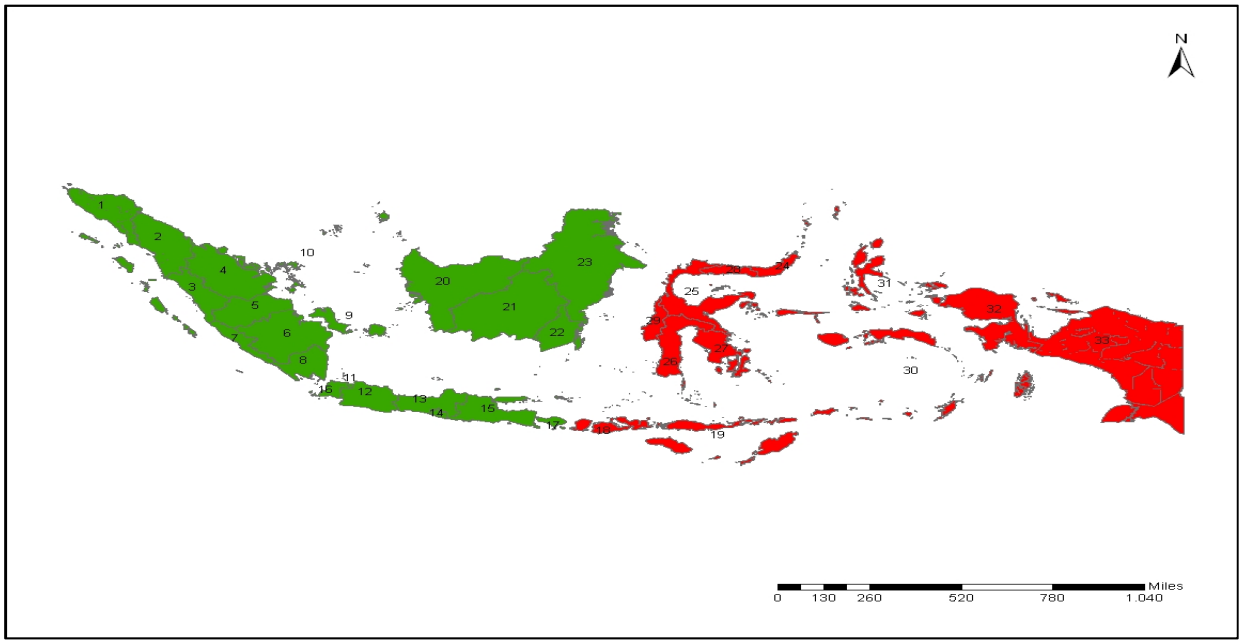
REGIONAL VARIATION OF FERTILITY IN INDONESIA: ANALYSIS OF IDHS 2012



university of groningen

Mohammad Fathan Romdhoni (S2330431)
Email: m.f.romdhoni@student.rug.nl
Supervisor: Dr. Shirish Darak

Master thesis Population Studies
Master of Science of Population Studies
Population Research Center
Faculty of Spatial Science, University of Groningen
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Mohammad Fathan Romdhoni

Abstract

Objective: This thesis aims to determine the regional variation of fertility and its proximate determinants in Indonesia. **Methods:** The estimation of TFR is using Bongaarts (1982) Framework ($TFR=C_m x C_c x C_a x C_i x 15.3$). The proximate determinants of fertility represent the indices (C_m,C_c,C_i,(C_a=1)). To determine the pattern of TFR and the indices, this thesis use Global Moran's I index and the results present in a map using hotspot analysis. To define the relation between TFR and the proximate determinants of fertility, this thesis overlay the groups of TFR and the group of indices into GIS. Lastly, to determine the variation of fertility–inhibiting effects this thesis uses prorated logarithm of each index of proximate determinants. **Results:** The regional variation of TFR in Indonesia shows pattern of lower TFR provinces located in western islands of Indonesia. The regional variation of C_m is randomly spread between provinces in Indonesia but indicate cluster high value in Kalimantan and Sumatera Islands and cluster low value in Papua Island. The regional variation of C_c is clustering high value in Papua Island and clustering low value in Sumatera, Java and Bali Islands. The regional variation of C_i is clustering high value in Sumatera and Kalimantan Islands and clustering low value in Maluku and Papua Islands. In most provinces, the most dominant fertility–inhibiting effect is contraception. **Conclusions:** The pattern of fertility in Indonesia between provinces in western islands and eastern islands of Indonesia is different. The same pattern occurs for C_c but opposite for C_m and C_i.

Keywords : TFR, indices of proximate determinants of fertility, regional variation of Indonesia, regional variations of proximate determinants of fertility in Indonesia and GIS

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Chapter 1 Introduction

1.1 Background

Indonesia is considered as the biggest archipelago country in the world. Its teritory mostly consist water and only 35% of it is lands that are spread into 17 thousands islands with only six thousands islands are inhabited (CIA Worldfact Book, 2014). Living in separate islands makes Indonesian people have many different culture, thousand races, six religions, and thousands of local languages (Statistics of Indonesia – BPS, 2010). Besides being culturally rich, Indonesia is also rich in natural resources.

Despite its huge potential, Indonesia has a serious problem of inequality between regions, mostly between western and eastern islands (Suryadarma, *et al*, 2006). The western islands of Indonesia (Sumatera, Java, Kalimantan, and Bali) are more economically and socially developed than the eastern islands (NusaTenggara, Maluku, Sulawesi, and Papua) (Akita and Alisjahbana, 2002, Suryadarma, et al, 2006 and Statistics of Indonesia – BPS, 2010).

Using economic approach, Akita and Alisjahbana (2002) argued that the western part of Indonesia had economic growth than its eastern counterpart. However, during the 1997-1998 economy crises, the eastern part recovered earlier. In a similar vein, Suryadarma, *et al* (2006) used social approach to indicate that access to education and health facilities in the western islands were better than those in the eastern islands. Despite various studies that investigated the inter-region disparity in Indonesia, to my best knowledge, demographic study about such issue is still lacking.

Indonesia is the fourth most populous country in the world (World Bank, 2012) with unequal distribution of the population between regions. The western islands are populated by about 85% of the total population (with Java Islands take the lion share of it) while only about 15% of total population inhabit the eastern islands (Statistics of Indonesia – BPS, 2010). This inequality is also reflected in other demographic indicators, such as fertility and migration. The western islands has lower fertility rate (measured by total fertility rate or TFR) but they have higher migration rate.). As for mortality rate the regional variation was unkonwn due to unavailability of the data (Statistics of Indonesia – BPS, 2010).

There are different factors that plausibly explain the inequality of TFR and migration in Indonesia. The regional variation of migration rate may be affected by the pulling economic factor (the western islands are more economically advanced) or the push factors (the underdeveloped eastern islands) that stipulates people to migrate from the eastern islands to the western islands (Statistics of Indonesia – BPS, 2010 and Lee, 1966). In the case of the regional variation of fertility, the variation of proximate determinants of

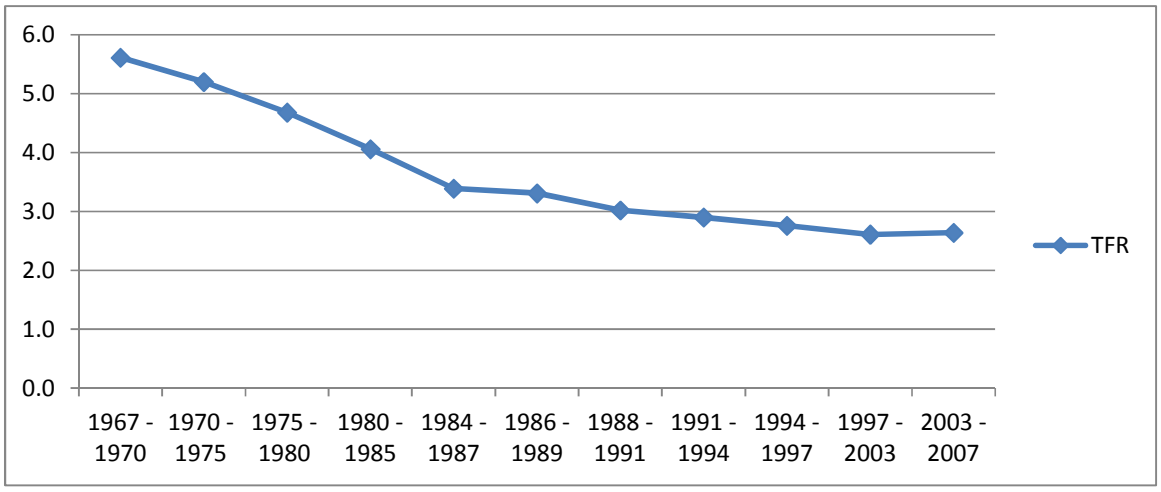
fertility such as proportion of married women, use of contraception, etc could be the cause of the inequality of TFR in Indonesia (Davies and Blake, 1956 and Bongaarts, 1982).

Despite there are two indicators that need to be solve its inequality, this will focus on the regional variation of TFR because this thesis feels the research of regional variation of fertility in Indonesia is still lacking. . By describing the fertility variation and its determinants through proximate determinants of fertility, it is expected that this thesis will assist the government in making fertility-related policy, especially in determining the targeted region. Before going through with the thesis, take a look at the history of fertility in Indonesia and how the variations have been made present in section 1.2.

1.2 Fertility in Indonesia.

The fertility rate in Indonesia was quite high during the Old Order era (1960s) but then declined afterwards. The decline was clearly remarkable since 1965 until 2002. Chart 1 below displays the fertility decline in Indonesia.

Chart 1. Fertility decline in Indonesia year 1967 – 2007 (children per woman)



Source data: IDHS 1991 and IDHS 2007.

Total fertility rate (TFR) in Indonesia declined very rapidly from 5.7 children per woman in the 1967 – 1970 periods into 2.6 in the year 2002/2003. Afterwards, the fertility rate stalled for five years since 2003 to 2007.

The rapid decline between 1967 and 1997 was due to rapid and vigorous efforts on family planning programs by the national government through promoting contraception and by promoting that having only two children will positively influence family prosperity (McNicoll and Singarimbun, 1983, Camack and Heaton, 2001, Muhidin, 2002). Consequently, there has been an increase of contraception use in

Indonesia. The program itself started in Java and Bali while the other islands followed (Camack and Heaton, 2001), making Java and Bali experienced rapid decline in fertility rate than the other regions (McNicoll and Singarimbun, 1983, Muhidin, 2002).

With regards to stable fertility rate in 2003-2007, it is probable that the economic crisis that started in 1997 reduced the national government ability to expend the sources to provide contraception that would eventually reduce the use of contraception in Indonesia (Frankenberg et al, 2003). Moreover, due to the Law Number 22 on Regional Government, the National Family Planning Coordinating Board (NFPCB) of Indonesia strengthens its strategy to help the local governments to provide a good family planning program to achieve the national goal. The national goal was balanced population growth in Indonesia in 2015 as indicated by the TFR score is 2.1 and a net reproduction rate of 1.0 (NFPCB, 2011). The NFPCB considered that decentralization reduced the effectiveness of family planning program to control the population (IDHS, 2012).

Furthermore the estimation method of TFR that had been used by the researchers to determined the regional variation of fertility were the age schedule of fertility which is a good estimation of TFR but this estimation cannot directly define the effect of proximate determinants to fertility (Bongaarts, 1982 and Muhidin 2002). Then this thesis will propose to use another estimation of TFR which is using Bongaarts (1982) method. This method estimates TFR using the proximate determinants of fertility and also determine the fertility – inhibiting effect of every proximate determinants to fertility in Indonesia. In that sense this thesis will use this method to elaborate the variation of TFR and also the proximate determinants of fertility that affecting it in Indonesia.

1.3 Objectives and research questions

The objectives of this thesis are to define the fertility level in Indonesia and its provinces. Furthermore this thesis is going to determine the differences of proximate determinants of fertility that affect the regional variations of fertility in Indonesia. Based on these objectives, this formulate two research questions followed with some sub questions. The research questions are:

a) What are the regional variations of fertility in Indonesia?
b) How does the proximate determinants of fertility vary in different provinces of Indonesia?
    - What are the patterns of proximate determinants of fertility between provinces in Indonesia?
    - What are the regional differences in the relative fertility – inhibiting effect of each proximate determinants of fertility?

1.4 Scientific and societal relevance

The scientific relevance of this thesis is that to enrich the literature of regional variation of fertility in Indonesia. Furthermore this thesis will use the Bongaarts method to estimate the TFR which never has been done by other researchers or Government of Indonesia. Lastly this thesis will provide the relative fertility – inhibiting effect of each proximate determinants of fertility for every provinces in Indonesia to define the most important proximate determinants of fertility as fertility – inhibiting factor in Indonesia.

The societal relevance of this thesis is that by determining the fertility – inhibiting effect of proximate determinants of fertility for every provinces in Indonesia, it will provide good information in which provinces need what policy. With the right policy of fertility for every provinces in Indonesia, it will help the Indonesian people to achieve happy and prosperous family through family program from NFPCB and they can achieve their vision of Indonesia TFR 2.1 in the year 2015.

1.5 Structure of the thesis

The strcuture of this paper consist into five chapters that will describe the regional variation of fertility in Indonesia. The first chapter is introduction which also include this page. The second chapter is theoretical framework. In this chapter presented the framework of proximate determinants of fertility and the literature of proximate determinants of fertility in Indonesia. Furthermore this chapter presented the conceptual model of this thesis based on the theory and the literature and the hypothesis based on the research questions, the framework and literatures of proximate determinants of fertility.

The third chapter is data and method. In this chapter presented the data that been used in this , the reflection of the quality of the data and the limitation of the data. This chapter also shown the method of proximate determinants of fertility and how the results being presented in this .

The fourth chapter is results. In this chapter presented the results of the which reflected the empirical evidence and the theories that been presented in the second chapter. Furthermore this chapter presented the map that will describe the variation of fertility and the variation of proximate determinants of fertility in Indonesia.

The fifth chapter is conclusions and discussion. In this chapter presented the summarized of the main findings of the . This chapter also shown how well the results can answered the research questions of the and the remains to be done in the future. Finally this thesis also presents the list of references that has been used to conduct this thesis.

Chapter 2 Theoretical Framework

The thesis of **"Regional Variation of Fertility in Indonesia: An Analysis of IDHS 2012"** is discussing the different fertility between regions in Indonesia. Furthermore, this thesis also discusses the factors that determined the differences of the level. This thesis uses the Framework of Proximate Determinants of Fertility to understand the level of fertility between provinces in Indonesia and some literatures based on this framework in Indonesia to strengthen and emphasize the results of this thesis.

2.1 Framework of proximate determinants of fertility

The framework of proximate determinants of fertility is a framework that stated that the effect of socio – economic and cultural factors affecting fertility can only be explained through a set of biological and behavior factors of the women in the population. This framework was firstly introduced by Davis and Blake when they introduced three broad categories with 11 intermediate variables (see. Davis and Blake 1956 p. 212). Later in 1978, Bongaarts (1978) improved the intermediate variables due to difficulties and complexity and also the availability of data to quantify the link between the intermediate variables and fertility. He suggested to reduce 11 variables of Davis and Blake to eight variables to simplify quantification.

