Association between birth rates and selected socio-economic indicators in a time of economic crisis: the case of Greece

Authors: Effie Simou, PhD; Myrto Stavrou, MSc; Eleftheria Kanavou, MSc; Eleni Koutsogeorgou, MA; Anastasia Roumeliotou, PhD

Contact details of corresponding author (same address for all authors):
Effie Simou
Department of Epidemiology and Biostatistics
National School of Public Health (ESDY)
196, Leoforos Alexandras
11521, Athens
Greece
Tel.: 00302132010376
Fax: 00302106444870
E-mail: esimou@esdy.edu.gr
ABSTRACT

**Background:** The impact of economic prosperity on birth rates is well-known, plus stillbirths’ rates in developed countries are expected to continue decreasing. The aim of this study is to investigate the association of these rates to certain socio-economic indicators in Greece, given the country’s current economic crisis.

**Methods:** National census data on live and stillbirths, Gross Domestic Product, unemployment and at-risk-of-poverty for the period 2003-2011 were provided by the Hellenic Statistical Authority and were analyzed using descriptive and correlation statistics.

**Results:** Analyses indicated that from 2008 to 2011 live births’ rate in Greece dropped, while stillbirths’ rate increased. Correlation analyses showed a linear association of live births to GDP. No significant associations were found between live births and unemployment or at-risk-of-poverty rates. Stillbirths were positively correlated to unemployment, especially of women.

**Conclusion:** The increasing unemployment coincides with an incline in stillbirths possibly due to the increasing share of unsecured population.

**Keywords:** Demographic economics; Birth rate; Stillbirths; Unemployment; GDP; Greece
1. Introduction

The effect of economic recessions on birth rates has been thoroughly discussed, and partly confirmed, throughout time and in different contexts. From a theoretical viewpoint, the association of fertility to prosperity has been a popular belief for centuries. Adam Smith connected affluence to “multiplication of the species” and Becker likened children to commodities, demands for which would increase together with couples’ income increase (Sobotka et al. 2010; Spengler 1976; Becker 1960).

Nevertheless, it occurs that often, but not always, economic recessions lead to a postponement of births, especially first ones, a gap which can later be, at some degree, compensated in periods of prosperity (Neels 2010). Historically, some of the economic crises of the 20th century appear to have influenced fertility rates for at least as long as they lasted. Starting from the Great Depression during the 1930’s, sudden unemployment and general uncertainty both were found to correlate to a decline in births (Kiser and Whelpton 1953). Later, during the mid-1970’s recession, a decline in birth rates was also recorded; however analyses on the respective data are less conclusive than the ones on the Great Depression, indicating that a decline in fertility was mostly a result of attitudinal and cultural indicators, such as the use of the contraceptive pill (Murphy 1992; Murphy 1993).

More recently, the fertility decline in Central and Eastern Europe during the 1990’s has been linked to the economic crisis which followed the collapse of Communism (Ranjan 1999). The trends of Gross Domestic Product (GDP) drop have shown the expected negative association to fertility rates, but as many studies have highlighted, the cases of Central and Eastern European countries followed specific-case patterns;
thus the changing economic conditions can explain only a limited part of fertility change in the area during the 1990’s (Sobotka et al. 2010). For example, in Billingsley’s study (2010) GDP change was positively correlated to fertility rates, even after controlling for inflation, but at the same time, the likelihood of postponing childbirth increased with improved economic conditions.

Apart from birth rates, the potential effect of economic recession on stillbirths has also been discussed extensively during the past few years. However, one should be careful when drawing conclusions on this linkage since stillbirths have been associated with a broad variety of factors. In a UK population study in 2009-2011 stillbirths were correlated to a series of contextual and mother-level factors such as maternal obesity, smoking, pre-existing diabetes, mental health problems and ethnicity (Gardosi et al. 2013); however, the single largest factor was ‘unrecognized fetal growth restriction’, a result consistent with findings from similar studies (Lindqvist and Molin 2005; Stacey et al. 2011). Stillbirth rate has been strongly associated to the absence of integrated prenatal screening tests, prevention strategies and a high level of surveillance before, as well as during, pregnancy (Gardosi et al. 2013). The absence of such tests and preventive measures depends strongly on the level of availability as well as quality of health services, both reflecting the fact that underprivileged populations are at higher risks for still births compared to others.

