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SELF-RATED HEALTH AND TEENAGE PREGNANCIES IN ROMA WOMEN: INCREASING HEIGHT IS ASSOCIATED WITH BETTER HEALTH OUTCOMES

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Summary. This paper reports on the association between early marriage, age at first reproduction and height, as an indicator of childhood environment, and maternal health outcomes among traditional Roma women in Serbia. Demographic data, marital and reproductive histories, height, weight and self-rated health were collected from 414 Roma women living in rural settlements in Serbia in 2015–2017. Data analysis showed that higher age and weight were associated with a greater risk of poor health, greater height contributed to reduced risk of poor health while reproductive variables were insignificant. The study provides evidence that the long-term effects of early childbearing may not always be associated with poorer health status. As indicated by the differences in height, it is likely that women who were capable of reproducing very early on and staying healthy in later life were probably very healthy to begin with. The results probably reflect both the biological and social differences of early childhood. Aside from height, the traditional Roma marriage pattern and social benefits may have an additional protective effect on the health of women.

Introduction

Early marriage and early childbearing may produce somatic costs that can affect different aspects of maternal health and well-being (Gurven *et al*., 2016; Marphatia *et al*., 2017). Despite the pervasiveness of child marriage (first marriage before 18 years of age) and subsequent early childbearing among Roma women, there is little empirical evidence regarding an association between early marriage/early reproduction and Roma women's health. Previous research on the determinants of Roma women's health outcomes have primarily focused on contemporary factors such as health differentials with non-Roma, socioeconomic status (SES), educational levels and utilization of, and access to, health care (Janevic *et al*., 2012; Sedlecky & Raševic, 2015; Logar *et al*., 2015).

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Evidence is mixed on the effects of reproduction on Roma women's health: a recent study suggested an inverse relationship between reproductive effort and health (Čvorović & Coe, 2017) but, at the same time, women in isolated Roma groups were found to have relatively good health and reproductive outcomes, despite early marriage, high fertility and poverty (Coe & Čvorović, 2017). An important 'missing' variable associated with early age at first reproduction and reproductive and health outcomes may be childhood health, indicated by a measure of adult height (Silventoinen, 2003; Monden & Smits, 2009; Waynforth, 2012).

Roma are a diverse population of South Asian stock whose nomadic lifestyle dispersed them to various parts of the world including Europe, where they started to arrive sometime after 1100 AD (Gresham *et al*., 2001). Throughout history, the Roma have been subject to enslavement and discrimination, including forceful attempts at changing their way of life. For the most part, the Roma have remained a traditional, hard-to-reach population with high levels of unemployment, sub-standard housing, lack of education and skills, and a deepening dependence on state benefits and services (Ladányi & Szelényi, 2002; FSG, 2009). Health data across Europe show that being Roma is associated with much poorer health outcomes, including lower life expectancy and higher child mortality, than those seen in the majority populations or among other ethnic minority groups (see review in Cook *et al*., 2013).

Early marriage, defined as marriage under the age of 18, persists particularly in the Commonwealth countries, known as global hotspots for child marriage (Nour, 2006; Amin *et al*., 2017), but also in parts of Eastern Europe (Raj, 2010). Age at marriage is one of the most significant aspects in population dynamics as well as a public health concern since it influences the fertility, mortality and health of women and children, having a strong effect on a variety of social, economic, demographic and public health factors (Rah *et al*., 2008; Santhya, 2011; Black *et al*., 2012; Godha *et al*., 2013; Koh, 2014; Kamal *et al*., 2015; Marphatia *et al*., 2017).

In many traditional societies childbirth usually follows soon after marriage. Previous studies have suggested that the optimal maternal age for first reproduction (age at first reproduction, AFR) in traditional societies is 18 years; the costs of postponed AFR include longer generation time and a greater chance of dying before reproducing (see review in Liu & Lummaa, 2011).

