrease	0.5	0.3
Total breech	2	614	Decrease	0.2	0.1	
LSCS emergency	3	230	Increase	0.1	0.01	
Forceps	4	134	Decrease	0.1	0.02	
LSCS elective	5	58	Increase	0.02	0.02	
Ventouse	6	23	Increase	0.02	0.0	

Source: POU unpublished data

Health issues in the neonatal period (first 28 days after birth) can include neonatal jaundice and neonatal diarrhoea. Neonatal vigour is also observed and is an indication of the potential viability of baby. The method of birth ranking for babies still in hospital 28 days after birth is shown in Table 5.6, where emergency delivery 4 787, normal spontaneous birth 2 489, elective caesarean a much lower 577, total breech 300 and ventouse 66.

Table 5.6: Newborn in hospital at 28 days after birth by method of delivery in South Australia 1985-2007

NEWBORN IN HOSPITAL AT 28 DAYS POU n=21	Methods of birth	Rank	Count	Variation
	Normal spontaneous	2	2 489	Increase
Total breech	5	300	Decrease	
LSCS emergency	1	4 787	Increase	
Forceps	4	525	Decrease	
LSCS elective	3	577	Increase	
Ventouse	6	66	Increase	

Source: POU unpublished data

There has been a modest increase between emergency delivery and ventouse birth, and a very significant increase for babies delivered by the aid of forceps of babies still in hospital at 28 days after birth in South Australia between 1985 and 2007. In an effort to target poor birth outcomes, Morrison et al (1989:298-307) in a Brisbane study, found low socio-economic status mothers engage in unhealthy behaviours such as smoking.

Table 5.7 shows how neonatal death by methods between 1985 and 2007. Most neonatal death is involved with spontaneous delivery, followed by emergency, total breech, forceps LSCS elective and ventouse. Neonatal death made up 0.3 per cent or a count of 1 378 baby deaths in South Australia between 1985 and 2007.

Table 5.7: Neonatal death trends by methods of delivery in South Australia 1985-2007

NEONATAL DEATHS BY METHODS OF DELIVERY POU n=1 378	Methods of birth	Rank	Count	Variation	Range annual % 1985-2007	
	Normal spontaneous	1	621	Decrease	0.2	0.12
Total breech	3	243	Decrease	0.08	0.05	
Emergency caesarean	2	356	Decrease	0.09	0.06	
Forceps	4	79	Decrease	0.07	0.01	
Elective caesarean	5	62	Decrease	0.02	0.01	
Ventouse	6	17	No change	0.01	0.01	

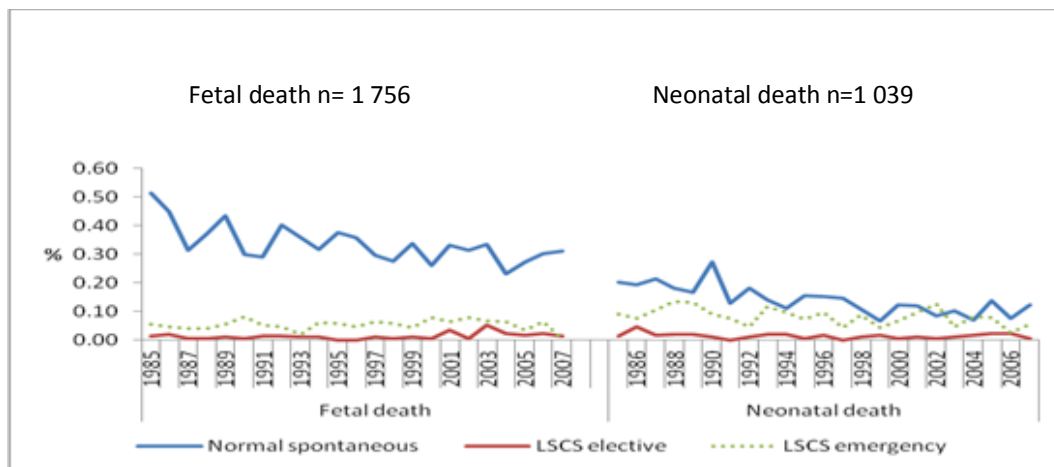
Source: POU unpublished data

The final classification of outcome of baby birth in the POU hospital classification system is neonatal death. Neonatal death is the death of a live born child within the first 28 days of life (POU 2007:84). The leading causes of neonatal death are a low gestation period (born too early); a low birth weight and congenital abnormalities.

5.5.1 Summary of baby status hospital discharge in South Australia 1985-2007

Figure 5.4 shows the decline of both fetal and neonatal death associated with normal spontaneous, LSCS (elective and emergency) deliveries. More baby deaths associated with emergency caesarean than elective caesarean. Most baby deaths are associated with normal spontaneous delivery. Elective caesareans show a consistently low mortality rate which may be a reason why women choose to deliver their babies by elective delivery.

Figure 5.4: Fetal and neonatal death trends for normal spontaneous, LSCS elective and emergency deliveries South Australia 1985-2007



Source: POU unpublished data

5.6 Fathers' occupation of babies born by caesarean section in South Australia

There seem to be only a few studies relating to the father's opinions about the method of birth for their children. One study was completed in Sweden (Johansson 2010) whose objective was to investigate prospective father's preferences for caesarean section, and if possible to identify associated factors. Gender equality in parenting has been the focus of government initiatives for some 30 years and the majority of fathers-to-be have attended antenatal visits, parent education classes, and attended labour and the birth (Plantin 2007).

Angeja (2006) Johansson et al (2010) found first time fathers and mothers had similar reasons for a preferred caesarean:

- Wished to plan the date of the birth;
- If a woman wants to have a caesarean section, she should be able to have one under any circumstances;
- Doctors should decide whether a woman has a caesarean section under any circumstances (Johansson 2010: 761)

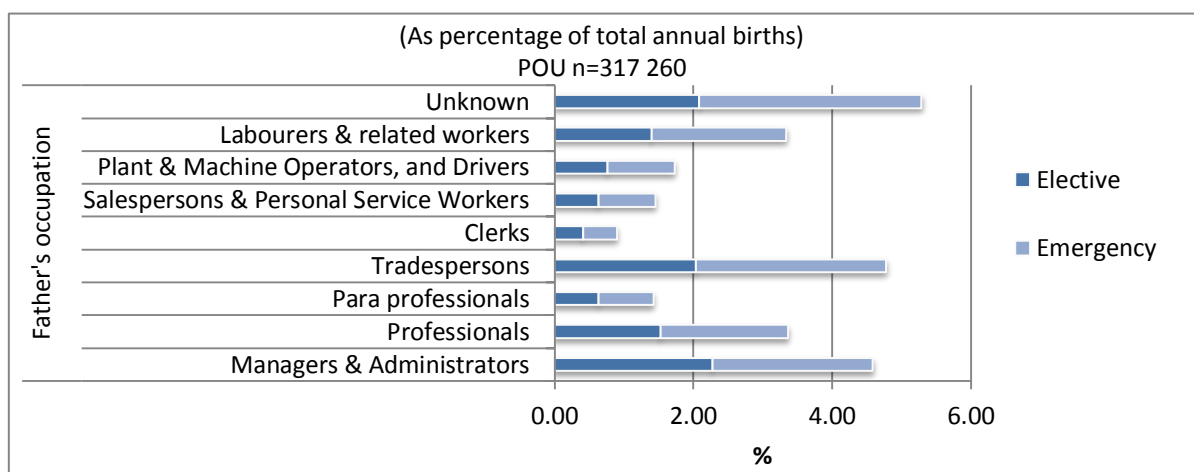
Fathers who trusted the medical staff involved in the birth of their child were less concerned with the issues of control of the childbirth process (Mutryn 1993), which means that the decision for a caesarean section delivery falls on the medical staff. When there is limited time to inform and support fathers for an impending emergency caesarean section psychological distress became evident, however the study did not refer to whether or not

this influenced the parent’s decision (if they had one), to support and emergency caesarean section for a first birth (Boyce 2007). Rosich-Medina and Shetty (2007) also describe a father’s anxiety, helplessness and frustration for an impending emergency caesarean section.

5.6.1 Relationship between father’s occupation and caesarean delivery in South Australia

Figure 5.5 shows the occupation of father and rank order of total caesarean births between 1991 and 2007. There were a large percentage of fathers classified with an ‘unknown’ occupation may be due to clerical error or may be due to being without work at the time of the child’s birth or not prepared to have their name used in the health system. Figure 5.5 indicates a higher rate of caesarean delivery for the cluster of father occupations with higher incomes and socio-economic status and by rank order are tradespersons followed by managers/administrators and professionals.

Figure 5.5: Total caesarean birth by father’s occupation South Australia 1991-2007



Source: POU unpublished data

5.7 Mothers in South Australia by age

If a woman is having her first child at the age of 40 she is unlikely to have many future pregnancies. Age as a predictor is less accurate if the mother is younger. Therefore, it is important that a mother who requests a caesarean section delivery when there are no medical indicators, is aware that there are incremental risks associated with each subsequent caesarean delivery (Silver et al 2006:1126-32) and (Grobman et al 2007:1249-55). Caesarean by maternal request without medical indications should only be

recommended, for women planning a maximum of two or three children. The following comments made by the mothers below were all younger women under 30 years of age and all of them do not want any more children. Maternal request for a caesarean is a controversial topic. Ethicists propose that, 'It is a woman's right' (Minkoff et al 2004) and also that it is a way to protect the pelvic floor and that it is convenient compared with the unpredictability and timing of a trial of labour, unexplained stillbirth, cord prolapses and fetal heart abnormalities (Eason et al 2002) and Rortveit et al 2003).

I only wanted one child and for that child to be born the best way possible (Private patient and mother of one five year old child born by elective caesarean 2010).

I took one look at women going through trial of labour during my nursing training and knew that if need be I would shop around for a gynaecologist who would support my decision to have my children by elective caesarean (Private patient and mother of two teenage children born by elective caesarean 2011).

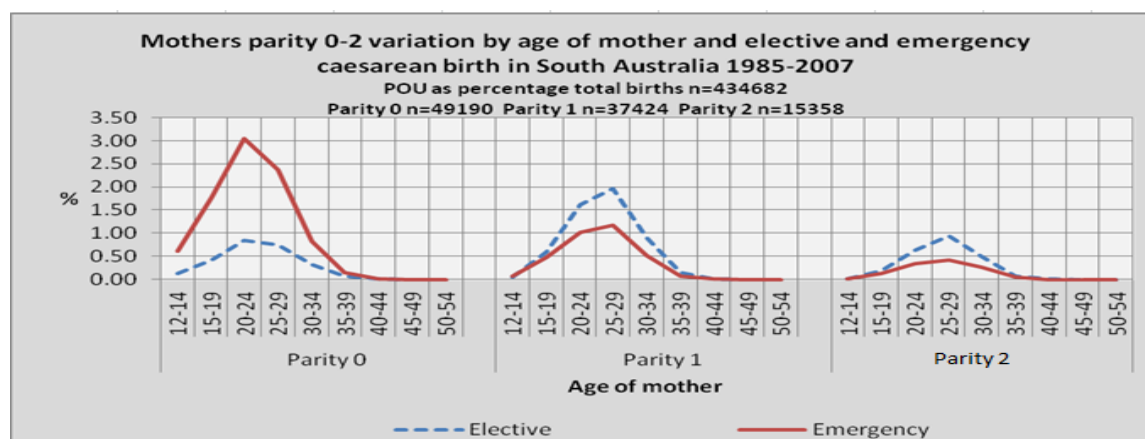
My first child was born after a very lengthy labour. It has taken me five years to get the courage to have another baby. This time I have booked a caesarean (Mother of five year old about to give birth 2012).

I had a caesarean for the birth of my first child. I was supposed to deliver this new second baby by caesarean too. But the baby arrived vaginally after a short two hour labour. So, the hospital kept me for an extra couple of days to make sure I was ok (Private patient mother).

5.7.1 Comparison by parity 0-2 and age of mother in South Australia 1985-2007

Age of mother by parity 0-2 and as a percentage of elective and emergency caesarean delivery of all the 434 682 births in South Australia is represented in Figure 5.6. There is a clear swap from a higher rate of parity 0 emergency caesareans to a higher rate of elective parity 1 and 2 caesarean births. The peak age for emergency and elective caesarean delivery for parity 0 deliveries is 20-24 years of age and for parity 1-2, 25-29 years.

