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Assessing social status effects on age of primiparity in Polish women

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Abstract: The maternal first birth age is an important predictor of the size, composition and future growth of population and a wide range of birth outcomes such as birth weight, multiple births, and birth defects. This paper aims to test the hypothesis that age of mothers at first childbirth depends on their socio-economic status and lifestyle behaviour. The examined sample emanated from the WOMID national cross-sectional survey on middle-aged women's health and life quality in 2000–2004, and it consisted of 1,924 parous women born between 1953 and 1969 and aged 35–45 years at the time of examination. Social status was defined by place of residence, educational attainment, employment status, financial strain, and lifestyle behaviour by physical activity, cigarette smoking, alcohol use, weight status and self-reported health status. The association of age at first childbirth with social status characteristics was adjusted to marital status and use of oral contraceptives (OCU). Multiple correspondence analysis (MCA) was used to cluster studied variables. Predictive factors for first childbirth timing were determined by a factorial design with the multi-way ANOVA and their interactions. The odds ratios of the factors associated with later maternal age at first childbirth were evaluated through multiple logistic regressions with backward elimination. Statistics for this analysis were performed using STATISTICA software, Version 10.0 (StatSoft Polska). It was found that large city residents with higher educational levels, currently employed and without financial strain, non-smoking cigarettes and drinking alcohol, participating in physical exercises and maintaining proper weight and oral contraceptive users were more likely to delay their first childbirth over the median age of 23 years, than their counterparts. The most important predictors of the maternal first birth age were: educational attainment ($F=19.8$; $p<0.001$), place of residence ($F=4.2$ $p<0.021$), employment status ($F=3.7$; $p=0.026$), tobacco use ($F=5.0$; $p=0.007$), and use of oral contraceptives ($F=3.6$; $p=0.033$),. They explained 15% of the total variance in the maternal first birth age. The probability of delivering first child at more advanced age was almost two times higher for large-city residents than for rural counterparts (OR=1.58); five times higher for women with better educational qualifications as compared to primarily educated peers (OR=5.24). Currently employed women were 1.5 times more likely to be primiparous at more advanced age than the unemployed counterparts (OR=1.5). Current smokers were 1.3 times less likely than their never smoked peers to deliver a child at older age (OR=0.75). The OC users were 1.5 times more likely for delaying childbirth than never OCU counterparts. The study have revealed key sets of social predictor variables for maternal first birth age. They include: place of residence, educational attainment and employment status, use of oral contraceptives and smoking habit. Women's education appears to be the most predictive factor for entering the motherhood.

Key words: motherhood, urbanization, education, employment, financial strain, physical activity, tobacco and alcohol use, BMI, OCU

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Introduction

The main trends in family structure and dynamics in Poland have changed considerably since the beginning of the transition from socialist centralized system mainly based on central planning to a market economy in the 1990s. The birth rate has largely been declining since then due to rapid decline in fertility rates and changes in fertility patterns, both primarily associated with three aspects of reproductive behaviour: giving first birth at more advanced ages, substantial limitation of offspring, and increasingly often choice to remain childless. Nuptiality levels is sharply declined, postponed marriage is increasingly replaced or preceded by cohabitation or living-apart-together (LAT) relations; unmarried cohabitation is increasing, both premarital and after separation, divorce or widowhood (Philipov and Kohler 2001; Kotowska et al. 2008). The total fertility rate (TFR) has been dropping steadily since 1990 and in 2011 it amounted 1.30 (GUS 2012; EUROSTAT 2012). It is worth noting that Poland has the lowest fertility rates in the world; it raises concern over the country's ability to keep its pension system afloat. The mean age at first child's birth for women increased from 23.7 years in 2000 to 26.1 years in 2011.

