Characteristics and Determinants of Thailand's Declining Birth Rate in Women Age 35 to 59 Years Old: Data from the Fourth National Health Examination Survey

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Objective: To describe characteristics and determinants of Thailand's declining birth rate using national representative survey data.

Material and Method: The Fourth National Health Examination Survey was conducted between 2008 and 2009. Four stages of stratified probability samples, proportionate to size, were used to represent the whole Thai population. Information from women aged 35 to 59 years old was included in the analysis. Curve estimation was used to characterize the correlation between the number of children ever born and the age of married and un-married women. Binary logistic regression analysis was used to identify predictors of having fewer than two children among ever married women.

Results: Of all 4120 women, the number of children decreased sharply among the oldest women aged 45 to 59 years old, decreased less sharply for women younger than 45 years of age, reached the lowest level at the age of 37 and 38 years old, and then increased minimally among the younger women surveyed. Among those who were ever married (n = 3,761), the independent predictors of having one or no child instead of having two or more children were aged 45 to 49 compared to 50 to 59 years old (OR = 1.66; 95% CI = 1.37-2.00), age 35 to 44 compared to 50 to 59 years old (OR = 1.39; 95% CI = 1.16-1.68), living in households with wealth index level 3 compared to level 1 (OR = 1.28; 95% CI = 1.01-1.63), urban residence (OR = 1.33; 95% CI = 1.14-1.57), attaining secondary school education (OR = 1.35; 95% CI = 1.11-1.64), and having junior college diploma or higher level of education compared to elementary or no education (OR = 1.81; 95% CI = 1.39-2.34).

Conclusion: Birth rate of Thai women declined steeply in the past then less steeply, and might have begun to rise minimally in recent years. Younger age, living in an urban area, and having higher socioeconomic status were predictors of having fewer than two children.

Keywords: Birth rate, Total fertility rate, Fertility decline, National survey, Thailand

Thailand's declining fertility was considered the fastest among current developing countries. The total fertility rate (TFR), the average number of children a woman has during her reproductive years, dropped from 6.3 in the mid 1960s to 2.1 (level needed to maintain a stable population) as early as the late 1980s[1], and decreased further to 1.5 in 2006[2]. The main reasons for this phenomenon were the wide spread adoption of family planning among women[3], delayed marriage and increased celibacy[4].

Thailand is the only developing country that experienced a decline in fertility from a high level to below-replacement-level in such a short time span[5]. Its period of most rapid fertility decline also occurred

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at an earlier stage of development than in other countries. The country was the lowest-ranking country in terms of socioeconomic development among 37 countries expected to reach replacement level by 2015[6].

There has been a growing concern that too low fertility would affect some societies in negative ways[7]. It was predicted that Thailand's dependency ratio would have reached its lowest level in 2010[8]. From that time on, the country would have a relatively smaller proportion of adults of working age, while the proportion of elderly would increase. The United Nations Population Fund (UNFPA) has warned Thailand about its aging population and the resulting labor shortages[9].

While there is consensus that Thailand's fertility has been declining, there are conflicting views over future trends. Most estimates projected that the fertility would plunge even further[10,11]. However, the 2009 national fertility survey revealed that young women are now having more children than women of the same age in the 2006 survey[12]. The present study used recent data from the Fourth National Health Examination Survey (NHES) to characterize the rate of fall in births, as well as the socio-demographic factors to characterize the fertility trend by looking at the number of children born from a woman according to age as well as to identify associated socio-demographic factors.

Material and Method

The Fourth Thai NHES[13] was conducted between 2008 and 2009 by the National Health Examination Survey Office to measure health risk behaviors, as well as the prevalence of major health problems in the Thai population. The study was approved by the Ethical Committee for Human Research, the Institute for Development of Human Research Protection, Health Systems Research Institute. To represent the whole Thai population, four stages of stratified probability samples, proportionate to size, were used. Face-to-face interviews by trained interviewers were used to collect demographic information. More detailed methodology of this survey has been described elsewhere[14].