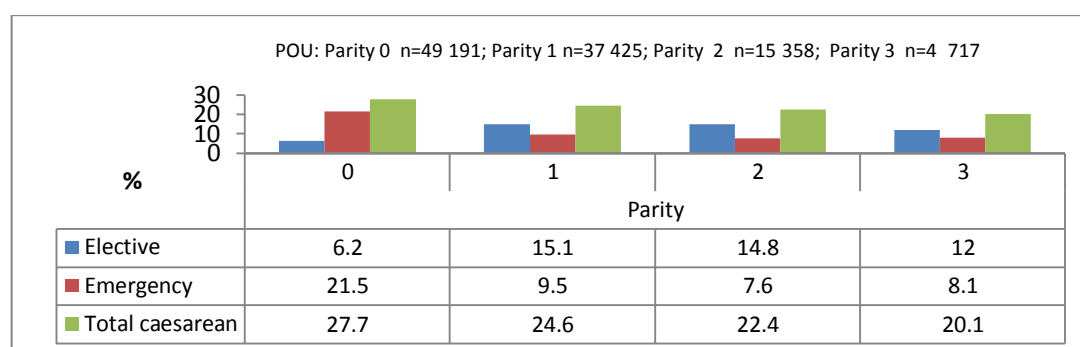
Figure 5.6: Mother's parity by caesarean delivery South Australia 1985-2007



Source: POU unpublished data

Figure 5.7 shows South Australia parity data from 0-3 for caesarean birth. The caesarean range between first and fourth births reduced from 27.7 down to 20.1 per cent. Between 1985 and 2007 the total number of caesareans numbered 108 941 of which parity 0-3 numbered 106 691 or 97.1 per cent of all caesarean deliveries. The total of parity 0-3 births (from all methods of delivery) make up 97 per cent of the total babies born in South Australia between 1985 and 2007. **The overall caesarean rate was 28.2 per cent.**

Figure 5.7: Caesarean birth by parity 0-3 mothers in South Australia 1985-2007



Source: POU unpublished data

5.7.2 Collection of parity data for service planning purposes

A request for better parity data in Australia has been put forward by Corr and Kippen (2006), and the need for better data collection of both the mother and father's parity, and birth order statistics in Australia as a basis for the planning of all services in Australia, including schools, hospitals, urban development and infrastructure. Corr and Kippen (2006) suggest adding further questions to the five yearly Census to cover both the mother and father's parity and birth order statistics. In South Australia the case-mix funding hospital morbidity and procedure data is collected in the Integrated South Australian Activity Collection (ISAAC), which collects mandatory public and private birth data (and all other hospital morbidity data) monthly. ISAAC uses the ICD-10-AM codes for hospital morbidity events which includes all birth and associated procedures. Each Australian state and territory collects birth data using the ICD-10-AM codes which are collated monthly. South Australia currently has a mandatory government collected public and private birth, pregnancy and puerperium database which is not available to the public. Methods for the analysis of fertility based on the age and parity fertility model have been proposed by Rallu-Toulemon (1993) and Kohler-Ortega (2004). Ortega (2004) writes of the need for reliable data availability regarding the distribution of women by parity, age and duration of fertility

to estimate childbearing intensities. Birth probabilities directly calculated from large sample surveys (Rallu and Touleman 1993) or reconstructed from census distribution, have problems. When the collected data is extrapolated over time, it is an estimate and not the reality of current birthing numbers and merging information from different censuses can create artificial dynamics.

Should the Minister for the Department of Health and Ageing feel obligated to release birth data at least annually on a website to clearly show the pregnancy, birth and puerperium outcomes in each Australian State and Territory? Currently, none of the Australian data collected in the ICD-10-AM coding system is available to the public. The release of the ICD-10-AM data annually and, the Corr and Kippen (2006) parity suggestions, would give a much clearer view of population method of birth trends within the Australian population.

5.8 Conclusion

Analysis of the released POU study demographic data has shown that the median age of mothers for all caesarean births has increased from 27 to 31 years of age. Social pressures for women to complete their education, perform in professional job structures and become secure financially have been given as reasons for a higher maternal age. Other reasons were given in the literature for the increasing rate of caesarean delivery included a lack of training of junior obstetricians in complex vaginal birth and the normalising of caesarean birth due to the complexities of vaginal birth due to the fear of litigation.

Private hospitals do have a higher rate of caesarean birth and their patients are older than public patients. Their patients are usually in the higher income group including professionals, managers and administrators. Whereas the public patients tend to be the lower incomes earners, such as labourers, who have a higher number of emergency caesarean deliveries. It is suggested that the case-mix funding system of both hospital systems may influence caesarean rates but in different ways. Private obstetricians may need to timetable their clients for when they are available for elective caesarean births. Public hospitals have to deal with more birthing women and often of a lower socio-economic group, and therefore a woman who is showing signs of distress for herself or her baby may lead to an emergency caesarean which will deliver the baby in a shorter time.

There is a trend for mothers not born in South Australia to develop similar trends to those born here with increasing rates of caesarean delivery. Fathers with higher incomes who are managers and administrators, and professionals tend to be associated with more elective caesarean deliveries for their partners, whereas for example labourers with lower incomes have a higher number of emergency caesarean section deliveries. COAG has recently recommended that maternity patients in public hospitals should be able to receive the same maternity services as those women in private hospitals. Will this new policy result in an increasing rate of elective caesarean deliveries in the public health system?

Of the 434 682 babies born by all methods of delivery in South Australia 1985-2007, 97.1 per cent were discharged. Fetal death in normal spontaneous birth ranked highest, and was more common in elective than emergency caesarean delivery. Neonatal death (within the first 28 days after birth) was also highest in normal spontaneous birth, and higher for emergency caesarean delivery than elective caesarean birth. For newborns still in hospital at 28 days, emergency caesarean delivery was the highest ranked method of delivery. The maternal death rate was extremely low at 0.061 deaths per 1 000 births and was the same for metropolitan public and private hospitals.

Parity and completed parity has emerged as a tool for the better understanding of the demography of birthing within the Australian population. This study has shown that when caesarean delivery is involved, more women only have two children. There is no data available for the parity, age of fathers or completed parity of fathers and the method of delivery of a father's children.

Although it is mandatory for each public and private hospital in South Australia to monthly report birth data, including the rate of caesarean section deliveries, to the Commonwealth Government, these data, as yet, are not made available to the public except as aggregate annual data in the South Australia Health Pregnancy Outcome Statistical Unit and the Australian Institute of Health and Welfare Mothers and Babies Annual Reports.

CHAPTER SIX

CAESAREAN BIRTH AND SOCIO-ECONOMIC DISADVANTAGE

6.1 Introduction

This chapter considers the spatial variation of caesarean delivery in relation to socio-economic disadvantage in the Adelaide Statistical Division over the last twenty years. This is due to changes in government policy and recognition of caesarean delivery as a preferred method of delivery across the birthing population. Firstly, data for 1985 to 2007 in South Australia is analysed for normal spontaneous, elective caesarean, emergency caesarean, ventouse and forceps deliveries, parity of mother, type of patient as either public or private, and the mother's co-morbidities of gestational diabetes, maternal asthma and fetal distress.

Secondly, the ten ranked most advantaged and disadvantaged SLAs using the Index of Relative Social Disadvantage (IRSD) in the SEIFA Index (ABS 2006c), and distribution maps are used to examine any variation in the spatial incidence of: all elective and emergency births to find out if the methods of birth (normal spontaneous, elective and emergency caesarean, forceps and ventouse); the levels of the co-morbidities of asthma, gestational diabetes and fetal distress; public and private patient status; baby birth weight; and parity 0-2 are influenced by social levels of advantage.

6.2 Previous study

Glover et al (2006:280) found a distribution pattern of caesarean birth (aggregate elective and emergency sections) in the Adelaide Statistical Division which showed high ratios of caesarean birth for women between 15 and 44 years of age recorded in the northern and southern areas and generally lower ratios in many inner and western areas. Overall, the caesarean birth distribution pattern showed the existence of an association at the SLA level between high rates of admissions for a caesarean section and socio-economic disadvantage. A significant inverse correlation of -0.51 was found for caesarean birth mothers who live in

areas which dwellings had no motor vehicles. Other meaningful correlations of significance included the variable for early school leavers (0.5), and weaker correlations with unskilled and semiskilled workers (0.5) and single parent families (0.3). People living in more disadvantaged areas experience poorer health due to their lower income limiting access to better housing and reduced access to medical services; achieving lower education standards which can impact on a person's ability to access information on health services and health risk prevention, and the recognition that long term stress can negatively impact on a person's sense of security as well as physical and mental wellness (AIHW 2009:153).

6.3 Correlation of birth methods and co-morbidities 1986-2006

Table 6.1 shows the results of Pearson correlations using the IRSD Index scores for the Census years of 1986, 1991, 1996, 2001 and 2006 which were calculated for methods of birth and the co-morbidities of fetal distress, asthma, gestational diabetes and parity 0-2.

Table 6.1: Pearson Correlation Coefficients between the Index of Relative Disadvantage and percentage of each method of birth and co-morbidities in each SLA (N) across the Adelaide Statistical Division 1986 to 2006

<i>POU variable</i>	<i>Number of SLAs</i>	<i>1986 r</i>	<i>1991 r</i>	<i>1996 r</i>	<i>2001 r</i>	<i>2006 r</i>
<i>Normal spontaneous</i>	52	-.020	-.075	-.333*	-.600**	-.730**
<i>Elective caesarean</i>	52	.050	-.055	.257	.388**	.593**
<i>Emergency caesarean</i>	52	-.128	-.053	-.213	.274*	.271
<i>Total caesarean</i>	52	-.033	-.065	.089	.546**	.605**
<i>Forceps</i>	52	0.11	.183	.285*	.255	-.204
<i>Ventouse</i>	52	.180	.185	.236	.046	.337*
<i>Fetal distress</i>	52	.017	-.272	-.434**	-.519**	-.547**
<i>Asthma</i>	52	Data not collected	-.484**	-.413**	-.478	-.363**
<i>Gestational diabetes</i>	52	Data not collected	Data not collected	-.393**	-.485	-.365

* Significant at 0.05 level

** Significant at 0.10 level

Source: POU unpublished data

The Pearson Correlation Co-efficient results indicate the following birth patterns across the Adelaide Statistical Division between 1986 and 2006, which show an increasing negative relationship between women of lower socio-economic status and **normal spontaneous** birth from $r = -.020$ in 1986 to a significant relationship of $r = -.730$ in 2006.

A mother 23 years of age commented after two spontaneous deliveries in a public hospital:

My job requires me to stand in a shop. As the first pregnancy went on I became very tired but I had to work. I cannot afford a car. Going to medical appointments was just too hard. After the baby was born I did not attend all baby appointments as catching the bus was slow and exhausting. I now have a second child. Both babies were born naturally. I did not know I could split (tear) in so many directions at the same time during a birth!

Jonas (1992) conceded that the term socio-economic status may be used as a marker for an array of maternal, social, economic and lifestyle factors that adversely affect neonatal and maternal care. Women residing in low socio-economic areas had less antenatal visits and more medical complications during pregnancy.

Caesarean section birth results from Table 6.1 have been divided into three sections:

- An increasing relationship between women of higher socio-economic status for elective caesarean delivery from $r=.050$ in 1986 to a very strong association in 2006 of $r=.593$.
- A change from a weak association of emergency caesarean delivery for women of lower socio-economic status in 1986 of $r= -.128$ to a modest but not significant association of $r=.271$ for women of higher socio-economic status.
- The total caesarean correlation has changed from no association of $r= -.033$ in 1986 to a significant relationship with women of higher socio-economic status of $r=.605$ in 2006. This indicates that over this period the increasing incidence of caesarean birth has been disproportionately occurring for women living in areas of high socio-economic status.

Table 6.1 shows that **forceps** deliveries have changed from a weak association ($r=.11$) in 1986 to a modest negative but not significant association with socio-economic status in 2006 ($r= -.204$). That is more women of lower socio-economic status experience forceps deliveries. Whereas, **ventouse** deliveries have had a continuous association with women of higher socio-economic status from a very weak $r=.180$ in 1986 to a stronger association of $r=.377$ in 2006.

About 11 per cent of births in Australia are assisted deliveries (also referred to as instrumental or operative vaginal deliveries) which require an obstetrician or midwife to use forceps and vacuum suction (ventouse). In addition, many practitioners fear litigation if a forceps-assisted delivery results in a poor birth outcome (emedicine.medscape.com). Yet, Werner et al (2011) claim forceps deliveries are faster and hence can save an infant from adverse neurological outcomes. Mahan (2012) writes that it is very important that the positive and negative effects of an epidural be presented to pregnant women. Women need to understand that an epidural will decrease their ability to control birth contractions,

which in turn may lead to the use of further mechanical intervention such as forceps, ventouse and caesarean section.