This newly established pattern of fertility with the "birth deficit" has progressed into the Second Demographic Transition (SDT), the concept launched in 1986 (Lesthaeghe and Van de Kaa 1986; Van de Kaa 1987). The basic idea behind the SDT concept is that industrialized countries in response to increasing changes in the structure, culture, economics and technology, and because of ideational shifts in attitudes towards marriage, childbearing, and responsibility for personal health, have reached a new stage in their demographic development, a stage that is characterized by full control over fertility and conscious choice of the number of children and the family size. The SDT saw fertility rates fall to a level which did not ensure generational replacement (Van de Kaa 1994, 2001; Glacier 2006).

Recent studies have demonstrated that the ongoing transformation of cohort fertility is closely related to changes in socio-economic status, social welfare, access to quality health-care and cultural reproduction patterns (UN Report 1994, UN 1999, Haines and Cassels 2004). The use of reliable contraception, a method to postpone pregnancy for the first time, underlies decisions regarding birth control, delivery ages for first and subsequent children and the number of children desired (Amaro et al. 2002). Longer education and building a professional career are among many other reasons for delayed childbirth (Kravdal and Rindfuss 2008; Mills et al. 2011). The complex problems of postponed parenthood are likely to be solved at least in part, by the assisted reproductive technologies (ART), such as in vitro fertilization (IVF) (Connolly *et al.*, 2010).

A woman's first birth is one of the most significant events in her life. It signifies the first visible outcome of the fertility process, the visible consumption of sexual intercourse, the sexual and social maturity. It is also a transition marks to a woman into motherhood.

The timing of this event, the maternal first birth age (AFB) is an important predictor of the size, composition and future growth of population because the age at which childbearing begins influences the number of children a woman

will bear throughout her reproductive period and a wide range of birth outcomes such as birth weight, multiple births, and birth defects. It is also an important indicator for maternal and infant health. Early childbearing is significantly associated with bad prenatal health care, lower birth weights, earlier weaning, and higher mortality, especially during the second year of life. Delaying first births is generally associated with a reduction in female total fertility, and the rise in labour force participation (Frejka and Sardon 2006; Thevenon 2009, Fogli and Veldkamp 2011).

The first birth timing depends on a woman's physiological ability to have children, her living conditions and lifestyle behaviours both linked to socio-economic status and the general external environment. It is also structured on the family model prevalent in individual societies. The direction and strength of biological and socio-environmental inter-relationships reflect local biology and local culture (Dressler 2004).

For all the above-mentioned reasons, the maternal first birth age is of particular interest to both researchers and the public health managers. Taking this into account, the aim of this paper is to evaluate the relationship between social and cultural factors and the age at which women give birth to their first child.

Materials and methods

The data for this work emanates from the national WOMID cross-sectional survey on middle-aged women's health and quality of life conducted in 2000–2004 and described in detail in the author's earlier works (Kaczmarek 2007a,b). The examined sample consisted of 1,924 parous women born between 1953 and 1969 and aged 35–45 years at the time of examination.

Participants completed Polish version of MSQ questionnaire on life aspects retrospectively centred on events in their reproductive life, and in this work on the maternal age at first childbirth (AFB), their socio-economic status, lifestyle behaviours and health status (Kaczmarek 2000). Social status was defined by residential area, educational attainment, employment status, financial strain, while physical activity, BMI, cigarette smoking and alcohol use described lifestyle behaviour. The association of age at first childbirth with social status characteristics was adjusted to marital status and the use of oral contraceptives (OCU) as potential confounder.

Age at first birth was considered either continuous or dichotomous (<23 years of age; ≥23 years) dependent variable. The independent variables included characteristics of socio-economic status and lifestyle behaviour, marital status and oral contraceptive use. Marital status was reported in four categories: (1) married/partnered (referent), (2) never married/partnered, (3) widowed, (4) divorced/separated. Type of place of residence was described by residential area as: (1) village – referent; (2) small and medium-sized city with <100,000 inhabitants and (3) large city with ≥ 100,000. Educational attainment centred on years of completed schooling or formal education, and was classified as: (1) low level – primary/vocational, equal to 7–11 school years – referent; (2) a medium level at 12 years secondary school and (3) high/academic, lasting more than12 years and awarded with academic title. Employment status was reported as: (1) unemployed – referent; (2) economically inactive and (3)