The number of children ever born was used as the main outcome variable. Women less than 35 years of age were excluded because they still have many more years of reproductive capability. Only data from women aged 35-59 years old at the time of interview were included since women aged 60 years old or older were not asked about childbirth during the survey. Both married and un-married women were included in the analysis to measure cumulative general fertility and the correlation between age of the women and the number of children. However, to identify predictors of having one child or none, compared to two or more, only women who were married were included in the analysis.

A structured questionnaire asked participants to identify which household assets they possessed (bed, washing machine, water heater, microwave, air conditioner, electric kettle, computer, household telephone, car, and flushing toilet). A wealth index variable was created to represent socioeconomic status. Principle components analysis was used to determine factor loading. The first factor score was used to represent the wealth index of each participant. Then the wealth index score was categorized into quintiles (with lower quintiles representing less wealth than higher quintiles) and each participant was assigned to a quintile.

Regression curve procedures (cubic, linear, inverse, logarithmic, and quadratic equation) were used to characterize the correlation between the number of children ever born and the age of the women. The percentage of variance among the number of children born according to age was used to justify the best fit model of the curve estimation. Binary logistic regression analysis was used to identify predictors of having fewer than two children. The evaluated predictors were age, wealth index, urban versus rural residence, and educational levels. Demographic characteristics, number of live births, and binary logistic regression analyses were weighted to take into account the probability of sampling of the 2008 Thai population aged ≥20 years. All analysis were done using STATA software version 11.

Results

Four thousand one hundred twenty women aged 35 to 59 years old who responded to the question about number of children were included in the analysis. The response rate to the survey among this population was 71%. Weighted analysis revealed that the average age of the subjects was 46.3 (SD = 6.8) years old. Twenty-eight percent had zero or one child, 39.9% had two children, and 31.9% had three or more children. Seventy-three percent of the subjects reported their highest formal educational level to be elementary school. Approximately 36% of participants lived in central region, 34% lived in northeastern region, 19%

in northern region, and 11% in south region. Two-thirds lived in rural areas and the rest lived in urban areas. The majority of subjects worked as manual laborers (53.0%), while the least number of subjects were professionals (3.2%). Twenty-eight percent lived in the households categorized in the lowest level (level 1) of wealth while 22.9%, 17.7%, 16.6%, and 14.6% were categorized into levels 2 to 5 respectively (Table 1).

Based on the results, Cubic equation, compared with other models, provided the best fit ($R^2 = 0.025$, $p<0.001$) for the correlation between number of children and age of the women (Fig. 1). According to the curve, the number of children fell

Table 1. Demographic characteristics and number of child births among 4,120 women aged 35-59 years old

Characteristics	n	(% weighted)
Age (years), (mean, SD)	46.3 (6.8)	
Number of child births		
0 or 1	1,264	28.2
2	1,592	39.9
3 or more	1,264	31.9
Education		
No education	145	4.4
Elementary	2,731	72.7
Early secondary	379	7.8
Late secondary	358	6.6
Diploma	142	2.3
University degree or higher	340	6.3
Region of residence		
Central	1,592	36.1
North	926	18.6
Northeast	883	34.1
South	719	11.2
Place of residence type		
Urban (inside municipality)	2,404	32.6
Rural (outside municipality)	1,716	67.4
Occupation		
Unemployed	729	18.2
Manual labor (daily laborer, farmer, fishermen, etc.)	1,786	53.0
Skilled labor (mechanic, clerk, salesman, etc.)	1,275	25.6
Professional (manager, physician, lawyer, etc.)	155	3.2
Wealth index*		
Level 1	856	28.2
Level 2	835	22.9
Level 3	784	17.7
Level 4	821	16.6
Level 5	824	14.6