Clifton (2010) claims that asthma affects 16 per cent of pregnancies in South Australia although South Australian medical statistics identify less than 7 per cent of pregnant women are asthmatic. Asthma is being underreported during pre-natal visits and therefore can be under treated in pregnancy. An asthma attack during pregnancy can lead to growth restriction of the baby, pre-term delivery and still-births. The Pearson co-efficient between the method of birth and **fetal distress, asthma and gestational diabetes** as shown in Table 6.1 were:

- Fetal distress has emerged as being a much stronger association with women of lower socio-economic status in 2006 where $r = -.547$.
- Asthma has always been more likely to be associated with women of lower socio-economic status has decreased between 1991 ($r = -.484$) to $-.363$ in 2006.
- Gestational diabetes has also been more likely to be associated with women of lower socio-economic status as shown with $r = -.393$ (1996), $r = -.484$ (2001) and $r = -.365$ (2006).

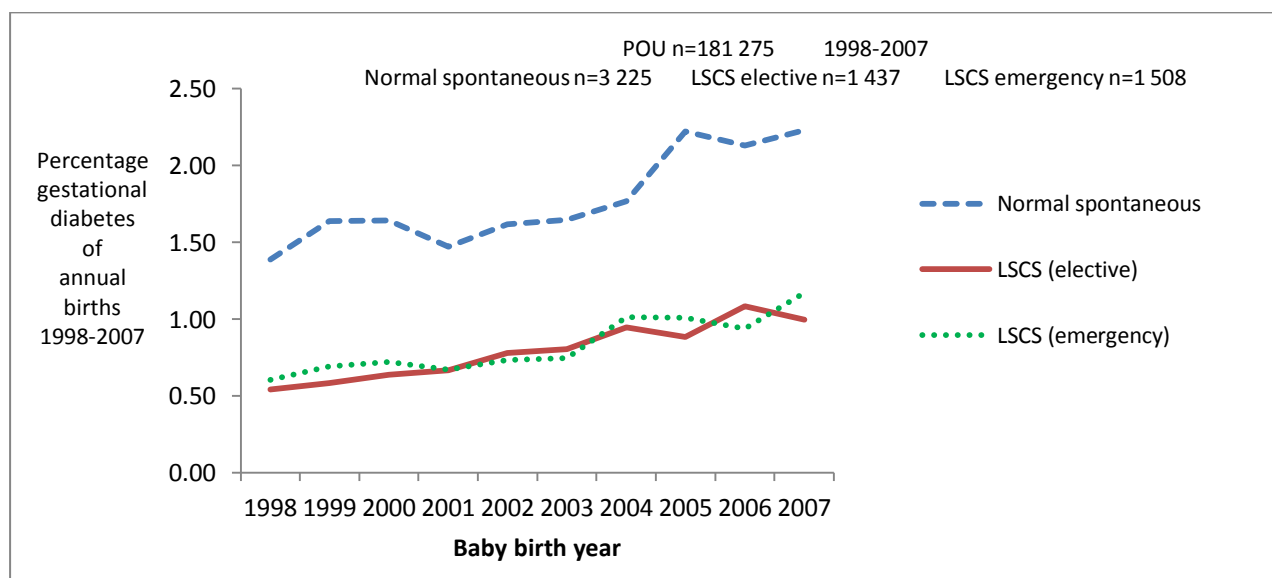
6.3.1 Gestational diabetes

Gestational diabetes mellitus (GDM) usually develops in the second and third trimesters of a pregnancy with the first recognition of glucose intolerance during a pregnancy (Metzger and Coustan 1998:161). The prevalence of gestational diabetes has been rising over the last twenty years, especially in individuals with a low socio-economic status (Berkowitz et al 1992; Ferrara 2007), together with the lifestyle changes, including the higher consumption of refined and processed foods. Children born to mothers who have developed gestational diabetes have a greater chance of long term behavioural consequences including a lower IQ (Ornay et al: 1999), language impairment (Dionne et al 2008), hyperactivity (Ornay 2005) and poorer cognitive function (Veena 2010), which include medical conditions such as attention deficit/ hyperactivity disorder (ADHD) (St Sauver et al 2004). The effect of the low socio-economic status environment for children can be detrimental for babies with a low birth weight (Nomura 2009), mothers with a prenatal substance abuse (Ornay et al 2010), relative to babies born without these risk factors (Nomura et al 2009). Excess weight gain

can result in the poor obstetric morbidity issues of jaundice, nerve palsy, overweight babies, shoulder dystocia and bone fractures.

Figure 6.1 shows a significant increase of the incidence of gestational diabetes in South Australia between 1998 and 2007. There is a very significant association between elective caesarean delivery and gestational diabetes ($r = 0.9317$; $n = 1\,437$) and a significant association with emergency caesarean delivery ($r = 0.83$; $n = 1\,508$). However, not all women with gestational diabetes deliver their babies by caesarean delivery, as 3 225 women in South Australia with this risk factor delivered their infants by normal spontaneous delivery. However, the number of women diagnosed with gestational diabetes who had a caesarean delivery has doubled over this period.

Figure 6.1: Trends in gestational diabetes for normal spontaneous, LSCS elective and emergency caesarean in South Australia 1998-2007



Source: POU unpublished data

Table 6.2 shows that there were a total of 181 275 births in South Australia between 1998 and 2007. Of the women with gestational diabetes, birth of their babies by normal spontaneous delivery was the most common method (46.5 per cent) followed by a caesarean rate of 42.2 per cent (20.7 per cent elective and 21.7 per cent emergency).

Table 6.2: Gestational diabetes and method of birth South Australia 1998-2007

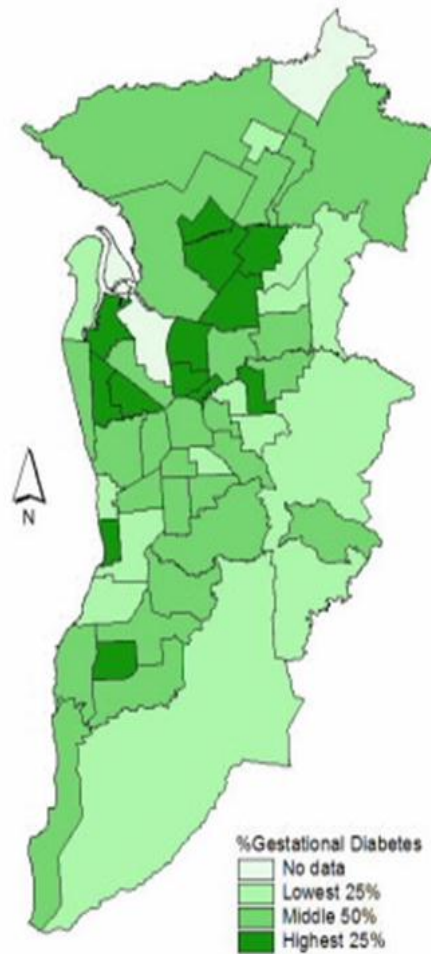
POU All births n=181 275 Gestational diabetes n=6 936

Method of birth	Count	% of all births
Normal spontaneous	3 225	46.5
Forceps	336	4.8
Breech	26	0.4
LSCS (elective)	1 437	20.7
LSCS (emergency)	1 508	21.7
Ventouse	404	5.8

Source: POU unpublished data

Figure 6.2 shows the distribution of gestational diabetes in the Adelaide Statistical Division in 2006. Most advantaged SLAs with lower rates of gestational diabetes were located on the eastern side of the metropolitan area stretching from the Norwood/Burnside, through the city at Walkerville, south to eastern Onkaparinga and the western areas of Holdfast Bay North, Marion and Port Adelaide/ Enfield Coast. Whereas the SLAs with the highest rates of gestational diabetes were found predominately in lower socio-economic status SLAs to the north and northwest of the Adelaide Statistical Division. Study analysis has found that the more disadvantaged areas have seen an average decrease in their IRSD scores over the last 20 years (ABS 2006c). There could be many reasons for this including the arrival of migrants with limited English language skills making it difficult to find work and difficulty in travelling to and from work without private transport where public transport systems are inadequate.

Figure 6.2: Gestational diabetes distribution across the Adelaide Statistical Division by SLA 2006



Source: POU unpublished data

Table 6.3 shows the variation of gestational diabetes in the SLAs of the ranked top ten lowest IRSD scores in 2006. The average IRSD score for the least advantaged SLAs for women who have delivered babies in these SLAs has become more disadvantaged with a decrease of an average IRSD score of 886 in 1998 down to an average IRSD score of 875 in 2006, a decrease of 11 points or 1.2 per cent. The SLAs with the highest rates of gestational diabetes were located north and north – west including Playford Elizabeth, Port Adelaide Enfield Port, Charles Sturt North East, Salisbury Inner North. The average percentage of gestational diabetes for all women who delivered babies in the most disadvantaged SLAs has increased from an average 3.4 per cent in 1998 to an average 5.7 per cent in 2006.

There was a doubling of gestational diabetes between 1998 and 2001 Burnside South West and a further large increase between 2001 and 2006. It must be pointed out that the number of women who gave birth in Walkerville was very small compared with the other SLAs. The significant increase of gestational diabetes between 1998 and 2006 may be due to the decrease of the average IRSD score for the most advantaged 10 ranked IRSD SLAs.

Table 6.3: Gestational diabetes as a percentage of all births in the ten most disadvantaged and advantaged SLAs in the Adelaide Statistical Division 1998, 2001, 2006

Rank	SLA code	Most disadvantaged SLAs	Percentage of gestational diabetes/SLA		
			1998	2001	2006
1	5683	Playford (C) Elizabeth	4.7	5.6	4.7
2	5688	Playford (C) West Central	2.7	6.3	4.0
3	5896	Port Adelaide Enfield (C) Port	3.9	2.9	9.3
4	5891	Port Adelaide Enfield (C) East	4.1	0.9	4.6
5	5894	Port Adelaide Enfield (C) Inner	3.5	2.6	6.8
6	5344	Onkaparinga (C) North Coast	3.1	0.9	4.5
7	7143	Salisbury (C) Inner North	5.0	5.1	5.7
8	7141	Salisbury (C) Central	2.5	4.1	6.7
9	5686	Playford (C) West	3.7	4.1	4.6
10	1068	Charles Sturt (C) North East	2.5	4.2	4.8
		Average	3.4	3.5	5.7
		Maximum	5.0	6.3	9.3
		Minimum	2.5	0.9	4.0
		Difference	2.5	5.4	5.3

Rank	SLA code	Most advantaged SLAs	Percentage of gestational diabetes/SLA		
			1998	2001	2006
1	0704	Burnside (C) South West	1.1	2.7	5.0
2	0121	Adelaide Hills (DC) Central	1.9	0.8	4.6
3	0701	Burnside (C) North East	1.5	4.4	2.7
4	4344	Mitcham (C) North West	1.7	1.7	4.4
5	0124	Adelaide Hills (DC) Ranges	1.1	2.2	1.0
6	8260	Walkerville (M)	2.1	0.0	7.4
7	4341	Mitcham (C) Hills	2.9	1.5	4.1
8	7981	Unley (C) East	2.03	1.7	2.6
9	5294	Norwood Payneham St Peters (C) W	1.7	1.1	5.1
10	5345	Onkaparinga (C) Reservoir	2.56	3.3	4.2
		Average	1.9	1.9	4.1
		Maximum	2.9	4.4	7.4
		Minimum	1.1	0.0	1.0
		Difference	1.8	4.4	6.4

Source: POU unpublished data

Data suggest a greater association of gestational diabetes with women of lower socio-economic status has occurred over the period 1998 to 2006, with an increase of 5.2 per cent compared with higher socio-economic status women of 1.0 per cent. However, it must also be pointed out that in 2006 the average rate of gestational diabetes in the more advantaged SLAs was a significant 4.1 per cent compared with the higher average rate of 5.7 per cent for more disadvantaged mothers. This study concludes that gestational diabetes is a co-morbidity which transcends socio-economic status of mothers.