employed. Financial strain was based on reported difficulty in affording food, clothing, housing, car, furniture, leisure activities, and the money owed. These were rated on the binary scale of: (1) for yes – referent; and (2) for no. Physical activity was reported as (1) non-active (referent), (2) active for at least 1 h/ week. Smoking status was reported as: (1) never smoked – referent; (2) former smoker, (3) current smoker and smoking amount was reported in three categories: (1) <10 cigarettes smoked daily (referent), (2) 10–20 cigarettes/ day, (3) more than 20 cigarettes smoked daily. Alcohol consumption was categorized as (1) no (referent) and (2) yes ≥2 drinks/week. Finally, weight status was determined on the basis of BMI as: (1) underweight<18.5 kg/m^2 – referent; (2) normal weight 18.5–24.9 kg/m^2; (3) overweight 25–29.9 kg/m^2, and (4) obese ≥ 30 kg/m^2. The present general health status (SRH) was self-rated on a five-point Lickert-type scale ranging from "very poor" to "excellent, could not be better". In the present analysis perceived health was categorized so that (1) was labelled very poor health – referent; (2) poor; (3) fair; (4) good, and (5) very good, excellent.

Descriptive statistics were generated on the study sample. The univariate χ^2 test for category variables and the Student *t* or Mann-Whitney *U* tests was utilized for traits with continuous distribution. Multiple correspondence analysis (MCA) was used to explore how the categories of variables relate to each other on a two dimensional Euclidean space and thereby to reveal their structure.

Bivariate relationships between the 12 potential predictor variables and the maternal first birth age (AFB) were evaluated with one-way ANOVA. Then, a factorial design by the multi-way ANOVA and their interactions were ran to generate a final explanatory model on the factors related to maternal first birth age (AFB). The relative weights of the factors associated with later maternal age at first childbirth were evaluated through multiple logistic regressions with backward elimination. All analyses were completed using STATISTICA software, version 10.0 (StatSoft Polska) and significance was determined at $p<0.05$.

Results

The background characteristics of the examined sample are shown in Table 1.

The mean age of the study cohort of women was 40.86; 95% CI: 40.74;40.99; SD 2.77 years. The overwhelming majority of women were married/partnered at the time of the survey (83.8%), employed (84.7%), urban residents (78.9%) with secondary education level (49.9%). Over

Table 1. The background characteristics of parous participants in the WOMID study; a cohort aged 35–45 years

Variable	N=1,924
Age (years) Mean±SD	40.86±2.77
Age at first birth (years) Mean±SD	23.17±3.39
Married/Partnered (%)	83.8
Place of residence: rural areas (%)	21.1
Place of residence: urban areas (%)	78.9
High educational attainment (%)	24.8
Currently employed status (%)	84.7
Without financial strain (%)	52.8
Physically active, ≥1h/ weekly (%)	29.2
Current smoker status (%)	43.5
Smoking >20 cigarettes/daily (%)	19.1
No alcohol use (%)	55.4
Normal weight status BMI 18.5–24.9 kg/m^2 (%)	65.6
Never used oral contraceptives (%)	64.2
Self-reported good health status (%)	44.5

half of the women in the sample (52.8%) reported not to experience financial strain and possessed to be sufficient to cover their basic needs. Only 29.2% of all women reported that they had performed physical activity for 1 h weekly. Forty three percent of women smoked cigarettes at the time of the survey and almost one-fifth of them smoked more than 20 cigarettes daily (19.1%). Nearly half of studied women reported to have two or more drinks weekly. Obesity was observed in 8.4% of women. One third of women reported to be OC users for at least a year. Majority of women reported to be in good health (44.5%).

Maternal ages at first childbirth ranged between 14 and 41 years, with the mean value 23.17; 95%CI:23.02;23.33; SD 3.39 years and median 23; Q1:21 and Q3:25 years.