Available studies of AFR, number of children and health in later life provide mixed support for links between an early entry into motherhood and physical health outcomes (Gagnon, 2015). While some studies have shown poorer later health and higher mortality among women with an early AFR (Grundy & Tomassini, 2005; Mirowsky, 2005; Thato *et al*., 2007; Pirkle *et al*., 2014; Grundy & Read, 2015), others have found no such effect (Lao & Ho, 1997; Smith & Pell, 2001; Gurven *et al*., 2016). In some populations early childbearing has been found to be associated with negative social, rather than direct medical, costs to the mother (Spence, 2008; Hardy *et al*., 2009). Furthermore, the long-term effects of childbearing may differ for women of different race and ethnicity (Geronimus, 2003; Spence & Eberstein, 2009). Across studies, the strongest finding is that risk is concentrated only in the youngest of mothers – generally those under 15 years of age (Kramer & Lancaster, 2010).

Throughout Eastern Europe, Roma cultural traditions have encouraged division into groups based on descent alone, and early endogamous marriages and high fertility

(Bošnjak & Acton, 2013; Berta, 2013; Čvorović, 2014; Osmanaj, 2014; Roth & Toma, 2014). Roma women often enter motherhood as teenagers, while the virginity of a girl is considered obligatory for a 'good' marriage (Pamporov, 2007). There are around 600,000 Gypsies in Serbia, comprising 8.18% of the total population (Council of Europe, 2010). For the most part, Roma women in Serbia live in poverty, reside in sub-standard housing in segregated communities and are poorly educated; they lack both the skills for, and access to, jobs, and have cultural practices that often limit women's choices (Coe & Čvorović, 2017). In comparison with other high-fertility groups in Serbia, the Roma have the earliest average age at marriage and first reproduction (Čvorović & Lynn, 2014). According to official estimates, almost 40% of Roma females had their first child before their 18th birthday, while 10% became mothers before 16 years of age (UNICEF, 2014).

Height is frequently used as a measure of long-term health as it proxies childhood circumstances, i.e. height serves as an indicator of growth, nutrition and social environment in earlier life (Smith *et al*., 2000; Silventoinen, 2003; Deaton & Arora, 2009; Case & Paxson, 2010; Perelman, 2014), but there is a lack of such data for non-Western populations (Sear, 2010). A previous study on Serbian Roma anthropometric measures found that stature (but not BMI) reflects a statistically significant heterogeneity in Roma females despite equal socioeconomic status and similar genetic makeup (Gallagher *et al*., 2009). Research on early marriage and reproduction, and anthropometric measures as proxies of early-childhood circumstances that might predispose Roma women to increased health adversity, remains limited.

The present study assessed the associations between early marriage, age at first reproduction, maternal height and health outcomes in a sample of women from the traditional Roma population in Serbia.

Methods

Fieldwork was conducted in 2015–2017 in three neighbouring Roma communities inhabited by a distinct Roma group self-named *Gurbeti*, in western Serbia, as a part of a larger anthropological study on health, culture and social networks among Roma women (Čvorović, 2010; Čvorović & Coe, 2017). The settlements were rural and relatively poor – typical for Roma. The sample consisted of 414 Roma women, recruited through personal contacts and Roma organizations. All women had been married at least once, and had given birth to at least one child. All participants had personal ID and health cards. In all cases, interviews were carried out at the participant's home or that of a neighbour. All women were fluent in Serbian while some also spoke the Romani language. The majority of women were recipients of social welfare while health care was covered by state-funded health insurance.

A general questionnaire was designed to collect information about women's age, level of education, marital and reproductive history (age at first menarche, age at first marriage, AFR, parity/full-term pregnancies and number of surviving children) and health. All measures were cross-sectional and self-reported.