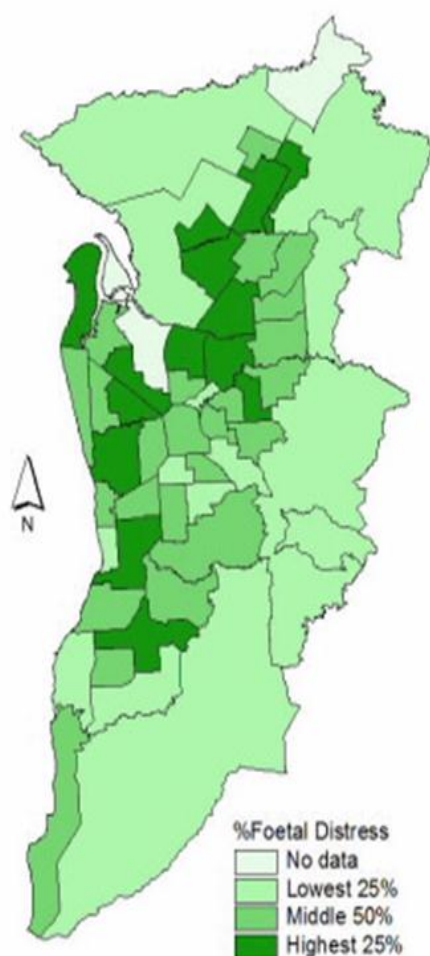
6.3.2 Fetal distress

Fetal distress can be defined as a condition of the unborn baby which is characterised by an abnormal heart rate or rhythm and abnormal blood readings often requiring specialist care of resuscitation after birth (Anderson et al 1998:627). The process of a baby travelling down the birth canal can be hazardous for a baby that is poorly positioned which can result in irreversible injuries, such as infant brain injury, cerebral palsy and injury to shoulder and neck nerves (De Caro and Kaplen 2012).

It is important that medical practitioners are skilled in using the medical diagnostic technology during these events which can lead to an emergency caesarean section delivery. Failures in obstetric management leading to birth related injury can include failure to recognise or respond to bleeding, umbilical compression or prolapsed, to recognise infections, misuse of a vacuum extractor, mis-use of forceps or failure to perform a timely caesarean section (De Caro and Kaplen 2012).

Figure 6.3 shows that the highest rate of fetal distress across the Adelaide Statistical Division in 2006 occurs in the western SLAs compared with the lowest rate of fetal distress in the eastern SLAs. As with the distribution of gestational diabetes, fetal distress shows a similar socio-economic spatial pattern indicating that less advantaged women in the western suburbs have a higher co-morbidity rate than the more advantaged women of the eastern suburbs.

Figure 6.3: Spatial incidence of fetal distress across the Adelaide Statistical Division by SLA in 2006



Source: POU unpublished data

Tables 6.4 shows the variation of fetal distress rates between the most advantaged and disadvantaged SLAs as well as comparing the rates of fetal distress between elective and emergency caesarean delivery in 2006. For both advantaged and disadvantaged women the rate of fetal distress is massively higher for emergency compared with elective caesarean delivery. The average rate of fetal distress in elective birth is 0.5 per cent for advantaged women and 0.4 per cent for disadvantaged women compared with the average fetal distress rate for emergency caesarean of advantaged women of 40.8 per cent and emergency caesarean for disadvantaged women of 38 per cent. The most advantaged SLA with the highest rate of fetal distress of 45.6 per cent in 2006 was Onkaparinga (C) Reservoir to the south of the AMA. Whereas, the fetal distress of the most disadvantaged SLA in 2006 was

Port Adelaide Enfield (C) Port, also at 45.1 per cent. The range of fetal distress diagnosis was 8.4 per cent across the advantaged SLAs and a higher 12.7 per cent across the more disadvantaged SLAs.

Table 6.4: Association between elective and emergency caesarean birth and fetal distress in the ten most disadvantaged and advantaged SLAs in the Adelaide Statistical Division 2006

			2006 percentage per SLA		
Rank	SLA code	Most disadvantaged SLAs	Elective	Emergency	Sum
1	5683	Playford (C) Elizabeth	0.4	35.7	36.1
2	5688	Playford (C) West Central	1.0	32.0	32.4
3	5896	Port Adelaide Enfield (C) Port	0.3	45.0	45.1
4	5891	Port Adelaide Enfield (C) East	0.5	38.2	38.7
5	5894	Port Adelaide Enfield (C) Inner	0.1	39.5	39.6
6	5344	Onkaparinga (C) North Coast	0.5	41.3	41.8
7	7143	Salisbury (C) Inner North	0.5	36.1	36.6
8	7141	Salisbury (C) Central	0.2	36.5	36.7
9	5686	Playford (C) West	0.3	34.6	34.9
10	1068	Charles Sturt (C) North East	0.1	41.7	41.8
		Average	0.4	38.0	38.4
		Maximum	0.6	44.8	45.1
		Minimum	0.1	31.8	32.4
		Difference	0.5	13.0	12.7

			2006 percentage per SLA		
Rank	SLA	Most advantaged SLAs	Elective	Emergency	Sum
1	0704	Burnside(C) South West	0.2	37.0	37.2
2	0121	Adelaide Hills (DC) Central	0.4	43.3	43.8
3	0701	Burnside (C) North East	0.2	39.3	39.5
4	4344	Mitcham (C) North West	0.3	40.8	41.0
5	0124	Adelaide Hills (DC) Ranges	0.7	44.2	44.8
6	8260	Walkerville (M)	0.9	38.5	39.4
7	4341	Mitcham (C) Hills	0.3	45.0	45.3
8	7981	Unley (C) East	0.6	37.2	37.8
9	5294	Norwood Payneham St Peters (C) West	0.6	37.8	38.3
10	5345	Onkaparinga (C) Reservoir	0.5	45.1	45.6
		Average	0.5	40.8	41.3
		Maximum	0.9	45.1	45.6
		Minimum	0.2	37.0	37.2
		Difference	0.7	8.1	8.4

Source: POU unpublished data

6.3.3 Caesarean birth rates in the Adelaide Statistical Division 2006

Figure 6.4 compares elective and emergency caesarean birth data as a percentage of all births in each SLA shows in 2006. Both elective and emergency caesarean deliveries occurred in all SLAs of the Adelaide Statistical Division. The SLAs with the highest percentage of both elective and emergency deliveries generally occurred to the south. The SLAs with the lowest percentage of caesareans in 2006 occurred to the north-west, which happens to be the location of the most disadvantaged SLAs. The maps suggest unequal access to caesarean delivery across the Adelaide Statistical Division according to levels of socio-economic disadvantage.

Figure 6.4: Rate of caesarean birth in the most advantaged and disadvantaged SLAs of the Adelaide Statistical Division 2006

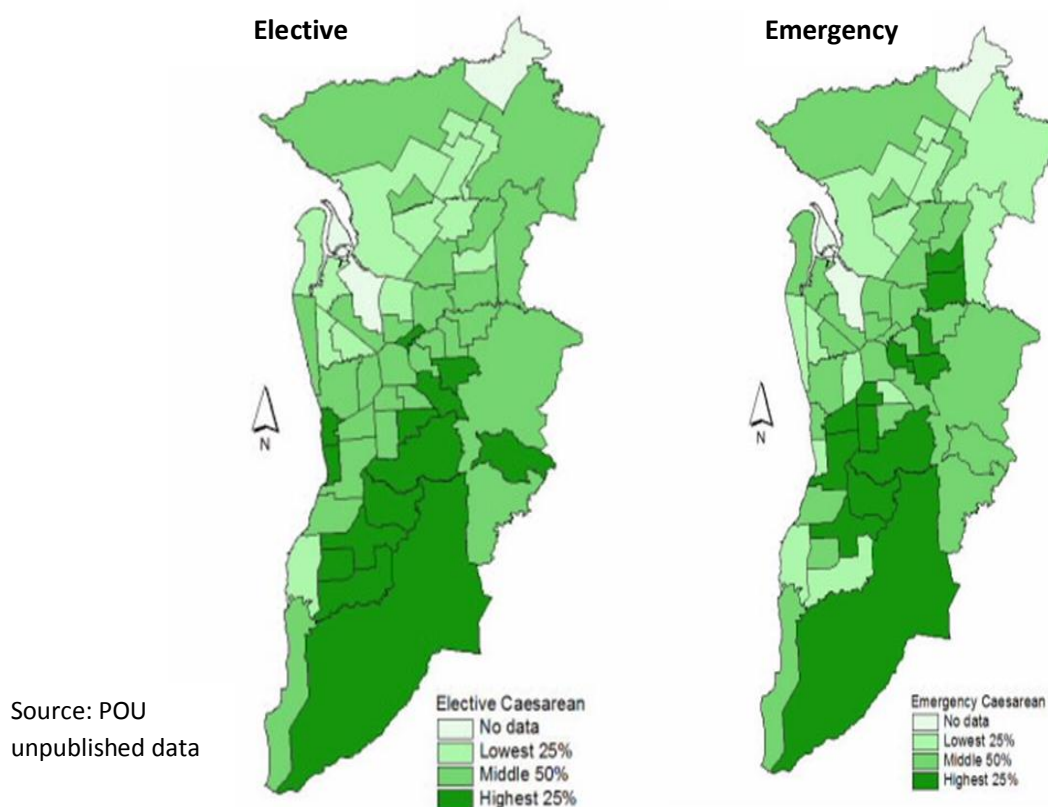


Table 6.5 shows Playford (C) Elizabeth was the most disadvantaged SLA in 2006 and had a total caesarean rate of 26.4 per cent or 15.6 per cent lower than the average for the most advantaged Burnside (C) South West area with a caesarean rate of 42 per cent. The lowest caesarean rate was of 25.6 per cent was in Onkaparinga North Coast. Overall, 9 out of 10 most disadvantaged SLAs had a higher emergency than elective caesarean delivery rate, and 4 out of 10 advantaged SLAs had a higher emergency than elective caesarean rate. Burnside

South West is the most advantaged SLA which had a total caesarean rate of 42 per cent in 2006 with a higher elective than emergency caesarean rate. Walkerville shows a caesarean rate of 52 per cent consisting of an elective rate of 33 per cent and an emergency rate of 19 per cent. In six out of the ten advantaged SLAs the elective rate was higher than the emergency rate.

Table 6.5: Relationship between caesarean birth of women in the ten most disadvantaged and advantaged SLAs in the Adelaide Statistical Division in 2006

Rank	SLA	Most disadvantaged SLAs 2006	IRSD	Percentage of caesarean/SLA		
				Elective	Emergency	Sum
1	5683	Playford (C) Elizabeth	797	11.8	14.6	26.4
2	5688	Playford (C) West Central	805	12.5	16.5	29.0
3	5896	Port Adelaide Enfield (C) Port	847	9.8	17.1	26.8
4	5891	Port Adelaide Enfield (C) East	868	13.4	19.7	33.1
5	5894	Port Adelaide Enfield (C) Inner	868	12.5	19.3	31.8
6	5344	Onkaparinga (C) North Coast	879	9.6	16.1	25.6
7	7143	Salisbury (C) Inner North	888	13.7	18.4	32.1
8	7141	Salisbury (C) Central	889	11.5	15.1	26.6
9	5686	Playford (C) West	922	18.5	16.7	35.2
10	1068	Charles Sturt (C) North East	930	12.7	17.2	29.9
		Average	869	12.6	17.1	29.7
		Maximum	930	18.5	19.7	35.2
		Minimum	797	9.6	14.6	25.6
		Difference	133	8.9	5.1	9.9

Rank	SLA	Most advantaged SLAs 2006	IRSD	Percentage of caesarean/SLA		
				Elective	Emergency	Sum
1	0704	Burnside (C) South West	1 113	23.5	18.0	42.0
2	0121	Adelaide Hills (DC) Central	1 105	21.0	19.0	40.0
3	0701	Burnside (C) North East	1 103	20.4	21.0	41.0
4	4344	Mitcham (C) North West	1 097	19.4	18.0	37.0
5	0124	Adelaide Hills (DC) Ranges	1 089	16.0	19.0	35.0
6	8260	Walkerville (M)	1 089	33.0	19.0	52.0
7	4341	Mitcham (C) Hills	1 086	21.0	25.0	46.0
8	7981	Unley (C) East	1 085	19.0	16.0	35.0
9	5294	Norwood Payn'ham St Peters (C)	1 072	14.0	25.0	38.0
10	5345	Onkaparinga (C) Reservoir	1 058	22.0	21.0	42.0
		Average	1 090	21.0	20.1	41.0
		Maximum	1 113	33.0	25.0	52.0
		Minimum	1 058	14.0	16.0	35.0
		Difference	55	19.0	9.0	17.0

Source: Unpublished data

So, what are the reasons for the variation of caesarean delivery from the poorer western areas to the more affluent eastern areas of the Adelaide Statistical Division in 2006? One reason is the much higher rate of private health cover in the most advantaged SLAs, a closer spatial association with the major private hospitals providing maternity health services including birth plans and the availability of more specialist obstetrician services. There is a clear association between higher socio-economic advantage and caesarean delivery as discussed in the next section.