In order to assess the impact of economic recessions on live and still births rates, a number of indicators have been considered. In a macro-level, GDP is the most sensitive indicator of economic upturns and downturns; for instance, in the 26 Organisation for Economic Co-operation and Development (OECD) countries fertility rates between 1998 and 2008 were more likely to drop when GDP declined (Sobotka et al. 2010).
Apart from GDP variations, unemployment, as a micro-level indicator, has a strong negative influence on fertility rates. Birth rates in 22 countries were found to be negatively associated to unemployment in both genders (Örsal and Goldstein 2010). Female unemployment was found to be associated to low fertility in the US (Manucovich 1996), Belgium, France and the Netherlands, especially for women below the age of 30 (Neels, 2010). By contrast, in England and Wales male unemployment has been found to be associated to lower fertility among women (De Cooman et al. 1987).

Since 2009, Greece, as well as most of the EU countries, has been facing a strong economic recession. Unemployment rates in Greece were over twice as high in 2011 as in 2008 (20.7% and 9%, respectively) while the Greek GDP dropped from 60.0 thousand market prices in 2009 to 51.1 in 2011. In the same direction, recent data (fourth trimester of 2012) revealed that unemployment rate has reached 26% (EL.STAT.)

Based on all above, the aim of this study is to investigate whether the evolution of live as well as still birth rates in Greece is associated to the GDP decline, and/or unemployment and at-risk-of-poverty rates’ incline from 2003 to 2011, considering the current socio-economic environment of the country due to the severe debt crisis since 2009.

2. Methodology

The population and economic indicators/variables used in the current study were provided by the Hellenic Statistical Authority (EL.STAT.) based on national census
data. Indicators were categorized in two groups: birth-related indicators, and socio-economic indicators. Reference years ranged from 2003 to 2011 due to the fact that no data on at-risk-of-poverty rate were available for previous years.

2.1 Birth-related indicators

*Live births per 1,000 inhabitants:* the number of live births\(^1\) occurring during a specific year, per 1,000 estimated inhabitants’ population.

*Stillbirths per 1,000 live births:* the number of stillbirths\(^2\) occurring during a specific year, per 1,000 live births.

2.2 Socio-economic indicators

*Gross Domestic Product (GDP):* GDP at market prices is the final result of the production activity of resident producer units. Annual fourth quarter time period indicator used in this research.

*Unemployed* (in total, males and females): Unemployed are the ones aged 15-74 who were without work during the reference week (they were not classified as employed), were currently available for work and were either actively seeking work in the past four weeks or had already found a job to start within the next three months.

Prevalence of unemployment is computed as the percentage of unemployed within the labor force. Data on annual fourth quarter time periods were used in this research.

\(^1\) ‘Live birth’ is the completed expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached. All live born infants should be registered and counted as such irrespective of the period of gestation or whether alive or dead at the time of registration, and if they die at any time following birth they should also be registered and counted as death.

\(^2\) ‘Stillbirth’ is the birth of infant which does not breathe after extraction from the mother or show any other evidence of life such as beating of the heart or definite movement of voluntary muscles, as death of the fetus occurred after gestation of twenty-eight completed weeks and over, prior to the complete expulsion or extraction from the mother.
At-risk-of-poverty rate (after social transfers): is calculated as the percentage of persons (over the total population) with an equivalised disposable income below the ‘at-risk of-poverty threshold’ (i.e. the equivalised disposable income of each person is compared with the at-risk-of-poverty threshold)³.

2.3 Statistical analyses

Due to the short reference time period of the data, statistical analyses were limited to descriptive statistics and correlations. Pearson’s and Spearman’s correlations were applied to all variables included in the study. Spearman’s correlations were applied in the cases that were not present the prerequisites to conduct Pearson’s correlations. Statistical analyses were performed using the SPSS version 19.

