

UNIVERSITY OF CAPE TOWN  
FACULTY OF HEALTH SCIENCES



**EFFECTS OF A SHORT INTERPREGNANCY INTERVAL ON  
PREGNANCY OUTCOMES**

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A dissertation submitted in partial fulfilment of the requirements for the Masters of Medicine degree (MMed) in Obstetrics and Gynaecology.

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## DECLARATION BY THE CANDIDATE

I, CASTRO ROBERTSON KISUULE, hereby declare that the work on which this dissertation is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

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## DECLARATION BY THE SUPERVISORS

Professor Zephne M Van Der Spuy, Professor Petrus S Steyn and Dr. Gregory Petro supervised the research undertaken by CASTRO ROBERTSON KISUULE and the presentation of this dissertation.

We are satisfied that this is CASTRO ROBERTSON KISUULE's original work and that this dissertation should be submitted in partial fulfilment of the requirements for the degree, MMed (Obstetrics and Gynaecology).

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## ABSTRACT

The interval between one pregnancy and the next may affect the outcome of pregnancy. Both short and long interpregnancy intervals (IPI) have been associated with adverse pregnancy outcomes and most of these occur with a short IPI.

Our primary objective was to determine the effects of a short IPI (< 24 months) compared with a long IPI ( $\geq$  24 months) on the subsequent potentially viable pregnancy in women who received antenatal care (ANC) in the secondary level hospitals in the Metro-West area of Cape Town. The secondary objective was to review possible determinants of a short IPI.

**Methods:** This was a pilot descriptive cross-sectional study conducted between 1<sup>st</sup> September 2016 and 28<sup>th</sup> November 2016. One hundred and thirty women who were Para 2 were recruited to the study in the early post-natal period. Sixty women were recruited into the short IPI group (<24 months) and 70 to the long IPI group ( $\geq$ 24months). Questionnaire-based interviews were conducted and data were entered using Microsoft Excel 2012 spread sheets. Statistical analysis was done using Stata® Edition 13.

**Results:** We analysed the data for both short and long IPI and found that there were no significant differences in preterm birth, abruptio placentae, preterm prelabour rupture of membranes (PPROM) and low birth weight. There was however a significant difference in the number of small-for-gestational-age (SGA) babies. In the short IPI group, 19 women (31.7%) had SGA babies in comparison to the long IPI group where 7 women (10%) had SGA babies(  $p = 0.015$ ). Of the 130 respondents, 79 women (60.8%) had unintended pregnancies, 44 (73%) with a short IPI vs 35 (50%) with a long IPI ( $p = 0.017$ ). Women with a long IPI were more likely to have a different partner for the subsequent pregnancy ( $p= 0.002$ ). Women in relationships longer than 5 years were more likely to have a long IPI ( $p = 0.049$ ). Thirty-eight women (63.3%) with a short IPI would have preferred the pregnancy later compared to 11 women (15.7%) with a long IPI ( $p<0.001$ ). There were 27 (38%) women who supported themselves financially in the long IPI group compared with 8 (13%) with a short IPI ( $p=0.001$ ).

A long IPI was associated with more formal employment and professional careers

compared to a short IPI ( $p= 0.002$ ). In the long IPI group 10 women (7%) had professional positions compared with none in the short IPI group ( $p=0.002$ ).

There were no significant differences in breastfeeding duration, contraception use and knowledge, social habits, previous obstetric history, educational status or emotional support between the two groups.

**Conclusion:** In our study, of all the pregnancy outcomes investigated, small-for-gestational age was the only clinical outcome significantly associated with a short IPI. There were differences in pregnancy intendedness, duration of relationships, financial support and employment between the two groups. The majority of women with a short IPI (63.3%) would have preferred the index pregnancy to have occurred later.

## ABBREVIATIONS

ANC	Antenatal care
BTP	Birth-to-pregnancy interval
COC	Combined oral contraceptive
IDI	Inter-delivery interval
IOI	Inter-outcome interval
IPI	Interpregnancy interval
IUCD	Intra uterine contraceptive device
IUS	Intra uterine system
LARC	Long acting reversible contraceptive
LBW	Low birth weight
NICU	Neonatal Intensive Care Unit
NSS	Not statistically significant
POP	Progesterone only pill
PPROM	Preterm prelabour rupture of membranes
PTB	Preterm birth
SGA	Small-for-gestational age
TOP	Termination of pregnancy
UK	United Kingdom
UNICEF	United Nations Children's Fund
USA	United States of America
USAID	United States Agency for International Development
WHO	World Health Organization

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## CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW

Birth spacing is one of the issues that obstetricians consider when advising women who are planning a pregnancy. A couple's decision to delay or plan a pregnancy is influenced by several interlinked factors. These may include the couple's age, fertility aspirations, fecundity, access to family planning, personal preference, outcome of previous pregnancies, cultural and religious beliefs.<sup>1, 2</sup>

Birth spacing has been defined in various ways including interpregnancy interval (IPI), birth to pregnancy interval (BTP), inter-delivery interval (IDI) or inter-outcome interval (IOI). IPI is defined as the period between a live birth and the start of the next pregnancy. This is the same as birth-to-pregnancy interval. IDI is defined as the period between two consecutive live births. This can also be called birth-to-birth interval. IPI is equal to IDI minus 40 weeks. Inter-outcome interval (IOI) is defined as the period between one pregnancy outcome and the next, regardless of pregnancy outcome. Because all pregnancies are evaluated, IOI provides better risk assessment for stillbirth, spontaneous and induced abortions.<sup>3-6</sup>

For the purpose of this study we have used the period between a live birth and start of the next pregnancy – birth to pregnancy interval as defined by the World Health Organisation (WHO).<sup>3</sup>

The WHO convened a team of experts on birth spacing in June 2005 in Geneva.<sup>3</sup> After reviewing all the available studies, it was agreed that an interpregnancy interval

between 18 and 27 months was found to have more favourable outcomes. This consultative group democratically agreed upon and recommended an IPI of at least 24 months to prevent adverse maternal and perinatal outcomes. This interval was considered consistent with the WHO and UNICEF recommendation of breastfeeding for 2 years, and this was considered easy to use in promotional programmes as 2 years may be clearer than “18 months” or “27 months” to the mothers.<sup>3</sup>

Both the WHO and United States Agency for International Development (USAID) recommend an optimal IPI of 24 months, citing various studies that show this interval results in the lowest relative risk of adverse perinatal and maternal outcomes after a live birth compared to shorter periods.<sup>4, 7-11</sup>

The IPI has been reported to influence the outcome of the subsequent pregnancy. Both a short IPI (less than 24 months) and long IPI (more than 60 months) have been associated with adverse pregnancy outcomes, most of which are seen with short intervals between pregnancies.<sup>4, 7, 12</sup>

In 2012, Sedgh et al in New York, reviewed periodic estimations of the incidence of global unintended pregnancies using multiple data sources and reported that 40% of all pregnancies worldwide that year were unplanned.<sup>13</sup> It is important to determine whether IPI is an independent risk factor for adverse pregnancy outcomes because women can potentially have some control over birth spacing and in so doing reduce these risks. While avoidance of a short IPI can be countered by adequate provision of postpartum contraception, avoidance of a long IPI is more complex as a desired pregnancy may be affected by subfertility, availability of a partner, economic issues or illness.<sup>2</sup>

A short IPI has been linked to increased risk of several obstetric complications including preterm birth, preterm prelabour rupture of membranes, low birth weight, small for gestational age (SGA), labour dystocia, maternal morbidity and mortality.<sup>14-</sup>

<sup>16</sup> The increased risk of adverse pregnancy outcomes due to a short IPI has been attributed to a number of mechanisms including maternal nutritional status and folate depletion, hormonal imbalance in the postpartum period and lactation stress.<sup>17-19</sup> The maternal nutrients including folate may not be replenished sufficiently between closely spaced pregnancies, especially among breastfeeding mothers, and this may lead to adverse pregnancy outcomes. The multifaceted nature of the pregnancy outcomes and racial and socioeconomic differences in the reported sampled populations has led to some hypotheses about the reasons for the different outcomes which are reviewed later in this chapter.<sup>6, 11</sup>

The interpregnancy interval should not be reviewed in isolation and is the result of different circumstances affecting the mother and the family. There are numerous factors that have been described in published literature to determine birth spacing. For example in rural Africa, where modern contraceptives are not readily accessible, women usually rely on breastfeeding their current child to delay the next pregnancy (lactational amenorrhoea method).<sup>20</sup> This method is reliable only if the infant is exclusively or nearly exclusively breastfed for the first 6 months of life otherwise the lack of contraception contributes to a short IPI. Hailu et al (2016) reviewed determinants of a short interbirth interval amongst 636 women in Arba Minch District, Ethiopia. These included having no formal education, duration of breast-feeding less than 24 months, the preceding child being female, no access to modern contraceptives and a poor wealth index. They were all independently positively correlated with a short interval.<sup>21</sup>

Youssef et al (2005) conducted a community-based survey of 4349 birth intervals of women in Southern Jordan and reported a longer interbirth interval (27 months) being positively predicted by breastfeeding for over 12 months, use of modern contraceptives, mother's higher education, more surviving children, older maternal age and longer marriage.<sup>22</sup>

The maternal depletion hypothesis may be more prevalent in the low-income countries due to malnutrition but it also applies to developed countries.<sup>5, 9, 23</sup> Ten studies from the USA, UK and the Netherlands have all reported low serum folate levels during the postpartum period.<sup>24-26</sup> In a large prospective cohort study from the Netherlands, Van Eijsden et al reported a negative association between short IPI and birth weight, and that women not using folic acid supplements were at a greater risk of intrauterine growth restriction (IUGR) after a short IPI.<sup>27</sup>

Other factors that have been suggested are infectious processes extending from the previous birth to the current pregnancy contributing a link between short IPI and adverse pregnancy outcomes.<sup>28, 29</sup> Inflammation of the genital tract that developed in the previous pregnancy and did not completely resolve is proposed to be the link between short IPI, preterm pre-labour rupture of membranes (PPROM) and subsequent preterm birth.<sup>30</sup> This is supported by a large USA study in Missouri (154,000 pregnancies) between 1989 and 1997 that found an increased risk of PPRM in the subsequent pregnancy with a short IPI.<sup>30</sup>

Other factors that have been suggested include cervical insufficiency, sibling competition for maternal resources, disease transmission between closely spaced siblings and incomplete healing of the uterine scar from previous caesarean delivery.<sup>24, 31</sup>

A physiological regression hypothesis has been suggested to explain the association between long IPI (more than 60 months) and adverse maternal outcomes. This suggests that pregnancy causes physiological adaptations of the reproductive system such as an increase in blood flow to the uterus. When conception is delayed beyond a certain point, the subsequent pregnancy may no longer benefit from these temporary beneficial adaptations.<sup>5</sup>

A number of studies have reviewed the various pregnancy outcomes and neonatal complications associated with IPI. Individual studies differ in their statistical strength and their ability to account for confounding factors such as socio-economic status or lifestyle differences.<sup>15, 32</sup> The pregnancy outcomes from a number of relevant studies are summarized below.

### **Preterm Birth (PTB)**

A short IPI is a well-recognized risk factor for preterm birth (PTB).<sup>5, 6, 33, 34</sup> In a 2006 meta-analysis by Conde-Agudelo et al in the USA, an IPI of less than 6 months was associated with a 40% increased risk for PTB.<sup>7</sup>

De Franco et al in Missouri, found that an IPI of <6months and 6-12 months increased the overall risk of PTB (adjusted OR, 1.48 [95% CI, 1.37 -1.61] and 1.14 [95% CI, 1.06-1.23], respectively).<sup>35</sup> This was after adjusting for co-existing factors.

A retrospective cohort study by de Weger et al in the Netherlands reviewing 263,142 women in their second delivery between 2000 and 2007, found a statistically significant higher risk (adjusted OR 1.92; 95% CI, 1.79 - 2.07) of PTB with a short IPI of < 6months.<sup>36</sup>

Rodrigues et al (2008), reported a significantly higher risk for spontaneous PTB in a study conducted among Portuguese public maternity units (OR 3.4, 95% CI 1.2 – 9.4).<sup>37</sup> Two large USA studies reported similar findings to the Netherlands and Portugal studies.<sup>38, 39</sup>

The highest risk from all these studies was seen in women with IPI  $\leq$  6 months followed by those between 6 – 12 months. It is worth noting that there was an increased risk generally of early PTB (below 34 weeks) but there was no correlation with late preterm birth (between 34 and 37 weeks).<sup>37</sup>

### **Preterm prelabour rupture of membranes (PPROM)**

In a large population based study in the USA, an IPI of less than 18 months was associated with an increased risk of PPRM in the subsequent pregnancy.<sup>30</sup> In a review of 11,122 pregnancies in the Matlab area of Bangladesh, which occurred between 1996 and 2002, Razzaque et al (2005) found a significant risk of having PPRM after a short IPI. The risk was highest amongst those with an IPI between 6 and 14 months.<sup>40</sup>

### **Abruptio placentae**

In a large USA study, Blumenfeld et al (2014) reported that a short IPI of less than 6 months was associated with an increased risk of placental abruption.<sup>41</sup> This population-based cohort study (140,577 singleton pregnancies) principally looked at the association of abnormal maternal serum analyte levels (PAPP-A, hCG, AFP, Estriol) and abruptio placentae, and found an increased risk from a short IPI (OR 1.8, 95% CI 1.2-2.7).