In field surveys, the use of self-rated health is a frequent measure as it independently predicts health outcomes, including all-cause mortality, morbidity and health service utilization (Schnittker & Bacak, 2014). Cultural conventions of describing symptoms and health vary between ethnic groups and evidence suggests that somatization may be

more common in some socio-cultural groups than others, which may affect the measurement of self-rated health (Chandola & Jenkinson, 2000). In general, women, individuals of low socioeconomic status and older people tend to rate their health as worse (Darviri *et al.*, 2012), so instead of the Roma's 'internal' view of their health, the study participants were asked whether their doctor had told them that they had a chronic disease (the responses were 1 for 'Yes' [i.e. poor health/presence of chronic disease] and 2 for 'No' [i.e. good health/absence of chronic disease]). This same measure has been used in previous studies on Roma health (Čvorović & James, 2017; Čvorović & Coe, 2017; Coe & Čvorović, 2017). Anthropometric measures, i.e. stature and body weight, were collected using standard procedures (Gallagher *et al.*, 2009). Both measures are correlated, but weight is affected both by the ability to acquire energy in adulthood and by reproductive events themselves (Winkvist *et al.*, 2003).

To assess the relationship between age at first marriage and health outcomes, the Roma women were divided into three groups based on age of first marriage: those who first married at 12–15, 16–17 and ≥ 18 years of age. Similar cut-off points were used for AFR at ages 13–15, 16–17 and ≥ 18 years. These cut-off points were chosen based on the sample characteristics (i.e. the earliest age at first marriage was 12, and the earliest age at first reproduction was 13) and previous studies (Reichman & Pagnini, 1997; Pirkle *et al.*, 2014), and because very young age at marriage and childbirth (<15 years) are more likely to be risk factors for poor maternal health (Gibbs *et al.*, 2012).

Descriptive statistics, chi-squared tests, ANOVA and ANCOVA tests were used to detect differences in demographic, anthropometric, health and reproductive variables between Roma women in different marriage and AFR cut-off groups. Because age at first marriage was found not to be significant with regard to health, it was dropped from further analyses (see Results).

Three logistic regression models were performed. The health outcome variable was dichotomous (with 0 being good health, i.e. absence of chronic disease, and 1 being poor health, i.e. presence of chronic disease). As parity may be a function of age at first reproduction, only the number of surviving children was used. It is the closest proxy for reproductive success among populations with relatively high child mortality (Sear, 2010) and, among Roma, has been found to be significant in previous studies (Čvorović *et al.*, 2008; Čvorović & Coe, 2017). In all models there were three categories for the AFR variable: first reproduction at 13–15 years of age, first reproduction at 16–17 and first reproduction at ≥ 18 years of age. Also, and to remove the effect of age on the variation in height, height was transformed into *z*-scores (the regression residuals – height was regressed on age and age-squared – were divided by the standard error of the estimate of the regression model). Given the poor education of the Roma, level of schooling was dichotomized as 4 grades or fewer and 5 grades or more. Number of surviving children, age and weight were continuous variables.

It is difficult to estimate socioeconomic status (SES) for the Roma since, in their case, traditional measures of this (such as level of education and income) are not very instructive (Čvorović & Coe, 2017). The majority of Serbian Roma survive through a combination of welfare benefits and informal work. In the absence of more objective measures, Roma women's own perceptions of (their husband's) family social standing relative to others in their communities were used instead. Thus, SES had three modalities: poor SES, average SES and above-average SES.

In the first model, the independent variables were reproductive: AFR and number of surviving children. In the second model, height was added to the reproductive variables. The third, full model, in addition to reproductive variables and height, included age, weight, SES and dichotomized level of schooling.

Results

The sample included 414 Roma women of middle age and little schooling (see Table 1). Mean age at first menarche was 12.77 (SD = 1.13). The majority (80.7%) entered marriage as teenagers, at an average age of 16 (15.90; SD = 1.58). Thirty-five per cent of the women married at ages 12–15, 46% at 16–17 and 19% at ≥ 18. The majority of marriages were arranged by the woman's family (70%) and all first births took place within marriage. Mean AFR was 17, with an average of four children per woman (see Table 1).

The majority of Roma women (54.1%) fell primarily within the acceptable nutritional status (BMI 18.5–24.9, mean = 22.5, SD = 1.55), although a substantial proportion were overweight (34.9%, mean = 27.1, SD = 1.40) and some were obese (10.1%, mean = 31.1, SD = 1.13). There were no underweight women. Regarding SES, 41.7% of women reported poor SES, 52.6% reported average (poor) SES while only 5.6% reported above-average SES.