3. Results

Live births per 1,000 inhabitants increased continuously during the period 2003-2008. From 2008 onwards, live births’ rate dropped to 10.45 per 1,000 population in 2009, to 10.15 in 2010, and to 9.39 in 2011 (Figure 1). Stillbirths per 1,000 live births declined from 4.83 per 1,000 live births in 2003 to 3.31 in 2008. By contrast, there had been radical incline in stillbirths from 2008 to 2010 (3.31 and 4.36 per 1,000 live births, respectively) (Figure 1).

³ The methodology for measuring at-risk-of-poverty has been proposed by Eurostat; poverty line is calculated with its relative concept and is defined at 60% of the median total equivalized disposable income of the household, using the modified OECD equivalized scale. As total equivalized disposable income of the household is considered total net income (that is income after deducting taxes and social contributions) received from all household members. More specifically, the income components included in the survey are: income from work, income from property, social transfers and pensions, monetary transfers from other households and imputed income from the use of company car.
The GDP increased from 2003 to 2009, whereas when the downturn started, there had been a decrease of 14.82%, from 2009 to 2011. Simultaneously, percentages of unemployed and at-risk-of-poverty population increased by 100.97% and 8.63% from 2009 to 2011, respectively (Figure 2).

**Figure 1.** Live births per 1,000 population and still births per 1,000 live births, 2003-2011

**Figure 2.** Unemployed and at-risk-of-poverty population, %, GDP, at thousands market price, 2003-2011
Gender differences in unemployment rates were moderated from 2008 to 2011, due to the higher increase in males’ unemployment, with an increase of 235.85% for male and 109.40% for female unemployment, respectively (Figure 3).

**Figure 3.** Unemployed by gender, %, 2003-2011
Based on the Pearson’s and Spearman’s correlation analyses performed (Table 1), it was found that live births rates were highly linearly correlated with GDP (Pearson’s $r(8)=0.894$, $p=0.001$) (Figure 4). No significant correlations were found between live births and the other socio-economic indicators used. Stillbirths rate were positively correlated only to unemployment, and especially to female unemployment rates (Spearman’s $r(8)=0.717$, $p=0.03$) (Figure 5).

**Table 1.** Correlations between socio-economic (unemployment, population at-risk-of-poverty, and GDP) and birth-related (live births and stillbirth) indicators (2003-2011).

<table>
<thead>
<tr>
<th></th>
<th>Unemployed population (% of labour force)</th>
<th>Unemployed males (% of labour force)</th>
<th>Unemployed females (% of labour force)</th>
<th>Population below risk of poverty threshold (percentage)</th>
<th>GDP (at market prices)</th>
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<tr>
<td></td>
<td>Spearman ($r_s$)</td>
<td>Pearson ($r_\rho$)</td>
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<td><strong>Live births</strong></td>
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<td>(per 1,000 inhabitants)</td>
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<td>Correlation Coefficient</td>
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<td>-.317</td>
<td>-.633</td>
<td>-.550</td>
<td>.894**</td>
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<td>$p$-value</td>
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<td>.067</td>
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<tr>
<td><strong>Stillbirths</strong></td>
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<td>(per 1,000 live births)</td>
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<tr>
<td>Correlation Coefficient</td>
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<td>.633</td>
<td>.717*</td>
<td>.113</td>
<td>-.577</td>
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<tr>
<td>$p$-value</td>
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<td>.067</td>
<td>.030</td>
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<td>.104</td>
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</table>
**Figure 4.** Live births per 1,000 population and GDP at tens of thousands market prices, 2003-2011

![Graph showing live births and GDP from 2003 to 2011.](image)

**Figure 5.** Still births per 1,000 live births and prevalence of female unemployment, 2003-2011

![Graph showing still births and female unemployment from 2003 to 2011.](image)
4. Discussion and Conclusions

Our findings indicate that there is a relationship between the economic crisis that has struck Greece from 2009 onwards on one side, and that there is a decline of birth rates and incline of stillbirths during the corresponding years on the other side.