## Low birth weight (LBW)

Several studies in the USA have reported an association between a short IPI and LBW (birth weight < 2500g).<sup>7, 23, 36, 38, 39, 42, 43</sup> Studies are summarised in the table below:

**Table 1:1 Studies on short IPI and LBW**

Study	Setting	Sample size	Study Design	IPI	Result
Khoshnood et al, 1998 <sup>43</sup>	USA (Chicago)	4,841,418	Retrospective cohort	<12months	OR 1.34; CI (1.30 - 1.37)
Zhu et al, 2003 <sup>23</sup>	USA (Michigan)	568,816	Retrospective cohort	< 6months	OR 1.4 ; CI (1.3-1.5)
Nabukera et al, 2008 <sup>38</sup>	USA (Missouri)	242,559	Retrospective cohort	<6months	p=0.0095
De Weger et al, 2011 <sup>36</sup>	Netherlands	263,142	Retrospective cohort	<6months	OR 1.22; CI (1.04-1.43)
Salihu et al, 2012 <sup>39</sup>	USA (Florida)	36,718	Retrospective Cohort	<6months and >24months	OR 1.39; CI (1.23-1.56)

Bakewell et al, suggested an increased risk seen with a short IPI causing repeat LBW in a cohort of 10,700 live births in Missouri, USA.<sup>42</sup> In a 2006 meta-analysis reviewing 10 different studies, an IPI of less than 6 months was associated with a 60% increase in risk of LBW compared with an IPI of 18 to 23 months (pool adjusted OR 1.61, 95% CI 1.39 – 1.86).<sup>7</sup>

## Small for gestational age (SGA)

SGA is defined as birth weight below the 10<sup>th</sup> centile for gestational age. Several studies have shown an IPI of less than 6 months was generally associated with 15%-30% increase of risk of SGA compared to longer IPI (> 24 months).<sup>4, 9, 38, 44</sup>

## **Congenital anomalies**

Several studies have reported an increased risk of congenital anomalies in births with both a short and long IPI.<sup>44-48</sup> Most of these studies were carried out in the USA. Among these, Grisaru-Granovsky et al (2009) reviewed 440,838 pregnancies in Israel and reported a significant risk (OR 1.14; 95% CI 1.04-1.24) of major congenital anomalies with both long and short IPI.<sup>44</sup>

In a population-based retrospective cohort study reviewing 46,423 consecutive births in Alberta Canada, the congenital anomaly rates with IPI of 0-5 months, 12 to 17 months and more than 24 months was 2.5 %, 1.9 % and 2.3 % respectively.<sup>47</sup> This association between IPI and congenital anomalies was significant only for the folate-independent anomalies (for example gastroschisis), which suggests that folate deficiency from close spacing of pregnancies was not the obvious aetiological factor in this review.

## **Autism and Schizophrenia**

Both autism and schizophrenia have been reported to be associated with a short IPI. A large population-based survey from California reported that second-born children after an IPI less than 12 months compared to >36 months were 3.39 times more likely to be diagnosed with autism<sup>49</sup>. This risk was independent of other factors such as LBW, PTB or previous child with autism.

Folate deficiency during famine is believed partially to explain the association between prenatal exposure to famine and schizophrenia in offspring.<sup>50-52</sup> A study in Cardiff, UK, particularly assessing children conceived following an IPI of less than 6 months suggested an increased risk for developing schizophrenia with a hazard ratio of 2.62.<sup>53</sup> This further supports the folate depletion hypothesis explained earlier.

These associations remain controversial and require further research and input.

### **Preeclampsia**

Preeclampsia is now an established risk from a long IPI as has been documented in a few studies. A large retrospective cross-sectional study in Latin America and the Caribbean where 456,889 pregnancies were reviewed, showed an increased risk of developing preeclampsia after a long IPI (more than 59 months) (OR 1.83; 95% CI 1.72 to 1.94).<sup>14</sup>

A systematic review of 22 observational studies by Conde-Agudelo et al (2007), suggested that an IPI longer than 5 years was independently associated with an increased risk of developing preeclampsia in the subsequent pregnancy.<sup>12</sup> Further to that, a Norwegian study by Skjaerven et al (2002) reviewing 551,478 pregnancies, suggested the risk of preeclampsia in a subsequent pregnancy following a long IPI, was directly proportional to the time elapsed since previous birth, with an adjusted OR of approximately 1.1 for every additional year.<sup>54</sup> A further population-based case-control study in Missouri by Mostello et al (2002), reported similar findings in the 4,700 pregnancies reviewed.<sup>55</sup> Interestingly, women with previous history of preeclampsia, in a Norwegian study, had the risk of preeclampsia in the subsequent pregnancy decreased with length of the IPI, even after adjusting for maternal age as seen.<sup>56</sup>

### **Labour Dystocia**

In a cross-sectional study including nearly 650,000 Michigan births, an IPI of more than 24 months increased the risk of labour dystocia by 50%.<sup>16</sup> This study adjusted for multiple factors including gestational weight gain, smoking, age, race, parity and infant birth weight.

A small study in Nigeria of 50 multiparous women did not detect any significant association between a long IPI (6 or more years) and risk for labour dystocia.<sup>57</sup> The sample size for this study was, however, inadequate and it would be interesting to review a larger population in this study.

### **Maternal death**

A few case controlled studies from the late 1990s failed to find a significant association between IPI and maternal death.<sup>58, 59</sup> In a subsequent cross-sectional study of 456,889 parous women in Latin America, maternal death was reported as 2.54 times more likely after an IPI less than 6 months versus 18 to 23 months.<sup>12, 14</sup>

### **Fetal, neonatal, or infant death**

An association between a short IPI and fetal, neonatal or infant death has been suggested by several studies; the reports have not, however, presented consistent findings.<sup>4, 31, 33, 38, 44, 60-63</sup>

In studies that report an association, odds ratios of 1.4 to 3.6 for fetal, neonatal, or infant death after a short IPI have been reported.<sup>4, 31, 33, 38, 44, 62</sup> The inconsistency between reports can be partially explained by differences in parity. A study in Sweden which found no significant correlation between short IPI and fetal, neonatal or infant death, assessed women only after their first pregnancy.<sup>61</sup> Since high parity can be associated with depletion in maternal nutrient reserves, women with low parity may be able to recover faster from one pregnancy to the next and thus not experience the adverse effects of a short IPI.<sup>60, 64</sup>

## **Neonatal morbidity**

A USA population-based retrospective cohort study using Ohio birth records from 2006 to 2011 evaluated the rate of adverse newborn outcomes in almost 400,000 singleton non-anomalous newborns of multiparous mothers with various IPI lengths.<sup>10</sup> The frequency of neonatal morbidity was lowest following IPI of 12 to < 24months despite adjusting for confounding factors including gestational age at birth.

## **Vaginal birth after caesarean section (VBAC)**

This is also described as trial of labour after caesarean section (TOLAC) in USA. TOLAC has been associated with about three-fold increase in risk of uterine rupture among women with short inter-delivery interval (IDI) up to 18 months as reported by fairly large US studies.<sup>65, 66</sup> The presumed mechanism is incomplete healing of the uterine scar.

## **Aim of study**

There are few studies published from Africa and none to date from South Africa with regard to the outcomes of a short IPI.<sup>57, 67-69</sup>

This study was therefore designed as a pilot study to investigate the effects of a short IPI on the subsequent pregnancy in a South African context and specifically in our local clinical community, only para 2 women being recruited.

Our secondary objective was to review possible determinants of a short interpregnancy interval in the women who participated in our study.

## CHAPTER 2: METHODS

This study was designed as a pilot descriptive cross-sectional study conducted among women who were Para 2 and who had just delivered their subsequent potentially viable baby in the secondary hospitals of the Metro-West area of Cape Town.

The main objective of the study was to assess the effects of a short interpregnancy interval (less than 24 months) on pregnancy outcomes in women delivering within our service and to compare this to women who had an IPI of more than 24 months. Our secondary objective was to investigate any factors that may possibly influence timing of the pregnancies including breastfeeding, socioeconomic status, relationships, pregnancy intendedness and contraception use and knowledge.

### **Sample size calculation:**

A power calculation was performed using OpenEpi, Version 3, open source calculator. We estimated from the literature that the risk of early preterm birth (<34 weeks gestation) would be 40% in the short interpregnancy interval group.<sup>7</sup> The risk of early preterm delivery in the long inter-pregnancy interval group was estimated as 14%.<sup>7</sup> These assumptions resulted in a power calculation estimate of 90%, which we deemed adequate to accept the sample size of 120 patients (60 in each group).

This was a pilot study and was limited to women who were Para 2 to achieve better comparability of outcomes and decrease confounding factors such as parity and age.

### **Data Analysis and Safety**

Data were transcribed from the completed questionnaires. The questionnaires were kept in a secure database with restricted access. Participants were assigned numbers for data capture to ensure anonymity.

All study data were transcribed onto an Excel® database. Data were double entered and verified using Excel®-Compare before exporting into Stata® Edition 13 for statistical analysis.

Demographic and descriptive data were presented in graphs and tables. Differences between the two groups, i.e. short inter-pregnancy interval (IPI) versus long inter-pregnancy interval were expressed as p-values. A p-value of <0.05 was used as the level of statistical significant difference for all reported results.

Results for the effect of short IPI on pregnancy outcomes are presented as categorical data. The difference between the groups was analysed using chi-square tests. The Fisher's exact test was used to analyse categories with fewer than 5 events.

## **Recruitment**

Potential participants were identified from labour ward records and only contacted post delivery. They were then approached by our research team and recruited after explanation of the study. An information leaflet with details of the study was given to them. [Appendix 2] If they agreed to participate, a signed consent form was then completed. No recruitment during labour was allowed.

Inclusion criteria;

1. Para 2, postnatal patients. All modes of delivery were recruited.
2. Women 18 years and older
3. All pregnancy outcomes were included.
4. Women willing to participate in the study and who understood the study.

Exclusion criteria;

1. Women who were multiparous and had more than 2 potentially viable pregnancies
2. Primigravid women
3. Women who elected not be interviewed or did not understand the study

### **Definitions**

We defined IPI or Birth to Pregnancy interval as the period between the previous birth at 26 or more weeks and start of the index (current) pregnancy. This was calculated using an early dating scan, symphysis-fundal height and/or last menstrual period (LMP). We did not include miscarriages, ectopic pregnancies or termination of pregnancies between the two viable pregnancies for this calculation as recommended by WHO.<sup>3</sup>

We defined the intervals according to WHO recommendations and a short IPI was defined as a birth to pregnancy interval of less than 24 months whereas the recommended IPI is between 24 or more and less than 60 months.<sup>3</sup>

### **Questionnaire:**

A questionnaire was designed for data collection. This was based in part on previous questionnaires used in our unit for other studies, which accessed participants' reproductive history.

The questionnaire was administered by the members of the Reproductive Medicine Unit in the Department of Obstetrics and Gynaecology at UCT. The investigators were not involved in the medical management of the participants and have considerable experience in patient interviews and administration of questionnaires.

The questionnaire was initially piloted with 30 participants and where questions were regarded as unclear, adjustments were made. The modified questionnaire was then approved by the Human Research Ethics Committee.

The questionnaire, attached as Appendix 1, included demographic information, socio-economic factors, breast-feeding and contraceptive information. The following information was assessed:

- Age, population group, home language, religion
- Marital status
- Financial and emotional support
- Length of relationships
- Education background, Employment status
- Accommodation
- Substance use
- Obstetric history
- Breast-feeding history
- Current pregnancy outcome
- Timing of pregnancy
- Contraception knowledge

We divided contraception methods into 5 groups for analysis: Modern, Barrier, Natural methods and TOP/emergency contraception and no use. The methods are outlined in Table 2:1.

**Table 2:1 Contraception methods**

<b>MODERN METHODS</b>	<b>BARRIER METHODS</b>	<b>NATURAL METHODS</b>	<b>TOP&amp;EMERGENCY CONTRACEPTIVE</b>	<b>NONE</b>
Pill (COC)	Cap/ Diaphragm	“Rhythm” method	Termination of Pregnancy	Never Used
Mini Pill (POP)	Male Condom	Withdrawal method	Emergency Contraception	Other
Injectable	Female Condom	Abstinence		
IUCD	Spermicide	Breastfeeding		
IUS (Mirena)				
Long term implants				
Female Sterilization				
Male Sterilization				

The questions were close-ended and required spontaneous unprompted responses.

Eligible participants not willing to participate in the study were informed that this would not jeopardise their current or future treatment. On average the questionnaire took about 6 minutes to complete. All pregnancy outcomes were captured.

The interviewer conducted the interview in the participants’ language of choice and the questionnaires were available in English, Xhosa and Afrikaans. This was carried out in a private and sensitive manner. Grief counselling was available for those women who were distressed about previous pregnancy losses.

Pregnancy outcomes were obtained from the maternity case record folders of the participants. Primary outcomes were preterm delivery (< 37 weeks), low birth weight (<2.5kg), small for gestational age (< 10<sup>th</sup> centile) – as calculated from the WHO birth-weight for gestational age chart, preterm prelabour rupture of membranes and abruptio placentae. In cases where women booked late for antenatal care and

gestational age was not reliable, we used the Ballard score to determine the estimated gestational age of the delivered babies.