The MCA included the Burt table with 33×33 variables: ages at first childbirth as dichotomous variable (younger vs equal to and older than 23 years), marital status, residential area, education level, employment status, financial strain, physical activity, smoking status, alcohol consumption, self-reported general health status, and weight status based on BMI, use of oral contraceptives. Structural relationships among the ma-

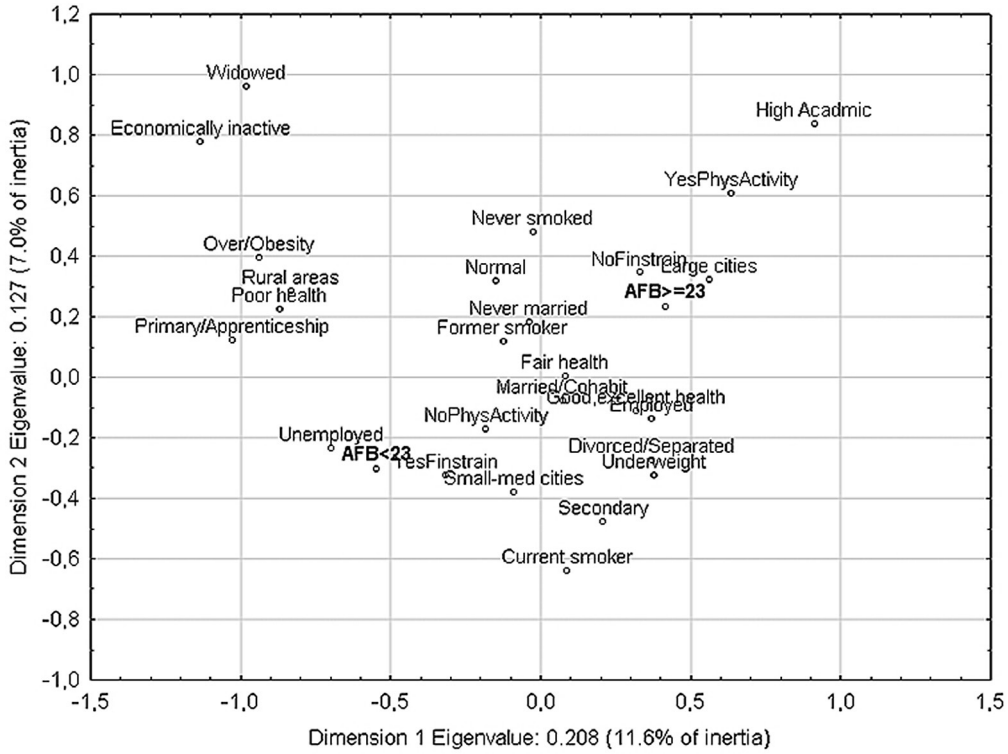

Fig. 1 The MCA for maternal first birth age, social and lifestyle variables
2-D plot of column coordinates: dimensions 1×2. Input Table (rows*columns): 33×33 (Burt's Table) of the following variables: age at first birth (AFB), marital status, place of residence, educational attainment, employment status, financial strain, physical activity, cigarette smoking, alcohol use, BMI, self-reported health status and use of oral contraceptives.

Table 2. Descriptive statistics and bivariate relationships between predictor variables and the maternal first birth age (AFB); results of one-way ANOVA