* Lower level representing less wealth than higher level
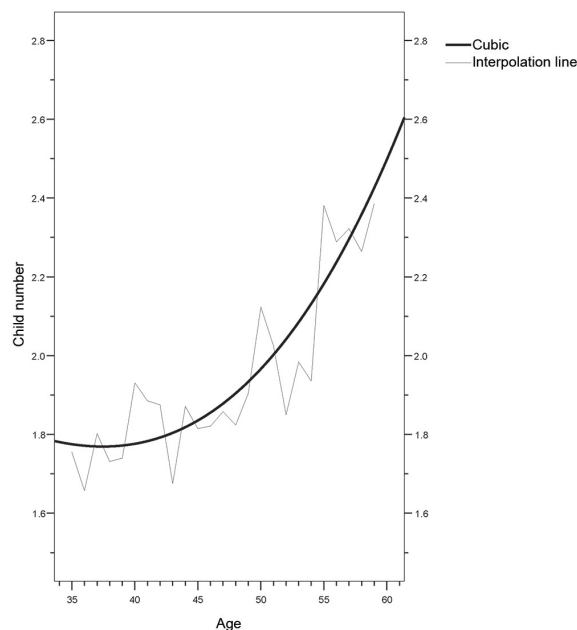

Fig. 1   Curve estimation for the correlation between age of the women and the number of children.

sharply among the oldest women aged 45 to 59 years old (whose peak child-bearing were in 1975 to 1990), fell less sharply for women younger than 45 years of age (peak child bearing in 1990 to 1995) then reached the lowest level at the age of 37 or 38 years old, and then rose minimally among the younger women surveyed.

Univariate analysis revealed that having one child or none, compared to two or more was significantly associated with younger ages, living in wealthier households, residing in urban areas, and higher educational level among 3,761 ever married women. After adjusting for all independent variables, aged 45 to 49 compared to 50 to 59 years old (OR = 1.66; 95% CI = 1.37-2.00), age 35 to 44 compared to 50 to 59 years old (OR = 1.39; 95% CI = 1.16-1.68), living in households with wealth index level 3 compared to level 1 (OR = 1.28; 95% CI = 1.01-1.63), urban residence (OR = 1.33; 95% CI = 1.14-1.57), attaining secondary school education (OR = 1.35; 95% CI = 1.11-1.64), and having junior college diploma or higher level of education compared to elementary or no education (OR = 1.81; 95% CI = 1.39-2.34) were independent predictors of having one or no children.

Discussion

Our examination of the recent data on the age of Thai women and fertility in Thailand found that the

Table 2. Predictors of having ≤1 child compared to having ≥2 children among 3,761 ever married women

Characteristics	≤1 child, n/N (%)	Crude OR (95% CI)	Adjusted OR (95% CI)
Age (years old)			
50-59	269/1,374 (19.6)	1	1
45-49	249/865 (28.8)	1.68 (1.41, 2.02)	1.66 (1.37, 2.00)
35-44	405/1,522 (26.6)	1.44 (1.20, 1.73)	1.39 (1.16, 1.68)
Wealth index#			
Level 1	166/797 (20.8)	1	1
Level 2	151/783 (19.3)	0.98 (0.77,1.25)	0.95 (0.74, 1.22)
Level 3	179/711 (25.2)	1.42 (1.14,1.76)	1.28 (1.01, 1.63)
Level 4	192/742 (25.9)	1.45 (1.16, 1.80)	1.20 (0.93, 1.53)
Level 5	235/728 (32.3)	1.79 (1.45, 2.21)	1.22 (0.97, 1.53)
Place of residence type			
Rural	329/1,599 (20.6)	1	1
Urban	594/2,162 (27.5)	1.54 (1.34,1.77)	1.33 (1.14, 1.57)
Education			
Elementary or no education	570/2,676 (21.3)	1	1
Secondary school	191/662 (28.9)	1.65 (1.38,1.98)	1.35 (1.11, 1.64)
Diploma or higher	158/400 (39.5)	2.31 (1.79, 2.97)	1.81 (1.39, 2.34)

Lower level representing less wealth than higher level

birth rate declined steeply in the past then less steeply. Interestingly, in recent years, it has begun to rise minimally. The number of child births among younger women (35-40 years old) used in the analysis must be regarded with caution since their reproductive capacity continues after the time of the survey. Taking this into account, the actual birth rate among the cohort of youngest women might eventually rise higher than indicated in the model.