In regard to health, the majority of Roma women (58%) reported good health (absence of chronic disease diagnosis); for the Roma women who reported poor health (43%) the most common complaints were hypertension and diabetes. For all groups there was no statistically significant association between age at first marriage, health status ($\chi^2 = 2.89$, $p = 0.408$) and specific diseases (diabetes: $\chi^2 = 3.06$, $p = 0.382$; hypertension: $\chi^2 = 4.62$, $p = 0.201$), so age at first marriage was not used in further analyses.

Fifteen per cent of the Roma women had their first child between the ages of 13 and 15, most (55%) gave birth for the first time at 16–17 while 30% gave birth to their first child at ≥ 18. Concerning differential AFR and health association, the majority of Roma women (78%) who gave birth for the first time between ages 13 and 15 reported good health (absence of chronic disease diagnosis) compared with women who gave birth for

Table 1. Descriptive statistics of the sample of Roma women from Serbia, 2015–2017 ($N = 414$)

	Age (years)	Schooling[a]	Weight (kg)	Height (cm)	AFR[b] (years)	No. of surviving children
Mean	44.49	4.47	64.34	160.54	17.22	3.65
Median	45.00	4.00	63.00	161.00	17.00	3.00
Mode	56.00	0.00	58.00	160.00	17.0	3
SD	14.32	3.45	8.70	5.14	2.26	1.84
Minimum	16.00	0.00	40.00	148.00	13.0	1
Maximum	80.00	12.00	90.00	175.00	33.0	10

[a]Years spent in school.
[b]AFR: age at first reproduction.

Table 2. Demographic and anthropometric characteristics of the sample Roma women by age at first reproduction (AFR) ($N = 414$)

AFR		Age (years)	Schooling[a]	Weight (kg)	Height (cm)	No. of surviving children
13–15	Mean	41.6	2.38	60.3	163.2	4.67
	SD	15.01	3.00	7.21	4.96	2.44
16–17	Mean	46.7	3.69	64.7	159.4	3.86
	SD	14.55	2.96	8.78	4.81	1.67
≥18	Mean	41.7	6.90	65.5	161.2	2.78
	SD	12.86	3.16	8.72	5.26	1.41
F		6.503	62.070	8.184	15.428	27.856
p-value		0.002	<0.001	<0.001	<0.001	<0.001

[a]Years spent in school.

the first time at older ages (48% of women with AFR 16–17 reported good health, and 65% with AFR ≥ 18). The differences in self-rated health and SES for the three groups were statistically significant ($\chi^2 = 21.776$, $p < 0.001$, and $\chi^2 = 232.001$, $p < 0.001$, respectively).

Roma women in the AFR group 13–15 had the earliest menarche ($F = 7.567$, $p < 0.001$) and more full-term pregnancies ($F = 23.344$, $p < 0.001$) than women in older AFR groups. Also, Roma women in the earliest AFR group were the youngest, with the least amount of time spent in school; they were lighter and taller than women in the two older AFR groups and had more surviving children – five on average (see Table 2). Additionally, ANCOVA showed that even after controlling for age, women from the earliest AFR group had more surviving children than the rest ($F(2.410) = 27.178$, $p < 0.001$).

Height and weight were found to be correlated ($p < 0.001$); additionally, height was positively correlated with schooling ($p = 0.002$) and inversely correlated with chronic disease ($p < 0.001$), while weight was correlated with age ($p = 0.011$), chronic disease ($p < 0.001$) and AFR ($p < 0.001$) but not with the number of surviving children ($p = 0.487$).

All three models were statistically significant. The first model ($\chi^2(3) = 28.07$, $p < 0.001$) with two independent variables – AFR and number of surviving children – explained between 6.6% (Cox and Snell R^2) and 8.8% (Nagelkerke R^2) of the variance of the dependent variable. The overall percentage of cases correctly predicted by the model was 59.4%. Both independent variables – AFR and number of surviving children – significantly contributed to the model ($p < 0.05$). An increase in number of surviving children increased the risk of chronic disease occurrence (OR = 1.15; 95% CI = 1.02–1.30; $p = 0.020$). In regard to AFR, having a first child between the ages of 13 and 15 increased by 4.5 times the possibility of chronic disease occurrence in comparison to having first birth at 18 and older (OR = 4.54; 95% CI = 2.27–9.05; $p < 0.001$). An AFR of 16–17 raised the possibility of chronic disease occurrence 2.64 times, in comparison with the AFR group of 18 and older (OR = 2.64; 95% CI = 1.22–5.71; $p = 0.01$).