### **Consent**

Participants signed a consent form in English, Xhosa or Afrikaans. One of the research team members explained the study to the participant, gave her an information leaflet and obtained informed consent. [Appendix 3] Interviews were conducted in the participant's language of choice. Participants were not paid for their inclusion in this study.

### **Ethical Considerations**

The research protocol was submitted to the Human Research Ethics Committee at the University of Cape Town for review and approval was obtained before the study commenced (HREC 480/2016) [Appendix 4]. Subsequently the questionnaire was amended and the modified questionnaire was also approved [Appendix 5]. This research project complied with all the principles of the Declaration of Helsinki of 2013 and followed Good Clinical Practice. We obtained permission to access patients and their records from the relevant authorities at Mowbray Maternity, New Somerset and Groote Schuur hospitals. [Appendix 6,7,8]

### **Dissemination of Findings**

The findings of the study will be made available to the Department of Obstetrics and Gynaecology and the Western Cape Department of Health through the Department of Obstetrics and Gynaecology. The data have been used for the MMed dissertation of the candidate.

### **Declaration of Interests**

There are no conflicts of interests.

## CHAPTER 3: RESULTS

### Recruitment

We aimed to recruit 60 women in each arm of this study. A convenience sample of 130 patients was finally recruited to the study. Sixty women were recruited in the short IPI group (less than 24 months) and 70 were recruited in the long IPI group (24 months or more).

We recruited Para 2 women who had just delivered a potentially viable baby (gestational age of at least 26 weeks or birth weight  $\geq 800\text{g}$ ).<sup>70</sup> Recruitment took place in the postnatal wards of the secondary level hospitals of the Metro-West area in Cape Town between 1<sup>st</sup> September 2016 and 28<sup>th</sup> November 2016.

The hospitals for recruitment were Mowbray Maternity Hospital and New Somerset Hospital. One woman, referred from New Somerset Hospital for neonatal reasons, was recruited at Groote Schuur Hospital after referral.

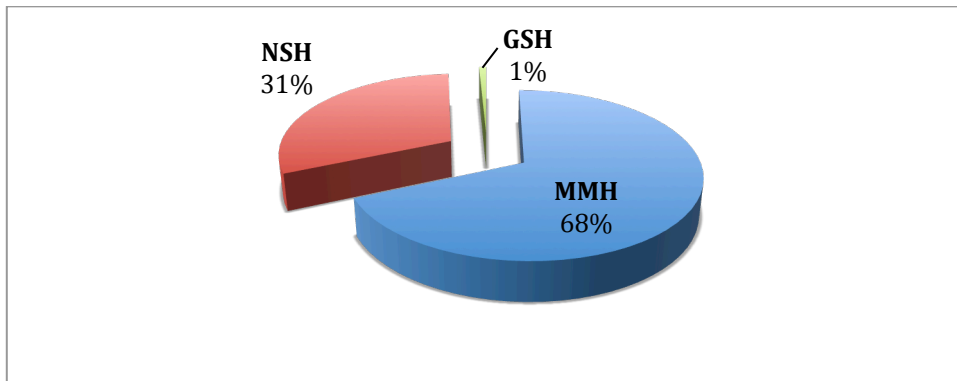
It took longer to reach the targeted sample size of 60 women with a short IPI (12 weeks) while recruitment of women with a long IPI was fairly rapidly achieved in 4 weeks. During the recruitment process, only one potential participant declined to participate in the study and this was due to time constraints around her discharge.

Potential participants received individual counselling and were consented for the study. They were then offered interviews in the language of their choice. Of the 130 participants, 129 were interviewed in English and only one in isiXhosa. The questionnaire had been translated into isiXhosa, English and Afrikaans. Members of the study team fluent in these languages were available for the administration of the questionnaires but most participants elected to be interviewed in English despite the availability of study staff fluent in Afrikaans and isiXhosa.

### Distribution of the Participants

Eighty-nine women (68%) were recruited at Mowbray Maternity Hospital, 40 (31%) at New Somerset Hospital and 1 (1%) at Groote Schuur Hospital who was referred from New Somerset Hospital.

**Figure 3:1 Distribution of Participants**

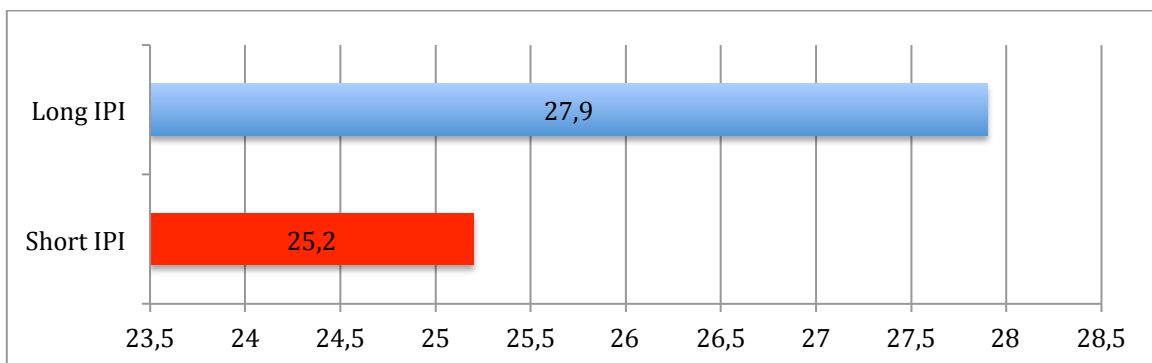


### Background Information:

#### Age:

The mean age of the participants was 26.7 years (SD= 4.93). The participants with a short IPI were generally younger. The mean age in the short IPI group was 25.2 (SD= 4.9) vs 27.9 (SD= 4.6) in the long IPI group.

**Figure 3:2 Age Differences (age in years)**



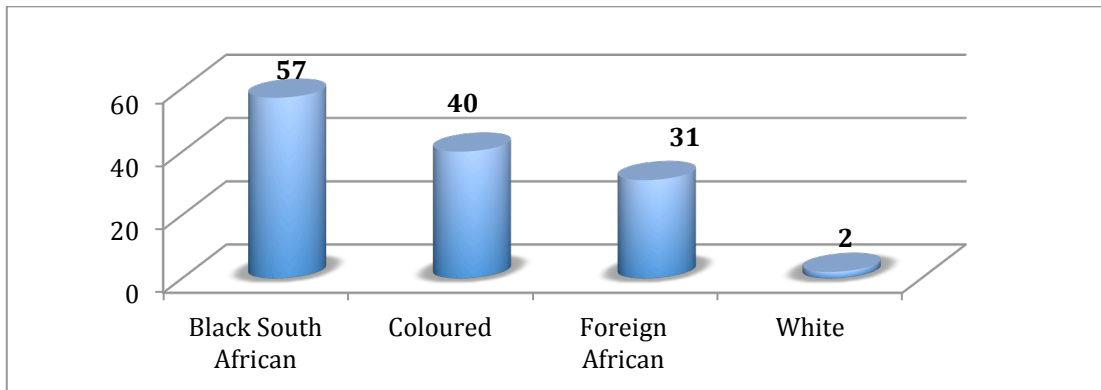
This difference in age between the two groups is statistically significant.  $t = -3.3067$

$Pr = 0.0012$

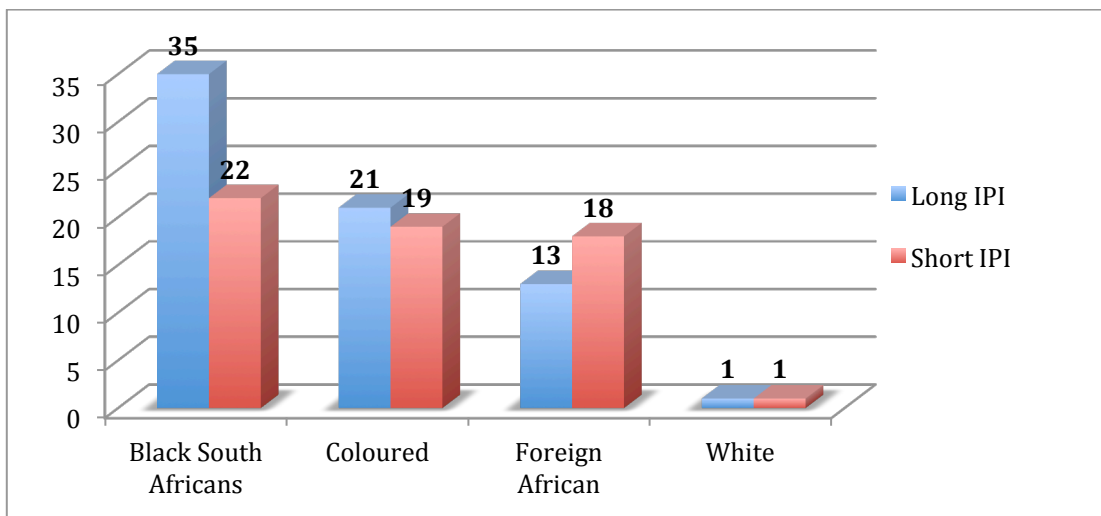
### Population group

The participants were black South Africans [n=57 (43.9%)], followed by women of mixed ancestry n=40 (30.8%), foreign African nationals n=31 (23.9%) and white women n=2(1.5%)

**Figure 3:3 Population group (number)**



**Figure 3:4 Differences in population group (NSS)**



There is no statistically significant difference in the distribution of ethnicity between the two groups. Pearson  $\chi^2(3) = 3.1206$  Pr = 0.373

### Home Language

The most commonly spoken home language among the women who participated in our study was IsiXhosa [n=49 (37.7%)], followed by Afrikaans [n=27 (20.8%)], then English [n=19 (14.6%)], and French [n=12 (9.2%)].

There were 23 (17.7%) foreign nationals who spoke other languages but were comfortable to answer the questionnaire in English.

Participants were interviewed in the language of choice. All but one elected to be interviewed in English although they were offered questionnaires in English, IsiXhosa and Afrikaans.

There were no statistically significant differences in the home languages between the two groups. Pearson  $\chi^2(4) = 6.1403$  Pr = 0.189

### **Religion**

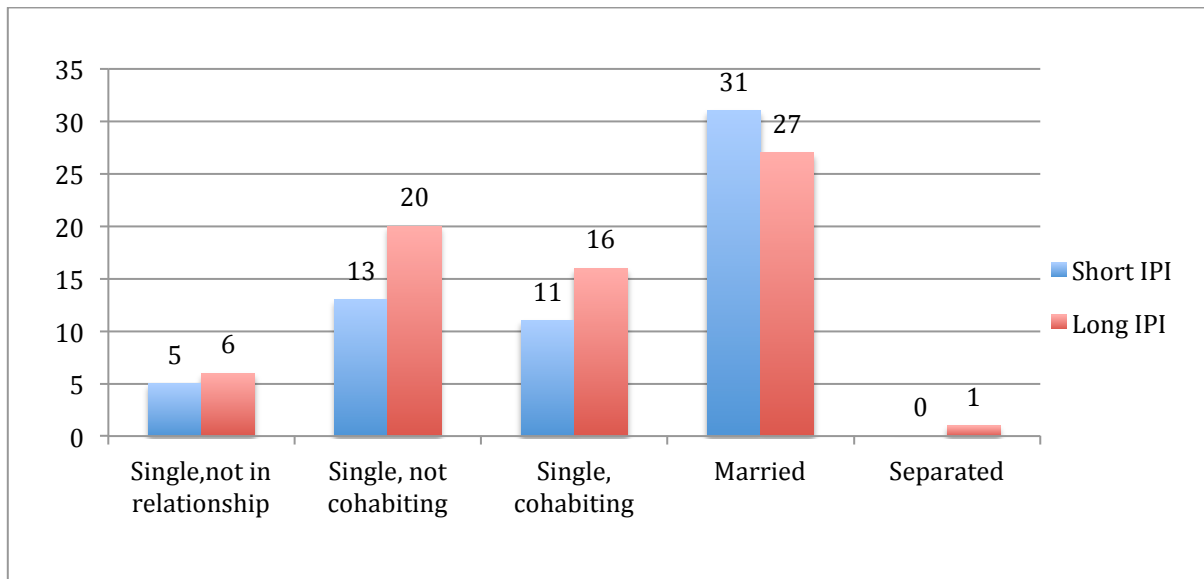
The religious distribution of the respondents included other Christian denominations n=68 (52.3%), Protestant n=29 (22.3%), Muslim n=16 (12.3%), Roman Catholic n=12 (9.2%) and n=5 (2.9%) were of other religions.

There was no significant difference in religion between the two groups. Pearson  $\chi^2(4) = 4.4334$  Pr = 0.351

### **Marital Status**

Fifty-eight (44.6%) of the respondents were married, 33 (25.4%) were single and in a stable relationship but not cohabiting, and 27 (20.8%) were single and cohabiting, 11 (8.5%) single and not in a relationship, and one (0.7%) reported to be separated. In Figure 3:5, the differences between the short and long IPI groups are presented.