Variation of clinical risk factors for caesarean delivery across a city area was found by Librero (2000) who documented variability of caesarean rates in different Spanish hospitals, which could not be justified by the differences in obstetric risks requiring caesarean birth. For example the presence of a large baby and fetal distress varied considerably from one hospital to another and non-clinical variable analysis showed that the day of the week maintained statistical significance (Librero 2000:631-6).

Fairley et al (2011:9) found between 1980 and 2000 in Scotland the social gradient for emergency caesarean sections disappeared. However a social gradient has emerged for more elective caesarean births in advantaged areas and that the factors leading to the clinical decision to plan a caesarean delivery are not routinely recorded but need to be understood to assess whether the provision of healthcare is equitable. For both emergency and elective caesareans, there was an unexplained variation of about 2.4 per cent that could not be explained by individual social class of the mother between Health Board Areas. Among women who had previously had a caesarean delivery there were no significant associations with socio-economic status and these women were more likely to have an elective caesarean birth for their second child's delivery.

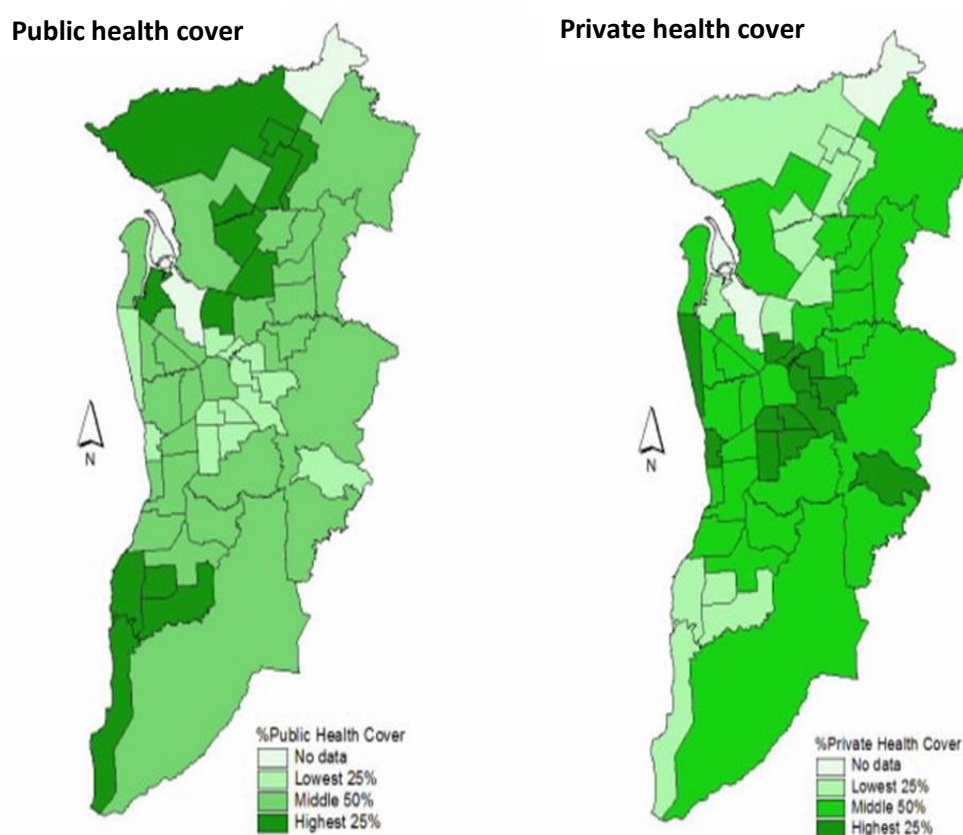
Fairley et al (2011) concluded that maternal social class and area deprivation are different indicators of socio-economic status which exhibit independent effects on the probability of a woman receiving a caesarean section delivery.

6.3.4 Public and private health cover

Figure 6.5 shows the highest rates of public health cover are found in the more disadvantaged northwest and southern coastal SLAs. The central more advantaged SLAs

have the higher rate of private health cover. Women with public health cover are located further from public hospital birthing services than the privately covered women who are located close to the private hospital network and major teaching hospitals, if there is a need to transfer for specialist mother or infant care. Advantaged women are more likely to have their own transport to medical services throughout pregnancy compared with more disadvantaged women. This may go to partially explain why the elective rate is higher for advantaged women and the emergency rate is higher for disadvantaged women.

Figure 6.5: Comparison of public and private health cover across the Adelaide Statistical Division 2006



Source: POU unpublished data

Table 6.6 indicates the variation of public and private health care across the most disadvantaged and advantaged SLAs. The most advantaged SLA of Burnside South West has a private cover rate of 77.7 per cent compared with the most disadvantaged SLA of Playford Elizabeth which has a private health cover rate of 3.6 per cent. The average rate of private health cover in the more advantaged SLAs is 66 per cent and in the more disadvantaged SLAs the average private health

cover rate is 16.9 per cent. More advantaged SLAs have an average IRSD score of 1 090 compared with the average IRSD score of 869 for the most disadvantaged SLAs, resulting in an average score of 221. Could these data be interpreted as the average mother living in most disadvantaged SLAs having a 25 per cent lower living standard (for example lower education, access to transport, suitable housing) than the average more advantaged mother? Certainly the most disadvantaged mothers have higher gestational diabetes and fetal distress rates for their infants and a higher emergency caesarean rate than mothers in the most advantaged SLAs.

Table 6.6: Association between public and private patients in the ten most disadvantaged and advantaged SLAs in the Adelaide Statistical Division 2006

Rank	SLA	Most disadvantaged SLAs 2006	IRSD score	Percentage/SLA	
				Public	Private
1	5683	Playford (C) Elizabeth	797	96.5	3.6
2	5688	Playford (C) West Central	805	97.8	2.2
3	5896	Port Adelaide Enfield (C) Port	847	84.4	15.6
4	5891	Port Adelaide Enfield (C) East	868	63.8	36.3
5	5894	Port Adelaide Enfield (C) Inner	868	76.1	23.9
6	5344	Onkaparinga (C) North Coast	879	87.4	12.6
7	7143	Salisbury (C) Inner North	888	89.1	11.0
8	7141	Salisbury (C) Central	889	86.5	13.6
9	5686	Playford (C) West	922	80.6	19.4
10	1068	Charles Sturt (C) North East	930	68.6	31.4
		Average	869	83.1	16.9
		Maximum	930	97.8	36.3
		Minimum	797	63.8	2.2
		Difference	133	14.7	34.1

Rank	SLA	Most advantaged SLAs 2006	IRSD score	Percentage/SLA	
				Public	Private
1	0704	Burnside(C) South West	1 113	22.4	77.7
2	0121	Adelaide Hills (DC) Central	1 105	32.0	68.0
3	0701	Burnside (C) North East	1 103	23.7	76.3
4	4344	Mitcham (C) North West	1 097	28.8	71.3
5	0124	Adelaide Hills (DC) Ranges	1 089	49.5	50.5
6	8260	Walkerville (M)	1 089	24.1	75.9
7	4341	Mitcham (C) Hills	1 086	45.0	55.0
8	7981	Unley (C) East	1 085	28.2	71.8
9	5294	Norwood Payneham St Peters (C) West	1 072	33.7	66.3
10	5345	Onkaparinga (C) Reservoir	1 058	52.3	47.7
		Average	1 090	34.0	66.0
		Maximum	1 113	52.3	77.7
		Minimum	1 058	22.6	47.7
		Difference	55	29.7	30.0

Source: POU unpublished data

6.3.4.1 Can caesarean birth rates in the public and private hospital system be accurately compared?

Brown (2009) compared the performance of public and private hospitals and concluded that due to different cost structures the two systems were unable to be compared. The Head of the AMA (Pesce 2009:1) has commented:

Comparing public and private hospital systems is not necessarily useful because private hospitals are funded through an uncapped system of fees for service and do not look after chronically ill patients whereas public hospitals rely on public funding, care for chronically ill patients and to anyone who needs them.

This comment raises equity issues within the Australian universal health care system. For example, if obstetricians and eligible midwives are trained using Government funding, are there obligations of graduates to work in both the public and private sectors of the birthing industry? Then again, if there are enough maternity patients who do not have concerns about maternity health costs, how much are these women willing to pay in private health gap fees to have medical specialists of their choice. Already, with limited private health cover, a woman can use a specialist of her choice for the delivery of her baby in a public hospital, thus making sure that if there are complications for mother or baby, huge private hospital costs do not accumulate. With regard to the private health gap fees, it seems that if a birth goes well without complications, private health is very successful.

Quint (2012) a Health Care and Insurance director stated:

Patients did not declare their private insurance when they went to a public hospital because they were trying to avoid expensive gap payments. These out-of-pocket gap costs for a hospital episode are being driven by medical professionals who charge well above the Medicare schedule fee. The gap fees are having an impact on insurance use. The Government's recent extra cost of private health insurance for high income earners will result in fewer beds available in the public health system (Quint 2012).

In a discussion with a new father about the birth of his children (2010):

Due to my high income I purchased Private Health cover. But for the births of my children we used the public health system. Our family expenses are such that we could not take the chance of a birth being difficult and costly in a private hospital.

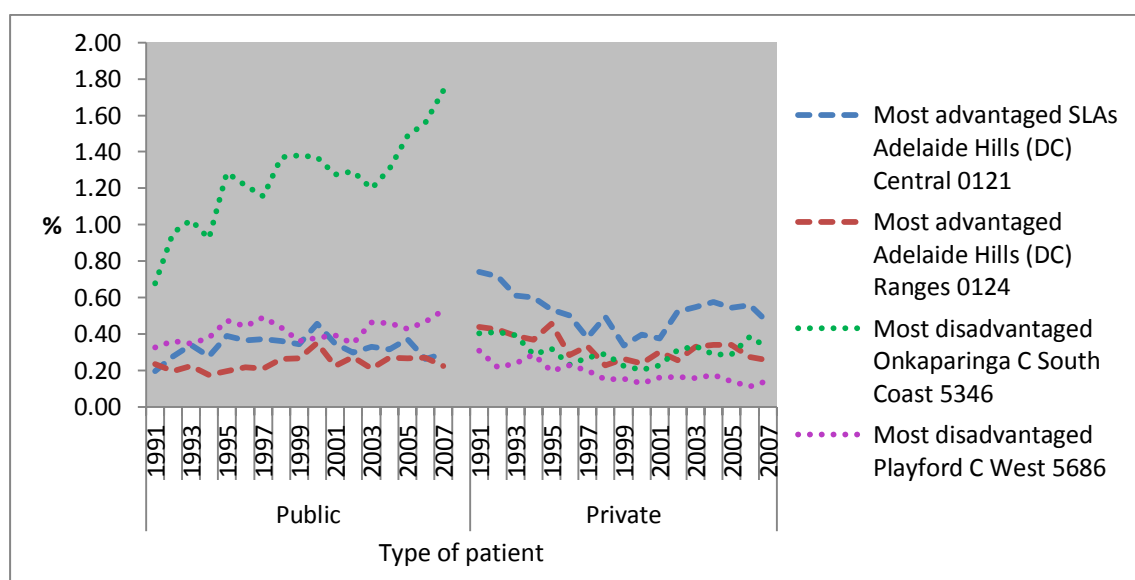
A difficult birth for a family had the following outcome (2008):

My husband and I are both high income earners. We had Private Health insurance. However my first pregnancy was problematic and I had to give up work earlier than expected. The baby had many medical issues after the birth. The gap costs eventually resulted in the downsizing of our family home.

The above comments expressing concern over rising gap fees for private hospital cover may be part of the reason for the very significant increase of public patients and the almost static level of patients with private health cover in South Australia.

Figure 6.6 shows the patterns of public and private patient loads in selected advantaged and disadvantaged SLAs in the Adelaide Statistical Division between 1991 and 2007. Although the public patient load is generally increasing over time, it cannot be assumed that the caesarean delivery rate will decrease, because of the increasing percentage of co-morbidities in both advantaged, and more so in disadvantaged SLAs, due to pregnancy co-morbidities and fetal distress rates.