The proximate determinants of fertility that Bongaarts (1978) proposed consisted three broad categories and eight variables which were **exposure factors** through variable proportion married, **deliberate marital fertility control factors** through variables contraception and induced abortion and **natural marital fertility factors** through variables lactational infecundability, frequency of intercourse, sterility, spontaneous intrauterine mortality and duration of the fertile period. The first two categories were picturing the behavior of the women and the third category picturing the biological factors that of women in the population.

In the framework, Bongaarts presented eight proximate determintans but in the measurements of fertility only four were considered. The four proximate determinants that were cosidered were the proportion of married among females respresented by index of marriage (C_m), the use of contraception as indicated by index of contraception (C_c), the practice of induced abortion represented by index of induced abortion (C_a) and period of fecundity after pregnancies represented by index of lactational infecundability (C_i). As for the rest four variables were represented in total fecundity that was measured in average 15,3 births per woman. The formula to predict the TFR was = C_m x C_c x C_a x C_i x TF. From these calculations, Bongaarts defined the relation between fertilility level (TFR) and the proximate determinants of fertility. The result of Bongaarts measurements mentioned in table 1.

Table 1. The relation between level of TFR and indices of proximate determinants of fertility.

Indices	TFR < 3 children per woman	TFR > 5 children per woman
C_m	0.4 - 0.65	0.65 - 0.9
C_c	0.22 - 0.45	0.8 – 1
C_a	0.5 - 1	1 or n.a
C_i	0.9 - 1	0.5 - 0.7

Source: Bongarts, 1978

Table 1 shows that in lower fertility level population, the C_m and C_c would have lower value than C_a and C_i. As for higher fertility level population, the C_m, C_c and C_a would have higher value than C_i.

By the year 1982, Bongaarts presented seven proximate determinants of fertility as the fertility – inhibited factors in the population. The variables were proportion of married females, use – effectiveness of contraception, prevalence of induced abortion, postpartum infecundability, fecundity (frequency of intercourse), spontaneous intrauterine mortality and prevalence of pemanent sterility. From these seven variables Bongaarts identified only four varibles that were important to analyze further to define the variations of fertility between populations. The four proximate determinants of fertility were proportion of married females, use – effectiveness of contraception, prevalence of induced abortion and postpartum infecundability. For interpretation, Bongaarts argued that a region or a country would had lower level of fertility than its maximum level if they had low proportion of married females, high use – effectiveness of contraception, high prevalence of induced abortion and long period of duration of infecund women after pregnancies.

In the measurement of TFR, Bongaarts (1982) used the indices from his previous study (1978) with formula TFR = C_m x C_c x C_a x C_i x 15.3. The indices were index of marriage (C_m), index of contraception (C_c) and index of induced abortion (C_a). As for C_i, instead of using term lactational infecundability Bongaarts used term postpartum infecundability. He argued that for measuring the duration of infecund women after pregnancies not only due to duration of lactation or breastfeeding but also the duration of abstinence of the women after pregnancies. As for the interpretation of the indices, he defined that lower value of C_m represented lower proportion of married women inhibit fertility, lower value of C_c represented higher use – effectiveness of contraception inhibit fertility, lower value of C_a represented higher prevalence of induced abortion inhibit fertility, lower value of C_i represented longer duration of infecund women after pregnancies inhibit fertility. On the contrary the higher value of C_m represented higher proportion of married women inhibit fertility, higher value of C_c represented lower use – effectiveness of contraception

inhibit fertility, higher value of C_a represented lower prevalence of induced abortion inhibit fertility, higher value of C_i represented shorter duration of infecund women after pregnancies inhibit fertility.

By the year 1983, Bongaarts and Potter proposed the variables to analyze the proximate determinants of fertility which inhibited fertility in population through two factors which were reproductive period and birth intervals. They defined variables that included in the duration of reproductive period were proportion of married females (analyzed through females' age at first marriage) and prevalence of permanent sterility. As for contraceptive use and effectiveness, prevalence of induced abortion, duration of postpartum infecundability (analyze through breastfeeding and abstinence of the women after pregnancies), fecundability (frequency of intercourse) and spontaneous intrauterine mortality (miscarriage) influenced the length of birth interval. In this paper they also provided the effectiveness method rate of contraception different from Bongaarts (1982) in which they distinguished the effectiveness between modern contraception methods and traditional contraception methods.

From previous descriptions, this thesis will use the method from Bongaarts' study in the year 1982 to estimate four indices of proximate determinants of fertility. As for the effectiveness method rate of contraception, this thesis will use the rate from Bongaarts and Potters propose in the year 1983. The interpretation of the indices will be the same as Bongaarts proposed in the year 1982. As for the results of the indices, this thesis expect the relation between regional variation of TFR and regional variation of indices of proximate determinants of fertility in Indonesia will get the same result as mentioned in table 1.

2.2. Literature review on regional variation of fertility in Indonesia.

As mentioned in introduction, the total fertility rate (TFR) in Indonesia declined from period 1960 to 2007 (IDHS, 1991, 2007 and Muhidin 2002). This finding had been strengthen by Hull (2003) that argued the TFR level in Indonesia would be near or below the replacement level (TFR = 2.1 children perwoman) by the year 2050. According to age schedule fertility in Indonesia by period 1960 – 1997, the fertility decline had occured in all ages but most prominent and rapid among the youngest and the oldest age groups and the peak of the childbearing in Indonesia was on age group of 20 – 24 years old (Muhidin, 2002). Muhidin (2002) also argued that there was a shift in childbearing in Indonesia to the ages of 25 – 29 years old during period 1960 – 1997.

In regional level, TFR was very diverse between provinces in Indonesia (McNicoll and Singarimbun, 1983 and Muhidin, 2002). In the period of 1960 – 1997 the lowest TFR was located in Java Island and the highest TFR was located in Papua Island (Muhidin, 2002). Western islands of Indonesia such as Java Island, Sumatera Island, Kalimantan and Bali Island had TFR lower than eastern islands of Indonesia

such as Nusa Tenggara Island, Sulawesi Island, Maluku Islands and Papua Island (McNicoll and Singarimbun, 1983 and Muhidin 2002).

From these literatures, this thesis expect results that the TFR of Indonesia will be closer to replacement level and the peak of childbearing will occur in the ages of 25 – 29 years old. On the regional level this thesis will expect that the low fertility level will happen in provinces located in western islands of Indonesia as for high fertility level will happen in provinces located in eastern islands of Indonesia.

2.3. Literature review on regional variation of proximate determinans of fertility in Indonesia.

There are four proximate determinants of fertility that is discussed in this thesis, i.e. proportion of married a female, use – effectiveness of contraception, induced abortion and duration of postpartum infecundability. Thus, the variables will be examined the current situation and the regional variation from previous literature that studied it either in regional level or national level in Indonesia.

a. Regional variations of proportion of married among female in Indonesia.

Fertility in Indonesia is assumed to happen only within marriage (Muhidin, 2002 and Hull, 2003). In that sense, understanding about marriage in Indonesia is one of vital part to explain fertility variations in Indonesia. In 1976, the proportion of married women in Indonesia accounted for 84 percent of the women population age 15 – 49 (McNicoll and Singarimbun, 1983). This proportion of married women in Indonesia was changing nowadays with just only 72 percent of the women population age 15 – 49 (IDHS, 2007).

Before the year 1990s marriage in Indonesia was a norm that bound traditionally to the customs and way of life of the people and there were a lot of women married at young ages (Blackburn and Bessell, 1997). But after the year 1990s marriage had been shifted from traditional customs into more modern way where young women decided on their own when they will get married (Hull, 1994). This shift has made many women postponed their first marriage which effected the rise of the age at first marriage (Muhidin, 2002, Hull, 2003 and Nilan, 2008). The median age at first married women in Indonesia by the year 1976 was recorded around 18.3 years old (McNicoll and Singarimbun, 1983). This indicator slightly changed by the year 2007 into around 19.8 years old (IDHS, 2007). This shifting indicator shows that most of the people in Indonesia followed the legal age at marriage which mentioned in the Law No. 1 year 1974 which stated the legal age at first married is 19 years old for male and 16 years old for female (Blackburn and Bessell, 1997 and Hull, 2003).

In regional level, marriage is quite diverse between provinces in Indonesia. McNicoll and Singarimbun (1983) found out that the proportion of married females in provinces in Java Island and western islands

of Indonesia was higher than the proportion in the eastern islands. of married women than the provinces in eastern islands of Indonesia. As for age at first married, Muhidin (2002) found out that regions located in western islands of Indonesia had lower age at first married than regions located in eastern islands of Indonesia.

From these literatures, this thesis expects that the regional variations of married women in Indonesia will be diverse between regions in Indonesia. This thesis will expect lower proportions of married women located in regions of eastern islands of Indonesia and higher proportion of married women will be located in regions of western island of Indonesia. In the contrary, the effect of the proportion of married women to inhibit fertility will be lower in regions located in western islands of Indonesia than regions located in eastern islands of Indonesia.

b. Regional variation of use – effectiveness of contraception in Indonesia.

Another factor that importantly influenced fertility decline in Indonesia was family planning program through the use of contraception methods (McNicoll and Singarimbun (1983), Jensen, 1996, Muhidin, 2002, Hull, 2003 and Frankenberg et al, 2003). The use of modern contraception in Indonesia was higher than traditional methods (McNicoll and Singarimbun (1983), Muhidin, 2002 and Frankenberg et al, 2003). Since the period of 1960s the use of modern contraception methods has been increasing in Indonesia (McNicoll and Singarimbun (1983), Jensen, 1996 and Muhidin, 2002).

The modern contraception methods that were famous among Indonesian women were oral method (pill) or injections (McNicoll and Singarimbun, 1983 and Muhidin, 2002). They used these methods because they felt these methods were much safer than other methods (Muhidin, 2002). As for sterilization was less used and only women that wanted to limit their family size used it (Muhidin, 2002). Condoms Indonesia was quite less common because most Indonesian men believed contraception used only for women and the used of condom was only to prevent the sexual transmitted diseases (STDs) and HIV/ AIDS to them (Ford, et al, 2000 and Butt et al, 2002).

In regional level, the promotions of family planning programs in Indonesia started earlier in Java and Bali Island and then continued to other regions of Indonesia (McNicoll and Singarimbun (1983), and Jensen, 1996). Based on this matter, Muhidin (2002) discovered that the prevalence of contraception used in regions of western islands of Indonesia where Java and Bali Islands located was higher than eastern islands of Indonesia. Camack and Heaton (2001) discovered the acceptanced of family planning (use contraception) in Java island and around it was higher due to facilities and services that provided by the government of Indonesia in those regions.

Base on these literatures, this thesis emphasizes the regional variation of use – effectiveness in regions located in Java Island and western islands of Indonesia will be higher than regions located in eastern islands of Indonesia. As for the fertility – inhibiting effect of contraception also will be higher in regions located in western islands of Indonesia than regions located in eastern islands of Indonesia.

c. Regional variation of induced abortion in Indonesia.

The practice of induced abortions believed to occur in Indonesia (Bennett, 2001). Some researchers estimated that the prevalence of induced abortion was quite high in Indonesia (Hull et al, 1993 and Sedgh and Ball, 2010). Even though induced abortion is quite high in Indonesia but some problems occurred in the practice of it. The practice of induced abortions in Indonesia restricted only for helping women that had problems with their pregnancies or victims of rape not as contraception methods according to the Law of Health No. 23 year 1992 (Hull et al, 1993 and Surjadjaja and Mayhew, 2010). According to religion and cultural/ beliefs reasons, the practice of induced abortion considered taboo and shameful and sinful to be done by women (McNicoll and Singarimbun, 1983, Bennett, 2001 and Muhidin, 2002, Nasir and Asnawi, 2011). Based on this matter, Muhidin (2002) found out that women reported had been doing abortion were quite scarce in the results of IDHS surveys.

Base on these literature this thesis assumes the data for estimating the practice of induced abortion will be lacking. In that sense the regional variation of induced abortion in Indonesia will not be diverse between regions in Indonesia. Due to this matter induced abortion will not further analyze in this thesis.

d. Regional variation of duration of postpartum infecundability in Indonesia.

Postpartum infecundability is related to the duration of breastfeeding and abstinence after pregnancies of women. The practice of breastfeeding and abstinence has been occurring in Indonesia because of traditional customs or beliefs of the people not influenced for reducing fertility (McNicoll and Singarimbun, 1983). The length of duration of breastfeeding in Indonesia was quite high, that is around 2 years after pregnancies (McNicoll and Singarimbun, 1983 and Muhidin, 2002). But this long duration of breastfeeding was not followed by long duration of amenorrhea due to not exclusive breastfeeding practice of the women (McNicoll and Singarimbun, 1983 and Jain and Bongaarts, 1981). As for practice of abstinence, McNicoll and Singarimbun (1983) predicted it to be decreased due to rapid used of modern contraception. As for the duration of abstinence, IDHS (2007) reported that in average the figure is around 2.4 months.

In the regional level, Muhidin (2002) found out that the duration of breastfeeding of women in regions located in western islands was longer than women in regions located in eastern islands of Indonesia.

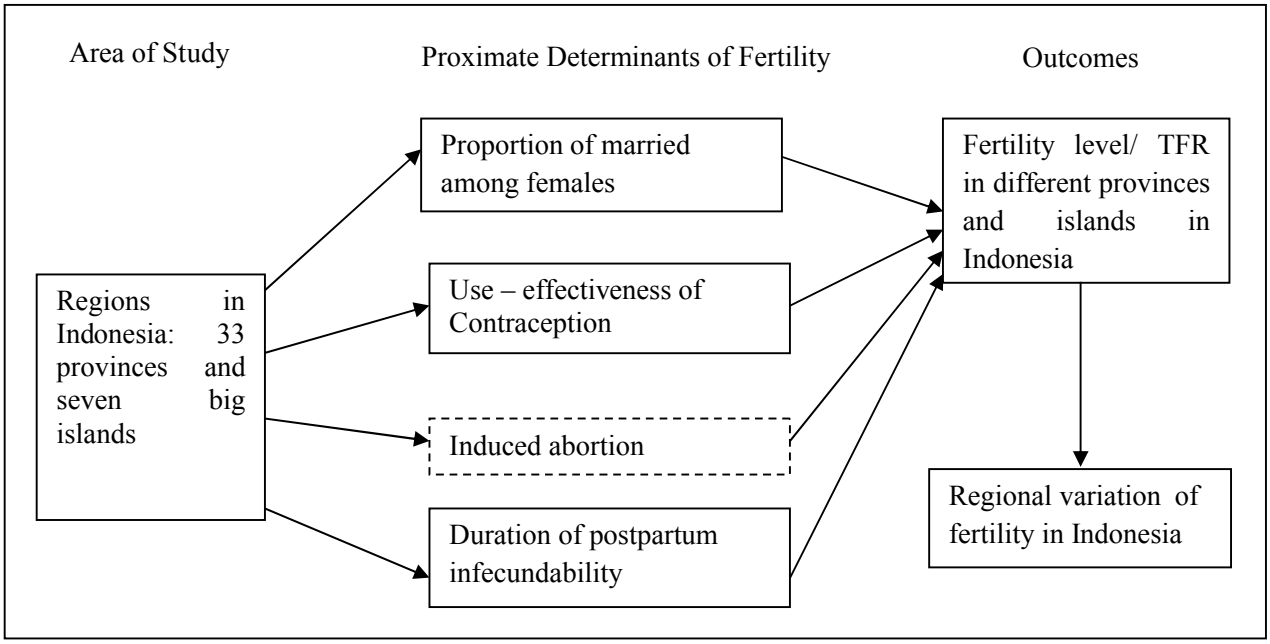
IDHS (2007) reported that the variation of duration of abstinence was not significantly different between western islands and eastern islands of Indonesia.