This recent increase in birth rate among the youngest age group is consistent with the contemporaneous 2009 national fertility survey that revealed that young women are now having more children than women of the same age in the similar 2006 survey[12]. If verified by other studies, this finding would support the argument by Knodel et al that the preferences of Thai couples to have both a son and a daughter sets the lower limit for declining fertility[15]. Similarly, a study in one province of Thailand also found that such intentions are the strongest factors to predict future childbearing[16].

In our analysis, the number of children ever born was grouped into fewer than two and ≥ two since we were interested in identifying the predictors of having fewer children than replacement level among married women. We found that higher educational level was an independent predictor of having fewer than two children. This was in line with similar findings from the 2009 survey[12], and a study that found that Thai women with higher levels of education desired

fewer children[17]. Since education usually correlates with other socioeconomic characteristics such as income and occupation, this raised concerns over childhood environments and availability of resources in families that have more children. The finding that the women in urban areas tended to have fewer children than rural women was less amenable to intervention. The ongoing migration from the country-side to the cities in Thailand will also increase the proportion of population in urban areas[18].

A major advantage of the results from this study is generalizability since women throughout the country were eligible to be sampled using stratified probability techniques. However, still some limitations exist. The non-response rate was quite high, approximately 30%, and may influence study results. The curve estimation was just an estimate and might not represent an exact figure. Our primary assumption was that women aged 35 years old or older had already completed their fertility. However, in reality, women who were more than 35 years old (especially the 36 to 40 years age group at the time of interview) still had reproductive capacity. This introduced bias towards fewer children among this younger age group as discussed earlier. This study only showed past fertility, which is not a predictor of future fertility. Therefore, the current and future trends of fertility may or may not be similar to what we have found. Lastly, we did not have information from elderly women aged 60 years old and older. Thus, trends and predictors of

low birth rates were limited due to the unavailability of those data.

Whether declining fertility is a real threat to the country is still subject to debate. Some scientists view this as an inevitable population transition that benefits the country more than it causes harm. They advised that Thailand should focus on improving quality of life more than trying to increase the fertility rate[10,19]. On the other hand, UNFPA viewed this issue as a serious problem, and has issued a recommendation that Thailand should consider implementing measures to increase its fertility[9]. The Eleventh National Socioeconomic Development Plan (2012-2016) also recognized the issue and set a target that the country should increase the TFR to at least 1.6 by promotion of childbearing among the couples who are ready[20]. However, this is just a suggestion and is not accompanied by an action plan for implementation.

If implemented, an intervention to raise fertility has to be initiated at a national level. Based on our findings of specific subgroups with low fertility, namely highly-educated and urban dwellers, efforts might specifically target this group. However, doing so might raise concerns from a human rights perspective. Some Asian countries with similar demographic patterns, such as Singapore, have tried to increase birth among specific groups, but with little success[21]. Allowing immigration and Thai nationalization would also increase the population, and allow some control of the characteristics of the population. However, this is also a very delicate issue, since Thai culture may not be ready for immigrants of different ethnic backgrounds.

Conclusion

Analysis of recent national representative probability samples of Thai women found that birth rate declined steeply in the past then less steeply, and has begun to rise minimally in recent years. Younger age, living in urban area, and having higher socioeconomic status were predictors of having fewer than two children. The country should monitor its fertility trend as well as determinants of having a small number of children closely.

What is already known on this topic?

Thailand's fertility has been falling rapidly. People who have higher socioeconomic status and live in urban areas tend to have a smaller number of children.

What this study adds?