Figure 6.6: Comparison of public and private patients in selected most advantaged and most disadvantaged SLAs as a percentage of annual births in South Australia between 1991-2007



Other OECD countries are attempting to find answers to the reasons for the increasing caesarean delivery rate using social class variables. A cross-sectional study of women who gave birth by caesarean section (Salvador et al 2009) between 1994-2003 using the type of delivery as the dependent variable, and maternal age, social class and type of hospital (public or private) as independent variables, found that although caesarean section was strongly related to higher social class. The main determinant of the high proportion of caesarean section deliveries, was delivering in private maternity units, even though all women in the study area of Barcelona city were covered by a universal national health system, where the overall caesarean delivery rate was 30 per cent. Although women from

lower socio-economic status groups have worse health than those from non-manual classes, it could be hypothesized that lower SES class women may have more complications and a higher risk of caesarean section than higher SES women. Tollanes et al (2007) and Murray (2003) found financial and scheduling reasons are the main causes of excess caesarean delivery in the private maternity unit population groups. Excess caesarean rates could be reversed by obstetric guidelines established decades ago (Makris et al 1999; Rasmussen et al 1996) and decrease the unnecessary risk for women and infants (MacDorman et al 2006) as well as the increased burden to the health systems.

6.3.5 Correlation between parity, caesarean section and level of advantage 1986-2006

The common current medical protocol tends to support a second birth by caesarean section if the first child is delivered by this method. This study wanted to find any variation in parity levels for the 20 years between 1986 and 2006 matched with the IRSD scores of advantaged and disadvantaged SLAs in the Adelaide Statistical Division? In other words, did the higher rates of caesarean delivery in advantaged areas lower the parity of these women? If caesarean birth did impact on parity, one would expect more advantaged women who deliver a higher rate of their babies by c-section to have a lower parity than more disadvantaged women who deliver a lower rate of their infants by c-section. Yet, Table 6.7 shows no significant association between parity 0-2 and IRSD scores. However, between 1986 and 2006 slightly more disadvantaged women gave birth to three children. It could be assumed that caesarean section does not significantly impact on parity 0-2 births (caesarean delivery has become normalised as a method of delivery) for women shown here between 1986 and 2006.

Table 6.7: Pearson Correlation co-efficients showing relationship between IRSD scores and parity 0-2 of women who gave birth in the Adelaide Statistical Division 1986-2006

<i>Census Year</i>		<i>Parity Zero</i>	<i>Parity One</i>	<i>Parity Two</i>
1986	Pearson Correlation	-.018	-.017	-.028
2006	Pearson Correlation	-.195	-.066	-.202

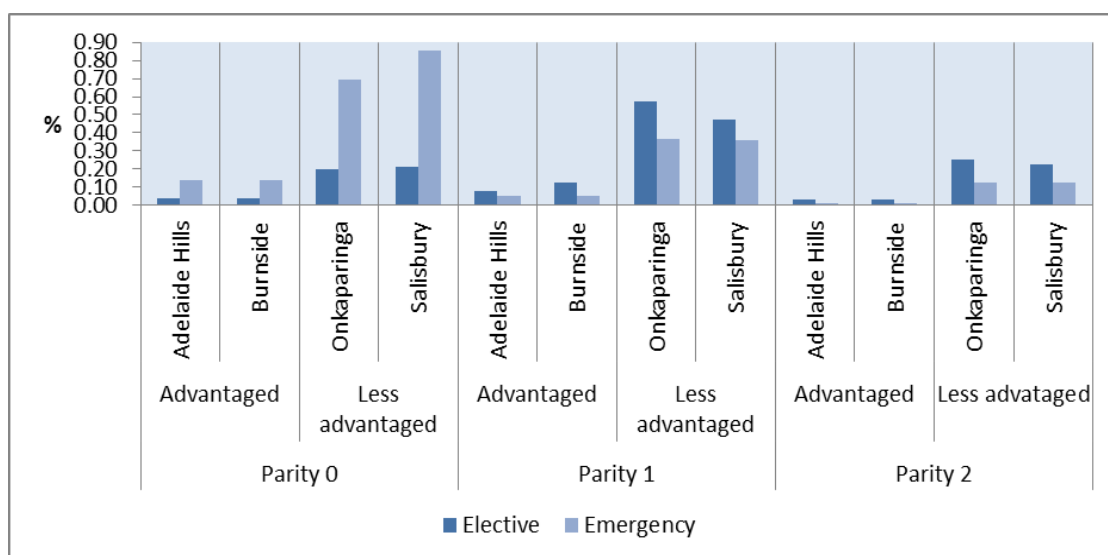
* Correlation is significant at the 0.05 level (2-tailed).

** N= 48 SLAs in the Adelaide Metropolitan Area

Source: POU unpublished data

Figure 6.7 compares elective and emergency caesarean deliveries from parity 0-2 in examples of advantaged and less advantaged SLAs in the Adelaide Statistical Division. The figure shows emergency caesarean deliveries are higher in both advantaged and disadvantaged SLAs for first births, while for second and third births elective caesarean delivery is higher in both the advantaged and disadvantaged SLAs. Besides the clinical necessity of the caesarean births, this result could be explained by birth experiences of first time mothers. There is also a trend showing a reduction in the number of babies born by caesarean delivery from parity 0-1 to 2 in both advantaged and disadvantaged SLAs.

Figure 6.7: Selected parity 0-2 of advantaged and disadvantaged areas in the Adelaide Statistical Division for elective and emergency caesarean delivery 1985-2007



Source: POU unpublished data

6.4 Where is the Body Mass Index data?

At the time the study databases were accessed, there were no variables relating to the mother's BMI, either at the start of pregnancy or at the end of pregnancy. There was also no data on morphology (size and weight) at the time of conception for the father. Is the morphology of the father and mother a factor which may influence the size of the unborn baby?

Rich-Edwards (1999) found an association between low birth weight and risk for type 2 diabetes which was strongest among women whose mothers had no history of diabetes.

Adjustment for socio-economic status did not alter this association. Bowers and Cohen (1999) were made aware from a stratified sample that women with a significantly high BMI were more likely to require a caesarean section delivery than those women with a lower one, and who were more likely to be able to deliver by vaginal birth.

The father's physical stature, particularly his own size at birth, influences the weight of his children (Klebanoff et al 1998). The leanest fathers had lighter children than the heaviest fathers and the trend was significant. The paternal contribution to an infant's birth weight has been ignored for decades and future studies of pregnancy outcomes should involve the father and mother. Joy et al (2009) show a long list of pregnancy complications associated with maternal obesity including gestational diabetes, gestational hypertension, gestational age for infants and higher after birth nursery admissions. Fetal development may be affected by mother's weight gains during pregnancy (Callaway et al 2006).

Schrauwers and Dekker (2009) found obesity represents an emerging epidemic amongst pregnant patients in Adelaide's northern suburbs, one of Adelaide's poorest urban areas in Australia resulting in baby high birth weights, high rates of pregnancy hypertension, increased risk of developing gestational diabetes and less likely to have a spontaneous onset of labour resulting in the need for instrumental deliveries or caesarean section delivery, and a higher rate of mental health issues. Policy intervention to educate women about the values of entering pregnancy with as healthy a weight as possible is required to reduce obesity harms and medical costs (Davis et al 1994). So, rising caesarean births could be another downside of obesity.

6.5 Conclusion

Method of birth trends have been established between 1986 and 2006 indicating a socio-economic gradient across the Adelaide Statistical Division resulting in a higher association of caesarean delivery in the more advantaged SLAs (significantly greater for elective than emergency caesarean), a lower association of spontaneous delivery and ventouse birth, gestational diabetes, fetal distress and a high association with private health cover. The more advantaged women also tend to live closer to private hospitals and public teaching hospitals where maternity services are available.

More women in disadvantaged SLAs have higher rates of spontaneous and forceps delivery, emergency caesarean, gestational diabetes and fetal distress and a very low rate of private health cover. Compared with those women in advantaged SLAs, more disadvantaged women live in areas much further from both public and private maternity services.

For women in both advantaged and disadvantaged SLAs, after a first birth by emergency caesarean, further deliveries are more likely to be by elective caesarean. Nearly all women who deliver by caesarean, are likely to have a completed parity of two or three children.

The caesarean birth rate in the ten highest IRSD scoring SLAs was 11 per cent higher than the ten lowest IRSD scoring SLAs indicating a very significant social gradient of caesarean delivery services. This could mean that the higher IRSD SLAs are over serviced or it could also mean that the lower IRSD scoring SLAs area underserviced. The role of this study is to point out the difference in caesarean section delivery across the Adelaide Statistical Division.

The application of levels of advantage using IRSD scores to SLAs releases a deeper understanding of the reasons for the variation of caesarean delivery across the Adelaide Statistical Division. Small area analysis enables maternal policy to be assessed at a local area and for future policy customisation to target the areas of greatest need for maternal and infant health equity.

CHAPTER SEVEN

CONCLUSION

7.1 Introduction

This chapter discusses the results of this caesarean birth study in relation to major findings, emerging questions, implications and suggested policy recommendations. The aim of the study was to examine and explain the pattern of caesarean births in South Australia between 1985 and 2007. In South Australia the caesarean delivery rate had increased to above the WHO recommendations of 10-15 per cent (WHO in Lancet 1985:437), and by 1981 was 16.9 per cent rising to 18.2 per cent in 1985 and to 32.2 per cent in 2007 (POU 2007:67). No government or professional medical or midwifery body in Australia has yet declared what they accept as a current suitable caesarean rate. Stakeholders have different points of view as to the reasons for the increasing rate of caesarean delivery in Australia. Allowing for the battle-lines drawn up between stakeholders who approve of caesarean birth and those who do not, both clinical and non-clinical reasons have been put forward as to why nearly one in three babies are currently born in South Australia by caesarean section.

The critical theory paradigm used in this study examined social justice and equity issues of caesarean birth under the areas of place of birth, demographic characteristics of mother and levels of social advantage in South Australia between 1985 and 2007. This study is based upon un-identified birth data released from the South Australian Pregnancy Outcome Statistical Unit custodians of women who delivered their babies in South Australia between 1985 and 2007. Of the 434 682 births, the total number of caesarean deliveries was 108 941 made up of 48 056 elective caesarean deliveries and 60 885 emergency deliveries. The average caesarean birth rate between 1985 and 2007 was 25 per cent.

7.2 Findings from the study

7.2.1 Reasons for increases in caesarean delivery

Caesarean deliveries are surgical births that can save the lives of both mothers and babies when dangerous clinical risk factors are established before or during birth (POU 2007:23-4). Elective caesarean deliveries in this study are defined as those caesarean births which are planned and do not involve a woman going through labour to give birth. An emergency caesarean birth is where the mother commences the labour only to find that it is dangerous to continue and an emergency caesarean delivery is performed. Obstetricians in the private health birthing system believe they are better at determining maternal and infant risk factors (Trentwith 2010:1), which has led to the private hospital system having a considerably higher elective caesarean birth rate than the public system which shows a significantly higher and increasing emergency caesarean rate.

Obstetricians are adamant that the constant threat of malpractice suits and the high medical indemnity costs for private practitioners adds to the private hospital caesarean delivery rate (MacLennan and Spencer 2002). The High Court of Australia supports caesarean delivery providing no negligence can be proved in the event. Recent malpractice research has suggested that malpractice claims should be regarded as a chance to improve the caesarean birth protocol and this would be more likely to occur if the blame was taken out of the caesarean birth court process (Runciman 2003:978). It is argued that the blame process can cause problems with caesarean birth protocols in that problems can be pushed underground and silenced. As obstetricians go through their training most become more convinced that caesarean delivery is the better way to birth if there is any chance of a risk factor being a problem (Robson et al 2009). It has been pointed out in the legal literature that the parental expectation of a perfect baby every time is unreasonable (MacLennan 1998).

Private health cover has been seen as a reason for increased caesarean delivery as the private system employs self-employed medical specialists with large overhead costs, including those costs of professional indemnity insurance (Medical Indemnity Insurance Report 2009). Private health cover maternity patients from higher socio-economic status backgrounds with lower co-morbidity levels tend to be older and this is the reason given for

the larger percentage of caesarean delivery births by obstetricians within the private patient hospital system (Shorten and Shorten 2007:43-55).

The Maternity Services Review completed by the Department of Health and Ageing (Roxon 2008) aims to give Australian women more choice in their model of birth care. A significant outcome of this Review has been the significant funding provided by the Australian Government for the training of more eligible midwives (Budget at a glance 2009). They work with low risk women during pregnancy and birth. The Maternity Services Review has ignited demands by both the AMA (Maternity Services Review Submission 2008), and the Midwives Associations (Maternity Services Review Submission 2008) who are demanding the accurate collection of birthing data during the process of using more eligible midwives in the birthing industry. COAG (2008) has recommended public hospital women be able to access the same medical pregnancy services as private health cover maternity patients. The questions relating to this study are: 'Will the employment of a greater number of midwives reduce the caesarean delivery rate in Australian hospitals?' 'Will more midwives be employed in rural and remote areas?' The collection of transparent clinical and non-clinical administrative data should be extremely helpful in assessing the need for caesarean delivery in all Australian models of birth care.