Base on these literatures, this thesis emphasizes the regional variation of postpartum infecundability in regions located in western islands of Indonesia will be higher than regions located in eastern islands of Indonesia. As for the effect of duration of infecundability inhibit fertility also will be higher in regions located in western islands of Indonesia than regions located in eastern islands of Indonesia.

2.4 Conceptual model of the thesis.

The author refers to the conceptual model from Bongaarts that was proposed in 1982. However, instead of explaining socio – economic factors, this thesis will explain the variation of TFR in every region in Indonesia. The regions in Indonesia consist 33 provinces that are located in seven big islands of Indonesia. The conceptual model of this thesis presents in Model 1 below.

Model 1 Conceptual model thesis on regional variation of fertility in Indonesia



Source: Bongaarts, 1982 modified by author.

Model 1 shows that the concepts of regional variation of fertility is a compilation of TFR for every 33 provinces in Indonesia. The estimation of TFR for every 33 provinces in Indonesia depends on the proximate determinants of fertility such as the proportion of married women, use – effectiveness of contraception and duration of infecundability in every 33 provinces in Indonesia. As for induced abortion will not analyze further due to lack of data in IDHS.

2.5 Hypothesis

Based on the research questions, the framework of proximate determinants of fertility and literature review on proximate determinants of fertility in Indonesia, this thesis formulates several hypothesis for emphasizing the results. The hypothesis of this thesis consists in five parts which are:

1. The fertility level in Indonesia will be closer to the TFR replacement level.
2. The regional variation of fertility in Indonesia will be different between provinces and islands. The lower fertility level will be in provinces located in western islands of Indonesia. In the contrary higher fertility level will be in provinces located in eastern islands of Indonesia.
3. Provinces that are located in western islands of Indonesia will have higher proportion of married females than provinces in eastern islands of Indonesia. But provinces in western islands of Indonesia will have lower fertility – inhibiting effect of proportion of married women than provinces in eastern islands of Indonesia.
4. Provinces that are located in western islands of Indonesia will have higher prevalence of use – effectiveness of contraception than provinces in eastern islands of Indonesia. Furthermore, provinces in western islands of Indonesia will also have higher fertility – inhibiting effect of use – effectiveness of contraception than provinces in eastern islands of Indonesia.
5. Provinces that are located in western islands of Indonesia will have longer duration of postpartum infecundability than provinces in eastern islands of Indonesia. Furthermore, provinces in western islands of Indonesia will also have higher fertility – inhibiting effect of duration of postpartum infecundability than provinces in eastern islands of Indonesia.

Chapter 3 Data and Methods

3.1 Data

This thesis used secondary data and cross sectional data from Indonesia Demographic and Health Survey (IDHS) year 2012. IDHS was held to provide data for estimating demographic events (i.e. fertility and mortality), data on reproductive health (i.e. maternal health care, contraceptive use etc.) and socio – economic factors indicators related to them in Indonesia. IDHS has been conducted in Indonesia for seven times since 1987. IDHS was held once in every five years and the last survey was held in the year 2012. This survey was conducted by government institutions that were responsible for providing data for population policy in Indonesia, i.e. Statistics of Indonesia – BPS in collaboration with Ministry of Health (MoH) of Indonesia, National Family Planning Coordinating Board (NFPCB) of Indonesia and expertise advice from USAID.

IDHS used stratified two-stage sampling method which used to get sample in a population proportionally based on place and characteristics of the households in the populationto ensure that every class of household was proportionally represented into the sample. With this methodology IDHS 2012 provided estimated data level for Indonesia and its 33 provinces, increasing from 2000 that only had 27 provinces. The sample size of IDHS 2012 was 45.607 women aged 15-49 with response rate around 96 percent and 9.306 men aged 15-54 with response rate of 92 percent. The high response rate provides assurance to this thesis to use IDHS data to analyze the regional difference in fertility rate in Indonesia. In that sense, this thesis used the provincial data of proximate determinants of fertility to estimate the fertility level for provices in Indonesia.

The quality of fertility data in IDHS 2012 was mostly affected by misreporting birthdates or undercount of births (IDHS, 2012 p. 49). Older women tend to misreport more because they cannot remember their birthdates of their children. Also, women whose child died afterward tend to misreport more (IDHS, 2012 p. 49). Based on this matters IDHS did some adjustments to estimate the fertility level in Indonesia and its 33 provinces (IDHS, 2012 p. 49).

The quality of the proximate determinants of fertility data as reported by IDHS showed that three out of four proximate determinants of fertility that were used in this thesis were quite good for estimation based on relative eror and missing data report (IDHS, 2012 p.328). The three variables were proportion of married women, prevalence of contraception, duration of amenorrhea and duration of abstinence, for these variables the completed data report accounted for around (95 – 98 percent) and relative error around 0.001 – 0.024. On the contrary for prevalence of abortion variable the missing data report were 76 percent and there was no information of relative error for this variable. Based on this reports this thesis could use

the data of proportions of married among females, prevalence of contraception and duration of postpartum amenorrhea and abstinence directly from the database of IDHS 2012 to answer the research questions but not for data of prevalence of abortion.

After assuring the data quality, this thesis then determined the definition of concepts that had been used to simplify the methods that were being used in this thesis. The definition of concepts and the methods that were being used in this thesis were explained in the next section

3.2 Ethical consideration

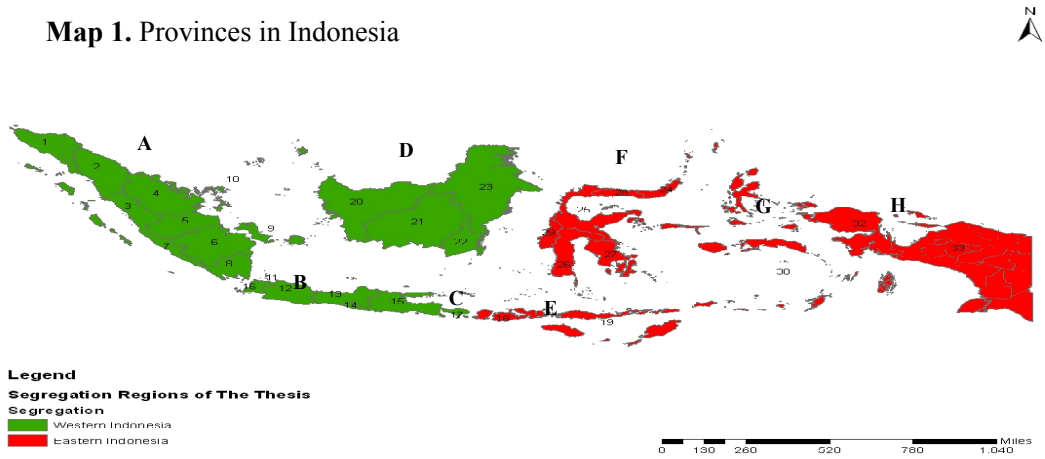
This thesis used individual data from IDHS year 2012, in that sense the confidentiality of the data must kept secret and the used of the data just only to answer the research questions of this thesis. Furthermore the results of this thesis will be in provincial level which means that the direct impact of the results from this thesis will not occur to individual of the respondents of IDHS year 2012. The ethical consideration of this thesis was by assuring the confidentiality of the respondent kept secret and will not be exposed in the results of this thesis.

3.3 Definition of concepts

This thesis used concepts and variables from Bongaarts (1982) i.e. the fertility – inhibiting effects of the intermediate fertility, which were marriage, contraception, induced abortion and postpartum infecundability. Additionally, this thesis also used two other concepts: fertility and Indonesian provinces. Further explanation of these concepts will be explained below.

a. **Provinces in Indonesia** are area that located in Indonesia which were ruled by local administrative government just one level below the national government of Indonesia. This thesis used the latest provinces in Indonesia which were 33 provinces (IDHS, 2012) as the unit of analysis. Additionally, the provinces can be categorized further into those located in the western islands of Indonesia and in the eastern islands. Map 1 below display provinces in the western part (green color) and in the eastern part (red color).

Map 1. Provinces in Indonesia



Source: IDHS, 2012

Table 2. The explanation of map 1

Provinces in western islands of Indonesia		Provinces in eastern islands of Indonesia	
A	**Sumatera Island**	**E**	**Nusa Tenggara Islands**
1	Aceh	18	West Nusa Tenggara
2	North Sumatera	19	East Nusa Tenggara
3	West Sumatera	**F**	**Sulawesi Island**
4	Riau	24	North Sulawesi
5	Jambi	25	Central Sulawesi
6	South Sumatera	26	South Sulawesi
7	Bengkulu	27	Southeast Sulawesi
8	Lampung	28	Gorontalo
9	Bangka Belitung	29	West Sulawesi
10	Riau Islands	**G**	**Maluku Islands**
B	**Java Island**	30	Maluku
11	Jakarta	31	North Maluku
12	West Java	**H**	**Papua Island**
13	Central Java	32	West Papua
14	Yogyakarta	33	Papua
15	East Java		
16	Banten		
C	**Bali Island**		
17	Bali		
D	**Kalimantan Island**		
20	West Kalimantan		
21	Central Kalimantan		
22	South Kalimantan		
23	East Kalimantan		

Source: Map 1 this thesis.

b. **Fertility (TFR)** is a demographic rate that shows the average number of children of a woman can have if she survive until her reproductive period (Preston et al, 2001).
c. **Proportion of married** women is a variable that measures the exposure of women to sexual activity. This variable includes women that are actually married and women in consensual unions. This variable considers as an inhabiting factor of fertility by decreasing the proportion of married women tend to lower fertility level than its maximum level. In this research the variable was measured as index of married (C_m).
d. **Contraception** is a variable that measures the deliberate parity dependent practice including abstinent and sterilization to reduce the risk of women conception. This variable pictures the use and effectiveness of contraception method in married women. This variable considers as an inhabiting factor of fertility by increasing the use – effectiveness of contraception tend to lower fertility level than its maximum level. In this research measured as index of contraception (C_c).
e. **Induced abortion** is a variable that measures the practice of deliberately interupt the normal gestation of women's pregnancies. This variable pictures the prevalence of abortion of married women. This variable considers as an inhabiting factor of fertility by increasing the prevalence of induced abortion tend to lower fertility level than its maximum level. In this research measured as index of induced abortion (C_a).
f. **Postpartum infecundability** is a variable that measures the duration of infecundability of women after pregnancies and induces by the duration of lactation amenorrhea and abstinence. This variable pictures the length of infecundability of women after pregnancies. This variable considers as an inhabiting factor of fertility by increasing the duration of postpartum infecundability tend to lower fertility level than its maximum level. In this research measured as index of postpartum infecundability (C_i).

3.4 Methods and operationalizations

This thesis was a quantitative research in which used quantify data to answer the research questions and complete the objectives stated in chapter one (Babbie, 2013). The methods that was used in this thesis further would be explained below.

3.4.1 Fertility and its Regional variation.

Fertility is a variable measured the condition when a woman fecund or can give birth to children (Preston et al, 2001). This thesis used Total Ferility Rate (TFR) as indicator to define fertility standardized by age. In this sense, this rate is reliable to measure regional variety between provinces in Indonesia. This thesis was trying to distinct the difference of TFR method using age specific fertility and method from Bongaarts in the year 1982.

TFR method of age specific fertility measured as a sum of age specific fertility in every five age groups. Formula for this TFR method defined in formula 1.

$TFR = 5 \times \sum_{n=15}^{45} ASFR_n$ ..... (1)

Where: $ASFR_n$ = age specific fertility rate in 5 age group. The age group started at age 15 and the last age is 49. These age groups used in this thesis because they commonly used to estimate TFR and the availability data in IDHS also at the same age group.

TFR method from Bongaarts (1982) was the estimation of TFR from four indices of the proximate determinants of fertility. Formula for this TFR method defined in formula 2.

$TFR = C_m \times C_c \times C_a \times C_i \times TF$ ..... (2)

Where: C_m was index of marriage, C_c was index of contraception, C_a was index of induced abortion, C_i was index of postpartum infecundability. As TF (total fecundity) which was measuring the total number of children per woman could have if the proximate determinants of fertility being absent in the population. This thesis used the value of TF that proposed from Bongaarts (1982) in average 15.3 children per woman.

3.4.2 Proximate determinants of fertility and their regional variation

There are 7 proximate determinants of fertility that have been brought up by Bongaarts (1982) and these determinants could be measured into 4 indices i.e. index of marriage (Cm), index of contraception (Cc), index of induced abortion and index of postpartum infecundability (Ci). These indices will be calculated as Bongaarts did. Further explanation on how to estimate the indices were describe below.

a. **Index of marriage (C_m)** measured the inhibiting factor of proportion of married or consensual union to fertility. The value of C_m range from zero to one. The value of C_m was zero if there was an absence of married or consensual unions and one if all women at reproductive age were married or in consensual unions.

   The formula to get $C_m = \frac{\sum m(a) x\ g(a)}{\sum g(a)}$ .....(3)

   The explanations of formula 3 are: 'g(a)' was age specific marital fertility rate and 'm(a)' was proportion currently married women and women in consensual unions.

b. **Index of contraception (C_c)** measured the inhibiting factor of use effectiveness of contraception to fertility. The value of C_c range from zero to one. The value of C_c was one if there was an absence of contraception and zero if all fecund women used 100 percent effective contraception.

   The formula to get $C_c = 1 - 1.08$ x e x u .....(4)

The explanations of formula 4 were: ‘e’ was the prevalence of contraceptive used among married women at reproductive age (15 – 49), ‘u’ was the average used effectiveness of contraception. ‘u’ measured as sum of pervalence of contraception multiplied by standard effectiveness of contraception that Bongarts and Potter (1983) proposed. The standard of contraception described in table 2 below. It is worth nothing thath 1.08 was sterility correction factor.

Table 3. Standard effectiveness of contraception

Modern Method	Use effectiveness	Traditional Method	Use effectiveness
Sterile	1.00	Periodic abstinence	0.80
Pill	0.90	Withdrawal	0.70
IUD	0.95	Other	0.30
Injections	0.99		
Implants	0.99		
Condom	0.90		
Diaphragm	0.85		

Source: Bongaarts and Potters, 1983.

c. **Index of induced abortion (C_a)** measured the inhibiting factor of abortion to fertility. The value of C_a range from zero to one. The value of C_a is one if there is an absence of abortion and zero if all pregnancies of women aborted.

The formula to get $C_a = \frac{TFR}{TFR[0.4 x(1+1)x TA]}$.....(5)

The explanations of formula 5 were: TFR was Total Fertility Rate, ‘u’ was the average use effectiveness of contraception and TA was total abortion rate (in this rate only included abortions among married women) if there is no reliable data on TA then assumed there is absence of induced abortions means that $C_a = 1$.