**Figure 3:5 Marital Status**

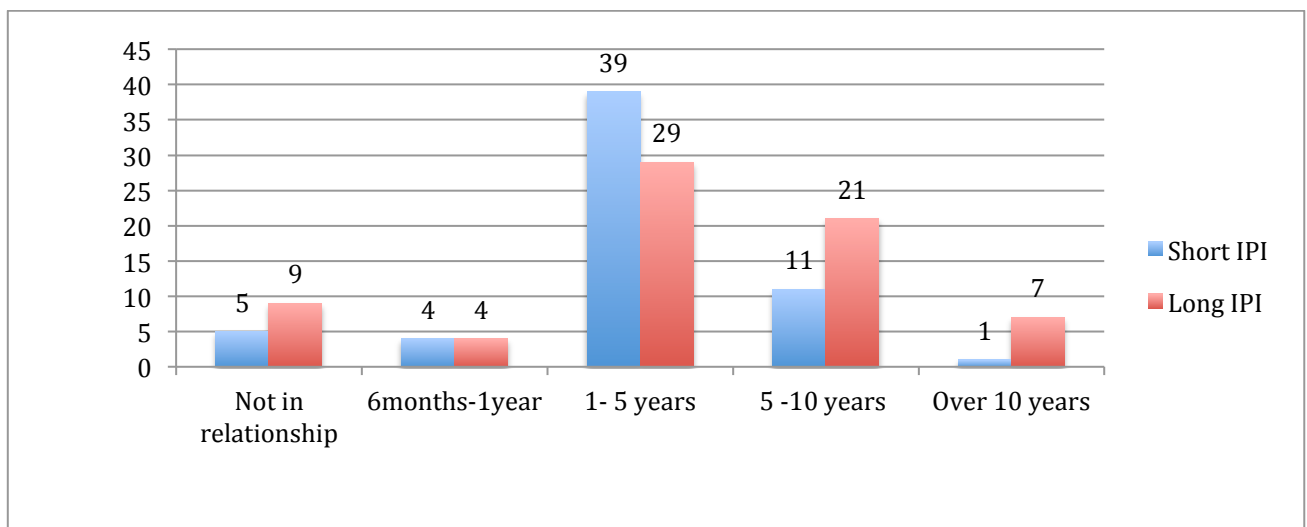


There is no statistically significant difference in marital status between the two groups. Pearson  $\chi^2(4) = 3.0262$  Pr = 0.553

### **Length of current relationship**

Information regarding length of the current relationships was obtained. Sixty-eight women (52.3%) reported to be in the relationship for 1-5 years, 32 (24.6%) for 5-10 years, 8 (6.2%) for 6 months to 1 year and 8 (6.2%) for over 10 years. Fourteen (10.8%) women were not in a relationship at the time of interview. This information is presented for the two groups in Figure 3:6.

**Figure 3:6 Length of relationship (number)**



There were statistical differences in the length of relationships observed between the two groups. Pearson  $\chi^2(4) = 9.5256$  Pr = 0.049

Of those in relationships over 10 years, seven had a long IPI compared to one in the short IPI. Pearson  $\chi^2(1) = 3.8849$  Pr = 0.049

### **Partner**

We obtained fewer responses than the total number of participants (130) to this question because the questionnaire was adjusted to include this question after the first 30 participants were already recruited.

Of the 100 participants who answered this question, seventy-six (76%) reported the same partner for both their pregnancies while 24 (24%) a different partner for this pregnancy.

Among those that had a different partner for this pregnancy, 5 (8.3%) had a short IPI while 19 (27.1%) of them had a long IPI.

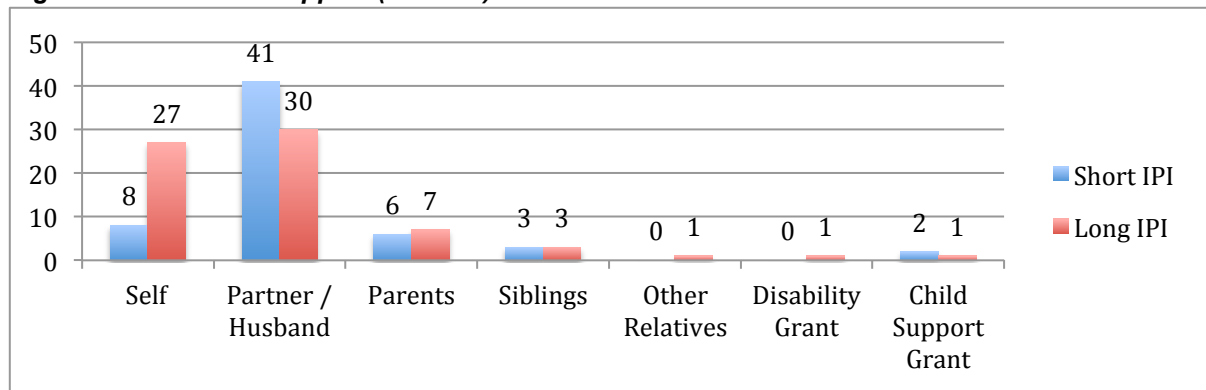
The participants with a long IPI were more likely to have a different partner for the subsequent pregnancy. Pearson  $\chi^2(1) = 10.0254$  Pr = 0.002

## **SOCIO-ECONOMIC STATUS**

### **Financial Support:**

Of the participants, 71 (54.6%) received financial support from their partner while 35 (26.9%) were financially independent. Thirteen (10%) received support from their parents, 6 (4.6%) from siblings, 1 (0.7%) from other relatives, 1 (0.7%) a disability grant and 3 (2.3%) utilized a child grant to support themselves.

**Figure 3:7 Financial Support (number)**



There are some differences in financial support observed between the two groups. Pearson  $\chi^2(6) = 13.7408$  Pr = 0.033. Specifically, there were 27 who supported themselves financially in the long IPI compared to 8 in the short IPI. Pearson  $\chi^2(1) = 10.4596$  Pr = 0.001

### Emotional Support

In our study 65 women (43.33%) depended on their partner for emotional support, while 46 (30.67%) sought support from their parents and 23 (15.33%) from their siblings. Other support was provided by a variety of relatives and friends as indicated in Table 3:1.

Two women said they had no emotional support and several participants listed more than one source of emotional support.

**Table 3:1 Emotional Support**

Emotional Support	Responses	Percentage
Partner/Husband	65	43.33%
Parent/s	46	30.67%
Siblings	23	15.33%
Children	0	0%
Other Relatives	8	5.33%
Friends	4	2.67%
Other	2	1.33%
Don't know	0	0%
No Emotional Support	2	1.33%
<b>Total</b>	<b>150</b>	<b>100%</b>

There was no statistically significant difference in emotional support between the two groups. Pearson  $\chi^2(6) = 6.6111$  Pr = 0.358

### **Educational Level**

*Table 3:2 Educational level*

<b>Highest Level of Education</b>	<b>Frequency</b>	<b>Percentage</b>
Grade 4	2	1.5%
Grade 6	1	0.8%
Grade 7	1	0.8%
Grade 8	5	3.8%
Grade 9	12	9.2%
Grade 10	18	13.8%
Grade 11	23	17.7%
Grade 12	33	25.4%
Tertiary (incomplete)	11	8.5%
Tertiary (Complete)	24	18.5%
<b>Total</b>	<b>130</b>	<b>100%</b>

Table 3:2 above shows the education status of the women who enrolled in our study.

Sixty-eight (52%) of the respondents had an education of grade 12 or higher.

There was no statistical difference in the educational level between the two groups.

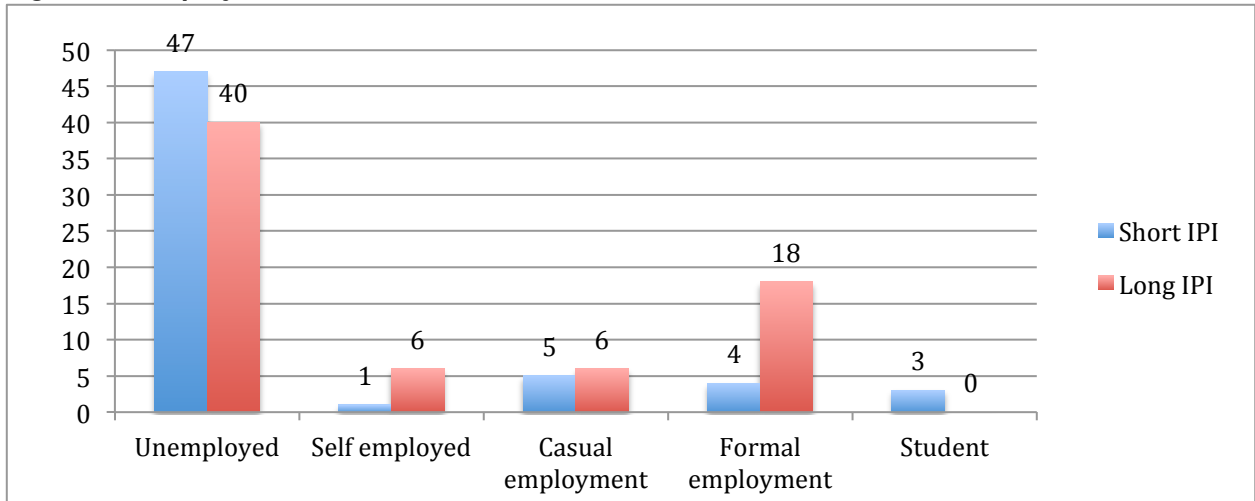
Pearson  $\chi^2(9) = 6.3685$  Pr = 0.703

### **Employment status**

The majority of the participants [n=87 (66.9%)] were unemployed. Of the unemployed women, 76% of them received financial assistance from their partner.

Of the 22 participants that were formally employed, 18 had a long IPI compared to 4 in the short IPI. Formal employment was associated with a longer IPI. Pearson  $\chi^2(1) = 8.3373$  Pr = 0.004.

**Figure 3:8 Employment Status**

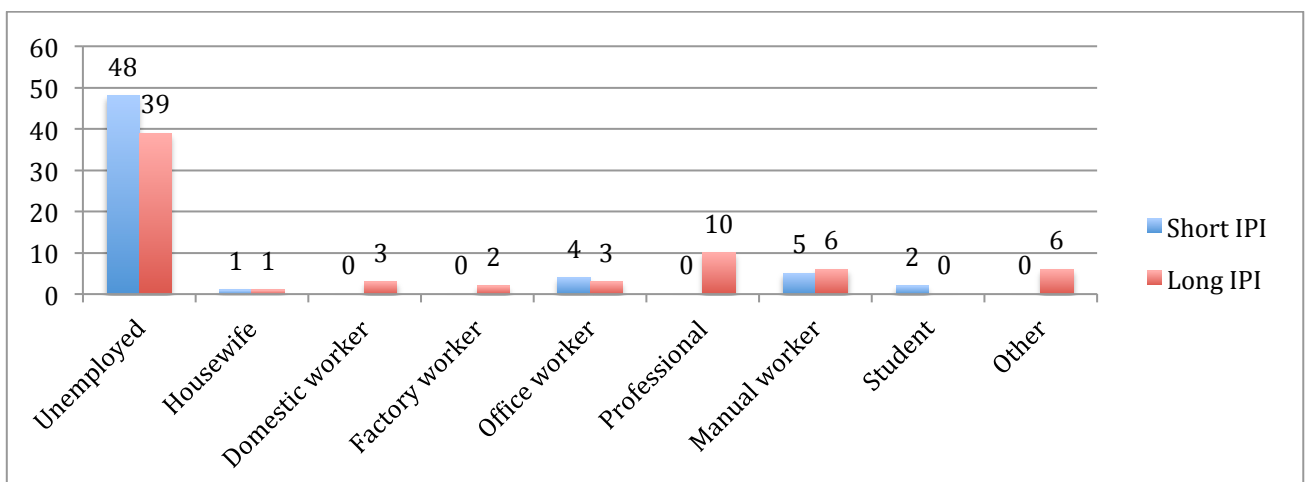


There was a statistical difference in employment status between the two groups. Pearson  $\chi^2(4) = 15.4569$  Pr = 0.004. This difference arises mainly from the difference seen in formal employment.

There was also a statistical difference in nature of employment between the two groups. Pearson  $\chi^2(8) = 23.5348$  Pr = 0.003

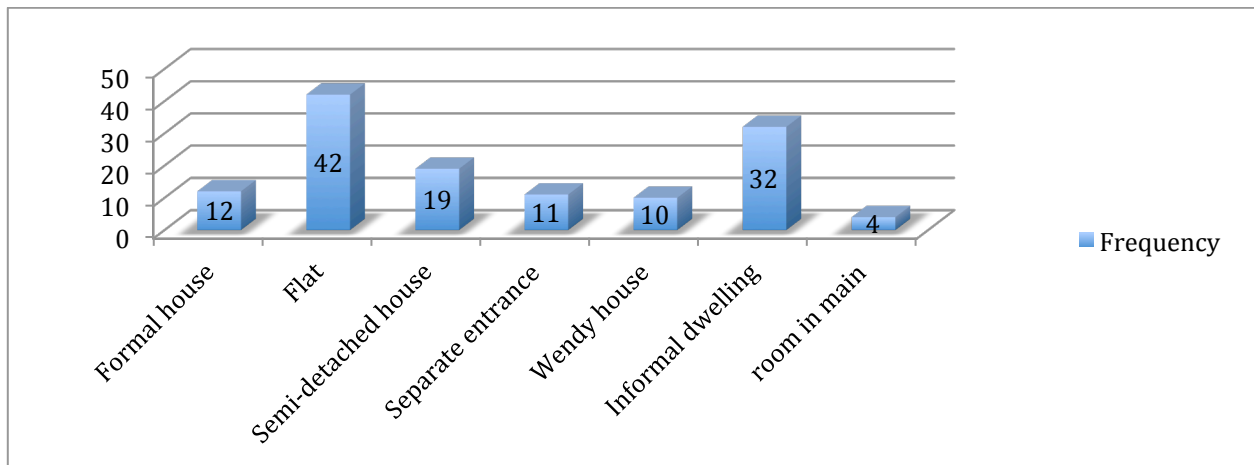
The nature of employment was reviewed. The distribution of the responses can be seen in Figure 3:9. The standout difference is seen in the professional positions. Of the women in professional positions, all (n=10) had a long IPI and none had a short IPI. Pearson  $\chi^2(1) = 9.2857$  Pr = 0.002

**Figure 3:9 Nature of work**



## Accommodation:

Figure 3:10 Type of dwelling



There was no statistical difference in the type of dwelling between the two groups.