Case-mix funding which determines the function of a hospital is emerging as an area of interest in the caesarean section delivery rate increase debate. Hospitals are funded by the throughput of procedures they perform. Lauer et al (2010:1-22) supports the view that available human resources and the financing profile of a medical facility have the largest impact on caesarean birth rates. Hart (1998:51) is concerned that public hospitals are targeting the high earning capacity of surgery as an efficiency measure instead of focusing on quality of patient care. In 2006-07 the Commonwealth Government had comparison costs of vaginal and caesarean delivery completed (Brown et al 2010), indicating Government concern over cost differences between vaginal and caesarean births. Caesareans cost nearly double a vaginal birth, women on average have an extra stay day in hospital and drug expenses are higher.

Female genital mutilation is illegal in Australia (Goward 2010). However, the increasing number of women immigrating to Australia from countries, where female genital mutilation

of various degrees is culturally acceptable is causing concern in the birthing wards where it has become a reason for caesarean delivery and Australian women's policy development. The Royal Women's and Children's Hospital, Melbourne (2010) reported a significant number of FGM cases which causes a 30 per cent greater chance of caesarean birth. Because FGM can be a very important ritual for some immigrant cultures it has become a culturally sensitive issue to deal with. Should young women be forced to undergo FGM in Australia? Should women who wish to have FGM be allowed to have FGM as an itemised health care coded procedure in an Australian public or private hospital where she is able to be looked after? Would banning FGM just send the procedure underground in Australia where it could be more prone to infection and haemorrhage?

No generic document was found during this study relating to the overall advantages and disadvantages of caesarean delivery and information relating to post-operative care. It appears that each patient relies on their medical advisors, public hospital forums, the internet, friends and relatives for information. Compounding the caesarean birth information pipeline is the training and experience of each medical practitioner and midwife. Kealy (2010) believes the area of post-operative care after caesarean has been neglected and if women were more aware of post caesarean health issues, women may think more carefully about caesarean section on request.

7.2.2 Caesarean birth rate

Between 1985 and 2007 the caesarean rate in South Australia had increased from 18.2 to 32.2 per cent (an increase of 77 per cent in 22 years). In 1985 the elective and emergency rate was almost identical (9.2 and 9.0 per cent). By 2007 the elective rate has increased to 15.3 per cent (an increase of 68 per cent) and the emergency caesarean rate had increased to a higher 17.3 per cent (an increase of 92 per cent). Women who delivered in a private hospital had an equal chance of elective or emergency delivery, whereas women in the public hospital system had a 40 per cent chance of an elective and 60 per cent chance of an emergency delivery.

Low birth weight is a major contributor to caesarean delivery. In South Australia between 1985 and 2007, low birth weight contributed to 5.6 per cent of the total elective caesareans and 16.7 per cent to all emergency caesareans. Gallego (2008) notes concern about the

rising number of babies admitted to intensive care after a caesarean when no indicated risk factor was evident before birth. Particular concern is related to respiratory morbidity in babies born before labour (Callaghan et al 2006). Dahlen and Kruske (2012) found caesarean increase is largely driven by the recommendations of doctors, particularly in private hospitals where women are likely to be older. However, caesareans are rising among all groups regardless of age, risk factors and weight. Dahlen and Kruske (2012) found a greater correlation of caesarean delivery with postcode and private insurance status.

Of the models of birth care available to women in South Australia for all births in 2007, the highest caesarean rate was for private obstetricians, followed by the hospital clinic, general practitioner and birth centre. Consequently, normal spontaneous delivery has decreased in private hospitals and increased in public hospitals between 1991 and 2007.

7.2.3 Demographic characteristics of mother

The literature on the rise of caesarean birth rates often referred to the ageing of the mothers (Bayrampour and Hearman 2010). The peak cohorts for age of mother increase in South Australia between 1985 and 2007 were 25-29 (+7.2 per cent) and the 30-34 age cohort (+5.72 per cent). It must be pointed out that the increase in mothers above 35 years of age as a percentage of the caesarean birthing population is very small. The median maternal age for all mothers who birthed by caesarean increased from 26 years in 1985 to 30 years in 2007.

For mothers not born in Australia and all races of mothers including Aboriginal and Asian mothers, there has also been an increase in caesarean delivery in the period 1985 to 2007. Aboriginal women are younger than Asian women for both elective and emergency caesarean section deliveries. For both Aboriginal and Asian women emergency caesarean sections are higher than elective caesarean section deliveries.

In South Australia between 1985 and 2007, 97 per cent of delivered babies were discharged after birth. Maternal death was almost negligible and was the same in both the public and private hospital system. Fetal death was ranked highest in the normal spontaneous delivery method of birth, followed by breech birth, emergency caesarean, forceps, elective caesarean and ventouse delivery. The top method of birth ranking for new born babies in

hospital at 28 days was emergency caesarean delivery, followed by normal spontaneous, elective caesarean delivery, forceps assisted delivery, total breech birth and ventouse assisted delivery. The highest ranked neonatal death by method of delivery was for normal spontaneous birth, followed by emergency caesarean section delivery. Elective caesarean birth ranked fifth out of the six methods of delivery which may be a significant reason as to why a mother may prefer an elective caesarean delivery for her child. Both fetal and neonatal deaths are trending downwards in South Australia.

The occupation of higher income fathers supports the use of caesarean section delivery, elective more so than emergency caesarean delivery. The opposite is true for lower income workers where emergency caesarean birth is over double the rate of elective caesarean delivery. This suggests an association between private health cover, income of father and elective caesarean delivery. Partners of tradespersons had the highest rate of c-section births followed by managers/Administrators and Professionals.

Of the women who gave birth in South Australia between 1985 and 2007, data show a higher rate of parity 0 (first births) by emergency c-section, and a clear swap to a higher rate of elective parity 1 and 2 elective caesarean deliveries. The peak age for parity 0 deliveries is 20-24 years of age and peak age for both parity 1 and 2 births is a higher 25-29 years of age. The Australian average age for first births was 28.9 years (ABS 2010a). The median age for caesarean deliveries in South Australia between 1985 and 2007 increased from 27 to 31 years of age. This study explored the relationship between parity and caesarean delivery and found 97 per cent of all caesarean deliveries were covered in parity 0-3 births in South Australia between 1985 and 2007. Some 77 per cent of second caesarean births are due to a woman delivering her first child by caesarean section. Each repeat caesarean is more complicated than the last due to a weakened uterine wall, problems with the placenta, bladder injuries and heavy bleeding (Harms 2012).

7.2.4 Caesarean birth and social disadvantage

In 2006, caesarean rates were 10 per cent higher in the most advantaged SLAs compared with the most disadvantaged SLAs in the Adelaide Statistical Division. More women in the most disadvantaged SLAs suffered from gestational diabetes, and their babies from fetal distress, than was the case for the more healthy women in the most advantaged SLAs. The

variation of caesarean delivery between them indicates a clear socio-economic gradient between the advantaged and disadvantaged SLAs for caesarean delivery. Normal spontaneous delivery has increased in areas of most social disadvantage. Menadue (2009:1) sees the private health insurance system as increasing the use of scarce medical resources and staff, and a form of corporate welfare. Whereas, Pesco (2009:1) argues that private hospitals are funded through an uncapped system of fees for service. These two opposing arguments are really beside the point in Australia which has a model of universal health care. All Australian birthing women, whether public or private in a universal health care system, no matter where they live, need qualified available staff, if a caesarean delivery is required.

7.3 Limitations of the study

Although the POU and ISAAC data sets contained a vast storage of maternal and infant variables, policy as yet does not allow for the linkage of a given mother and infant with the variables by a personalised linkage number within the health data system. That means for example, it was not possible to identify a mother who was a public patient and follow through her labour and birth medical interventions resulting in a caesarean outcome. Also, it is not possible to link the POU maternity patients with say that of their after birth care provided by a midwife or obstetrician or paediatrician or general practitioner, to study mother and infant after caesarean birth outcomes. Such a linkage between data silos would give unbiased results for example, on the rate and time frame of maternal urinary incontinence after different methods of birth.

Maternal request in the literature has been given as significant reason for the increase of caesarean delivery. There is no data variable in the study datasets to cover such a request. Therefore, at a population level, an accurate estimation is not possible. Similarly, there are no data variables to cover the impact of administrative functions of specific obstetrician, midwife or theatre time availability. Such data are needed to find out how great the influence is of human resources are on the caesarean rate.

The POU and ISAAC data sets used in this study were formatted for medical staff on medical matters. There is a need for a life-course study on women and infants involved in caesarean delivery, in the format of a series of mother (and father and even grandparent or other close

contacts) with interviews say six months apart, to assess the positive and negative aspects of caesarean birth.

7.4 Implications

The Maternity Services Review in 2008 has flushed out the different approaches to birth between obstetricians and eligible midwives. The Commonwealth Government has also sought the differences between the costs of caesarean and normal spontaneous delivery, and released budget funding for the training of more midwives. Midwives are cheaper than obstetricians to train and pay for their services. Without a serious collaborative effort between obstetricians and midwives to service maternity patients with due care, maternity patients could be worse off with regard to theatre access if a caesarean became necessary.

Without a collaborative effort between these two medical parties pregnant and birthing women are left to fend for maternity and birth information themselves. Both medical parties need to collaborate within Australia's universal health system to give all women the most suitable model of birth care. An approved collaborative caesarean birth information document supported by Australian obstetricians and eligible midwives could be used as an education tool in the education system and for maternity patients. Without a basic universal document outlining the reasons, positive and negative aspects of caesarean delivery and post natal care available, each maternity patient is left to the opinions of their health provider depending on his or her medical training, bias and experience. The 2008 COAG recommendation for providing public and private patients with the same maternity services could mean several things: Firstly, public women with an identified birth risk factor may gain greater access to caesarean delivery. Secondly, it could mean that private patients who choose a caesarean without a diagnosed medical risk factor may have to pay for the complete caesarean event or the difference between a caesarean and a vaginal birth.

7.5 Recommendations

Table 7.1 shows recommendations have emerged from this study which would assist in understanding the reasons for the increasing rate of caesarean birth. These suggested recommendations fall under data collection and linkage; public information; policy and planning of maternity services in South Australia

Table 7.1 Policy recommendations from study

Recommendations	Explanation
Maternity patient information	Need for a generic document available to all women approved by the AMA and eligible midwives of Australia for both public and private maternity patients?
Mandatory father data	Besides occupation, type of health care and parity data there is a need for age, BMI, diabetes, alcohol and smoking habits at time of conception to find any relationship with outcome at birth.
Maternal request for caesarean birth data item ICD-10-AM code	To clarify how many women desire birth at a given date or because their obstetrician is only available at a certain time or theatre availability.
Release of annual individual hospital birth data	To give prospective parents an understanding of the reasons for the models of birth care predominantly used in each hospital.
Home birth	That the nearest hospital be notified of a home birth in case there is a need for hospital assistance.
Post birth mother and infant caesarean care data linkage	To collect maternal and infant morbidity data for each method of delivery to establish to establish realistic guidelines to help women to heal and recover after birth.
De-identified patient linkage between medical silos	To identify patients with a unique patient identifier which can link de-identified maternity and infant data across medical silos, for example hospital data and general practitioner events at a population level to analyse life-course maternal and infant morbidity differences associated with elective and emergency birth.
Female genital mutilation	To formulate an ICD-10-AM code for the safety of women and to open up the topic for public discussion to reduce the caesarean delivery rate of women who have undergone FGM.
Non-judgmental review of legal malpractice claims	For all staff involved in malpractice cases be able to express their clinical views without fear to improve caesarean and other models of birth care.
Parental lifestyle policy	To make available first class food both advantaged and disadvantaged families can afford, safe areas for parents and children to exercise and clean and quiet housing.