For index of induced abortion, this thesis would assumed the value was 1 or there was no abortion in Indonesia. This assumption due to unavailability and unreliablility of the total abortion rate data in Indonesia and IDHS 2012 (Bongaarts, 1982).

d. **Index of postpartum infecundability (C_i)** measured the inhibiting factor of fertility due to duration of lactation amenorrhea and abstinence of women after pregnancies. The value of C_i range from zero to one. The value of C_i was one if there was an absence of lactation amenorrhea and abstinence and zero if the duration of lactation amenorrhea or abstinence was infinite.

The formula to get $C_i = \frac{20}{1.85 + i}$.....(6)

The explanations of formula 6 are: 'i' was the mean duration of postpartum infecundability. In this thesis the mean duration of postpartum infecundability was measured by the median duration of insuceptibility. Insuceptibility was a measurements from DHS that showed the combination of the duration of postpartum amenorrhea and postpartum of abstinence (Stover, 1998). This indicator has been chosen because the duration of breastfeeding in Indonesia cannot pictured the variation of infecundability of women after pregnancies. This happened because the intensity of the breasfeeding in Indonesia was not exclusive breasfeeding (Jain and Bongaarts, 1981

e. **The effect of proximate determinants fertility** measured how many numbers of children been inhibited by proportion of marriage or by use – effectiveness of contraception or by induced abortion or by postpartum infecundability. These effects calculated separately for every proximate determinants. These calculations were prorated by the logarithm of each index of proximate determinants to sum all of logarithm of each index multiplied by the difference between total fecundity and the estimated fertility from the indices (Wang et al, 1987). Calculation of the formula for every index shown in formula 7, 8 and 9 as for index of induced abortion assumed to had effect of zero.

The effect of C_m calculated as = $\frac{[TF - TFR] \times \log Cm}{\log Cm + \log Cc + \log Ca + \log Cm}$ .....(7)

The effect of C_c calculated as = $\frac{[TF - TFR] \times \log Cc}{\log Cm + \log Cc + \log Ca + \log Cm}$ .....(8)

The effect of C_c calculated as = $\frac{[TF - TFR] \times \log Cc}{\log Cm + \log Cc + \log Ca + \log Cm}$ .....(9)

3.4.3 Spatial analysis using GIS.

This thesis used ARCGIS software for two reasons. The first reason was to present the results of TFR Groups and the relation between TFR and the indices of proximate determinants of fertility for every province in Indonesia into a map. The second reason was to figure out the geographical effect of variations of TFR and variations of indices of proximate determinants of fertility in Indonesia. This thesis used three different tools to get the results which were Mapping Properties, Spatial Autocorrelations (Global Moran's I) and Hot Spot Analysis (Getis – Ord Gi*).

a. Mapping properties

The TFR groups in this thesis consisted into three groups. The first group was TFR group consisted provinces that had TFR below the replacement level (2.1 children per women). The second group was TFR group consisted provinces that had TFR between replacement level and Indonesia's TFR. The third group was TFR group consisted provinces that had TFR higher than Indonesia's TFR. Before operated the ARCGIS software this thesis categorized TFR provinces included in which TFR groups. Then to map the results some procedures has been done which were:

• Go to layer properties
• Choose symbology
• Choose categories and chose value field TFR
• Click OK

Before defined the relation between TFR and indices of proximate determinants of fertility, this thesis made two groups of each indices of proximate determinants of fertility. The two groups differ based on Indonesia's value of indices of proximate determinants of fertility. The first group included provinces that had indices value of proximate determinants of fertility lower than Indonesia's value and the second group included provinces that had indices value of proximate determinants of fertility higher than Indonesia's value. Then to map the results some procedures has been done which were:

• Go to layer properties
• Choose symbology
• Choose multiple attributes and chose value field TFR in the first field and value field of indices of each proximate determinants of fertility in second field.
• Click OK

This study used replacement level as the first group of TFR because this study would like to figure out which provinces that already had TFR below replacement level which has been predicted by Hull (2003). This study also used the value of Indonesia as a distinction for TFR groups and proximate determinants of fertility groups because because this thesis felt to compare between regions in a country it must had standardized that closed to the mean or median for every value of the regions in this sense was the country value it selves (Preston et al, 2001).

b. Spatial autocorrelation (Global Moran's I)

The tools of spatial autocorrelation (Global Moran's I) in ARCGIS has been used in this study to determine whether the pattern of TFR in Indonesia and the pattern of indices of proximate determinants of fertility in Indonesia were geographically clustered, dispersed or random (Gatrell, 2002). This tool measured patterns based on both the value and the location of the provinces in Indonesia (ArcGIS Desktop Help, 2014a). The interpretation whether there was any pattern of TFR and indices of proximate determinants of fertility in Indonesia showed by Moran's I Index value which ranges from -1 to 1 (Spriensma, 2010 p.20). If the Moran´s I index was close to 1, it meant that the pattern was perfectly clustered. On the contrary, if the Moran´s I index was close to -1 it meant that the pattern was perfectly dispersed and if the value was close to zero it meant that the pattern was random (Mitchell, 2005). The z – score and p – value of the Moran´s I index were referred to determine the significance of the patterns. If

the p – value below 0.05 with hypothesis null there were no spatial autocorrelation then this thesis concluded the patterns were statistically significant (ArcGIS Desktop Help, 2014a).

The following were the procedures to run the spatial autocorrelation tool (Global Moran's I):

1. In ArcMap, open ArcToolbox, expand Spatial Statistics Tools and also expand Analyzing Patterns and then double-click the Spatial Autocorrelation tool
2. Input Feature Class = Indonesia provinces map
3. Input Field = TFR and proximate determinants of fertility field
4. Check Display Output Geographically box = Yes
5. Conceptualization of spatial relationships = Inverse Distance
6. Distance Method = Euclidean
7. Standardization = None
8. Distance Band or Threshold Distance (optional) = none
9. Weights Matrix File (optional) = none

(Source: ArcGIS Desktop Help, 2014a)

c. Hot spot analysis (Getis – Ord Gi*)

The pattern of TFR and indices of proximate determinants of fertility has been presented by using the hot spot analysis (Getis – Ord Gi*) tool in ARCGIS. This tool identified statistically significant spatial clusters of high values (hot spots) and low values (cold spots). To interpret whether the provinces considered hot spots or cold spots clusters depended on the Gi* statistics z-score and p-value that has been produced from the tool (Mitchell, 2005).

The interpretation of high value cluster pattern (hot spot) was by considering province had high value of Gi* z – score and surrounding by other provinces also with high value of Gi* z – score. On the contrary, if the province had low value of Gi* z – score surrounding by other provinces also with low value of Gi* z – score considered as low value cluster (cold spot). Moreover if a province had Gi* z-score near zero, this indicated no apparent spatial clustering in that province (ArcGIS Desktop Help, 2014b).

The procedures to run the hot spot analysis (Getis – Ord Gi*) were:

1. In ArcMap open ArcToolbox, expand Spatial Statistics Tools, also expand Analyzing Patterns and double-click the hotspot analysis (Getis – Ord Gi*) tool
2. Input Feature Class = Indonesia provinces map
3. Input Field = TFR and proximate determinants of fertility field
4. Output Feature Class = Hotspot analysis (TFR or indices) map
5. Conceptualization of spatial relationships = Inverse Distance

6. Distance Method = Euclidean
7. Standardization = None
8. Distance Band or Threshold Distance (optional) = none
9. Self Potential Field = none
10. Weights Matrix File (optional) = none (Source: ArcGIS Desktop Help, 2014b).

Chapter 4. Results

4.1. Regional variations of fertility in Indonesia

The first research question of this thesis is regional variation of fertility in Indonesia. The answer of this research questions is by considering the fertility level of each provinces in Indonesia.Before answering the research question, this thesis will describe the situation of fertility in Indonesia in 2012.

4.1.1. Fertility of Indonesia, year 2012

Table 4. TFR estimation of Indonesia, year 2012

Method of TFR	**Procedures/ Results**							
(1)	(2)							
1. Age specific fertility rate	15-19	20-24	25-29	30-34	35-39	40-44	45-49	TFR
	48	138	143	103	62	21	4	2,6
2. Bongaarts (1982)	Cm	Cc	Ca	Ci	TF	TFR	**Difference (%)**	
	0.63	0.37	1.00	0.90	15.30	3.16	**0.56 (21.8)**	

Source data: IDHS 2012

The table 4 above indicates that women aged 25 – 29 years old have the highest fertility rate, implying that most Indonesian women are giving birth at this age interval. As from Bongaarts (1982) method this thesis finds out that the highest index of proximate determinants of fertility is index of contraception. This implies that fertility in Indonesia was strongly inhibited by the use – effectiveness of contraception. Moreover this study discovers that the difference of TFR result from the two methods is quiet high (around 21.8 percent). The difference may indicate that induced abortion is quite high in Indonesia because in the previous calculation of Bongaarts (1982) method induced abortion is absent.

To elaborate more the variation of TFR in Indonesia, this thesis is going to explain it through the variation of TFR in provincial level.This thesis uses Bongaarts' method (1982) to elaborate more the variation of TFR in Indonesia. The explanations of the variation will be described in the next subsection.

4.1.2. Regional variation of TFR in Indonesia, year 2012

As indicated before, this thesis classified Indonesian provinces into two regions: the western and the eastern islands. Table 5 below displays the inter-province variance of TFR.

Table 5. Regional variation of TFR in Indonesia, year 2012. (average number of children per woman)

Western islands of Indonesia		TFR	Eastern islands of Indonesia		TFR
(1)		(2)	(3)		(4)
A.	**Sumatera Island**		**E**	**Nusa Tenggara Islands**	
1	Aceh	3.81	18	West Nusa Tenggara	3.45
2	North Sumatera	3.20	19	East Nusa Tenggara	2.45
3	West Sumatera	3.54	**F**	**Sulawesi Island**	
4	Riau	3.27	24	North Sulawesi	2.57
5	Jambi	3.14	25	Central Sulawesi	3.84
6	South Sumatera	2.61	26	South Sulawesi	3.39
7	Bengkulu	3.30	27	Southeast Sulawesi	3.63
8	Lampung	2.64	28	Gorontalo	3.06
9	Bangka Belitung	2.88	29	West Sulawesi	4.08
10	Riau Islands	3.94	**G**	**Maluku Islands**	
B.	**Java Island**		30	Maluku	2.91
11	DKI Jakarta	2.89	31	North Maluku	2.67
12	West Java	3.58	**H**	**Papua Island**	
13	Central Java	2.80	32	West Papua	3.88
14	DI Yogyakarta	1.94	33	Papua	5.18
15	East Java	2.89			
16	Banten	3.09			
C.	**Bali Island**				
17	Bali	2.53			
D.	**Kalimantan Island**				
20	West Kalimantan	3.07			
21	Central Kalimantan	3.08			
22	South Kalimantan	2.84			
23	East Kalimantan	3.45			

Source data: IDHS, 2012

Note: ☐ = the highest TFR; ⋯ = the lowest TFR.

Table 5 shows that the regional variation of TFR between provinces in Indonesia is quite different (around 1.9 to 5.2 children per woman). This variation shows that provinces located in western islands of Indonesia tend to have lower TFR than provinces that are located in eastern islands of Indonesia. For example, the lowest TFR is in Yogyakarta which is located in Java Island and the highest TFR is in Papua which is located in Papua Island. Provinces located in western islands of Indonesia that have relatively high TFR (TFR> Indonesia's TFR) are Aceh, North Sumatera, West Sumatera, Riau, Bengkulu, Riau Islands, West Java, West Kalimantan, Central Kalimantan and East Kalimantan. On the contrary other

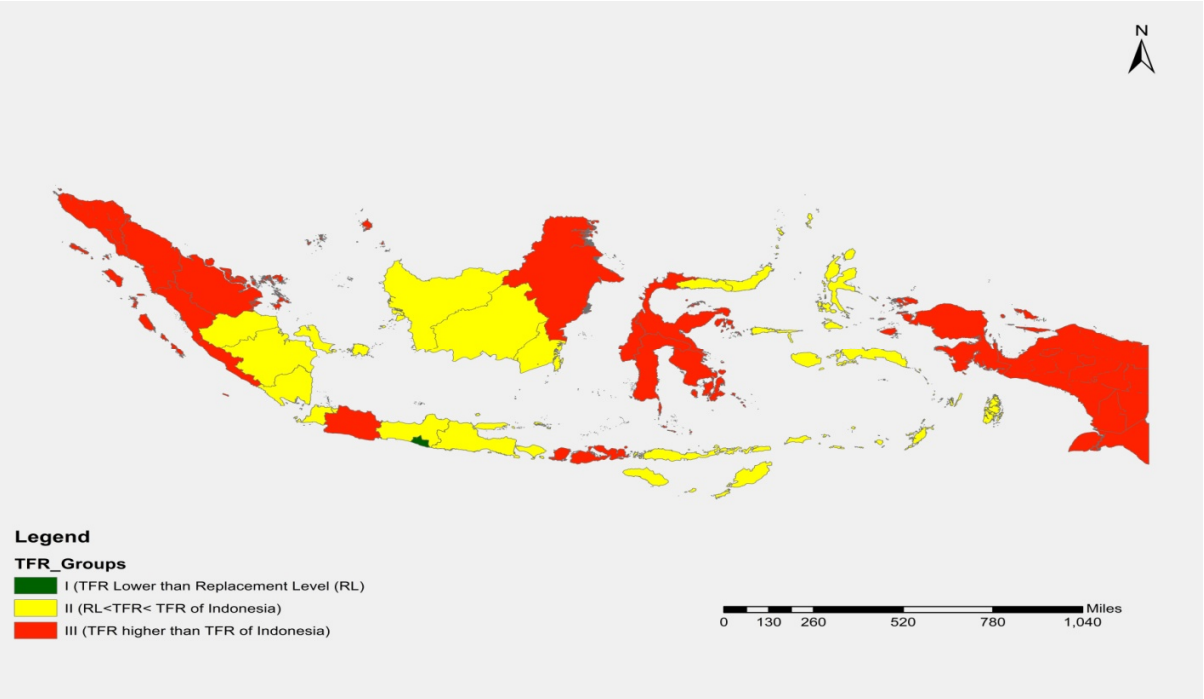
hand provinces located in eastern islands of Indonesia that have relatively low TFR (TFR<Indonesia's TFR) are only East Nusa Tenggara, Maluku, North Maluku and North Sulawesi..

The next part will further explain about pattern of TFR and the level of TFR in Indonesia using ARCGIS Software. The analysis of the results will follow.

4.1.3. The level and pattern of TFR in Indonesia in 2012

This thesis classifies the Indonesian provinces into three groups based on the level of TFR. Provinces in the first group have TFR lower than the TFR of replacement level. The second group have TFR lower than the average Indonesian TFR but higher than the TFR of replacement level. Finally, the third group have TFR higher than the average Indonesian TFR. Figure 1 shows these groups in more detail.

Figure 1. TFR level of provinces in Indonesia, year 2012.