Pearson  $\chi^2(6) = 10.5339$  Pr = 0.104

## HABITS:

### Smoking

One hundred and four participants (80%) were non-smokers while twenty six (20%) were currently smoking of whom 2 (1.5%) smoked over 20 cigarettes per day. There was no significant statistical difference in smoking between the short and long IPI groups. Pearson  $\chi^2(3) = 4.4578$  Pr = 0.216

### Alcohol

Most of the participants (n=111 (85%)) did not consume alcohol. The remaining 19 (15%) only consumed alcohol infrequently. (NSS; Pearson  $\chi^2(3) = 2.2827$  Pr = 0.516)

### Recreational Drugs:

Most of our study population (n= 117) had never used recreational drugs. Thirteen women (10%) had previously used recreational drugs, mainly tik(n=7). No one reported current use. There was no significant statistical difference in use of recreational drugs between the two groups. Pearson  $\chi^2(3) = 2.6138$  Pr = 0.455

## CONTRACEPTION INITIATION

The mean age of first coitus in our whole study group was reported as 18.4 years (+/- SD = 3.49) while the mean age of first use of contraception was 19.3 years (+/- SD = 3.73). There was a significant delay in accessing contraception after initiating sexual activity.

There was no statistical difference in mean age at first coitus [18.53 years (SD= 3.78) vs 18.39 years (SD= 3.26),  $t = 0.2328$ ,  $Pr = 0.8163$ ] or in mean age of first contraception [18.73 years (SD= 3.52) vs 19.83years (SD= 3.84),  $t = -1.5620$ ,  $Pr = 0.1211$ ] between the two groups.

## OBSTETRIC HISTORY

Women who were Para 2 were recruited to this study. We excluded those who had only previous miscarriages or were primigravid or multiparous. The previous delivery history was taken and is summarized in Table 3:3. We recorded all miscarriages, ectopic pregnancies and terminations of pregnancy (TOPs).

**Table 3:3 Obstetric History**

GRAVIDITY	NUMBER	PERCENT AGE (%)
• 2	106	81.5
• 3	23	17.7
• 4	1	0.8
• Total	130	100%
PARITY		
• 2	130	100%
MISCARRIAGES		
• 0	115	88.5
• 1	14	10.8
• 2	1	0.7
• Total	130	100%
ECTOPICS		
• 0	129	99.2
• 1	1	0.8
Total	130	100%
TOPs		
• 0	122	93.8
• 1	8	6.2
• Total	130	100%

### **Gestational age at previous delivery**

Information regarding gestational age at the previous delivery was obtained from clinical records and participant's history. One hundred and five (80.8%) of the previous deliveries were at term and 25(19.2%) were preterm. The summary of the gestational age at previous delivery is presented in Table 3:4.

**Table 3:4 Gestational age at previous delivery**

<b>Gestation age (NSS <math>p=0.246</math>)</b>	<b>Frequency</b>	<b>Percentage</b>
• 41	8	6.1
• 40	81	62.3
• 39	7	5.4
• 38	9	6.9
• 37	5	3.8
• 36	2	1.5
• 35	2	1.5
• 34	2	1.5
• 32	2	1.5
• 31	2	1.5
• 30	2	1.5
• 29	1	0.7
• 28	1	0.7
• 27	1	0.7
• 26	5	3.8
• Total	130	100%

### **OUTCOME OF PREVIOUS PREGNANCY**

The outcome of the previous potentially viable pregnancy was obtained. Of the preceding pregnancies, 118 (90.8%) babies were alive, 5 (3.8%) were still born while 7 (5.3%) died within the first month of life. Most of the babies were healthy (86.2%).

The outcomes of the preceding pregnancy are summarised in Table 3:5.

**Table 3:5 Outcome of previous pregnancy**

OUTCOME OF PREVIOUS PREGNANCY (NSS $p=0.161$ )	FREQUENCY	PERCENTAGE
• Alive	118	90.8
• Still born	5	3.8
• LNND	2	1.5
• ENND	5	3.8
<b>Total</b>	<b>130</b>	<b>100%</b>
<b>BABY OUTCOME</b>		
• Healthy	112	86.2
• Physical impairment	2	1.5
• Subsequent demise	11	8.5
• No live baby	5	3.8
<b>Total</b>	<b>130</b>	<b>100%</b>
<b>MODE OF PREVIOUS DELIVERY (NSS <math>p=0.521</math>)</b>		
• NVD	73	56.2
• Forceps	3	2.3
• Vacuum	1	0.8
• Caesarean Section	53	40.8
<b>Total</b>	<b>130</b>	<b>100%</b>
<b>BIRTH WEIGHT OF PREVIOUS DELIVERY (NSS <math>p=0.218</math>)</b>		
• 700g -1100g	8	6.2
• 1200g- 2500g	16	12.3
• 2600g-4000g	81	62.3
• 4100g-4900g	10	7.7
<b>Total</b>	<b>115</b>	<b>88.5%</b>

## **BREASTFEEDING**

Of the participants, 107 (82.3%) had breastfed following their first delivery, while 12 (9.2%) elected not to breastfeed. Eleven participants (8.5%) had stillborn babies.

There was no significant statistical difference in breastfeeding practices between the two groups. Pearson  $\chi^2(2) = 3.4366$  Pr = 0.179

The duration of breastfeeding is summarised in Table 3:6 below.

**Table 3:6 Duration of breastfeeding following first delivery**

Duration (in months)	Short IPI	Long IPI	Total	Percentage
No Breastfeeding	13	10	23	17.7%
1 – 6	23	26	49	37.7%
7 – 12	9	12	21	16.2%
13 - 18	11	12	23	17.7%
19 – 24	4	5	9	6.9%
Over 24 months	0	5	5	3.8%
<b>TOTAL</b>	<b>60</b>	<b>70</b>	<b>130</b>	<b>100%</b>

There was no statistical difference in the duration of breastfeeding between the two groups [7.50 months (SD= 7.18) vs 10 months (SD= 9.98) , t= -1.5892, Pr = 0.1145] in the previous pregnancy.

#### **CURRENT PREGNANCY:**

##### **Gestational age:**

The gestational age was recorded for all the deliveries in the index pregnancy and is listed in Table 3:7.

**Table 3:7 Gestation age at delivery**

Gestational Age (in weeks)	Short IPI	Long IPI	Frequency	Percentage
33	1	4	5	3.8%
34	2	0	2	1.5%
35	3	1	4	3.1%
36	2	0	2	1.5%
37	2	6	8	6.2%
38	13	15	28	21.5%
39	17	17	34	26.2%
40	12	20	32	24.6%
41	6	6	12	9.2%
42	2	1	3	2.3%
<b>TOTAL</b>	<b>60</b>	<b>70</b>	<b>130</b>	<b>100%</b>

Mean gestational age at delivery was 38.6 weeks (SD= 1.93) in the short IPI vs 38.7 weeks (SD= 1.89) in the long IPI.  $t = -0.1915$  Pr = 0.8484 (NSS)

### **Body Mass Index (BMI)**

The mean booking BMI was 29.2 kg/m<sup>2</sup> (SD = 6.20) with lowest being 18.2 kg/m<sup>2</sup> and highest 46.7kg/m<sup>2</sup>.

There were no statistical differences in the BMI between the two groups. Mean BMI was 28.5 (SD=5.85) in the short IPI vs 29.8 (SD= 6.46) in the long IPI.  $t = -1.0628$  Pr = 0.2900

## **OUTCOME OF CURRENT PREGNANCY**

### **Gender**

There were seventy-six (58.5%) male and 54 (41.5%) female babies. There was no difference between the long and short IPI. (p=0.701)

### **Birth weight**

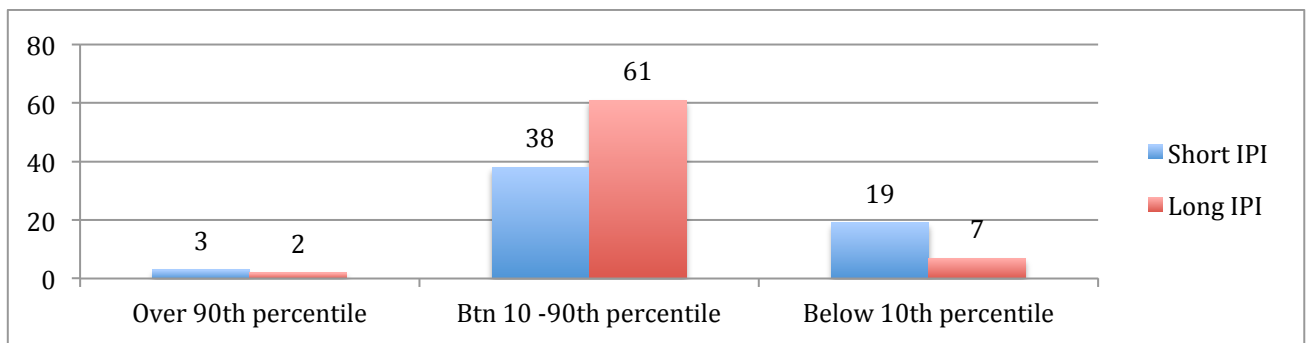
The mean birth weight of the babies born to the participants was 3119.8kg (SD= 602.48). Comparisons were made between the short and long IPI participants and there was no statistical difference in birth weight between the two groups. Mean birth weight was 3039gm (SD= 642.8) in the short IPI vs 3189.2gm (SD= 561.0) in the long IPI.  $t = -1.4228$  Pr = 0.1572

### **Weight-for-gestational-age Percentiles**

Of the participants, 5 (3.8%) had babies whose weight was above the 90<sup>th</sup> centile while 46 (35.4%) had babies with weight between 50<sup>th</sup> and 90<sup>th</sup> centile, 53 (40.8%) between 50<sup>th</sup> and 10<sup>th</sup> centile and 26 (20%) had a birth weight below the 10<sup>th</sup> centile.

We analysed the data for both short and long IPI and found that the short IPI was associated with more SGA babies. There were more SGA babies in the short IPI vs long IPI groups; 19 (31.7%) vs 7 (10%) respectively. Pearson  $\chi^2(3) = 10.4445$  Pr = 0.015

**Figure 3:11: Weight-for gestational age**



### **Preterm Birth**

Fourteen (10.8%) of the participants had preterm birth while 116 (89.2%) delivered at term. There was no significant statistical difference in the incidence of preterm birth between the two groups. 8 (13.3%) vs 6 (8.6%) in the short vs long IPI groups respectively. Pearson  $\chi^2(1) = 0.7624$  Pr = 0.383

### **Early Preterm Birth**

With particular reference to the participants who delivered at or before 34 weeks, seven (5.4%) had early preterm birth while 123 (94.6%) delivered after 34 weeks. There was no significant statistical difference in the incidence of early preterm birth between the two groups. 3 (5.0%) vs 4 (5.7%) in the short vs long IPI groups respectively. Fisher's exact test p=1.000

### **Preterm prelabour rupture of membranes (PPROM)**

Only 2 of the 130 participants (1.5%) had PPRM and they had a long IPI. (NSS: 0 vs 2 in the short vs long IPI respectively. Pearson  $\chi^2(1) = 1.7411$  Pr = 0.187)

### **Abruptio placentae**

Two (1.5%) of the participants, one in each group, had their pregnancies complicated by abruptio placentae, 128 (97.7%) had no abruptio. Pearson  $\chi^2(2) = 0.8737$  Pr = 0.646)

### **Maternal Complications**

The majority of the participants [ n= 84 (64.6%)] reported no maternal complications. Of those who had complications, 5 (3.8%) had hypertension, 2 (1.5%) pyelonephritis, 9 (6.9%) preeclampsia , 3 (2.3%) post-partum haemorrhage and 27 (20.8%) other complications.

There were no statistically significant differences in the maternal complications between the two groups. Pearson  $\chi^2(5) = 7.2802$  Pr = 0.201

### **Mode of delivery**

Fifty-six (43.1%) participants delivered by normal vertex delivery and 74 (56.9%) by caesarean section. No participant had an assisted vaginal delivery. There was no significant statistical difference in the mode of delivery between the two groups. Pearson  $\chi^2(1) = 0.1681$  Pr = 0.682

### **Indication for Caesarean section (C/S)**

Of those participants who were delivered by caesarean section, 25 (33.8%) had previous C/S, 20 (27%) had fetal distress, 12( 16.2%) failed to progress, 6 (8.1%) had CPD , 4 (5.4%) had breech presentation and 7 (9.5%) had other indications.