Variable	N=1924	%	Age at first childbirth Mean±SD	*p*-value
Marital status				<0.001
Married/Partnered	1611	83.8	23.21±3.36	
Never married	137	7.1	26.19±5.51	
Widowed	57	2.9	21.92±2.93	
Divorced/Separated	119	6.2	22.48±2.90	
Residential area				<0.001
Village	406	21.1	22.40±3.12	
Small and medium-sized city <100,000 people	868	45.1	23.08±3.30	
Large city ≥100,000 people	650	33.8	23.81±3.55	
Educational attainment (level, years)				<0.001
Primary/Vocational, 8–11	487	25.3	21.66±3.08	
Secondary, 11–12	960	49.9	23.26±3.14	
High/Academic, >12	477	24.8	25.08±3.58	
Employment status				<0.001
Unemployed	249	12.9	22.01±3.14	
Economically inactive	45	2.3	21.76±2.84	
Employed	1630	84.7	23.39±3.39	
Financial strain				0.028
Yes	908	47.1	23.03±3.36	
No	1018	52.8	23.41±2.45	
Physical activity				0.001
Non active	1362	70.8	23.05±3.48	
Active, ≥1h/ week	562	29.2	23.67±3.18	
Smoking status				0.001
Never smoked	777	40.4	23.54±3.38	
Past smoker	310	16.1	23.04±3.35	
Current smoker	837	43.5	22.89±3.39	
Smoking amount				0.175
<10 cigarettes/day	204	24.4	22.80±3.55	
10–20 cigarettes/day	473	56.5	23.17±3.36	
>20 cigarettes/day	160	19.1	23.29±3.39	
Drinking alcohol				0.199
No	1066	55.4	22.99±3.25	
Yes, ≥2 drinks/week	858	44.6	22.70±3.31	
BMI, kg/m^2				0.009
Underweight <18.5	48	2.5	23.67±4.10	
Normal weight 18.5–24.9	1262	65.6	23.33±3.37	
Overweight 25–29.9	452	23.5	23.03±3.45	
Obese ≥30	162	8.4	22.39±3.31	
Use of oral contraceptives				0.021
No, never	1235	64.2	22.49±3.39	
Yes, for at least one year	689	35.8	23.52±3.38	
Self-reported health status				0.456
Very good, excellent	79	4.1	23.47±3.88	
Good	856	44.5	23.28±3.36	
Fair	743	38.6	23.17±3.36	
Poor	230	11.9	22.80±3.56	
Very poor	16	0.9	23.00±4.12	

ternal first birth age and socio-cultural variables, plotted as the Euclidean distances is presented in Figure 1.

The goodness of fit of the model, estimated by chi-square value, was overall $\chi^2=58315$; with df=1845; $p<0.001$. The total inertia was 1.8. Two dimensions of Euclidean distances explained 18.6% of the total inertia i.e. the entire chi-square distribution of the maternal first birth age among socio-cultural factors. First dimension: $\lambda_1=0.208$, explains 11.6% of the inertia and second dimension: $\lambda_2=0.127$, explains 7% to inertia. With regard to first dimension, the great majority of studied variables were scattered near the origin of axes. The most rightwards, with positive value coordinates (+0.913) were women with high educational attainment. In the opposite site, most leftwards with negative value coordinates (–1.132) were economically inactive women. The magnitude of the loadings on the second dimension revealed that the highest loading attributed to widowed status – a positive item (+0.959) and current smoking status as negative item (–0.604).

The scatter diagram has points for two variable clusters close to (1) the maternal first birth age younger than median value of 23 years and (2) equal to and older than 23 years. Residents of small to medium- sized cities, with secondary level education, unemployed, with insufficient income to meet their needs, current smokers and inactive physically were clustered around younger than 23 years of first childbirth. Large city residents without financial strain, physically active, never smoked a cigarette nor alcohol used, maintaining normal weight, oral contraceptive users were clustered around equal to and older than 23 years.

Table 2 shows the results of the bivariate analyses of the associated factors for maternal first birth age performed using the one-way ANOVA.

These analyses returned statistically significant associations at $p<0.05$ between age of a first-time mother and following variables: marital status, place of residence, maternal schooling, employment and financial situation, physical activity and smoking status, weight status,

Table 3. Social and lifestyle variables associated with maternal first birth age in Polish women. Results of multi-factor ANOVA

Factor effect*	DF	SS	MS	F	p
Marital status	3	27.7	9.23	0.96	0.411
Place of residence	2	88.4	44.2	4.21	0.021
Educational attainment	2	381.1	190.5	19.81	<0.001
Employment status	2	70.3	35.1	3.66	0.026
Financial strain	1	33.13	33.1	3.45	0.064
Physical activity	1	13.0	13.0	1.36	0.244
Smoking status	2	96.4	48.2	5.01	0.007
Smoking amount	2	42.8	21.4	1.23	0.099
Drinking alcohol	1	21.0	21.0	2.18	0.139
BMI, kg/m^2	3	40.7	13.6	1.35	0.238
Use of oral contraceptives	1	69.8	34.9	3.61	0.033
Self-reported health status	4	23.9	11.9	1.24	0.289
Residual	621	5969.1	9.6		

*No order interactions were found to be significant in this model.

and use of oral contraceptives. Number of cigarettes smoking, alcohol use and self-reported health status did not show significant associations with age at first childbirth. Finally, the set of 12 variables were included in the multivariate analysis (Table 3).