7.6 Conclusion

Caesarean delivery has increased significantly between 1985 and 2007. Many reasons have been put forward for the caesarean increase, in particular increasing age of mother, the threat of legal malpractice claims for obstetricians, private health care and the case-mix process of hospital funding. There are more elective caesareans in the private system and

more emergency caesareans in the public hospital system. The most disadvantaged mothers have a higher incidence of maternal co-morbidities, such as gestational diabetes and fetal distress for their infants, yet a lower caesarean rate than women of higher socio-economic advantage who have lower rates of maternal co-morbidities and fetal problems. A recent comprehensive Commonwealth Department of Health and Ageing Maternity Services Review has recommended the training of more eligible midwives and an enquiry into the costing of spontaneous and caesarean birth differences. Both enquiries suggest changes to the models of birth care available to Australian mothers. Recently COAG has recommended that public patients receive the same maternity care as private patients. This would mean an increase of elective and a decrease of caesarean deliveries in the public system. So far, costing appears to be the dominant force of determination of caesarean rates which has resulted in private models of birth care having a higher rate of caesarean delivery than areas of lower socio-economic advantage.



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30 August 2007

Professor GJ Hugo
Discipline of Geographical and Environmental Studies

Dear Professor Hugo

PROJECT NO: *Caesarean birth trends in South Australia*
H-115-2007

I write to advise you that I have approved the above project on behalf of the the Human Research Ethics Committee. Please refer to the enclosed endorsement sheet for further details and conditions that may be applicable to this approval.

Approval is current for one year. The expiry date for this project is: 31 August 2008

Where possible, participants taking part in the study should be given a copy of the Information Sheet and the signed Consent Form to retain.

Please note that any changes to the project which might affect its continued ethical acceptability will invalidate the project's approval. In such cases an amended protocol must be submitted to the Committee for further approval. It is a condition of approval that you immediately report anything which might warrant review of ethical approval including (a) serious or unexpected adverse effects on participants (b) proposed changes in the protocol; and (c) unforeseen events that might affect continued ethical acceptability of the project. It is also a condition of approval that you inform the Committee, giving reasons, if the project is discontinued before the expected date of completion.

A reporting form is available from the Committee's website. This may be used to renew ethical approval or report on project status including completion.

Yours sincerely

Professor Garrett Cullity
Convenor
Human Research Ethics Committee

APPENDIX TWO



RESEARCH BRANCH
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CRICOS Provider Number 00123M

Applicant: Professor GJ Hugo
Department: Discipline of Geographical and Environmental Studies
Project Title: *Caesarean birth trends in South Australia*

THE UNIVERSITY OF ADELAIDE HUMAN RESEARCH ETHICS COMMITTEE

Project No: H-115-2007 **RM No:** 000007944

APPROVED for the period until: 31 August 2008

subject to minor modification to the participant information sheet. It is noted that this study will be conducted by Judith Coxell, Masters student.

Refer also to the accompanying letter setting out requirements applying to approval.

Professor Garrett Cullity
Convenor
Human Research Ethics Committee

Date: 29 AUG 2007



5th December 2008

Ms Judith Coxell
Department of Geography and Environmental Studies
Level 8, Napier Building
The University of Adelaide
North Terrace Adelaide
SA5005

Reference No: **04-08-262**

Dear Judith

Thank you for submitting your research project, *Caesarean Birth Trends in the Adelaide Metropolitan Area: 1996-2006*, on the 20th November 2008 for ethical consideration.

At our last meeting your application was assessed and I am pleased to inform you that this proposal has met with support and that the committee has decided that your application be recommended.

In accordance with the NH&MRC guidelines, *National Statement on Ethical Conduct in Research Involving Humans*, we require at regular periods, at least annually, reports from principle researchers.

If you require any further information please do not hesitate to contact the Executive Officer or myself.

We wish you well with the project and look forward to receiving a copy of your report.

Sincerely yours

DR MATTHEW BOURKE
CHAIRPERSON
Ref: Proposal/Approval/5December08



AHREC is a sub-committee of AHCSA

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SA Health

**Human Research Ethics
Committee**

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Ms Judith Coxell
Department of Geography and
Environmental Studies
The University of Adelaide
ADELAIDE SA 5005

Dear Ms Coxell,

**Re: Caesarean Birth Trends in the Adelaide Metropolitan Area – 1996 – 2006.
HREC PROTOCOL NO: 265/11/2011**

Thank you for submitting the above proposal to the Department of Health Human Research Ethics Committee for review. The Committee considered your application at its meeting on 3rd December.

I am pleased to advise that ethics approval has been granted to your project. Please note that approval is subject to the following conditions:

- A copy of the completed master's thesis being provided to the HREC.
- A public report being produced (e.g. publication in a peer reviewed journal).
- The research being conducted in accordance with the 'National Statement on Ethical Conduct in Human Research.'
- Provision of a final report when the project is completed.
- Immediate notification to HREC of any complaints by or adverse events involving participants.
- Immediate notification of any unforeseen events that might affect continued ethical acceptability of the project.
- Submission of any significant changes to the original proposal. Such changes should be approved by the HREC before they are implemented.
- Immediate advice, giving reasons, if the project is discontinued before its completion.

Caesarean Birth Trends in South Australia: 1985-2007

Approval is given for a period of three (3) years only, and if the research is more prolonged than this, a new submission will be required.

Please note that while ethics approval has been granted to this project, access to the required data must be negotiated with Mr Paul Basso and Dr Annabelle Chan. Please contact them both to discuss this further.

Should you have any questions or concerns, please contact Sarah Lawson, Executive Officer of the HREC, Tel 8226 6367 or E-mail hrec@health.sa.gov.au

We wish you well with your project.

Yours sincerely,

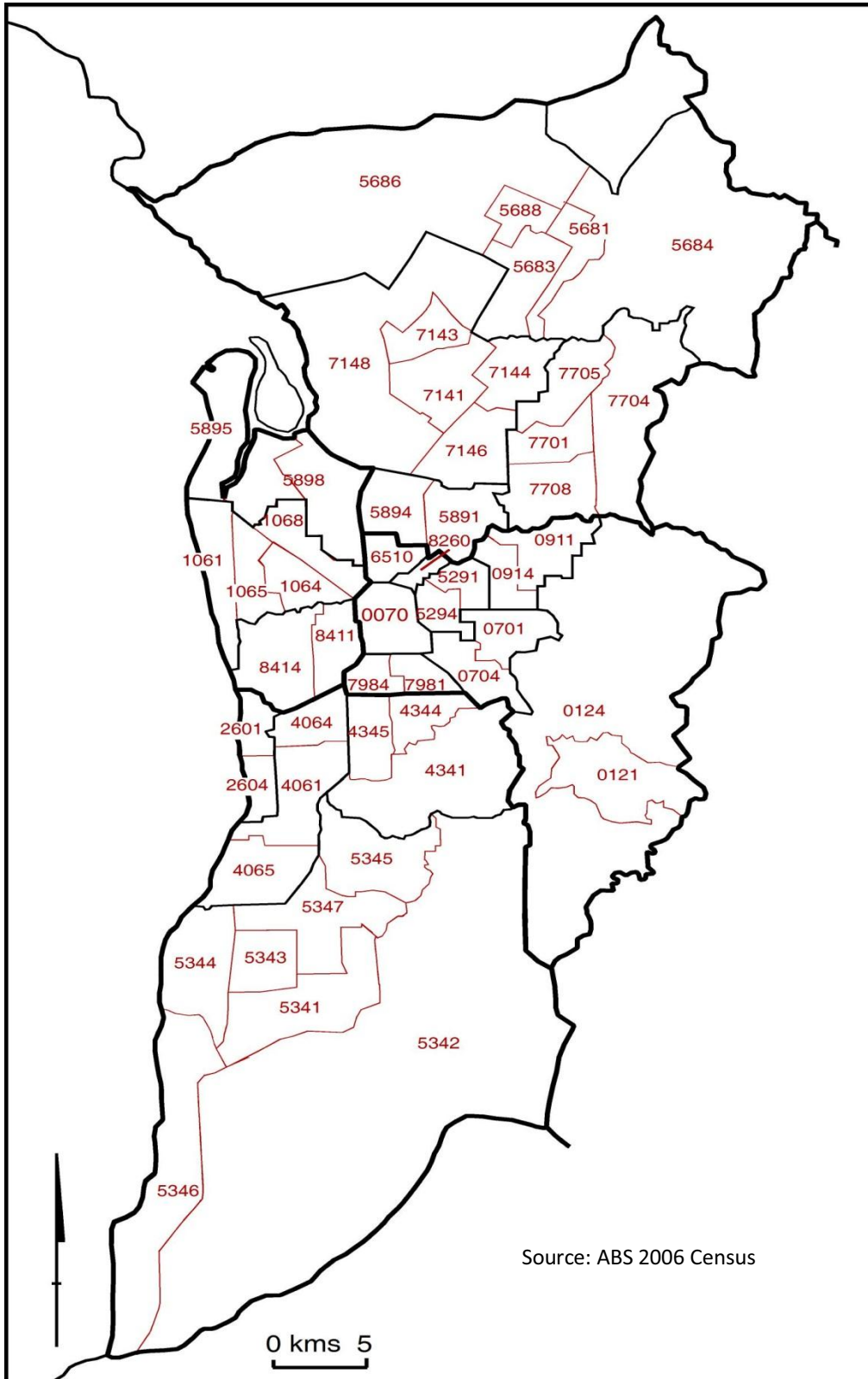
Andrew Stanley
CHAIRPERSON
HUMAN RESEARCH ETHICS COMMITTEE

10/12/2008

CC: Mr Paul Basso, Department of Health
Dr Annabelle Chan, Department of Health

APPENDIX FIVE

Adelaide Statistical Division by SLA, 2006



APPENDIX FIVE continued:

Statistical Local Areas of the Adelaide Statistical Division 2006			
0070	Adelaide (C)	5681	Playford (C) - East Central
0121	Adelaide Hills (DC) - Central	5683	Playford (C) - Elizabeth
0124	Adelaide Hills (DC) - Ranges	5684	Playford (C) - Hills
0701	Burnside (C) – North East	5686	Playford (C) - West
0704	Burnside (C) – South West	5688	Playford (C) - West Central
0911	Campbelltown (C) - East	5891	Port Adel. Enfield (C) - East
0914	Campbelltown (C) - West	5894	Port Adel. Enfield (C) - Inner
1061	Charles Sturt (C) - Coastal	5896	Port Adel. Enfield (C) - Park
1064	Charles Sturt (C) - Inner East	5897	Port Adel. Enfield (C) - Port
1065	Charles Sturt (C) - Inner West	6510	Prospect (C)
1068	Charles Sturt (C) - North-East	7141	Salisbury (C) - Central
2601	Holdfast Bay (C) - North	7143	Salisbury (C) - Inner North
2604	Holdfast Bay (C) - South	7144	Salisbury (C) - North-East
4064	Marion (C) - North	7146	Salisbury (C) - South-East
4065	Marion (C) - South	7148	Salisbury (C) Bal
4341	Mitcham (C) - Hills	7701	Tea Tree Gully (C) - Central
4344	Mitcham (C) - North-East	7704	Tea Tree Gully (C) - Hills
4345	Mitcham (C) - West	7706	Tea Tree Gully (C) - North
5291	Norw. P'ham St Ptrs (C) - East	7708	Tea Tree Gully (C) - North
5294	Norw. P'ham St Ptrs (C) - West	7981	Unley (C) - East
5341	Onkaparinga (C) - Hackham	7984	Unley (C) - West
5342	Onkaparinga (C) - Hills	8260	Walkerville (M)
5343	Onkaparinga (C) - Morphett	8411	West Torrens (C) - East
5344	Onkaparinga (C) - North Coast	8414	West Torrens (C) - West
5345	Onkaparinga (C) - Reservoir	Source: ABS 2006	
5346	Onkaparinga (C) - South Coast		
5347	Onkaparinga (C) - Woodcroft		

Maternal mortality rate South Australia 1985-2007

The mother's mortality rate outcome of 434 682 births in South Australia between 1985 and 2007 calculated using the aggregate deaths between 1998 and 2007 is as follows: Metropolitan teaching mother death rate = $6 \text{ mother deaths} / 94\,094 \text{ mother births} \times 1\,000 = 0.064$ mother deaths per 1000 mother births; Private metropolitan mother death rate = $3 \text{ mother deaths} / 46\,290 \text{ birth mothers} \times 1\,000 = 0.065$ mother deaths per 1000 mother births; Mt Gambier and Whyalla mother death rate = 0 mother deaths per 1000 mother births; Other country hospitals mother death rate = $2 \text{ mother deaths} / 32\,153 \text{ birth mothers} \times 1\,000 = 0.062$ mother deaths per 1000 mother births, resulting in a South Australia mother death rate 1998-2007 = $11 \text{ mother deaths} / 181\,275 \text{ birth mothers} \times 1\,000 = 0.061$ mother deaths per 1 000 baby deliveries.

Source: POU study database

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