There was no statistically significant difference in the indications for caesarean section between the two groups. Pearson  $\chi^2(5) = 2.0550$  Pr = 0.841

### **Birth Outcome**

There was one stillborn infant in the long IPI group. At the time of interview no participant reported an early neonatal death. There was no difference in the birth outcome between the two groups. Pearson  $\chi^2(1) = 0.8638$  Pr = 0.353

Eleven babies (8.5%) were admitted to NICU. There was no significant statistical difference in the NICU admission rate between the short and long IPI, 5 vs 6 respectively. Pearson  $\chi^2(1) = 0.0024$  Pr = 0.961

### Neonatal complications

The participants reported the complications their babies had during the stay in the hospital. In addition, the records of the baby's clinical notes were obtained and summary of complications are presented in Table 3:8 below.

**Table 3:8: Neonatal Complications**

COMPLICATION (NSS $p=0.634$ )	SHORT IPI	LONG IPI	TOTAL	PERCENTAGE %
Hyaline Membrane Disease	1	0	1	0.8
Respiratory Distress Syndrome	3	2	5	3.8
Macrosomia	0	1	1	0.8
Hypoglycaemia	0	2	2	1.5
Very Low Birth Weight	4	2	6	4.6
Neonatal Jaundice	4	4	8	6.2
No complications	48	59	107	82.3
<b>TOTAL</b>	60	70	130	100

### Timing of the pregnancy

Participants were asked whether the index pregnancy occurred “at the right time” for them. A significant proportion (37.7%) would have preferred to defer their pregnancies. There was a statistically significant difference in the preference of pregnancy timing between the two groups. Among those who preferred to get pregnant later, 38 (63.3%) had a short IPI compared to 11 (15.7%) with a long IPI (P=0.011).

Of those who thought their pregnancy was at the right time, 48 (68.6%) had a long IPI compared to 17 (28.3%) with a short IPI. Pearson  $\chi^2(3) = 32.7694$  Pr < 0.001  
Essentially those who had a short IPI preferred pregnancy later and those who had a long IPI generally thought their pregnancy was at the right time. [See Table 3:9]

**Table 3:9: Timing of pregnancy**

<b>Timing of Pregnancy</b>	<b>Short IPI</b>	<b>Long IPI</b>	<b>Combined</b>	<b>Percentage %</b>
At the right time	17	48	65	50.0
Preferred earlier	1	6	7	5.4
Preferred later	38	11	49	37.7
Not sure	4	5	9	6.9
<b>TOTAL</b>	<b>60</b>	<b>70</b>	<b>130</b>	<b>100%</b>

## **CONTRACEPTION:**

### **Contraception use at conception**

Nineteen participants were using contraception at the time of conception. This included 11 (18.3%) in the short IPI vs 8 (11.4%) in long IPI. [NSS: Pearson  $\chi^2(1) = 1.2343$  Pr = 0.267]. Although the majority of the above reported use of COCs at the time of conception, we do not have information about all the methods in use. In addition, it was not clear whether their use was correct or appropriate.

### **Contraception knowledge**

Participants were asked (without prompting) to name ways of preventing or delaying pregnancy. It was found that most of the participants knew at least one modern contraceptive method. Multiple responses were often obtained from individual patients and these responses are recorded in Table 3:10.

### **Prior use of contraception**

The participants were asked to name which contraceptive methods they had ever used in the past. Only five mothers (3.8%) reported having never used any form of contraception. The previous use reported by 125 participants is illustrated in Table 3:10.

### **Future use of contraception:**

The participants were asked which method they planned to use after this delivery and these are included in Table 3:10. A total of 103 (79.2%) mothers chose LARCs

including depo-provera (n=64), Implanon (n=21) and IUCD (n=17) and 8 chose either male or female sterilization as a permanent method. Two mothers decided not to use any method of contraception.

**Table 3:10 Contraception knowledge, previous use, current use and future use**

CONTRACEPTIVE	KNOW ABOUT	USED BEFORE	PLANNED FUTURE USE
	N	N	N
Pill	71	23	7
Mini Pill	5	2	5
Injection	124	96	64
IUCD	66	5	17
Mirena	3	0	1
Cap/Diaphragm	1	0	0
Male Condom	58	26	5
Female Condom	7	0	3
Long Term Implants	65	1	21
"Rhythm" Method	2	0	2
Withdrawal Method	1	0	0
Abstinence	8	1	1
Spermicides	0	0	0
Female Sterilisation	20	0	1
Male Sterilisation	3	0	1
Morning After Pill	4	2	0
TOP	0	0	0
Other	1	1	0
None	0	5	2
<b>Total</b>	<b>439</b>	<b>162</b>	<b>130</b>

### Intention of pregnancy

Seventy-nine (60.8%) of the respondents reported that the index pregnancy was unintended. There were more reported unintended pregnancies in the short IPI group 44 (73.3%) vs 35 (50%) in the long IPI group.

**Table 3:11 Pregnancy Intendedness**

	Short IPI	Long IPI	Combined	Percentage %
Intended	16	33	49	37.7
Unintended	44	35	79	60.8
Don't know	0	2	2	1.5
<b>Total</b>	<b>60</b>	<b>70</b>	<b>130</b>	<b>100%</b>

There was a statistical difference between the short and long IPI. Pearson  $\chi^2(2) = 8.2026$  Pr = 0.017

## **SUMMARY OF RESULTS**

- There were 130 participants in the study. All their responses were analysed.
- Of those in relationships over 10 years, seven had a long IPI compared to the one in the short IPI. [p = 0.049]
- The participants with a long IPI were more likely to have a different partner for the subsequent pregnancy. [p = 0.002]
- There were more in the long IPI (27) that were financially independent compared to the short IPI (8). [p = 0.001]
- There was no difference in the emotional support and educational levels between the two groups.
- The majority of the participants [n=87] were unemployed. Of the 22 participants that were formally employed, 18 had a long IPI compared to 4 in the short IPI. Formal employment was associated with a longer IPI. [p = 0.004]
- There was a significant delay in accessing contraception after initiation of sexual activity. [NSS between the short and long IPI]
- Index pregnancy
  - Gestational age: Mean gestational age at delivery of current pregnancy was 38.6 weeks (SD= 1.93) in the Short IPI vs 38.7 weeks (SD= 1.89) in the long IPI. [NSS]
  - There were more small-for-gestational-age (SGA) babies among the women with a short IPI vs Long IPI; 19 vs 7 respectively. [p = 0.015]
  - Preterm: Fourteen (10.8%) of the participants had preterm birth. [NSS]
  - PPROM: Only 2 participants (1.5%) had PPROM. [NSS]

- Abruptio Placentae: Two (1.5%) of the participants had their index pregnancies complicated by abruptio placentae. [NSS]
- Pregnancy timing: 37.7% would have preferred to defer their pregnancies to a later time.
- Modern contraceptive knowledge was high (99%) but 79 participants (60.8%) had an unintended pregnancy. There were more reported unintended pregnancies in the short IPI group. [p = 0.017]

## CHAPTER 4: DISCUSSION

In our study, we found that small-for-gestational age (SGA) babies were significantly associated with a short IPI (less than 24 months) compared to a long IPI (>24months). This was the only positive finding among the pregnancy outcome reported in the literature.

We did not find any associations with preterm birth, early preterm birth, PPRM, abruptio placentae and low birth weight. This is consistent with the results of international studies. In Latin America, Conde-Agudelo et al (2005) reported that an inter-pregnancy interval of less than 6 months was independently associated with a 30% increased risk of SGA. This, together with other outcomes, was investigated in 1,125,430 pregnancies recorded in the Perinatal Information System database of the Latin American Centre for Perinatology and Human Development, Uruguay between 1985 and 2004.<sup>4</sup>

Several studies however have found inconsistent results in this regard. De Weger et al, reviewed 263,142 Dutch women with second deliveries and found no association between an IPI of less than 6 months and SGA.<sup>36</sup> Auger et al (2008) analysed 98,330 live births in Montreal, Canada and reported that being unmarried increased the likelihood of SGA as the IPI shortened [OR 1.6, 95% CI 1.3-1.95].<sup>71</sup> In our study marital status did not impact the length of the interpregnancy interval. The various studies have had different definitions for a short IPI (less than 6, 18, 24 months), which sometimes makes comparisons difficult.

In our study, we used 24 months as the cut off for the short IPI as recommended by WHO, which was different to some of the studies we accessed and referenced.

Our population sample was a reasonable representation of women attending the public antenatal service in our drainage area. There were 43.9% black South Africans, 30.8% of mixed ancestry and only 2 % white participants. White and Asian women made up a small proportion of our sample size. There were no differences in the ethnicity between the short and long IPI groups. In a US study however, there were differences in ethnicity with the non-US born Hispanic women having the highest percentage of long IPI of all races and ethnic groups (30%), followed by non-Hispanic black women (24%), US-born Hispanic women (22%) and non-Hispanic white women (16%).

We recruited women in secondary level hospitals because we believed that if we demonstrated a particular risk in this group of patients, it would suggest the need for a bigger population study. This is based on the fact that our Midwife Obstetric Units (MOUs) only deliver uncomplicated pregnancies and refer all patients with any risk of an adverse outcome to secondary level hospitals.

### **Age**

In our study, younger women had a shorter IPI. This is consistent with a USA study that showed younger mothers had a shorter IPI and older women a longer IPI.<sup>72</sup> According to a 2015 report by the Center for Disease Control and Prevention in the USA that included birth certificate data from 36 states, about 30% of American women had a short IPI defined as less than 18 months, which is shorter than the WHO recommended 24 months.<sup>72</sup> From the same study, a short IPI was associated with young maternal age, where more than two-thirds of teenagers aged 15-19 had a short IPI. A long IPI was more common among older women, which is a similar finding in our study. This may be due to older women presumably having more personal responsibilities or work demands and therefore delaying pregnancy.

## **Partners and length of relationship**

In our study, women with a long IPI were more likely to have a different partner for the index pregnancy. This may have been due to widely spaced pregnancies with a higher likelihood to have another partner over time. This may be a reflection of the current societal dynamics highlighting the increasing number of separations or divorce. Women in longer relationships, however, had a longer IPI, which suggests stability of their relationships and planning of pregnancy.

## **Religion**

We reviewed the impact of religion in our questionnaire. This was investigated as one of the possible factors that might influence contraceptive practices and therefore pregnancy spacing. In some religions, contraception is strongly discouraged and this could potentially influence interpregnancy interval. There were, however, no differences identified in religion between the two groups in our study.

## **Socio-economic factors**

Low socio-economic status and poor housing were associated with a short IPI in a Danish study.<sup>73</sup> In our study, we obtained information from the participants about their financial support, employment, housing and emotional support. We also reviewed educational levels of the participants. In a USA study, women with less than a bachelor's degree were twice more likely to have a long IPI.<sup>72</sup>

In our study, there were no differences between the short and long IPI groups in levels of education attainment, type of housing and source of emotional support. We found that 67% of our participants were unemployed. This is a reflection of the nation-wide unemployment challenge in South Africa. Most of these participants were financially dependent on their partners and parents. We also found that women in the long IPI group were more likely to be financially independent compared to

those in short IPI. This can be explained by the fact that the women with long IPI were generally older, employed and possibly had more responsibilities. More women with a long IPI had formal employment and professional positions. Being in employment and having a professional career made it more likely to have a long IPI in our study.

### **Breastfeeding**

Several studies suggest that the duration of breastfeeding has an influence on the interpregnancy interval. This is noted especially in the conservative communities that do not believe in the use of modern contraceptives. Women in these communities rely on lactational amenorrhoea to space their pregnancies.<sup>20, 21</sup> In our study, no differences were seen between those that breastfed and those that did not. There was also no difference in the duration of breast-feeding. (p=0.632)

### **Contraception knowledge and use**

In our study, 99% of the participants knew at least one modern method of contraception and 96% reported using at least one such method in the past. This was not consistent with the fact that 85% were not using contraception at the time they conceived and about 80% reported unintended pregnancies. This may, in part, be explained by improper or inconsistent use of contraception.

The knowledge and use of emergency contraception was very poor and this needs to be reviewed in a campaign to improve knowledge of emergency contraception in an attempt to prevent unplanned pregnancies. We noted 19 participants were using contraception at the time of conception, of whom 80% were using COCs and no differences were seen between the two groups.

Birth spacing has been increased over the years. This can be explained by the changing trends worldwide and possibly the uptake of modern contraceptives such

as the LARCs. The impact of the Implanon drive about 2-3 years ago in South Africa has possibly started taking effect and resulted in less short IPI. This may explain our need for extended recruitment for the short IPI group.

Kaharuza, et al (2001) reviewing pregnancies in Denmark, found that unplanned pregnancies were associated with a short IPI. In our study, 67% of all the participants reported unintended pregnancies with significantly more in the short IPI group. Pregnancies with a long IPI are more likely to be intended.

In our study we also found that more women with a short IPI would have preferred to delay their pregnancy further compared to those with a long IPI ( $p=0.011$ ), and this demonstrates the need for more active reproductive health information programs.

### **Pregnancy outcomes**

While the literature reports studies showing several adverse outcomes with a short IPI, our study only showed one significant clinical outcome namely SGA. There were no differences in PPRM, PTB, abruptio placentae and low birth weight.

This may be explained by the maternal depletion hypothesis, suggesting inadequate replenishment of the maternal folate stores. Maternal nutrient stores may not be adequate between very closely occurring pregnancies. This may be particularly true in our setting (developing country) and not the same in the developed world. The nutritional differences may support the maternal depletion hypothesis in closely spaced pregnancies in Africa.