After the adjustment, four variables lost their statistical significance. As a result, in the final model the following variables proved to have significant effect on the maternal first birth age: educational attainment (F=19.81; p<0.001); place of residence (F=4.21; p=0.021); employment status (F=3.66; p=0.026), smoking status (F=5.01; p=0.007 and use of oral contraceptives (F=3.61; p=0.033). They explain 15% of the total variation (adjusted R^2=0.1543). Since no order interactions were found to be significant, the simplest model with only the main factors was considered to evaluate relative risk of later maternal first birth age. According to this model, maternal educational attainment, place of residence and employment status had direct effect and smoking status inverse effect on the age at first childbirth (Table 4).

Educational attainment seemed to be the most important factor contributing

Table 4. The relative weights (OR) and 95% confidence interval of the predictor variables found to be associated with older maternal age; data for the final most parsimonious model of multiple logistic regression with backward elimination

Variable	β	SE	Wald χ^2	OR (95%CI)
Residential area	0.229	0.073	9.84	
Village (referent)				1
Small and medium-sized city <100,000 people				1.25 (1.09;1.45)
Large city ≥100,000 people				1.58 (1.18;2.10)
p for trend 0.002				
Educational attainment: level, years	0.828	0.082	102.98	
Primary/Vocational,8-11(referent)				1
Secondary,11-12				2.29 (1.95;2.69)
High/Academic,>12				5.24 (3.81;7.22)
p for trend <0.001				
Employment status	0.204	0.087	5.55	
Unemployed (referent)				1
Economically inactive				1.23 (1.03;1.45)
Employed				1.50 (1.07;2.11)
p for trend 0.018				
Smoking status	–0.142	0.057	6.18	
Never smoked (referent)				1
Past smoker				0.87 (0.77;0.97)
Current smoker				0.75 (0.61;0.94)
p for trend 0.013				
Use of oral contraceptives	0.390	0.127	7.45	
No, never				1
Yes, for at least 1 year				1.47 (1.15;1.89)
p for trend 0.011				

to an increased risk of advanced maternal first birth age. Highly educated women were 5 times more likely to have their first child at more advanced age than those of low educational level (OR=5.2; *p*-for trend<0.001). A fertility timing gap between more and less educated women reached 4 years with respective mean ages 25.1 years and 21.7 years.

Place of residence was also directly associated with age at first child birth; the larger the urbanization category the more advanced maternal first birth age. The likelihood of delivering first child at more advanced age was almost two times higher for the large-city residents than for the rural counterparts (OR=1.58; *p*-for trend=0.002). The large-city residents with high educational level were likely to deliver their first child almost 5 years later than residents of rural areas with primary/vocational level of education.

Currently employed women were 1.5 times more likely to be primiparous at more advanced age than the unemployed counterparts (OR=1.5; *p*-for trend=0.018).

Current smokers were 1.3 times less likely than their never smoked peers to deliver a child at older age (OR=0.75; *p*-for trend=0.013). They were likely to give their first child for one year earlier than their counterparts who had never smoked (22.89 years versus 23.54 years).

Women using oral contraceptives were 1.5 times more likely to have their first child at more advanced age than the non OC users (OR=0.75; *p*-for trend=0.013)

Discussion

Using data from the national WOMID cross-sectional survey on middle-aged women's health and quality of life conducted in 2000–2004, this paper evaluates social determinants of maternal first birth age i.e. the association of the age when childbearing starts with women's socio-economic position and their lifestyle behaviour. A target group was Polish women born between 1953 and 1969 who delivered their first child between the late 1970s until the 1990s.