The second model ($\chi^2(4) = 44.01$, $p < 0.001$) with two reproductive variables (AFR and number of surviving children) and height explained between 10.1% (Cox and Snell R^2) and 13.5% (Nagelkerke R^2) of the variance of the dependent variable. The overall percentage of cases correctly predicted by the model was 64.7%. All variables

Table 3. Logistic regression: predictors of Roma women's health status

			95% CI for exp(*B*)	
	p-value	exp(*B*)	Lower	Upper
SES average	0.182	0.532	0.211	1.343
SES above average	0.269	0.599	0.241	1.487
Height	<0.001	0.525*	0.383	0.719
Weight	0.003	1.044*	1.015	1.073
Schooling	0.506	0.823	0.464	1.461
Age	<0.001	1.063*	1.043	1.084
AFR 13–15	0.055	2.560	1.157	5.669
AFR 16–17	0.152	1.960	0.781	4.923
Number of surviving children	0.486	1.052	0.913	1.212

*p <0.05.

significantly contributed to the model ($p < 0.05$). An increase in number of surviving children increased the risk of chronic disease occurrence (OR = 1.14; 95% CI = 1.01–1.29; $p = 0.031$). Having an AFR of 13–15 increased the possibility of chronic disease occurrence in comparison to having an AFR of 18 years and older (OR = 3.43; 95% CI = 1.67–7.04; $p = 0.001$). An AFR of 16–17 also increased the possibility of chronic disease occurrence in comparison to the group 18 and older (OR = 2.25; 95% CI = 1.01–5.00; $p = 0.046$). In contrast, an increase in height reduced the risk of chronic disease occurrence (OR = 0.56; 95% CI = 0.43–0.74; $p < 0.001$).

Table 3 shows the results of the full (third) model. This model ($\chi^2(4) = 119.234$, $p < 0.001$), which included all the predictor variables, explained between 25% (Cox and Snell R^2) and 33.6% (Nagelkerke R^2) of the variance of the dependent variable. The overall percentage of cases correctly predicted by the model was 74.2%. Statistically significant variables were height, weight and age ($p < 0.05$). An increase in height of 1 cm reduced the risk of chronic disease occurrence (OR = 0.53; 95% CI = 0.38–0.72; $p < 0.001$). An increase in weight increased the risk of chronic disease occurrence (OR = 1.04; 95% CI = 1.02–1.07; $p = 0.003$). An increase in age also increased the risk of chronic disease occurrence (OR = 1.06; 95% CI = 1.04–1.08; $p < 0.001$). Age at first reproduction, number of surviving children, SES and level of schooling were not found to be statistically significant.

Discussion

The combined effects from the full regression model, which included all predictors, showed that age and weight increased the risk of self-rated poor health (chronic disease occurrence) while greater height contributed to a reduced risk of self-rated poor health in this sample of Roma women in Serbia. Age at first reproduction, number of surviving children, SES and level of schooling were not significant in regard to the self-rated health of these women.

Age and weight are two well-known factors associated with an increased risk of a range of major chronic diseases (Prasad *et al.*, 2012; Zheng *et al.*, 2017), while, for

women, ageing is consistently associated with gains in weight (Gurven *et al*., 2016). In turn, height is a very valuable proxy for 'metabolic capacity', which is the ability to maintain homoeostasis (Wells, 2011). For example, short stature is now a well-established risk factor for cardiovascular disease and diabetes, whilst obesity is a second well-established risk factor (Leon *et al*., 1995; Jousilahti *et al*., 2000; Smith *et al*., 2000; Perelman, 2014; Pereira *et al*., 2016). In addition, adult body height is highly influenced by childhood environment (inclusive of socioeconomic, nutrition and health conditions) and early-life events (Guven & Lee, 2015). The early-life burden of undernutrition and disease is not only responsible for mortality in childhood but also leaves a residue of long-term health risks for survivors – risks that express themselves in adult height and in late-life disease (Bozzoli *et al*., 2009). For Roma women, any potential losses from early reproduction, ageing and weight gain seem to be moderated by greater height, suggesting that early-childhood conditions have long-lasting effects (Case & Paxson, 2010).