**Strengths:**

This was a pilot observational cross-sectional study evaluating pregnancies of women in the Metro-West drainage area. We recruited only para 2 women to limit other confounding factors with multiparity. We recruited from secondary level hospitals due to the fact that primary level care in the MOUs, would not manage any high risk associated with pregnancy while tertiary level hospitals would have many confounding complications affecting pregnancy outcomes. We believe this was a strength of this study.

**Limitations:**

We did not have information on when women had booked for ANC as early booking may have had an impact on nutritional state in terms of provision of supplements. The dating of the pregnancy was also not accurate for those that booked late. We used a neonatal Ballard score to estimate gestational age of the pregnancy for the women who were unbooked at the time of delivery.

Our study was limited to Para 2 women and only investigated one pregnancy interval compared to some studies that compared different intervals on the same participant using the same woman as her own control.

We excluded women under 18 on the advice of the Ethics Committee as there are many confounding factors having a second child as a teenager.

This was a pilot study and there is a need for a larger population based study to evaluate the other pregnancy outcomes. It is possible, with a larger population sample size, that we could have demonstrated more adverse pregnancy outcomes with a short IPI.

## CHAPTER 5: CONCLUSIONS

Birth spacing is an important aspect of the management of women in obstetric practice. This study has investigated the effect of a short interpregnancy interval on pregnancy outcomes and possible determinants for a short IPI. Having analysed the results of this study, the following conclusions can be made.

Small-for-Gestational age babies were associated with a short IPI in this study. This finding (SGA) may impact neonatal morbidity and the economic burden associated with the management of these babies. Advice to women of reproductive age about adequately spacing their children may be one of the ways of preventing SGA.

In our study, longer relationships and formal employment were factors associated with a longer IPI. This emphasizes the importance of stable relationships and financial security in planning pregnancies. This is information that can be shared with the relevant bodies and women advised accordingly.

It is particularly regrettable that the majority of women in our study had unintended pregnancies. Low contraceptive use affects pregnancy intendedness and can therefore lead to a short IPI. Education and promotion of emergency contraception with programs like *Leading Safe Choices* can contribute to preventing unplanned pregnancies and also influence appropriate child spacing.

We can potentially use these data in our own community to advise women as part of the efforts to provide adequate reproductive health information.

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# APPENDIX 1: PATIENT INFORMATION LEAFLET

**STUDY NUMBER:** HREC 480/2016



**UNIVERSITY OF CAPE TOWN**  
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

## INFORMATION LEAFLET

### **EFFECTS OF A SHORT INTERPREGNANCY INTERVAL ON PREGNANCY OUTCOMES**

The Department of Obstetrics and Gynaecology of the University of Cape Town, is doing a study at your hospital. It has been approved by the Human Research Ethics committee at the Faculty of Health Sciences of the University of Cape Town and by the appropriate authorities in the Department of Health in the Western Cape. We think you are eligible for the study and wish to invite you to participate.

#### **Reasons for doing the study:**

Birth spacing is very important issue that is seldom discussed with any health care providers. Women have various reasons for deciding when to get pregnant. However, many pregnancies are actually unplanned. Sometimes, the pregnancies are too soon or delayed. There are various reasons accounting for the particular birth spacing.

The literature from numerous studies done so far, show that there may be complications to the subsequent pregnancy if one gets pregnant very soon or too long after the last birth. These studies have been done in other countries and not South Africa. We, therefore, want to study the effects of short birth spacing on our population.

#### **Participants in the study:**

Women who have delivered their second baby at your facility will be recruited into the study. There will be no payment to the participants.

#### **Questionnaire**

The investigators are from the Department of Obstetrics and Gynaecology, University of Cape Town. They do not have any involvement with your clinical management at the hospital and you will receive your usual routine medical care. None of your doctors are involved in the study. If you are interested in participating, the investigators will interview you using a standard questionnaire. At times they may need to review your medical folder to confirm medical information. The will take about 15 minutes to complete and will not impact your clinical care.

#### **Risks anticipated**

You will be completing a questionnaire with the help of a skilled interviewer, and there are no specific risks to you.

## **Benefits**

The study will not benefit you personally. In the long term, it will assist in the improving reproductive health service provision to women planning future pregnancies. If you need immediate assistance, we will refer you to the appropriate person.

## **Confidentiality**

You will be interviewed in private. Your name and contact details will not be available when the data is analysed. We do need your name and signature for the consent form, which will not be attached to the questionnaire to ensure that there is no link between your answers and identity. The questionnaires will be kept in a secure place, and will be property of the University of Cape Town.

The investigators will present the research results to the Department of Obstetrics and Gynaecology at the University of Cape Town. The study will be submitted to the University of Cape Town for completion of a postgraduate degree and will be published in the medical literature. We will also present a report of this study to the Provincial Health services for their information.

## **Contact details:**

If you have any further queries regarding this study, please feel free to contact:

1. Prof Zephne Van Der Spuy: Supervisor. Department of Obstetrics and Gynaecology, University of Cape Town

Tel: 021 404 4496 Email: [Zephne.VanDerSpuy@uct.ac.za](mailto:Zephne.VanDerSpuy@uct.ac.za)

2. Dr. Castro Kisuule: Department of Obstetrics and Gynaecology, University of Cape Town

Tel: 0782 907 488 Email: [ckisuule@gmail.com](mailto:ckisuule@gmail.com)

If you wish to discuss this research with someone who is not involved in the study, you may contact:

1. Prof Marc Blockman, Chairman of Human Research Ethics Committee, Faculty of Health Sciences, University of Cape Town.

Contact: **Tel:** 021 404 6492 **Fax:** 021 406 6411 **Email:** [Marc.Blockman@uct.ac.za](mailto:Marc.Blockman@uct.ac.za)

2. Dr. Khatija Kadwa, Department of Obstetrics and Gynaecology, University of Cape Town.

Contact: **Tel:** 021 404 4453 **Email:** [Khatijak@gmail.com](mailto:Khatijak@gmail.com)

## APPENDIX 2: QUESTIONNAIRE

### EFFECTS OF A SHORT INTERPREGNANCY INTERVAL ON PREGNANCY OUTCOMES

HREC: REF 480/2016



Study Number: \_\_\_\_\_

Name of Patient: \_\_\_\_\_

Hospital Number: \_\_\_\_\_

Date of Delivery: \_\_\_\_\_

Date of Interview: \_\_\_\_\_

Place of Interview: \_\_\_\_\_

Interviewer: \_\_\_\_\_

BACKGROUND INFORMATION

1. Date of Birth	
2. Age (in years)	
3. Population Group (1) Black South African (2) Coloured (3) White (4) Indian (5) Foreign African (please specify) _____ (6) Foreign Non African (please specify) _____ (7) Other (please specify) _____	
4. Home Language (1) English (2) Afrikaans (3) Xhosa (4) French (5) Other (please specify) _____	
5. Language of Interview (1) English (2) Afrikaans (3) Xhosa	
6. Religion (1) Muslim (2) Protestant (3) Roman Catholic (4) Christian Other (please specify) _____ (5) Hindu (6) Jewish (7) Other (please specify) _____	

#### RELATIONSHIP STATUS AND SUPPORT

7. Marital Status (1) Single, not in a relationship (2) Single in a stable relationship but not cohabiting (3) Single and cohabiting (4) Married (5) Divorced (6) Separated (7) Widowed	
8. What is the source of your <b>financial support</b> ? (Mark all that apply) (1) Self (2) Partner/ Husband (3) Parent/s (4) Sibling/s (5) Other Relative/s (please specify) _____ (6) Friend/s	

<ul style="list-style-type: none"> <li>(7) Disability Grant</li> <li>(8) Child Support Grant</li> <li>(9) No Financial Support</li> <li>(10) I don't know</li> </ul>	
<p>9. Length of current relationship if any(reported from day of interview)</p> <ul style="list-style-type: none"> <li>(1) N/A – if not in a relationship</li> <li>(2) Less than 6 months</li> <li>(3) 6 months to 1 year</li> <li>(4) 1 year to 5 years</li> <li>(5) 5 years to 10 years</li> <li>(6) Over 10 years</li> </ul>	
<p>(a) Have you had the same partner for both of your pregnancies?</p> <ul style="list-style-type: none"> <li>(1) Yes</li> <li>(2) No</li> <li>(3) Don't know</li> </ul>	
<p>10. From whom do you receive <b>emotional support</b>? (Mark all that apply)</p> <ul style="list-style-type: none"> <li>(1) Partner/Husband</li> <li>(2) Parent/s</li> <li>(3) Sibling/s</li> <li>(4) Children</li> <li>(5) Other relatives (please specify) _____</li> <li>(6) Friend/s</li> <li>(7) Other (please specify) _____</li> <li>(8) No Emotional Support</li> <li>(9) I don't know</li> </ul>	

**SOCIO-ECONOMIC STATUS**

<p>11. Highest Level of Education</p> <ul style="list-style-type: none"> <li>(1) No formal schooling</li> <li>(2) Grade 1</li> <li>(3) Grade 2</li> <li>(4) Grade 3</li> <li>(5) Grade 4</li> <li>(6) Grade 5</li> <li>(7) Grade 6</li> <li>(8) Grade 7</li> <li>(9) Grade 8</li> <li>(10) Grade 9</li> <li>(11) Grade 10</li> <li>(12) Grade 11</li> <li>(13) Grade 12</li> <li>(14) Tertiary (incomplete)</li> <li>(15) Tertiary (complete)</li> <li>(16) Unknown</li> </ul>	
<p>12. Employment Status</p> <ul style="list-style-type: none"> <li>(1) Unemployed</li> <li>(2) Self Employed</li> <li>(3) Employed (Casual)</li> <li>(4) Employed (Formal)</li> <li>(5) Student/Scholar</li> <li>(6) Housewife</li> </ul>	

<p>(7) Disability or Other Grant  (8) Other (please specify) _____</p>	
<p>13. What is your job?  (1) N/A – unemployed  (2) Housewife  (3) Domestic Worker  (4) Factory Worker  (5) Office Worker  (6) Professional  (7) Manual worker  (8) Student/Scholar  (9) Other (please specify) _____</p>	
<p>14. Type of Dwelling  (1) Formal house on separate stand  (2) Flat  (3) Semi-detached house  (4) Separate entrance (room in main dwelling)  (5) Wendy house (room in backyard)  (6) Informal Dwelling/Shack  (7) Room in main dwelling  (8) Homeless  (9) Other (please specify) _____</p>	

**HABITS**

<p>15. Do you smoke cigarettes?  (1) YES  (2) NO, never  (3) STOPPED less than 6 months ago  (4) STOPPED more than 6 months ago</p>	
<p>16. If <b>YES</b> how many cigarettes a day?  (1) 0 -10  (2) 10-20  (3) &gt;20  (4) &gt;30  (5) Other (please specify) _____  (6) N/A</p>	
<p>17. Do you consume alcohol?  (1) YES  (2) NO, never  (3) STOPPED less than 6 months ago  (4) STOPPED more than 6months ago  (5) N/A</p>	

<p>18. If <b>YES</b>, how many units/week?  1 unit of alcohol = 1 glass of wine, a nip or 1 shot of spirit, 1 glass of beer (~200mls)  &lt;1 = infrequent use  99 if no alcohol</p>	
<p>19. Do you use any recreational drugs?  (1) YES  (2) NO, never  (3) STOPPED less than 6 months ago  (4) STOPPED more than 6 months ago</p>	
<p>20. If <b>YES</b>, what drug do you use? (please list all)  (1) TIK  (2) Dagga  (3) Opiates  (4) Ecstasy  (5) Mandrax  (6) Other (please specify) _____  (7) Not Applicable</p>	

**OBSTETRIC HISTORY**

21. Age of first coitus	
22. Age of first contraception	
23. Age of menarche( first period)	
24. Gravidity	
25. Parity	
26. Miscarriages	
27. Ectopic	
28. TOP	

**Outcome of previous delivery**

29. Year (dd/mm/yy)	30. Gest age at end of pregnancy	31. Outcome of Pregnancy 1. Alive 2. SB 3. NND 4. ENND 5. Miscarriage 6. Ectopic 7. TOP	32. Baby Outcome 1. Healthy 2. Physical Impairment 3. Mental Impairment 4. Subsequent Demise 5. N/A	33. Mode of Delivery 1. NVD 2. Forceps 3. Vacuum 4. C/S	34. Birth weight	35. Complications 1. YES 2. NO 3. Can't remember
1.						
2.						
3.						
4.						
5.						
6.						