The results of this study confirm the relationship between maternal first birth age and women's social background and lifestyle. Of all predictor variables studied, the following appeared to be directly associated with age at firth childbirth: place of residence, education level and employment status, and hormonal birth control (OCU). Smoking status was one of the lifestyle behaviours inversely associated with the onset of motherhood.

Although MCA rates the interrelationships of studied variables at less than half the total inertia at 18.6%, our results are regarded completely satisfactory. Socio-economic gradients in physical growth and biological maturation are well documented phenomena (amongst others: Bielicki et al. 1982, 1997; Rona et al 2003; Shell et al 2007). It must be emphasized here that social environmental factors only indirectly modulate genetic determinants of physical growth, and their overall contribution to total phenotypic variation is not high (Wolański 2012).

This study has shown that women's education is the strongest predictor of the first childbirth age. Women who start childbearing at more advanced ages are likely to have higher levels of education. They are likely to be urban residents who are twice as likely to delay their first childbirth as rural counterparts. They also constitute significantly higher proportions of

the total employed. Although the average age difference in conceiving first child between urban and rural women is one year and a half, total variability ranged up to four years, and this higher variance was mainly manifested in comparisons between the differently educated women. The more highly educated women delayed the timing of their first child by almost four years compared to women with primary level of education. The rural urban gap in fertility patterns has its source at least in part in local culture as rural residents are more likely than urban peers to adhere more to traditional patterns of motherhood. The influence of religion on fertility behaviour cannot be overestimated. Catholic women are less likely to use contraceptives than members of other religions or non-believers.

Another important factor of maternal first birth age revealed in this study is the employment status and subsequent economic attainment (here latent variable). Employed women are more likely than unemployed counterparts to enter motherhood at more advanced age. And proportion of women with higher levels of education among those employed was significantly larger as compared to less educated peers (Pearson's $\chi^2 = 1356$; $p < 0.001$).

This study has also shown that highly educated urban women use oral contraception more readily than less educated rural women (Pearson's $\chi^2 = 10.99$; $p = 0.004$) thereby deliberately delaying their first birth in pursuit of higher education.

These findings corroborate other studies of a positive relationship between education and age at first birth (Bloemen and Kalwij 2001; Lappegård and Rønsen 2005; Nicoletti and Tanturri 2005; Klasen and Launov 2006; Rodgers et al. 2008; Tavares 2010).

There is general agreement as to the association of education and childbearing onset, more educated women delay motherhood with respect to less educated women; however the mechanism of this relationship remains less clear. Two possible explanations have been suggested to explain the relationship of education and delayed onset of childbearing: (1) that the opportunity costs of children for highly educated women are higher than for less educated, and therefore women with high education have fewer children and they starts child bearing at a later age and (2) effect of education on age at first birth might be due to selection arising because of unobserved heterogeneity or confounding factors affecting both fertility and educational choices (Lappegård and Rønsen 2005; Hoem et al. 2006). However, resolution of this issue requires further research.

Another interesting finding of this study is that of association between maternal first birth age and smoking habit. Smoking is most likely to be associated with earlier age at first birth. Women who are still smoking are twice more likely than never smoked counterparts to give birth at younger age. It should be noted that smoking habit is associated with education level. Women with higher levels of education were more likely to be abstaining and/or quitting smoking than less educated counterparts. It seems that both smoking habit and use of oral contraceptives affect the age at first childbirth through education thus giving evidence for its powerful role in entering the motherhood.

Conclusion

This study confirmed a strong relationship between maternal first birth age relative to women's social background and lifestyle. Key sets of predictor variables include women's place of residence, educational attainment and employment status, use of oral contraceptives and smoking habit. Women's education is at the top of the structure of these variables and the most powerful predictor of maternal first birth age. Further search is needed to explain the mechanism of this phenomenon.

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Conflict of interest

Author declares that there is no conflict of interests.

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