The decline in births rate in Greece after 2009 was found to be in pace with the country’s declining GDP during the corresponding time period. In addition, when looking at birth rate patterns in Greece from 2003 onwards, it is clear that births also increased just before and shortly after 2004, which was a year of GDP growth in Greece, and consequently of improved living conditions for the population, compared to previous years. These findings are in line with the ones from other population studies (Sobotka et al. 2010; Santow and Bracher 2011) which have highlighted that periods of higher birth rates coincide with (or closely follow) times of affluence. In Sweden, for example, a strong effect of recession, as measured by GDP decline, on first-birth rates was detected, with conception rates being reduced by 21% in years of economic recession compared to non-recession periods (Santow and Bracher 2011).

Regarding unemployment rate, it is clear that unemployment relates negatively to birth rates, since the higher the unemployment rate, the lower the birth rate is. In line with findings from other studies (Adsera 2004; Billari and Kohler 2004), our results could indicate that high unemployment rates, especially among young adults, resulting to job insecurity and uncertainty for the future, can explain, at least partly, the decline in birth rates.

Opposite to the findings of the current study, Butz and Ward (1979) suggested that economic prosperity can cause a decline in birth rates since in times of prosperity children would be more costly to raise and women would be more discouraged to do
so. Similarly, despite the fact that in Billingsley’s study (2010) GDP growth was found to be positively correlated to fertility rates, the likelihood of postponing childbirth was also found to increase with improved economic conditions.

Nonetheless, one should interpret the current findings with caution, so no direct causal relationships can be drawn between economic growth and birth rates since many other explanatory parameters or factors, that have not been investigated here, could account for fluctuations in fertility trends.

Certainly, in modern societies the “price” of raising children has spurted since parents wish to ensure that not only do they provide for their children’s basic needs but also for the best possible foundations for a prosperous life, such as a safe home and neighbourhood to grow up in, high quality health care, healthy food and good level of education. However, considering that pregnancies are not always planned, incline in birth rates can also be attributed to general euphoria, increased self-esteem and reduced stress factors related only partially and indirectly to economic development and prosperity. For example, articles in the media have pointed out that births in England and Wales had been falling for at least a decade until the early 2000s, but the year after England’s quarter final success in soccer World Cup and Queen’s celebration of the Golden Jubilee (2002), an increase in births was recorded, with births jumping from 596,122 to 621,469 (increase of 4.25%) (Cecil 2012; Gordon 2012). Similarly, in 2005, the year after Olympic Games were held in Athens and the year of Greece’s success in the European Football Championship, births in Greece rose from 105,917 to 107,584, an increase of 1.57%.

Results on whether economic crisis, as expressed by both GDP change as well as unemployment rates, constitutes a risk factor for stillbirths, were also confirmatory. In
addition, when gender differences in unemployment were analyzed, the results yielded a significant correlation of stillbirths to female unemployment. This finding is in line with findings from other studies (Gardosi et al. 2013; Reeske et al. 2011) highlighting that a fetus at risk is most of the times diagnosable and appropriate maternal-fetal care can lead to well-timed delivery and improved perinatal outcome (Alfirevic and Nielson 1995; Figueras and Gardosi 2010). Due to this fact, stillbirth rates differ by country, from 2 per 1,000 births in Finland and Singapore, to 47 in Pakistan and 42 in Nigeria per 1,000 births, respectively. Worldwide, stillbirth rate has dropped by 14.5%, from 22.1 stillbirths per 1,000 births in 1995 to 18.9 stillbirths per 1,000 births in 2009. In 2009, 76.2% of stillbirths occurred in South Asia and Sub-Saharan Africa indicating once again that low-income populations are much more vulnerable compared to high-income ones (Cousens et al. 2011).

As stated in the recent WHO Report on Maternal, Newborn & Child Health (PMNCH) (WHO 2011), if every woman could have access to a properly skilled birth attendant (i.e. midwife and/or physician) that could provide both basic and specialized care (such as emergency caesarean sections), then there would have been a significant decrease of the number of stillbirths. The findings of the current paper on stillbirths in Greece are rather alarming, especially when considering the continuously increasing rate of unemployed and, consequently, unsecured mothers-to-be. With youth (and especially female) unemployment in Greece reaching all-time highs, not everyone can afford specialized laboratory tests and exams that could detect potential stillbirth risk factors.

