Appendix

ที่ ศธ 0520.204/วสถ 103/2550

ภาควิชาสถิติ คณะวิทยาศาสตร์
มหาวิทยาลัยศิลปากร
วิทยาเขตพระราชวังสนามจันทร์
นครปฐม 73000

4 เมษายน 2550

เรื่อง ตอบรับบทความเข้าร่วมประชุมวิชาการสถิติและสถิติประยุกต์ประจำปี 2550

เรียน คุณปฐมา อาแว

คณะกรรมการฝ่ายอำนวยการจัดงานและประสานงาน การจัดการประชุมวิชาการสถิติและสถิติประยุกต์ประจำปี 2550 โดย ภาควิชาสถิติ คณะวิทยาศาสตร์ มหาวิทยาลัยศิลปากร ร่วมกับเครือข่ายการวิจัยสถิติศาสตร์และสมาคมสถิติแห่งประเทศไทย ระหว่างวันที่ 24-25 พฤษภาคม 2550 ณ โรงแรมโนโวเทลทิพย์วิมานรีสอร์ท แอนด์สปา อ.ชะอำ จ.เพชรบุรี มีความยินดีที่จะแจ้งให้ทราบว่าบทความเรื่องต่อไปนี้ได้รับการพิจารณาว่าเหมาะสมที่จะนำเสนอในการประชุมวิชาการฯ ดังกล่าว

"การเปลี่ยนแปลงภาวะเจริญพันธุ์ใน 4 จังหวัดภาคใต้ของประเทศไทย ระหว่างปี พ.ศ. 2545-2548"
โดย ปฐมา อาแว จำเนียร ฉุ้นประดับ และนิตยา แม็คแนล

จึงเรียนมาเพื่อทราบและดำเนินการต่อไปโดยเฉพาะการจองที่พักและการลงทะเบียนเข้าร่วมประชุมฯ คณะกรรมการฯ ขอขอบพระคุณที่ท่านให้สนใจส่งบทความเข้าร่วมในการประชุมวิชาการ และหวังว่าจะได้รับความร่วมมือจากท่านอีกในโอกาสต่อไป

ขอแสดงความนับถือ

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การประชุมวิชาการสถิติและสถิติประยุกต์

ประจำปี 2550

วันที่ 24 - 25 พฤษภาคม 2550

ณ โนโวเทลทิพย์วิมานรีสอร์ทแอนด์สปา

อำเภอ จังหวัดเพชรบุรี

เนื่องในโอกาสครบรอบ 35 ปีคณะวิทยาศาสตร์ มหาวิทยาลัยศิลปากร

ภาควิชาสถิติ คณะวิทยาศาสตร์ มหาวิทยาลัยศิลปากร

และเครือข่ายการวิจัยสถิติศาสตร์

ร่วมกับ

สมาคมสถิติแห่งประเทศไทย

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FERTILITY VARIATION IN FOUR SOUTHERN THAI PROVINCES: 2002-2005

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Abstract

This study aimed to investigate the pattern of fertility in Southern Thailand and to account for variations in these patterns based on religion and east-west location. Four provinces were selected for study, two (one mostly Muslim and one mostly non-Muslim) on each side of the peninsula. Data were obtained from birth certificates, aggregated by month of birth, age of mother, and district of registration of birth from January 2002 to December 2005 and female population resident counts were obtained from the 2000 Thai Population and Housing Census. The age of mother was classified into 5-year age groups and districts were classified into demographic regions according to east-west location and percent Muslim. Logistic regression was used to model the effects of age group, region and period on the fertility in each 3-month quarter of a year. Overall, the fertility rates were higher, where there was a Muslim majority in both east and west regions. Fertility among Muslims was higher on the east coast.