Thailand's declining birth rate might have been slowed down and the birth rate might have been increasing recently.

Potential conflicts of interest

None

References
1. Hirschman C, Tan J, Chamratrithirong A, Guest P. The path to below replacement-level fertility in Thailand. Int Fam Plann Perspect 1994; 20: 82-7.
2. National Statistical Office. The survey of population change 2005-2006. Bangkok: National Statistical Office; 2006.
3. Kamnuansilpa P, Chamratrithirong A, Knodel J. Thailand's reproductive revolution: an update. Int

Fam Plann Perspect 1982; 8: 51-6.

4. Guest P, Tan J. Transformation of marriage patterns in Thailand. Nakhon Pathom, Thailand: Institute for Population and Social Research, Mahidol University; 1994.

5. Gubhaju B, Moriki-Durand Y. Fertility transition in Asia: past experiences and future directions. Asia Pac Popul J 2003; 18: 41-68.

6. Mauldin WP, Ross JA. Prospects and programs for fertility reduction, 1990-2015. Stud Fam Plann 1994; 25: 77-95.

7. Morgan SP. Is low fertility a twenty-first-century demographic crisis? Demography 2003; 40: 589-603.

8. Wongboonsin K, Guest P, Prachabmoh V. Demographic change and the demographic dividend in Thailand. Asian Pop Stud 2005; 1: 245-56.

9. The United Nation Population Fund. Impact of demographic change in Thailand, policy recommendation. Bangkok: The United Nation Population Fund; 2011.

10. Prasartkul P, Vapattanawong P. Population situation of Thailand 2005. In: Archavanitkul K, Prasartkul P, editors. Population and Society: Population of Thailand at 2005. Bangkok: Amarin Printing; 2005: 14-31.

11. United Nations, Department of Economics and Social Affairs. World population prospects, the 2010 Revision. New York: United Nations; 2011.

12. National Statistical Office. 2009 reproductive health survey, Bangkok: National Statistical Office; 2010.

13. National Health Examination Survey Office. Report on the Thai national health examination survey IV, 2008-2009. Bangkok: National Health Examination Survey Office; 2010.

14. Aekplakorn W, Chariyalertsak S, Kessomboon P, Sangthong R, Inthawong R, Putwatana P, et al. Prevalence and management of diabetes and metabolic risk factors in Thai adults: the Thai National Health Examination Survey IV, 2009. Diabetes Care 2011; 34: 1980-5.

15. Knodel J, Ruffolo VP, Ratanalangkarn P, Wongboonsin K. Reproductive preferences and fertility trends in post-transition Thailand. Stud Fam Plann 1996; 27: 307-18.

16. Zhang H, Chamratrithirong A, Shah I, Jampaklay A. The place of fertility intentions: analysis of subsequent childbearing behavior among married Thai women. J Pop Social Stud 2008; 16: 51-72.

17. Guest P. Fertility preferences in Thailand. J Pop Social stud 1999; 8: 1-19.

18. Prasartkul P, Vapattanawong P. Transitional point of the Thai population. In: Punpuing S, Sunpuwan M, editors. Thailand population in transition, a turning point for Thai society. Bangkok: Amarin Printing; 2011: 13-22.

19. Thongthai V, Masmalai M. Eye on 13 important factors effecting Thailand's fertility. In: Archavanitkul K, Prasartkul P, editors. Population and society 2005. Bangkok: Amarin Printing; 2005: 32-9.

20. Office of the National Economic and Social Development. The eleventh national economic and social development plan (2012-2016). Bangkok: National Economic and Social Development Board Office of the Prime Minister; 2011.