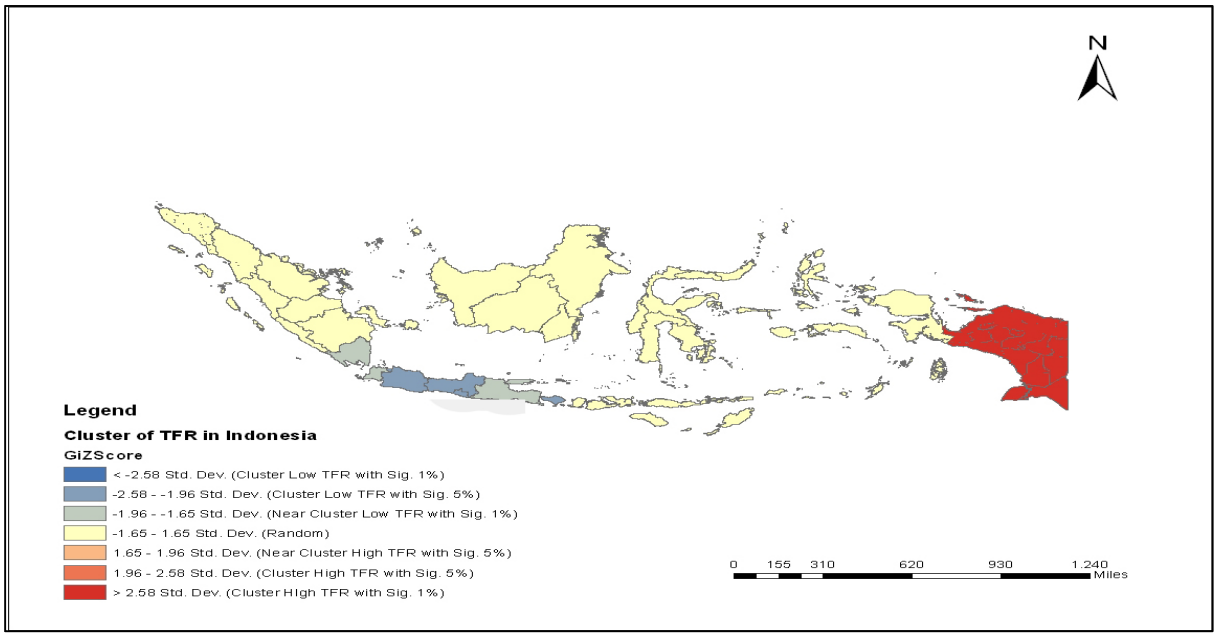
Source data: table 4 and table 5 of this thesis.

Figure 1 shows that most Indonesian provinces belong to group II and III. Moreover, most provinces in the western parts of Indonesia belong to group II, implying that most of the western provinces have TFR lower than the average Indonesian TFR but higher than TFR of replacement level. On the other hand, provinces located in the eastern islands belong to group III, indicating that the eastern provinces have TFR level higher than TFR of Indonesia. It is also worth noting that only Yogyakarta belongs to group I because it has TFR lower than TFR of replacement level.

After defining the level of TFR of provinces in Indonesia, this thesis continues the analysis by defining the pattern of TFR using Global Moran's I index. Furthermore this thesis presents the results of the pattern using hotspot analysis (Gettis – Ord Gi*) tools. The results of these procedures are described in the next paragraphs.

The result of Global Moran's I index of TFR of provinces in Indonesia is 0.15 with the z-score around 1.98 and p-value 0.04, implying that the null hypothesis (there is no special autocorrelation) is rejected . Based on the results of Global Moran's I index, this thesis concludes that TFR of provinces in Indonesia have cluster pattern. The pattern of TFR of provinces in Indonesia is described in figure 2.

Figure 2. Cluster pattern of TFR of provinces in Indonesia, year 2012



Source data: table 5of this thesis.

Figure 2 shows that there are two cluster patterns of TFR in Indonesia , i.e. cluster of low value of TFR and cluster of high value of TFR. The cluster of low value of TFR (cold spot) mostly consists of provinces located in the western islands of Indonesia, more specifically provinces in Java and Bali Islands with significance of Gi* statistics 5 percent. On the contrary, the cluster of high value of TFR (hot spot) mostly consists of the provinces located in eastern islands of Indonesia, i.e. at the provinces in Papua island with significance of Gi* statistics 1 percent.

Afterwards, this thesis will discuss the level and cluster pattern of TFR in Indonesia through the proximate determinants of fertility. More specifically, this thesis will analyze through index of marriage (C_m), index of contraception (C_c) and index of postpartum infecundability (C_i) between provinces in Indonesia

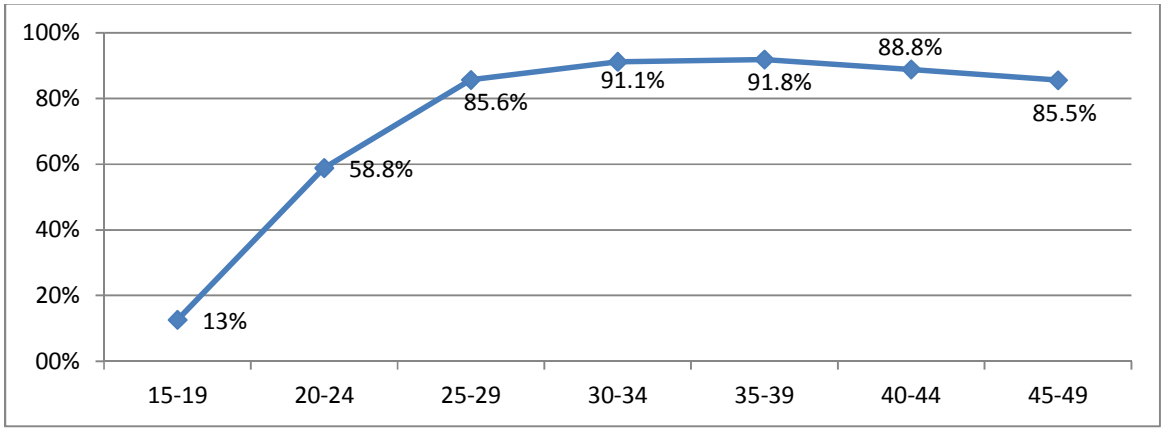
4.2. Proximate Determinants of Fertility in Indonesia

The second research questions of this study is the variations of proximate determinants of fertility in Indonesia. The indicator consists of only three indices, i.e. index of marriage (C_m), index of contraception (C_c) and index of postpartum infecundability (C_i). The thesis does not discuss further the index of induced abortion (C_a) because the data is lacking. Therefore, the index is assumed to be 1 (one). Section 3.3.2 discusses the methods while the subsequent section explains the variations of the three indices.

4.2.1 Regional variations of Index of marriage (C_m) in Indonesia

From the IDHS 2012 data set, it can be deduced that on average, Indonesian women have their first marriage when they are 20.4 years old. Additionally, about 73.4 percent of Indonesian women married. Chart 2 shows the proportion of married women in age group.

Chart 2. Proportion of married women in Indonesia, year 2012 (%).



Source data: IDHS, 2012

Chart2 shows the proportion of married women in Indonesia according age groups. In age group 15 – 19 years old, the proportion of married women in Indonesia is lower than the other age groups. This pattern increases until age group 35 – 39 years old which has the higher proportion of married women in Indonesia and then drop again. Further explanation of marriage in Indonesia will be described in variation of index of marriage (C_m) between provinces in Indonesia.

Index of marriage (C_m) represents the effect of sexually inactive women (in this thesis through proportion of married women) to inhibit fertility in a population. The variations of index of marriage (C_m) between provinces in Indonesia are described in table 6.

Table 6. Variation of index of marriage (C_m) between provinces in Indonesia, year 2012.

Western islands of Indonesia		C_m	Eastern islands of Indonesia		C_m
(1)		(2)	(3)		(4)
A.	**Sumatera Island**		**E**	**Nusa Tenggara Islands**	
1	Aceh	0.54	18	West Nusa Tenggara	0.62
2	North Sumatera	0.54	19	East Nusa Tenggara	0.46
3	West Sumatera	0.59	**F**	**Sulawesi Island**	
4	Riau	0.62	24	North Sulawesi	0.62
5	Jambi	0.71	25	Central Sulawesi	0.63
6	South Sumatera	0.65	26	South Sulawesi	0.56
7	Bengkulu	0.66	27	Southeast Sulawesi	0.62
8	Lampung	0.66	28	Gorontalo	0.65
9	Bangka Belitung	0.68	29	West Sulawesi	0.63
10	Riau Islands	0.58	**G**	**Maluku Islands**	
B.	**Java Island**		30	Maluku	0.52
11	DKI Jakarta	0.50	31	North Maluku	0.55
12	West Java	0.68	**H**	**Papua Island**	
13	Central Java	0.62	32	West Papua	0.51
14	DI Yogyakarta	0.51	33	Papua	0.62
15	East Java	0.67			
16	Banten	0.65			
C.	**Bali Island**				
17	Bali	0.55			
D.	**Kalimantan Island**		**Indonesia**		**0.63**
20	West Kalimantan	0.66			
21	Central Kalimantan	0.70			
22	South Kalimantan	0.66			
23	East Kalimantan	0.62			

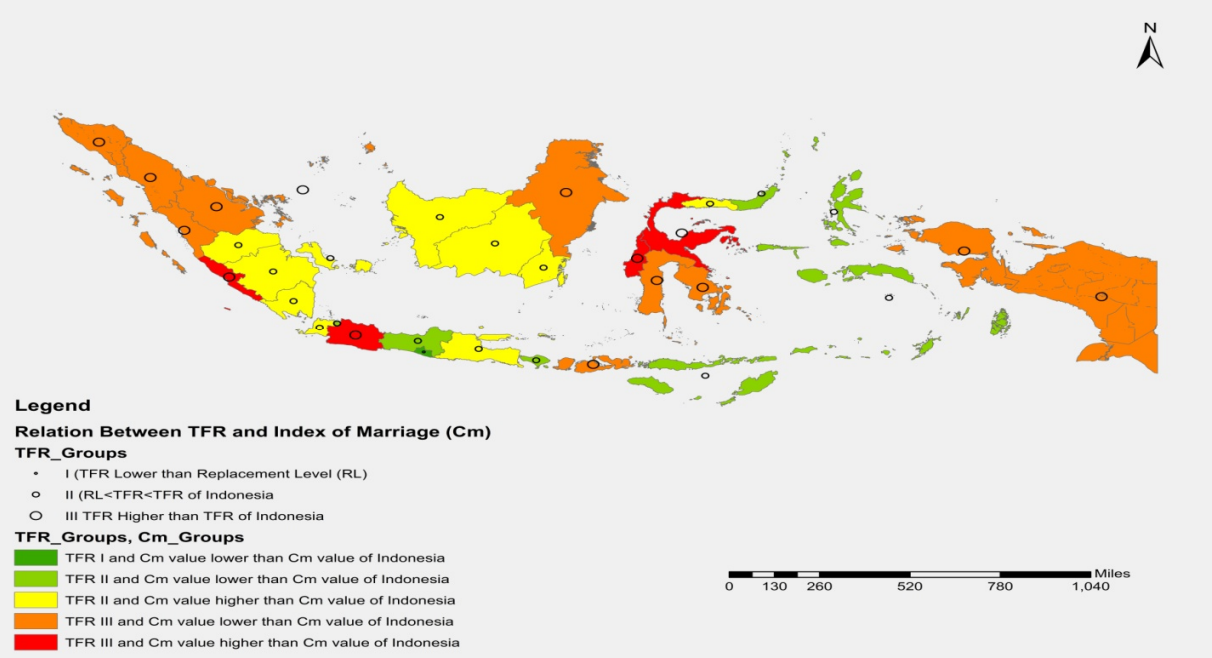
Source data: IDHS, 2012
Note: [ ] = the highest value of C_m; [ ] = the lowest value of C_m.

Table 6 shows that the variation of index of marriage (C_m) between provinces in Indonesia is not significantly different (just around 0.5 to 0.7). However, this variation shows that provinces located in western islands of Indonesia tend to have higher index of marriage (C_m) than provinces located in eastern islands of Indonesia. For example, the highest value of C_m is in Jambi which is located in Sumatera Island and the lowest value of C_m is in East Nusa Tenggara which is located in Nusa Tenggara Islands. . Provinces located in western islands of Indonesia that have relatively low value of C_m (value of C_m< Indonesia's value of C_m) are Aceh, North Sumatera, West Sumatera, Riau, Riau Islands, Jakarta, Yogyakarta, Central Java, Bali and East Kalimantan. On the other hand provinces located in eastern

islands of Indonesia that have relatively high value of C_m (value of C_m >Indonesia's value of C_m) are only West Sulawesi, Gorontalo and Central Sulawesi. Further explanations about pattern of index of marriage (C_m) and the relation between TFR and index of marriage (C_m) is described in the next paragraphs.

The relation between TFR and index of marriage (C_m) in Indonesia described by overlaying the TFR groups and index of marriage (C_m) groups in ARCGIS software. The result of this procedure is shown in figure 3.

Figure 3. Relation between TFR and index of marriage (C_m) in Indonesia, Year 2012



Source data: Table 6, table 4 and table 5of this thesis.

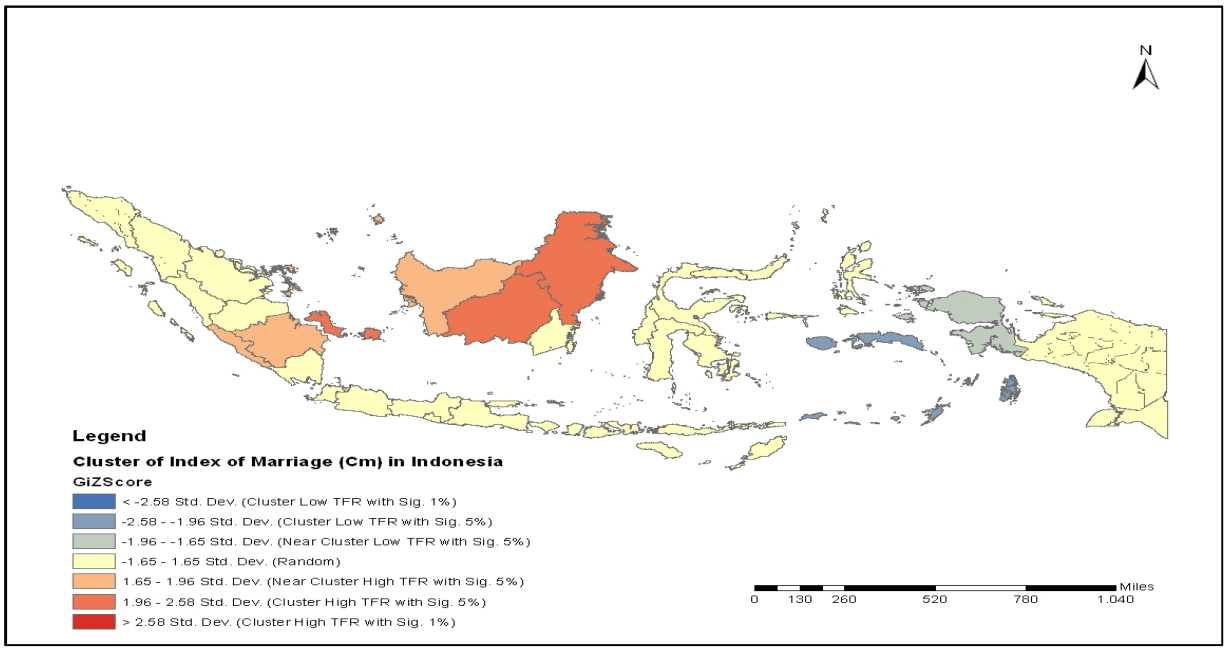
Figure 3 shows that there are five relationships between TFR and index of marriage (C_m) in Indonesia. The first relationship shows that only Yogyakarta which has TFR lower than replacement level also has value of C_m lower than Indonesia's C_m value. This means that Yogyakarta has low fertility and low proportion of married women. The second relationship shows that provinces that have lower TFR and lower value of C_m. This means that these provinces have low TFR and low proportion of married women. Provinces that have this relationship mostly are located in eastern islands of Indonesia. The third relationship shows provinces that have lower TFR but higher value of C_m. This means these provinces have low TFR but high proportion of married women. Provinces that have this relationship are mostly located in western islands of Indonesia. The fourth relationship shows provinces that have higher TFR but lower value of C_m. This means that these provinces have high TFR but low proportion of married women. Provinces that have this relationship are mostly located in eastern islands of Indonesia. The last

relationship (five) shows that provinces that have higher TFR and higher value of C_m. This means these provinces have high TFR and high proportion of married women. Provinces that have this relationship are Jambi and West Java (western islands of Indonesia); Central Sulawesi and West Sulawesi (eastern islands of Indonesia).