Key words fertility rate, demographic region, logistic regression, southern Thailand

1. Introduction

In Thailand the total fertility rate (the average number of children who would be born alive to a woman during her lifetime if she were to bear children at each age in accordance with the prevailing age-specific fertility rates) declined from 6.48 in 1960 to 1.82 in 2000. Year 2000 estimates of fertility were higher for the South of Thailand for example, 2.25 in the southern region compared to 1.17 in the Bangkok metropolitan area (Prachuabmoh and Mithranon, 2003).

The 2000 Population and Housing Census of Thailand (National Statistical Office, 2002) recorded substantial differences in growth rates between the Muslim and non-Muslim populations in the southern provinces. For example, between 1990 to 2000 in Pattani province, the Muslim population increased by 19% but the non-Muslim population by only 3%, however the relativity of rates varied- the Muslim population of Krabi also increased by 19% but the non-Muslim population increased by 23%.

In Southern Thailand, where four of the 14 provinces have Muslim majorities, there is also evidence of substantial differences in fertility within the Muslim population. The relationship between religion and

reproduction is complex. Religion influences reproduction in interaction with ethnicity, culture and the status of minority groups.

This study aimed to investigate the pattern of fertility in Southern Thailand and attempt to account for variations in these patterns based on religion and east-west location. The Muslim proportions (2000) were West: Trang 17%; Satun 68% and East: Pattani 82%; Songkhla 23%.

2. Materials and Methods

The data records comprised the numbers of live births B_{ijt} classified by registration district i, age-group and month t, and the estimated populations of women in the age-group. We estimated this population using the formula

$$P_{jt} = p_t N_j + (1-p_t) N_{j\square 1}, \tag{1}$$

where N_j is the female population recorded at the 2000 Population Census in age group j (where $j = 1$ for 0-4, $j =$ 2 for 5-9, etc.), which is one year less than the reported age group of the mother, and p_t is the proportion of the 5-year period elapsed from January 2001 until month t. This calculation synchronizes the Census population age groups with those used in the birth registration form.

In the preliminary analysis we classified the 45 districts into 8 regions according to east-west location and percent Muslim using four groups (below 20%, 20-50%, 51-80%, more than 80%). We computed the total fertility rate (*TFR*) for each year and region i using the standard demographic formula (Pollard et al 1974) for 5-year age groups, namely

$$TFR_i = \sum_{j=4}^{10} \left(5 \sum_t B_{ijt} \Big/ \tfrac{1}{12} \sum_t P_{ijt} \right), \tag{2}$$

where t is summed over all months within the specified year. Note that the contribution from each of the seven age groups ($j = 4, 5, \ldots, 10$) is 5 (the width of the age group in years) times the total number of births in the 12-month period of interest divided by the average number of women in the corresponding age group.

In further analysis logistic regression (Kleinbaum and Klein 2002) was used to model the effects of age group, region and period on the fertility in each 3-month quarter of a year. The observed fertility is the proportion that a woman in a specified age group registers a birth in a specified region and quarter.

Goodness-of-fit of model

For each cell corresponding to a combination of nominal determinants, the Pearson residual is defined as

$$z = \frac{p - \hat{p}}{\sqrt{\hat{p}(1-\hat{p})/n}}, \tag{3}$$

where p is the proportion of outcomes observed in the cell, $\hat{p}$ is the corresponding probability given by the model, and n is the total number of cases in the cell. The goodness-of-fit of the model can be assessed visually by plotting these z-values against corresponding normal scores. The fit is adequate if the points in this plot are close to a straight line with unit slope. A p-value for the goodness-of-fit is obtained by subtracting the deviance

associated with the saturated model from the model deviance and comparing this difference R_g with a chi-squared distribution having degrees of freedom equal to n_g- m, where n_g is the number of cells and m is the number of parameters in the model.