21. Mcdonald P. Low fertility and the state, the efficacy of policy. Popul Dev Rev 2006; 32: 485-510.

ลักษณะและปัจจัยทำนายการลดลงของอัตราเกิดของประเทศไทยในสตรีอายุ 35-59 ปี: ข้อมูลจากการสำรวจสุขภาพประชาชนไทยครั้งที่ 4

เกรียงไกร ศรีธนวิบุญชัย, วันชัย มุ่งตุ้ย, รัตนา พันธ์พานิช, จิราพร สุวรรณธีรางกูร, สุวัฒน์ จริยาเลิศศักดิ์, รัศมี สังข์ทอง, ปัตพงษ์ เกษมบูรณ์, พรรณวดี พุธวัฒนะ, จิราลักษณ์ นนทารักษ์, สุรศักดิ์ ฐานีพานิชสกุล, วิชัย เอกพลากร, ทีมศึกษา NHES IV

วัตถุประสงค์: เพื่อบรรยายลักษณะและหาปัจจัยทำนายการลดลงของอัตราเกิดของประเทศไทย โดยใช้ข้อมูลจากการสำรวจที่เป็นตัวแทนของประชากรทั้งประเทศ

วัสดุและวิธีการ: การศึกษานี้ใช้ข้อมูลจากการสำรวจสุขภาพประชาชนไทยครั้งที่ 4 ที่ดำเนินการระหว่างปี พ.ศ. 2552-2553 ซึ่งใช้วิธีการสุ่มเลือกกลุ่มตัวอย่างแบบ *four stages of stratified probability samples, proportionate to size* เพื่อให้ได้กลุ่มตัวอย่างที่เป็นตัวแทนของประชากรทั้งประเทศ ข้อมูลของสตรีอายุ 35-59 ปี ถูกนำมาวิเคราะห์ โดยใช้ *curve estimation* ในการหาความสัมพันธ์ระหว่างจำนวนบุตรกับอายุในสตรีทั้งหมด (ทั้งเคยและไม่เคยแต่งงาน) และใช้ *binary logistic regression* ในการหาปัจจัยทำนายการมีบุตรน้อยกว่า 2 คน ในสตรีที่เคยแต่งงาน

ผลการศึกษา: ในสตรีทั้งหมดจำนวน 4,120 คน พบว่าจำนวนบุตรลดลงเร็วในสตรีกลุ่มที่มีอายุมากที่สุด (45-59 ปี) ลดช้าลงในสตรีกลุ่มอายุน้อยกว่า 45 ปี สตรีอายุ 37-38 ปี มีบุตรน้อยที่สุด และสตรีอายุ 35-36 ปี มีบุตรเพิ่มขึ้นเล็กน้อย ในสตรีที่เคยแต่งงานจำนวน 3,761 คน พบว่าปัจจัยทำนายอิสระของการไม่มีบุตรหรือมีเพียง 1 คน แทนที่จะมีบุตรตั้งแต่ 2 คน ขึ้นไปได้แก่ อายุ 45-49 ปี เทียบกับอายุ 50-59 ปี (OR = 1.66; 95% CI = 1.37-2.00) อายุ 35-44 ปี เทียบกับอายุ 50-59 ปี (OR = 1.39; 95% CI = 1.16-1.68) อาศัยอยู่ในครัวเรือนที่มี *Wealth index* ระดับ 3 เทียบกับระดับ 1 (OR = 1.28; 95% CI = 1.01-1.63) อาศัยในเมือง (OR = 1.33; 95% CI = 1.14-1.57) ระดับการศึกษาชั้นมัธยม (OR = 1.35; 95% CI = 1.11-1.64) ระดับการศึกษาอนุปริญญาหรือสูงกว่า เทียบกับระดับประถมศึกษาหรือไม่ได้เรียน (OR = 1.81; 95% CI = 1.39-2.34)

สรุป: อัตราเกิดของสตรีไทยลดลงเร็วในอดีตจากนั้นชะลอลงและอาจเพิ่มขึ้นเล็กน้อยในระยะหลัง การที่มีอายุน้อย อาศัยในเมืองและมีฐานะทางเศรษฐกิจและสังคมดี เป็นปัจจัยทำนายการมีบุตรน้อยกว่า 2 คน