After defining the relation between TFR and index of marriage (C_m) of provinces in Indonesia, this thesis continues the analysis by defining the pattern of index of marriage (C_m) using Global Moran's I index. Furthermore this thesis presents the results of the pattern using hotspot analysis (Gettis – OrdGi*) tools. The results of these procedures are described in the next paragraphs.

The result of Global Moran's I index of index of marriage (C_m) of provinces in Indonesia is 0.05. This index produce z – score around 0.84 and p – value around 0.4, implying that the null hypothesis cannot be rejected (there is no spatial autocorrelation). Based on the result of Global Moran's I index this thesis concludes that index of marriage (C_m) of provinces in Indonesia has random pattern. The pattern of index of marriage (C_m) of provinces in Indonesia is described in figure 4.

Figure 4. Pattern of index of marriage (C_m) in Indonesia, year 2012



Source data: table 6 of this thesis.

Even though Global Moran's I index test shows random pattern, but from figure 4 it can be shown that there are two cluster patterns of index of marriage (C_m) in Indonesia. The cluster patterns are cluster of low value of index of marriage (C_m) and cluster of high value of index of marriage (C_m). The cluster of high value of index of marriage (C_m) (hot spot) mainly consists of the provinces located in western islands

of Indonesia, i.e. provinces in Sumatera and Kalimantan Islands with significance of Gi* statistics 5 percent. On the contrary the cluster of low value of index of marriage (C_m) (cold spot) mainly consists of the provinces located in eastern islands of Indonesia, i.e. provinces in Papua and Maluku islands with significance of Gi* statistics 5 percent.

4.2.2 Regional variations of Index of contraception (C_c) in Indonesia.

The situation of contraceptive use in Indonesia by the year 2012 can be shown from the indicator of prevalence of contraceptive use and the pattern of contraception method that women use. From the IDHS data set in the year 2012, the prevalence of contraception use in Indonesia is quite high, around 61.9 percent of married women. From this prevalence, 57.9 percent of married women use modern method and only 4 percent use traditional method. Further explanation of contraception use in Indonesia will be described in variation of index of contraception (C_c) between provinces in Indonesia.

Index of contraception (C_c) represents the fertility – inhibiting effect of contraception use and effectiveness in a population. The variations of index of contraception (C_c) between provinces in Indonesia is described in table 7.

Table 7. Variation of index of contraception (C_c) between provinces in Indonesia, year 2012.

Western islands of Indonesia		C_c	Eastern islands of Indonesia		C_c
(1)		(2)	(3)		(4)
A.	**Sumatera Island**		**E**	**Nusa Tenggara Islands**	
1	Aceh	0.52	18	West Nusa Tenggara	0.41
2	North Sumatera	0.46	19	East Nusa Tenggara	0.52
3	West Sumatera	0.42	**F**	**Sulawesi Island**	
4	Riau	0.38	24	North Sulawesi	0.30
5	Jambi	0.32	25	Central Sulawesi	0.44
6	South Sumatera	0.30	26	South Sulawesi	0.44
7	Bengkulu	0.34	27	Southeast Sulawesi	0.48
8	Lampung	0.28	28	Gorontalo	0.35
9	Bangka Belitung	0.29	29	West Sulawesi	0.48
10	Riau Islands	0.47	**G**	**Maluku Islands**	
B.	**Java Island**		30	Maluku	0.54
11	DKI Jakarta	0.41	31	North Maluku	0.44
12	West Java	0.36	**H**	**Papua Island**	
13	Central Java	0.33	32	West Papua	0.56
14	DI Yogyakarta	0.30	33	Papua	0.79
15	East Java	0.33			
16	Banten	0.34			
C.	**Bali Island**				
17	Bali	0.33	**Indonesia**		**0.37**
D.	**Kalimantan Island**				
20	West Kalimantan	0.32			
21	Central Kalimantan	0.32			
22	South Kalimantan	0.31			
23	East Kalimantan	0.40			

Source data: IDHS, 2012

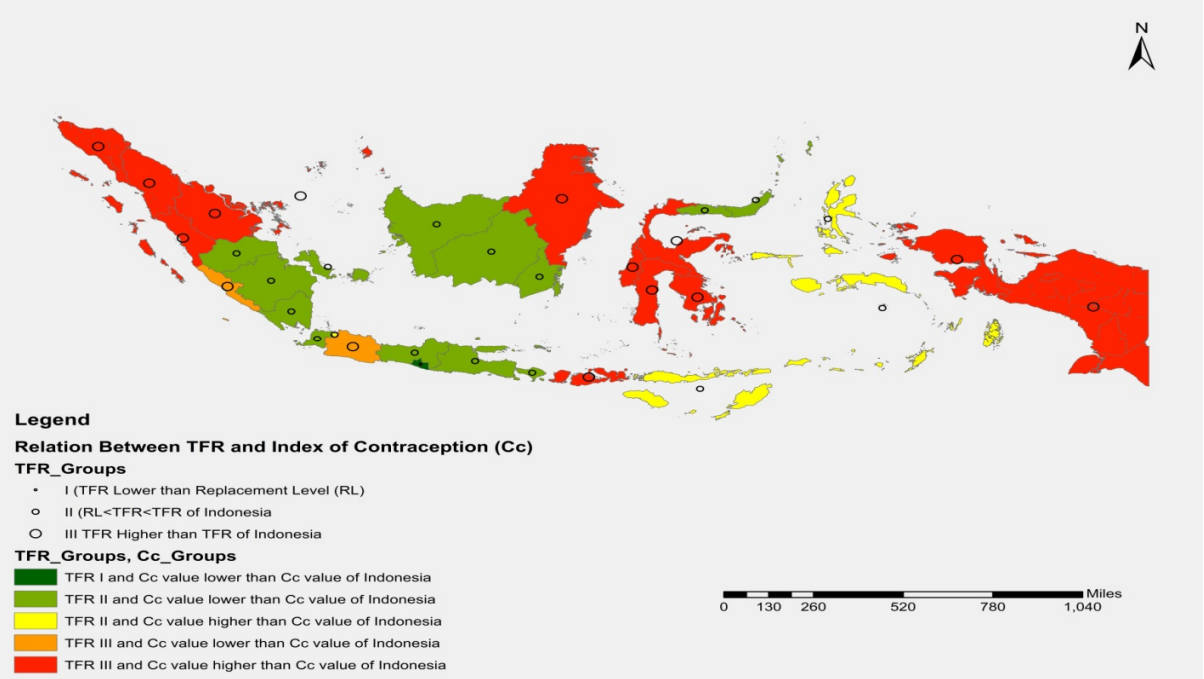
Note: ☐ = the highest value of C_c; ⋯ = the lowest value of C_c.

Table 7 shows that the variation of index of contraception (C_c) between provinces in Indonesia is diverse around 0.3 to 0.8. This variation shows that provinces located in western islands of Indonesia has index of contraception (C_c) lower than provinces located in eastern islands of Indonesia. For example, the lowest value of C_c is in Lampung which is located in Sumatera Island and the highest value of C_c is in Papua which is located in Papua Island. Provinces located in western islands of Indonesia that have relatively high value of C_c (value of C_c> Indonesia's value of C_c) are Aceh, North Sumatera, West Sumatera, Riau, Riau Islands, and East Kalimantan. On the contrary provinces located in eastern islands of Indonesia that have relatively low value of C_c (value of C_c<Indonesia's value of C_c) is only North Sulawesi and

Gorontalo. Further explanations about pattern of index of contraception (C_c) and the relation between TFR and index of contraception (C_c) is described in the next paragraphs.

The relation between TFR and index of contraception (C_c) in Indonesia describe by overlaying the TFR groups and index of contraception (C_c) groups in ARCGIS software. The result of this procedure is shown in figure 5.

Figure 5. Relation between TFR and index of contraception (C_c) in Indonesia, year 2012



Source data: Table 7, table 4 and table 5of this thesis.

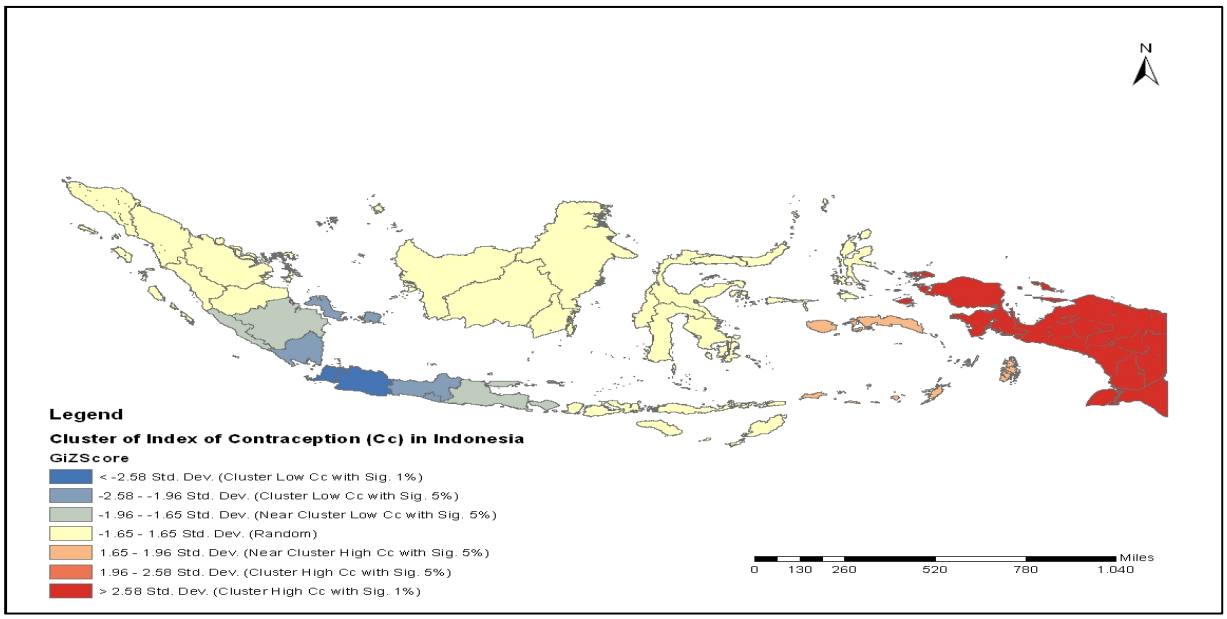
Figure 5 shows that there are five relationships between TFR and index of contraception (C_c) in Indonesia. The first relationship shows that only Yogyakarta which has TFR lower than replacement level also has value of C_c lower than Indonesia's C_c value. This means that Yogyakarta has low fertility but high use – effectiveness of contraception. The second relationship shows provinces that have lower TFR and lower value of C_c. This means these provinces have low TFR but high use – effectiveness of contraception. Provinces that have this relationship mostly are located in western islands of Indonesia. The third relationship shows provinces that have lower TFR but higher value of C_c. This means these provinces have low TFR and low use – effectiveness of contraception. Provinces that have this relationship mostly are located in eastern islands of Indonesia. The fourth relationship shows provinces that have higher TFR but lower value of C_c. This means these provinces have high TFR and high use – effectiveness of contraception. Provinces that have this relationship are located in western islands of Indonesia. The last relationship (five) shows provinces that have higher TFR and higher value of C_c. This

means these provinces have high TFR but low use – effectiveness of contraception. Provinces who have this relationship are quite a lot which are Aceh, South Sumatera, West Sumatera, Riau, Riau Islands and East Kalimantan (western islands of Indonesia); West Nusa Tenggara, Central Sulawesi, Southeast Sulawesi, South Sulawesi, West Sulawesi, West Papua and Papua (eastern islands of Indonesia).

After defining the relation between TFR and index of contraception (C_c) of provinces in Indonesia, this thesis continues the analysis by defining the pattern of index of contraception (C_c) using Global Moran's I index. Furthermore this thesis presents the results of the pattern using hotspot analysis (Gettis – Ord Gi*) tools. The results of these procedures are described in the next paragraphs.

The result of Global Moran's I index of index of contraception (C_c) of provinces in Indonesia is 0.29. This index produce z – score around 3.54 and p – value around 0.00 which means reject hypothesis null (there is no spatial autocorrelation). Based on the result of Global Moran's I index this thesis conclude that index of contraception (C_c) of provinces in Indonesia have cluster pattern. The pattern of index of contraception (C_c) of provinces in Indonesia is described in figure 6.

Figure 6. Pattern of index of contraception (C_c) in Indonesia, year 2012



Source data: table 7 of this thesis.

Figure 6 shows that there are two cluster patterns of index of contraception (C_c) in Indonesia i.e. cluster of low value of index of contraception (C_c) and cluster of high value of index of contraception (C_c). The cluster of low value of index contraception (C_c) (cold spot) mainly consists of the provinces located in western islands of Indonesia i.e. provinces in Sumatera Island, Java Island, and Bali Island with significance of Gi* statistics 1 percent. On the contrary the cluster of high value of index of contraception

(C_c) (hot spot) mainly consists of the provinces located in eastern islands of Indonesia i.e. provinces in Papua and Maluku islands with significance of Gi* statistics 1 percent.

4.2.3 Regional variations of Index of postpartum infecundability (C_i) in Indonesia

The situation of postpartum infecundability in Indonesia by the year 2012 can be indicated from the indicator of duration of breastfeeding, duration of postpartum amenorrhea, duration of abstinence and duration of insusceptibility. From the IDHS data set in the year 2012, the duration of breastfeeding in Indonesia quite long (around 21.4 months). This long duration of breastfeeding apparently is not followed by long duration of amenorrhea which is only 2.4 months. As for duration of postpartum of abstinence, the length is quiet short, only 2.4 months.

Another indicators of postpartum of infecundability is postpartum of insusceptibility. This is an indicator that measures the combination of duration of amenorrhea and duration of abstinence. In Indonesia, this indicator is 3.8 months. This indicator seems to be more reasonable in representing the duration of postpartum infecundability in Indonesia than duration of amenorrhea or duration of abstinence. In that sense, this thesis use postpartum insusceptibility to determine the index of postpartum infecundability (C_i).

Index of postpartum infecundability (C_i) represents the fertility – inhibiting effect of duration of amenorrhea and duration of abstinence of women after pregnancies in a population. The regional variation of index of postpartum infecundability (C_i) is shown in table 8.