The performance of the health care system itself in Greece has been declining since the beginning of the economic crisis and, as expected, vulnerable groups – in our case the low-income and unemployed ones – have been particularly affected by this
change. Indeed, data from the recent EU-SILC Survey (2011) have revealed that the percentage of Greeks reporting omitted medical care, despite needing it, also because of its high cost, reaches the 6.2% and constitutes the highest respective percentage in Europe together with the one of Poland. Further reductions to access to healthcare services are expected in the near future for Greece once the imposed austerity measures become fully implemented.

Given that stillbirths are preventable to a high degree and depend on the quality of care in maternal health programmes, WHO has proposed a series of key interventions to strengthen existing programmes including comprehensive emergency obstetric care, detection and management of fetal growth restriction, detection and management of hypertension during pregnancy, identification and induction for mothers with >41 weeks gestation, folic acid fortification before conception, and detection and management of diabetes during pregnancy (WHO 2011).

One of the limitations of the current study is that our results on both the decline in birth rates and the incline in still births cannot be generalized since long-term effects of the current economic recession on population’s demographic characteristics will be safely interpretable using data that will be published in the near future; therefore, debt crisis’s effects on poverty, unemployment, insurance and consequently birth rates will be safely evaluated in the years to come. Another limitation, is that there might have been factors other than the ones included in the current study which have influenced birth rates in the given time period, such as delay of family formation due to better-educated women or rise in housing prices, however, according to Sobotka et al. (2011) the most important variable adding pressure on fertility is unemployment, which has been investigated and confirmed in our study. Moreover, given that data on unemployment are available per gender and not by marital or parental status, it should
be clarified that unemployed (and consequently unsecured) women, mothers and mothers-to-be rates are only quasi-coinciding. Nevertheless, the findings are of high value for triggering the implementation of encouraging measures and interventions for young and unemployed couples who wish to conceive together with measures for providing unemployed expecting mothers with the appropriate prenatal care.

Declining birth rates have been a persisting pattern in population change, during the last decades throughout developed countries. For instance, in EU-27 countries, from the 1960s up to the beginning of the 21st century, the number of live births in the EU-27 declined from 7.5 to 5.0 million. In Greece, live births per 1,000 population, dropped from 28.35 in 1932, to 18.01 in 1962 and 9.31 in 1998. In 2010, live births inclined slightly to 10.15 per 1,000 population (EL.STAT. 2012). Nevertheless, birth rates in Greece were traditionally lower than the respective EU-27 average, with the EU average reaching 10.6 births per 1,000 inhabitants in 2000, while the same year in Greece births were 9.5 per 1,000 inhabitants. During the period 2006-2009 this difference was moderated but from the start of the economic recession onwards, the differences escalated again. This finding, in combination to the continuously rising percentage of population over 65 years old, raises the alarm about a gradual ageing of the Greek population; indicative of this is the fact that the aged to children ratio from 23% in 1951 reached 110% in 2001 and is expected to reach 247% in year 2050 (EDIM 2013). In times of economic recession it is imperative to tackle the issue of declining births as well as inclining stillbirths by providing population with the security of prenatal and perinatal care, as well as with benefits for raising children. Examples of such measures and benefits are the provision of welfare payments to families with more than one child, and to the low-income or unemployed individuals who wish to conceive, as well as the guarantee that each mother-to-be will have
public insurance – at least for as long as she is expecting. Indicatively, measures implemented in Germany to address the issue of declining birth rates included an increase in government subsidies to families with children, benefits for parents who stay home to care for newborns, leave payments for new fathers, and an expansion of day-care services (Versieux 2012).

Since the effect of economic recession is not the same for all population groups, future research on the topic can investigate the potential differences in economic recession’s impact to births’ decline by evaluating a set of additional factors such as parents’ education, parents’ residence level of urbanicity and cultural parameters, such as religion and attitudes towards contraception.
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