3. Results

Preliminary Analysis

Table 1shows the total fertility rate (*TFR*) and its age-specific components based on registered births in all four provinces for years 2002-2005. This indicates that the overall fertility in the four provinces appears to be near replacement level. Table 2 shows the total fertility by demographic region. This indicates that the fertility rates were higher in both east and west regions where there is a Muslim majority.

year	age group							*TF*
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	
2002	0.248	0.481	0.523	0.394	0.212	0.066	0.023	1.946
2003	0.262	0.459	0.507	0.383	0.211	0.064	0.021	1.907
2004	0.285	0.459	0.521	0.389	0.206	0.067	0.015	1.943
2005	0.299	0.458	0.526	0.387	0.202	0.056	0.010	1.938

Table 1: *Total fertility and age-specific components based on births from 4 provinces*

		West coast				East coast			
	% Muslim	<20	20-49	50-79	80+	<20	20-49	50-79	80+
year	2002	1.825	2.217	1.976	2.213	1.613	1.873	2.211	2.786
	2003	1.827	1.943	1.803	2.242	1.634	1.750	2.150	2.686
	2004	1.900	1.873	2.017	2.065	1.725	1.918	2.159	2.432
	2005	2.034	1.901	1.967	1.865	1.741	1.745	2.157	2.318

Table 2: *Total fertility by demographic region based on birth registrations*

Model Fertility Pattern

The result of fitting a logistic regression model to the number of registered births in a month by region, age group and period is statistically significant. However, the fit is inadequate with Residual deviance 902.3 and 381 degrees of freedom. This due to the very large number of data set (the population data). The model contains coefficients for each combination of age group and region (56 parameters), as well as 8 parameters describing the change from 2002-2003 to 2004-2005 for each region, and a further 3 parameters describing a quarterly seasonal effect.

The coefficients obtained from the model are plotted in Figure 1. It can be seen more clearly from this plot that the fertility rates of the mother in both east and west regions where there is a Muslim majority are higher than where there is a Muslim minority. Fertility among Muslims majority was higher on the east coast.

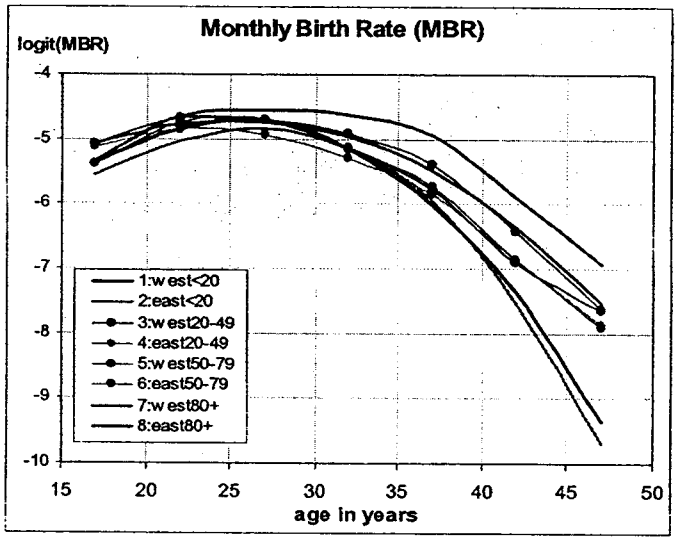

***Figure* 1:** *Logits of monthly birth rates based on fitted logistic model*

4. Conclusion and Discussion

In this study, we used graphical and statistical methods to investigate the pattern of fertility in each period and region, using a logistic regression model for predicting the effects of age group, region (by both east/west location and religious majority) and period on the fertility in each 3-month quarter of a year. Our study found that the age group with highest fertility was the 25 to 29 years old. The result also indicated that the fertility rates of Muslim majority provinces were higher than for non-Muslim majority provinces. This result agrees with studies in India, Malaysia, Philippines and Thailand (Mishra, 2004; Morgan et al, 2002; Knodel et al, 1998). It is evident that fertility rate among Muslims majority was higher on the east coast.

We also found that the fertility rate in all regions continuously declined to near replacement level or below, consistent finding by Prachuabmoh and Mithranon, 2003; Gubhaju and Moriki-Durand, 2003. In Non-Muslim regions, the fertility rate sharply declined while in Muslim regions it only slightly declined.

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