**Breastfeeding:**

36. Did you breastfeed after your previous delivery?  (1) Yes  (2) No  (3) NND (Go to Q38)	
For how long did you breastfeed your child? (in months)  (0 months if no breast feeding)	

**Current Pregnancy:**

38. Last Menstrual Period(LMP)	
39. Gestational age at delivery (weeks and days) or Ballard score	
40. Interpregnancy Interval ( in months) from last delivery to LMP	
41. Booking weight (kg)	
42. Booking height (m)	
43. BMI (kg/m <sup>2</sup> )	
44. Mid pregnancy weight (20 -24 weeks) (kg)	

<b>Outcome of this pregnancy</b>	
45. Gender (1) Male (2) Female	
46. Birth weight (g)	
47. Small for gestational age (percentile)	
48. Preterm Labour (1) Yes (2) No (3) Don't know	
49. PPRM (1) Yes (2) No (3) Don't know	
50. Abruptio placenta (1) Yes (2) No (3) Don't know	
51. Other Maternal antenatal/intrapartum complications (mark all that apply) (1) Hypertension (2) Pyelonephritis/UTI _____ (3) GPH (4) Chorio-amnionitis (5) PPH (6) Other(Specify)  (7) None	
51 (a) Mode of delivery (1) NVD (2) Forceps (3) Vacuum extraction (4) C/S	
51 (b) Indication for C/S (1) N/A (2) CPD (3) Breech (4) Failure to progress (5) Previous C/S (6) Fetal distress (7) Abruptio placenta (8) Hypertension/GPH (9) Placenta preavia (10) Other(Specify)_____	
52. Birth Outcome (1) Live Birth (2) Still Birth (3) ENND	
53. Baby admitted to NICU? (1) Yes (2) No (3) Don't Know	

<p>54. Any complications</p> <ul style="list-style-type: none"> <li>(1) Hyaline membrane disease (HMD)</li> <li>(2) Necrotising Enterocolitis (NEC)</li> <li>(3) Hypoxic Ischaemic Encephalopathy (HIE)</li> <li>(4) Extreme immaturity less than 28 weeks</li> <li>(5) Respiratory distress syndrome</li> <li>(6) Neonatal sepsis</li> <li>(7) Congenital malformations</li> <li>(8) Intra-ventricular haemorrhage</li> <li>(9) Other (specify) _____</li> <li>(10)None</li> </ul>		
<p>55. Was this pregnancy</p> <ul style="list-style-type: none"> <li>(1) At the right time?</li> <li>(2) Would have preferred earlier</li> <li>(3) Would have preferred later</li> <li>(4) Not sure</li> </ul>		
<p>56. If you would have preferred to fall pregnant earlier, how much earlier?</p> <ul style="list-style-type: none"> <li>(1) Less than 1 year</li> <li>(2) 1-3 years</li> <li>(3) 3-5 years</li> <li>(4) more than 5 years</li> <li>(5) N/A</li> </ul>		
<p>57. If you would have preferred to have fallen pregnant later, then when?</p> <ul style="list-style-type: none"> <li>(1) 1 year later</li> <li>(2) 1-3 years later</li> <li>(3) more than 3 years later</li> <li>(4) N/A</li> </ul>		
<p>58. Were you using any contraception at the time you conceived?</p> <ul style="list-style-type: none"> <li>(1) Yes</li> <li>(2) No</li> <li>(3) Other (specify) _____</li> </ul>		

<p>59. Please list all the methods of family planning which you <b>KNOW ABOUT?</b> [SPONTANEOUS INPUT]</p>
<p>60. I will now ask you to list all methods you have ever <b>USED.</b> [SPONTANEOUS INPUT]</p>

61. Which method are you <b>PLANNING ON USING</b> ? [SPONTANEOUS INPUT]			
METHOD	59. KNOW ABOUT	60. USED BEFORE	61. PLANNED FUTURE USE
a] Pill (COC)			
b] Mini pill (POP)			
c] Injection (Depo)			
d] Loop (IUCD)			
e] IUS (Mirena)			
f] Cap/Diaphragm			
g] Male condom			
h] Female Condom			
i] Long term implants			
j] "Rhythm" method			
k] Withdrawal method			
l] Abstinence			
m] Spermicides			
n] Female sterilisation			
o] Male sterilisation			
p] Morning after pill			
q] Termination/abortion			
r] none of the above			
s] other (please specify)			
(t) uncertain			

<p>62. What was the reason for the TOP? (Refer to Q28 and only ask if applicable)</p> <p>(1) Maternal complications  (2) Fetal complications/abnormality  (3) Socio-economic reasons  (4) Unintended pregnancy  (5) N/A (no previous TOP)  (6) Other (Specify) _____</p>	
<p>63. Were all your pregnancies intended?</p> <p>(1) YES  (2) NO  (3) I can't remember/I don't know</p>	

# APPENDIX 3: CONSENT FORM

**STUDY NUMBER: HREC 480/2016**



**UNIVERSITY OF CAPE TOWN**  
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

## CONSENT FORM

### **EFFECTS OF A SHORT INTEPREGNANCY INTERVAL ON PREGNANCY OUTCOMES IN THE METRO-WEST AREA OF CAPE TOWN**

I agree to participate in this study, which is being conducted by researchers from the Department of Obstetrics and Gynaecology of the University of Cape Town. I understand the Human Research Ethics Committee of the Faculty of Health Sciences has approved it.

This study has been fully explained to me in a language of my choice by a member of the research team. I understand the purpose of this study is to find out the pregnancy outcomes and demographic differences between women with short birth spacing (less than 24 months) and those with longer spacing. It is hoped that the information obtained in this study will assist in improving health care delivery and provide information for women planning a pregnancy.

I have been informed that the results of the study will be submitted as part of a postgraduate degree to the University of Cape Town.

I understand I may withdraw from the study without compromising my medical care. There will be no payment to me for participating in this study.

I will be interviewed in private and my identity will be kept anonymous. I will complete a questionnaire with the assistance from a member of the research team who will not be involved in the clinical management.

Name of participant

Signature of participant

.....

Name of interviewer

Signature of interviewer

.....

.....

Name of witness

Signature of witness

.....

.....

Date: .....

# APPENDIX 4: HREC RESEARCH APPROVAL



UNIVERSITY OF CAPE TOWN  
Faculty of Health Sciences  
Human Research Ethics Committee



Room E53-46 Old Main Building  
Groote Schuur Hospital  
Observatory 7925  
Telephone [021] 406 6626  
Email: [shuretta.thomas@uct.ac.za](mailto:shuretta.thomas@uct.ac.za)

Website: [www.health.uct.ac.za/fhs/research/humanethics/forms](http://www.health.uct.ac.za/fhs/research/humanethics/forms)

29 August 2016

**HREC REF: 480/2016**

**Prof Z van Der Spuy**  
Obstetrics & Gynaecology  
H-Floor, OMB

Dear Prof van Der Spuy

**PROJECT TITLE: EFFECTS OF A SHORT INTERPREGNANCY INTERVAL ON PREGNANCY OUTCOMES (MMED Candidate - Dr C Kisuule)**

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

**Approval is granted for one year until the 30<sup>th</sup> August 2017.**

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: [www.health.uct.ac.za/fhs/research/humanethics/forms](http://www.health.uct.ac.za/fhs/research/humanethics/forms))

**Please quote the HREC REF in all your correspondence.**

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval before the research may occur.

***The HREC acknowledge that the student, Dr Castro Kisuule will also be involved in this study.***

Yours sincerely

**Signed**

**PROFESSOR M BLOCKMAN**  
**CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE**



Federal Wide Assurance Number: FWA00001637.

Institutional Review Board (IRB) number: IRB00001938

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical

HREC 480/2016

# APPENDIX 5: HREC APPROVAL AMENDMENT

**HUMAN RESEARCH ETHICS COMMITTEE**  
**FACULTY OF HEALTH SCIENCES**  
 - 1 OCT 2016 Human Research Ethics Committee

**UNIVERSITY OF CAPE TOWN**  
 IYUNIVESITHI YASEKAPA - UNIVERSITEIT VAN KAAPSTAD

**Form FHS006: Protocol Amendment**  
 HEALTH SCIENCES FACULTY  
 UNIVERSITY OF CAPE TOWN

<b>HREC office use only (FWA00001637; IRB00001938)</b>		
<input checked="" type="checkbox"/> Approved	<input checked="" type="checkbox"/> Type of review: Expedited	<input type="checkbox"/> Full committee
This serves as notification that all changes and documentation described below are approved.		
Signature Chairperson of the HREC	<i>Signed</i>	Date <i>4/10/2016</i>
<p><b>Note:</b> All <u>major</u> amendments must include a local <u>PI Synopsis</u> justifying the changes for the amendment. Please note that incomplete amendment submissions will not be reviewed.</p>		
Comments from the HREC to the Principal Investigator:		
<p><b>Note:</b> The approval of this protocol amendment does not grant annual approval. Please complete the FHS016 / FHS017 form for annual approval at least one month before study expiration.</p>		

**Principal Investigator to complete the following:**

**1. Protocol information**

Date (when submitting this form)	27 <sup>th</sup> September 2016	
HREC REF Number	480/2016	
Protocol title	Effects of a short interpregnancy interval on pregnancy outcomes	
Protocol number (if applicable)		
Principal Investigator	Prof. Zephne Van Der Spuy	
Department / Office Internal Mail Address	Department of Obstetrics and Gynaecology	
1.1 Is this a major or a minor amendment? (see FHS006hlp) Major (tick box) Minor (tick box)	<input type="checkbox"/> Major	<input checked="" type="checkbox"/> Minor
1.2 Does this protocol receive US Federal funding?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
1.3 If the amendment is a major amendment and receives US Federal Funding, does the amendment require full committee approval?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

4 March 2016

Page 1 of 3

FHS006

## **APPENDIX 6: APPROVAL FROM MOWBRAY MATERNITY**

### **HOSPITAL**

**From:** Sue Fawcus <Sue.Fawcus@westerncape.gov.za>  
**Subject:** RE: Request to Conduct research at MMH  
**Date:** 24 August 2016 at 11:28:31 SAST  
**To:** Castro Kisuule <ckisuule@gmail.com>  
**Cc:** "Zephne Van Der Spuy (Zephne.VanDerSpuy@uct.ac.za)"  
<Zephne.VanDerSpuy@uct.ac.za>

Dear Dr Kisuule

Re: MMED

EFFECTS OF A SHORT INTERPREGNANCY INTERVAL ON PREGNANCY  
OUTCOMES

The MMH research committee has given you permission to  
conduct your research study at MMH, pending UCT HREC approval  
which you must send us once finalised

We always like when researchers have completed their research  
that they provide feedback to the MMH research committee

Best wishes

Sue Fawcus  
**Professor S.R. Fawcus (MBBS FRCOG)**  
**Head Obstetric MMH**  
**Chairperson MMH research committee**  
**Professor Department: Obstetrics/Gynaecology**  
**University of Cape Town**

# APPENDIX 7: APPROVAL FROM NEW SOMERSET HOSPITAL



NEW SOMERSET HOSPITAL

Enquiries: Dr. D Stokes

Contact number: 021 402 6408

Email: Donna.Stokes@westerncape.gov.za

Dear Dr Kisuule

## **PERMISSION TO CONDUCT A RESEARCH AT NEW SOMERSET HOSPITAL**

HREC Ref: 480/2016 – letter dated 29<sup>th</sup> August 2016.

I am pleased to inform you that your request to conduct a research at New Somerset Hospital (with Anne Hoffman and Shane Moore) has been approved.

PROJECT TITLED: **Effects of a short interpregnancy interval on pregnancy outcomes.**

Please note that your research will be conducted under the Supervision/Department of Dr G Petro, the HOD for Obstetrics and Gynaecology at NSH or a representative appointed/nominated by himself to liaise with.

Please note that no files may be removed from the premises and data collection should not interfere with the daily activities of staff in our Medical Records Department.

Please produce this approval letter when requesting folders from the Medical Records Department.

Yours sincerely

**Signed**

Dr. Donna Stokes  
Chief Executive Officer  
New Somerset Hospital

Beach Road, Green Point, Cape Town, 8001  
tel: +27 21 402 6408 fax: +27 21 402 6409

Private Bag, Green point, 8051  
www.capegateway.gov.za

# APPENDIX 8: APPROVAL FROM GROOTE SCHUUR HOSPITAL



## GROOTE SCHUUR HOSPITAL

Enquiries: Dr Bernadette Eick

E-mail : [Bernadette.Eick@westerncape.gov.za](mailto:Bernadette.Eick@westerncape.gov.za)

Professor Z. van der Spuy  
Obstetrics & Gynaecology  
H-floor – Old Main Building

E-mail: [zephne.vanderspuy@uct.ac.za](mailto:zephne.vanderspuy@uct.ac.za) / [ckisuule@gmail.com](mailto:ckisuule@gmail.com)

Dear Professor van der Spuy

**RESEARCH PROJECT: Effects Of A Short Interpregnancy Interval On Pregnancy Outcomes (Mmed Dr C. Kisule)**

Your recent letter to the hospital refers.

You are hereby granted permission to proceed with your research which is valid until **30 August 2017**.

Please note the following:

- a) Your research may not interfere with normal patient care.
- b) Hospital staff may not be asked to assist with the research.
- c) No additional costs to the hospital should be incurred i.e. Lab, consumables or stationary may be used.
- d) **No patient folders may be removed from the premises or be inaccessible.**
- e) Please introduce yourself to the person in charge of an area before commencing.
- f) Please discuss the study with the HOD before commencing.
- g) Please provide the research assistant/field worker with a copy of this letter as verification of approval.
- h) Confidentiality must be maintained at all times.
- i) Should you require additional research time beyond the stipulated expiry date, please apply for an extension.
- j) **On completion of research, please submit a copy of the publication or report.**

I would like to wish you every success with the project.

Yours sincerely

**Signed**

**DR BERNADETTE EICK  
CHIEF OPERATIONAL OFFICER**

Date: 7 September 2016

BE/vms

C.C. Mr L. Naidoo, Dr H. Aziz, Professor L. Denny

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Private Bag X,  
Observatory, 7935

[www.capegateway.gov.za](http://www.capegateway.gov.za)