Table 8. Variation of index of postpartum infecundability (C_i) between provincesin Indonesia, year 2012.

Western islands of Indonesia		C_c	Eastern islands of Indonesia		C_c
(1)		(2)	(3)		(4)
A.	**Sumatera Island**		**E**	**Nusa Tenggara Islands**	
1	Aceh	0.88	18	West Nusa Tenggara	0.88
2	North Sumatera	0.85	19	East Nusa Tenggara	0.67
3	West Sumatera	0.93	**F**	**Sulawesi Island**	
4	Riau	0.90	24	North Sulawesi	0.90
5	Jambi	0.90	25	Central Sulawesi	0.90
6	South Sumatera	0.88	26	South Sulawesi	0.90
7	Bengkulu	0.96	27	Southeast Sulawesi	0.80
8	Lampung	0.94	28	Gorontalo	0.88
9	Bangka Belitung	0.95	29	West Sulawesi	0.87
10	Riau Islands	0.96	**G**	**Maluku Islands**	
B.	**Java Island**		30	Maluku	0.67
11	DKI Jakarta	0.91	31	North Maluku	0.71
12	West Java	0.96	**H**	**Papua Island**	
13	Central Java	0.90	32	West Papua	0.88
14	DI Yogyakarta	0.81	33	Papua	0.69
15	East Java	0.86			
16	Banten	0.92			
C.	**Bali Island**				
17	Bali	0.91			
D.	**Kalimantan Island**		**Indonesia**		**0.90**
20	West Kalimantan	0.93			
21	Central Kalimantan	0.90			
22	South Kalimantan	0.91			
23	East Kalimantan	0.92			

Source data: IDHS, 2012

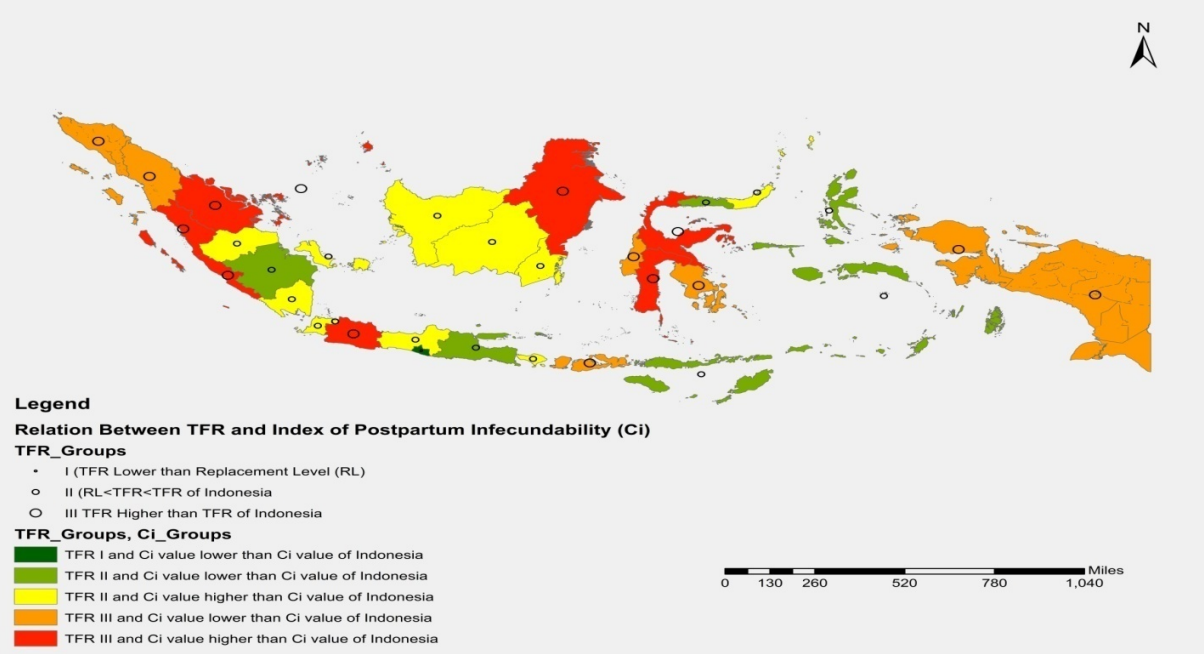
Note: ☐ = the highest value of C_i; ⋯ = the lowest value of C_i.

Table 8 shows that the variation of index of postpartum infecundability (C_i) between provinces in Indonesia is not significantly different (just around 0.7 to 0.9). However, this variation shows that provinces located in western islands of Indonesia tend to have higher index of postpartum infecundability (C_i) than provinces located in eastern islands of Indonesia. For example, the highest value of C_i is in Riau Islands which is located in Sumatera Island and the lowest value of $C_i$is in East Nusa Tenggara which is located in Nusa Tenggara Islands. Provinces located in western islands of Indonesia that have relatively low value of C_i (value of C_i< Indonesia's value of C_i) are Aceh, North Sumatera and North Sumatera. On

the contrary provinces located in eastern islands of Indonesia that have relatively high value of C_i (value of C_i>Indonesia's value of C_i) is only North Sulawesi, South Sulawesi and Central Sulawesi. Further explanations about pattern of index of postpartum infecundability (C_i) and the relation between TFR and index of postpartum infecundability (C_i) is described in the next paragraphs.

The relation between TFR and index of postpartum infecundability (C_i) in Indonesia is described by overlaying the TFR groups and index of postpartum infecundability (C_i) groups in ARCGIS software. The result of this procedure is shown in figure 7.

Figure 7. Relation between TFR and index of postpartum infecundability(C_i) in Indonesia, Year 2012



Source data: Table 8, table 4 and table 5of this thesis.

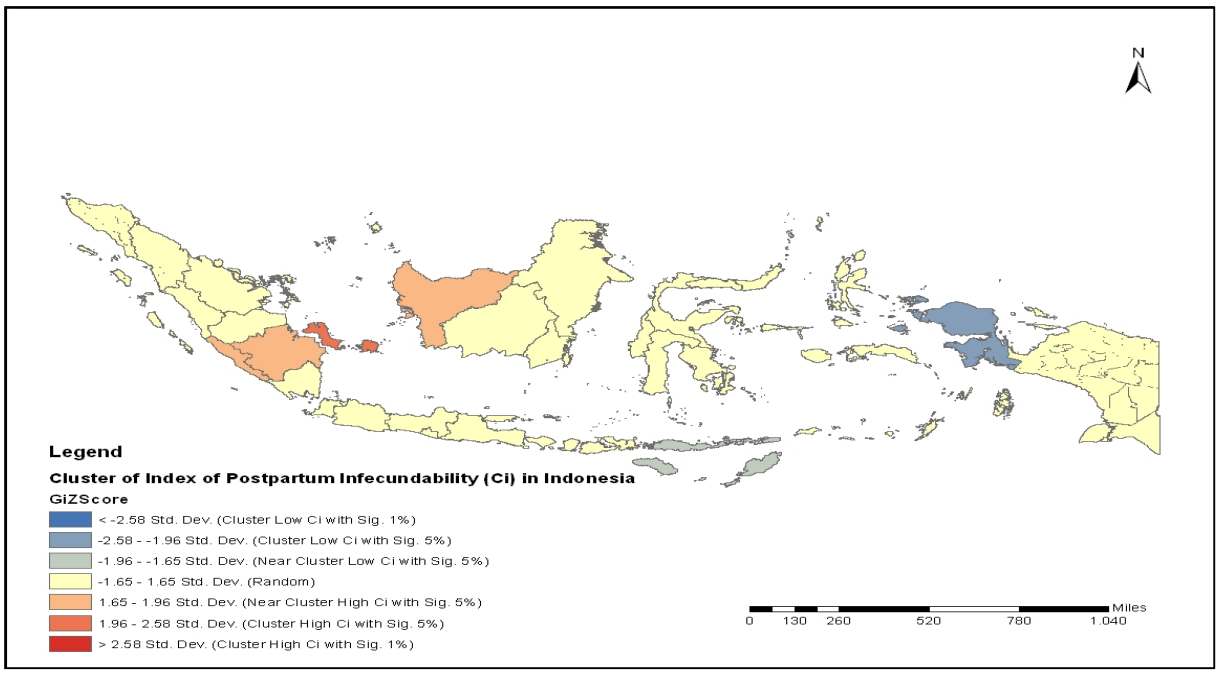
Figure 7 shows that there are five relationships between TFR and index of postpartum infecundability (C_i) in Indonesia. The first relationship shows that only Yogyakarta which has TFR lower than replacement level also has value of C_i lower than Indonesia's C_i value. This means that Yogyakarta has low fertility and the women have long duration of amenorrhea and abstinence after their pregnancies. The second relationship shows provinces that have lower TFR and lower value of C_i. This means these provinces have low TFR and the women have long duration of amenorrhea and abstinence after their pregnancies. Provinces that have this relationship mostly are located in eastern islands of Indonesia. The third relationship shows provinces that have lower TFR but higher value of C_i. This means these provinces have low TFR and the women have short duration of amenorrhea and abstinence after their pregnancies. Provinces that have this relationship mostly are located in western islands of Indonesia. The fourth

relationship shows provinces that have higher TFR but lower value of C_i. This means these provinces have high TFR andthe women havelongduration of amenorrhea and abstinence after their pregnancies. Provinces that have this relationship mostly are located in eastern islands of Indonesia. The last relationship (five) shows provinces that have higher TFR and higher value of C_i. This means these provinces have high TFR and the women have short duration of amenorrhea and abstinence after their pregnancies. Provinces that have this relationship mostly located in western islands of Indonesia such are West Sumatera, Riau, Bengkulu, Riau Islands West Java and East Kalimantan. As for provinces in eastern islands only Central Sulawesi and South Sulawesi have the last relationship (five).

After defining the relation between TFR and index of postpartum infecundability (C_i) of provinces in Indonesia, this thesis continues the analysis by defining the pattern of index of postpartum infecundability (C_i) using Global Moran's I index. Furthermore this thesis presents the results of the pattern using hotspot analysis (Gettis – Ord Gi*) tools. The results of these procedures are described in the next paragraphs.

The result of Global Moran's I index of index of postpartum infecundability (C_i) of provinces in Indonesia is 0.20. This index produce z – score around 2.53 and p – value around 0.01 which means hypothesis null (there is no spatial autocorrelation). Based on the result of Global Moran's I index this thesis concludes that index of postpartum infecundability (C_i) of provinces in Indonesia have cluster pattern. The pattern of index of postpartum infecundability (C_i) in Indonesia is described in figure 8.

Figure 8. Pattern of index of postpartum infecundability (C_i) in Indonesia, year 2012



Source data: table 8 of this thesis.

Figure 8 shows that there are two cluster patterns of index of postpartum infecundability (C_i) in Indonesia i.e. cluster of low value of index of postpartum infecundability (C_i)and cluster of high value of index of postpartum infecundability (C_i). The cluster of high value of index of postpartum infecundability (C_i) hot spot mainly consists of the provinces located in western islands of Indonesia, more specifically provinces in Sumatera and Kalimantan Islands with significance of Gi* statistics 5 percent. On the contrary, the cluster of low value of index of postpartum infecundability(C_i) cold spot mainly consists of the provinces located in eastern islands of Indonesia, more specifically provinces in Papua and Maluku islands with significance of Gi* statistics 5 percent.

After defining the variations of fertility and the variations of proximate determinants of fertility between provinces in Indonesia, this study also elaborates the effect of proximate determinants of fertility to TFR in Indonesia. The effects of proximate determinants will show how much proportion of married women, use – effectiveness of contraception and duration of infecundability inhibit fertility in a population. These effects will be further discussed in the next subsection.

4.3 Effects of Proximate determinants of fertility in Indonesia

This subsection will discuss on the effect of the proximate determinants of fertility inhibit fertility. The effect indicates whether the number of children per woman are being inhibited by proximate determinants of fertility from her maximum level of fertility. In Indonesia as a whole nation, the index of contraception (C_c) is considered as the highest effect because it reduces fertility around 7.71 children per woman or 63 percent from total inhibit. index of marriage (C_m) follows, reducing fertility around 3.59 children per woman or 30 percent from the total inhibit. As for the lowest effect ist he index of postpartum infecundability (C_i) with value of 0.84 children per woman or seven percent from the total inhibit.

Furthermore this study is exploring the variation of the effect of proximate determinants of fertility in inhibiting fertility between provinces in Indonesia. These variations of the effects can be distinguished into three different TFR groups which were mentioned in subsection 4.1.3. Further explanations about this effect is discussed in the next subsections.

4.3.1 The Effects of proximate determinants of fertility in TFR Group I of Indonesia.

From subsection 4.1.3, the province that is included in TFR group I is only Yogyakarta which is located in western islands of Indonesia. The explanations of the effects of proximate determinants of fertility in TFR group I is shown in table 9.

Table 9. The effects of proximate determinants of fertility of provinces included in TFR group I of Indonesia, year 2012 (children per woman).

Provinces	TFR	Effect of proximate determinants of fertility				TF
		C_m (%)	C_c (%)	C_i (%)	Total Inhibit (%)	
A. Java Island						
1. Yogyakarta	1.94	4.32 (32)	7.70 (58)	1.34 (10)	13.36 (100)	15.3
Indonesia	**3.16**	**3.59 (30)**	**7.71 (63)**	**0.84 (7)**	**12.14 (100)**	**15.3**

Source Data: IDHS, 2012

Table 9 shows that the pattern of the effect of proximate determinants of fertility of provinces in TFR group I has the same pattern of Indonesia. For example, in Yogyakarta the index of contraception (C_c) contribute the highest effect to inhibit fertility with value of 7.70 children per woman are being inhibited or 58 percent from the total fertiltility being inhibited. Then, it is followed by index of marriage (C_m) that inhibit fertility around 4.32 children per woman or 32 percent from the total fertiltility being inhibited. As for the lowest effectis index of postpartum infecundability (C_i) with effect of 1.34 children per woman are being inhibited or 32 percent from the total fertiltility being inhibited. This means that the use of contraception is the most important proximate determinants of fertility for provinces that included in TFR group I of Indonesia

4.3.2 The Effects of proximate determinants of fertility in TFR Group II of Indonesia.

From subsection 4.1.3, there are 17 provinces included in TFR group II of Indonesia, i.e. South Sumatera, Jambi, Lampung, Bangka Belitung, Jakarta, Central Java, East Java and Banten, Bali, East Nusa Tenggara, West Kalimantan, Central Kalimantan and South Kalimantan which are located in western islands of Indonesia; and North Sulawesi, Gorontalo, North Maluku and Maluku which are located in eastern islands of Indonesia. The explanations of the effects of proximate determinants of fertility in TFR group II is shown in table 10.

Table 10. The effects of proximate determinants of fertility of provinces included in TFR group II of Indonesia, year 2012 (children per woman).