In contrast to many studies (Santhya, 2011; Ganchimeg *et al*., 2014; Pirkle *et al*., 2014; Marphatia *et al*., 2017; Amin *et al*., 2017), AFR and number of surviving children explained only a small percentage (less than 10%) of self-rated health outcome. This finding is consistent with studies suggesting that the long-term effects of early childbearing may not always be associated with poorer health status (Geronimus & Korenman, 1991; Hoffman, 1998; Helle *et al*., 2005; Gurven *et al*., 2016). Variation among women may be so large that both early reproduction and good health are expressed by the same women (van Noordwijk & de Jong, 1986). Previous studies have suggested that age at first reproduction is a good predictor of individual quality (Viallefont *et al*., 1995; Oli *et al*., 2002; Sear, 2007; Zhang *et al*., 2015; Fay *et al*., 2016), greater reproductive success and adult survival (Stulp *et al*., 2015). For the Roma, it is likely that women who are capable of reproducing very early and staying healthy in later life are probably very healthy to begin with, as indicated by the differences in height (Doblhammer & Oeppen, 2003; Gagnon, 2015). In the present study, Roma women in the earliest AFR group were the tallest, had earliest menarche and greater parity than women in other AFR groups. Cross-cultural studies have found that girls who reach menarche early tend to marry and have their first child at a younger age (Kramer & Lancaster, 2010) and, for Roma women, these allow a head-start on reproduction but without later health consequences (but see Helle, 2008; Sear, 2010). Even after controlling for age, women from the earliest AFR group had more surviving children than the rest suggesting that early AFR may be adaptive, providing the advantage of greater fertility and more surviving children.

In developed populations, early age at first birth has been found to be associated with chronic disease risk factors in both males and females implying a social, rather than biological, path (Hardy *et al*., 2009). For Roma women, the traditional marriage pattern may act as an additional protectant, as teenage motherhood is the customary childbearing pattern and marriage and childbearing take place within the context of extended kinship networks, where child care and other support are readily available (Newson & Richerson, 2009; Kramer & Lancaster, 2010). Roma women become mothers at a relatively early age, and given the universal early age of marriage and reproduction, they also become grandmothers early – another possible benefit of early AFR, as grandmothers are expected to help with child care (Čvorović & Coe, 2017).

As chronic diseases are mostly detected at relatively older ages, Roma children thus benefit from relatively young mothers and grandmothers at the same time. Cross-culturally, evidence suggests that the presence of kin is important in improving child survival, with grandmothers being reliable sources of help (Sear & Mace, 2008).

Finally, social benefits may have an additional protective effect such that any costs of reproduction may not be sufficiently severe to be apparent (Hinkula *et al*., 2006; Grundy & Kravdal, 2007, 2010; Čvorović & Coe, 2017).

Given the heterogeneity of Roma groups, the overall findings of this study do not rule out the possibility that within other groups the associations may differ from the ones observed here. Furthermore, the sample included volunteer participants while health and other variables were self-reported, which may have led to numerous biases. Future studies should assess specific childhood social conditions such as parental investment and kin relations, and whether these interactions may be correlated with health and well-being outcomes in adulthood (Case & Paxon, 2010; Oesch & Dunbar, 2015).

Ethical Approval. Informed consent was obtained from all participants. The author asserts that all procedures contributing to this work comply with the ethical standards of the Helsinki Declaration of 1975, as revised in 2008. Approval to conduct a study of human subjects was awarded by the Institute of Ethnography SASA research committee.

Conflicts of Interest. The author has no conflicts of interest to declare.

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