	Provinces	TFR	Effect of proximate determinants of fertility				TF
			Cm (%)	Cc (%)	Ci (%)	Total Inhibit (%)	
A.	**Sumatera Island**						
1	Jambi	3.14	2.68 (22)	8.64 (71)	0.84 (7)	12.16 (100)	15.3
2	South Sumatera	2.61	3.14 (25)	8.68 (68)	0.88 (7)	12.69 (100)	15.3
3	Lampung	2.64	2.95 (23)	9.26 (73)	0.45 (4)	12.66 (100)	15.3
4	Bangka Belitung	2.88	2.82 (23)	9.21 (74)	0.40 (3)	12.42 (100)	15.3
B.	**Java Island**						
5	Jakarta	2.89	5.18 (42)	6.55 (53)	0.68 (5)	12.41 (100)	15.3
6	Central Java	2.80	3.56 (28)	8.21 (66)	0.73 (6)	12.50 (100)	15.3
7	East Java	2.89	2.99 (24)	8.31 (67)	1.11 (9)	12.41 (100)	15.3
8	Banten	3.09	3.34 (27)	8.24 (68)	0.62 (5)	12.21 (100)	15.3
C.	**Bali Islands**						
9	Bali	2.53	4.20 (33)	7.89 (62)	0.68 (5)	12.77 (100)	15.3
D.	**Nusa Tengara Islands**						
10	East Nusa Tenggara	2.45	5.45 (42)	4.55 (35)	2.85 (22)	12.85 (100)	15.3
E.	**Kalimantan Island**						
11	West Kalimantan	3.07	3.16 (26)	8.56 (70)	0.52 (4)	12.23 (100)	15.3
12	Central Kalimantan	3.08	2.71 (22)	8.75 (72)	0.76 (6)	12.22 (100)	15.3
13	South Kalimantan	2.84	3.03 (24)	8.72 (70)	0.71 (6)	12.46 (100)	15.3
F.	**Sulawesi Island**						
14	North Sulawesi	2.57	3.40 (27)	8.62 (68)	0.71 (6)	12.73 (100)	15.3
15	Gorontalo	3.06	3.30 (27)	8.00 (65)	0.93 (8)	12.24 (100)	15.3
G.	**Maluku Island**						
16	Maluku	2.91	4.82 (39)	4.62 (37)	2.95 (24)	12.39 (100)	15.3
17	North Maluku	2.67	4.32 (34)	5.86 (46)	2.46 (19)	12.63 (100)	15.3

Source Data: IDHS, 2012

Note: no color = Pattern effect 1; grey color = Pattern effect 2

= the highest effect; = the lowest effect

Table 10 shows that there are two patterns ofvariation of effect of proximate determinants of fertility in TFR group II of Indonesia. The first pattern is the similar to Indonesia's pattern. For example, Jakarta which is located in western islands of Indonesia has index of contraception as the highest effect of proximate determinants of fertility with value of fertility is being inhibited around 6.55 children per women or 53 percent from the total fertiltility being inhibited. Then, it is followed by index of marriage (C_m) that inhibits fertility around 5.18 children per woman or 42 percent from the total fertiltility being inhibited. As for the lowest effectis index of postpartum infecundability (C_i) with effect of 0.68 children

per woman are being inhibited or 5 percent from the total fertiltility being inhibited. This means that the use of contraception is the most important proximate determinants of fertility for provinces that have this pattern. The second pattern is when the Index of marriage (C_m) is considered as the highest effect of proximate determinants of fertility then follow by index of contraception (C_c) and the least effectof proximate determinants of fertility is index of postpartum infecundability (C_i). The provinces that have this patterns are East Nusa Tenggara and Maluku which are located in eastern islands of Indonesia. This means that the proportion of married females is the most important proximate determinants of fertility for East East Nusa Tenggara and Maluku.

Another finding from table 10 is the highest effect and the lowest effect for every indices (C_m, C_c, C_i) for provinces in TFR group II of Indonesia. The lowest effect of index of marriage (C_m) in TFR group II of Indonesia is in Jambi which is located in western islands of Indonesai with inhibit – fertility effect around 2.68 children per woman. As for the highest effect of $C_m$is in East Nusa Tenggara which is located in eastern islands of Indonesia with inhibit – fertility effect around 5.45 children per woman. The lowest effect of index of contraception (C_c) can be found in East Nusa Tenggara which is located in eastern islands of Indonesia with inhibit – fertility effect around 4.55 children per woman. As for the highest effect of index of contraception (C_c) can be found in Lampung which is located in western islands of Indonesia with inhibit – fertility effect around 9.26 children per woman. As for index of postpartum infecundability (C_i), the lowest effect is in Bangka Belitung which is located in westernislands of Indonesia with inhibit – fertility effect around 0.40 children per woman and the highest effectis in Maluku which is located in easternislands of Indonesia with inhibit – fertility effect around 2.95 children per woman.

4.3.3 The Effects of proximate determinants of fertility in TFR Group III of Indonesia.

From subsection 4.1.3, there are 15 provinces included in belongs to TFR group II of Indonesia.The provinces included in this group are Aceh, North Sumatera, West Sumatera, Bengkulu, Riau, Riau Islands in Sumatera Island; West Java in Java Island; West Nusa Tenggara in Bali and Nusa Tenggara Islands; East Kalimantan in Kalimantan Island; Central Sulawesi, South Sulawesi and West Sulawesi in Sulawesi Island; West Papua and Papua in Papua Island.The explanations of the effects of proximate determinants of fertility in TFR group III is shown in table 11.

Table 11. The effects of proximate determinants of fertility of provinces included in TFR group III of Indonesia, year 2012 (children per woman).

	Provinces	TFR	Effect of proximate determinants of fertility				TF
			Cm (%)	Cc (%)	Ci (%)	Total Inhibit (%)	
A.	**Sumatera Island**						
1	Aceh	3.81	5.05(44)	5.40(47)	1.05(9)	11.49(100)	15.3
2	North Sumatera	3.20	4.84(40)	6.01(50)	1.25(10)	12.10(100)	15.3
3	West Sumatera	3.54	4.26(36)	6.89(59)	0.62(5)	11.76(100)	15.3
4	Riau	3.27	3.73(31)	7.49(62)	0.81(7)	12.03(100)	15.3
5	Bengkulu	3.30	3.21(27)	8.49(71)	0.31(3)	12.00(100)	15.3
6	Riau Islands	3.94	4.63(41)	6.40(56)	0.33(3)	11.36(100)	15.3
B.	**Java Island**						
7	West Java	3.58	3.13(27)	8.23(70)	0.36(3)	11.72(100)	15.3
C.	**Nusa Tengara Islands**						
8	West Nusa Tenggara	3.45	3.84(32)	7.01(59)	1.01(8)	11.85(100)	15.3
D.	**Kalimantan Island**						
9	East Kalimantan	3.45	3.86(33)	7.34(62)	0.65(5)	11.85(100)	15.3
E.	**Sulawesi Island**						
10	Central Sulawesi	3.84	3.77(33)	6.83(60)	0.86(8)	11.46(100)	15.3
11	South Sulawesi	3.39	4.64(39)	6.41(54)	0.86(7)	11.91(100)	15.3
12	Southeast Sulawesi	3.63	3.85(33)	5.98(51)	1.84(16)	11.67(100)	15.3
13	West Sulawesi	4.08	3.87(35)	6.20(55)	1.15(10)	11.22(100)	15.3
F.	**Maluku Island**						
14	West Papua	3.88	5.56(49)	4.81(42)	1.05(9)	11.42(100)	15.3
15	Papua	5.18	4.48(44)	2.23(22)	3.41(34)	10.12(100)	15.3

Source Data: IDHS, 2012

Note: uncolor = Pattern effect 1; grey color = Pattern effect 2; dark grey color = Pattern effect 3

□ = the highest effect; ⋮⋮ = the lowest effect

Table 11 shows there are three patterns of variation of effect of proximate determinants of fertility in TFR group III of Indonesia. The first pattern is the same pattern as Indonesia's pattern. For example, West Java which is located in western islands of Indonesia has index of contraception as the highest effect of proximate determinants of fertility with value of fertility is being inhibited around 8.23 children per women or 70 percent from the total fertiltility being inhibited. Then follow by index of marriage (C_m) that inhibits fertility around 3.13 children per woman or 27 percent from the total fertiltility being inhibited. As for the lowest effectis index of postpartum infecundability (C_i) with effect of 0.36 children per woman are being inhibited or 3 percent from the total fertility being inhibited. This means that the use of contraception is the most important proximate determinants of fertility for provinces that have this

pattern. The second pattern is when the Index of marriage (C_m) consider as the highest effect of proximate determinants of fertility then follow by index of contraception (C_c) and the least effectof proximate determinants of fertilityis index of postpartum infecundability (C_i). The provinces that have this pattern is only West Papuawhich is located in eastern islands of Indonesia. This means that the proportion of married females is the most important proximate determinants of fertility for West Papua. The third pattern is when the Index of marriage (C_m) is considerd as the highest effect of proximate determinants of fertility then follow byindex of postpartum infecundability (C_i) and the least effect of proximate determinants of fertilityis index of contraception (C_c). The provinces that have this pattern is only Papua which is located in eastern islands of Indonesia. This means that the use of contraception is very low in Papua which make TFR in this province is the highest in this thesis.

Another finding from table 11 is the highest effect and the lowest effect for every indices (C_m, C_c, C_i) for provinces in TFR group III of Indonesia. The lowest effect of index of marriage (C_m) in TFR group III of Indonesia is in West Java which is located in western islands of Indonesa with inhibit – fertility effect around 3.13 children per woman. As for the highest effect of C_m is in West Papua which is located in eastern islands of Indonesia with inhibit – fertility effect around 5.56 children per woman. As for index of contraception (C_c), the lowest effect can be found in Papua which is located in eastern islands of Indonesia with inhibit – fertility effect around 2.23 children per woman and the highest effect is happening in Bengkulu which is located in western islands of Indonesia with inhibit – fertility effect around 8.49 children per woman. As for index of postpartum infecundability (C_i), the lowest effect is in Bengkulu which is located in western islands of Indonesia with inhibit – fertility effect around 0.31 children per woman. On the contrary the highest effect of index of postpartum infecundability (C_i) can be found in Papua which is located in eastern islands of Indonesia with inhibit – fertility effect around 3.41 children per woman.

Chapter 5. Discussions and Conclusions

5.1 Discussions of the findings.

From the results chapter this thesis have figured out the level of fertility in Indonesia is still quite high and is not closer to replacement level of fertility (2.1 children per woman). This results do not support the prediction from Hull (2003) who suggested that the level of fertility in Indonesia would be closer or even below the replacement level. In that sense, the national target of 2.1 children per woman that is being conducted by the NFPCB is still a hard-working target to achieve. Furthermore this thesis figure out that the most important proximate determinants of fertility in Indonesia is the use of contraception which was predicted by other researchers such McNicoll and Singarimbun (1983), Camack and Heaton (2001), Muhidin (2002), Angeles et al (2005) and Kim (2010).

Another finding from this thesis is that by defining the difference of fertility level between age schedule of fertility method and Bongaarts (1982) method, this thesis discovers that the practice of induced abortion in Indonesia is being practiced much in Indonesia. This finding is in line with the result from Hull et al (1993) and Segh and Ball (2010) that defined that there were almost one million induced abortion a practiced in Indonesia every year. Since the data on induced abortion is lacking, it is not analyzed further in this thesis.

For provincial level this thesis discovers the pattern of fertility for provinces located in western islands of Indonesia tends to be lower than its eastern islands counterparts. This pattern has not changed since McNicoll and Singarimbun (1983) and Muhidin (2002) defined it at their time. The new finding about fertility pattern is that there is a cluster of high fertility in Indonesia in eastern islands of Indonesia, specifically only provinces located in Papua Islands. On the contrary, there is a cluster of low fertility in Indonesia which is in western islands of Indonesia specifically for provinces located in Java and Bali Islands.

The continuation of this thesis is to determine the pattern of proximate determinants of fertility that defines the pattern of fertility in Indonesia. The pattern of use – effectiveness of contraception show the same pattern as fertility pattern. On the other hand the pattern of proportion of married women and duration of postpartum infecundability has opposite pattern as TFR pattern of Indonesia. These findings is in line with McNicoll and Singarimbun (1983) and Muhidin (2002).

These findings are strengthened by the findings of cluster of high value of index of contraception in Southern Sumatera, Java and Bali Islands, cluster of high value of index of marriage in Papua and Maluku Islands and cluster of high value of index of postpartum infecundability in Papua and Maluku Islands.

The reason of the pattern of use – effectiveness of contraception is the promotion of family planning program through use of contraception was firstly and vigorously introduce in Java and Bali Islands (McNicoll and Singarimbun, Jensen, 1996 and Camack and Heaton, 2001). Moreover, Java and Bali Islands is considered as the most developed regions in Indonesia, implying that the access of contraception method in these regions is better than any other regions in Indonesia (Franknberg et al, 2003).

The reason of the pattern of proportion of married is that people in western islands of Indonesia tend to have cultural beliefs that bind them strongly in term of marriage than people in eastern islands of Indonesia (Blackburn and Bessell, 1998). As the reason of the pattern of duration of postpartum infeundability, it is a common pattern if the contraceptive use is high then the duration of postpartum infecundability tend to be low (Bongaarts, 1978).

Furthermore this thesis finds out that the pattern of fertility – inhibiting effect for most of the provinces in Indonesia has the same pattern as Bongaarts (1978) patterns. When the fertility level is quite low (TFR < 3 children per women), the highest effect of proximate determinants of fertility will be use of contraception follow by proportion of married women and last is duration of postpartum infecundability. On the contrary if the fertility level is quite high (TFR >5 children per woman), the highest effect of proximate determinants of fertility will be proportion of married women follow by duration of postpartum infecundability and the last is use of contraception. However, there is another pattern that this thesis finds out which is the pattern in between (3<TFR<5) which are located in Maluku, East Nusa Tenggara and West Papua. The pattern of these provinces has the highest effect of proportion of married women then followed by use of contraception and the last is duration of postpartum infecundability.

5.2 Conclusion and limitation of the thesis

The conclusions of this thesis are based on the research questions of this thesis. There are two conclusions this thesis can define from the findings, which are:

1. The variation of fertility level in Indonesia tends to be lower in the provinces located in western islands of Indonesia and it was higher in the provinces located in eastern islands of Indonesia. Provinces that have TFR below the replacement level is only Yogyakarta.

2. The variation of proximate determinants of fertility that affected the variation of fertility level in Indonesia are lower use of contraception in provinces located in western islands of Indonesia but higher proportion of married women and shorter duration of postpartum infecundability. On the other hand, higher use of contraception in provinces located in eastern islands of Indonesia but lower proportion of married women and longer duration of postpartum infecundability. Based on this findings, this thesis concludes that the fertility – inhibiting effect in provinces located in western islands of Indonesia is mostly due to the use of contraception. As in provinces located in eastern islands of Indonesia, it is mostly due to the proportion of married women and duration of postpartum infecundability.

The limitation of this thesis is that the TFR estimation using Bongaarts (1982) was not completed due to lack of data in prevalence of induced abortion. This implies the results of the estimation of TFR are quite high compared to TFR from IDHS (using age schedule of fertility method) and the fertility – inhibiting effect of induced abortion and is still unknown.

5.3 Recommendation of the thesis

From the findings, this thesis recommends the NFPCB of Indonesia to vigorously promote the contraception method for provinces located in eastern islands of Indonesia specifically for provinces in Maluku and Papua Islands. Moreover, NFPCB could also promote the happy and prosperous family for whole provinces in Indonesia by socializing the ideal age of marriage and the effectiveness of exclusive breastfeeding.

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