

Changes in Total Number of Births and Birth Size during the 1995-2013: The Reflection of Socio-Economic Fluctuations in Lithuania?

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ABSTRACT

The aim of the study was to examine changes of total number of births and birth weight of Lithuanian newborns during the 1995–2013 in relation to the national and regional socio-economic welfare and governmental maternity support. The present results were based on Lithuanian Medical Data of Births Register. Only data of single newborns of identifiable sex, whose mothers were citizens of Lithuania, were included into the present analysis, and total number of analysed cases was N=597091. The total number of births dramatically decreased during the 1995-2002, slightly increased in the 2007-2009, and decreased again in the 2010-2013. Diminishing index was in line with increase of unemployment rate and decline of total Lithuanian population. Increase in number of births was estimated only in the 2007-2009, when maternity benefits were increased very evidently. The significant differences of mean birth weight by year were observed: the decrease in boys' weight was detected in the 2001-2003, and the decrease in girls' weight was detected in the 1995-1996 and in the 2001-2003 ($p < 0.05$). However, the increase in weight of both sexes was observed in the 2008-2010 (right after raised maternal allowance). The prevalence of low and suboptimal birth weight was the highest in the 2002 and the lowest – in the 2008-2010 years. The obvious regional differences in changes of total number of births and birth weight were estimated.

Key words: total number of births, birth weight, socio-economic indicators, Lithuania.

Introduction

It is known that exposure to stressful events during the pregnancy could impair fetal development: mothers who experience high stress levels during the pregnancy tend to have poorer birth outcome^{1,2}. The leading hypothesis is that stress during the pregnancy could have negative effects on the fetus through neuroendocrine changes, changes in immune function, also through behavioral channels³. Many researchers have focused on investigations of cortisol and corticotropin-releasing hormone, which regulate the response to stressors, the development of the fetus, and the timing of birth⁴.

There is number of empirical studies, which used data, obtained after so called natural quasi-experiments to investigate how the environment might affect pregnant woman and the fetus. Scientists have made important

contributions by considering a wide range of exposures, which include natural and man-made catastrophes⁵⁻¹⁰. Shocking events, for example, terrorism and natural disasters, can decrease birth weights and shorten gestation^{8,11}. However, these events were very extreme, and it is not clear if common situations that lack physical destruction and involve less acute experiences of stress might influence mother and fetus. There are some data, that economic crises¹²⁻¹⁵ and policy changes^{16,17} influenced birth outcomes and infant's health as well.

Numerous studies link economic difficulties to worsening mental well-being of many populations. Paul and Moser's (2009)¹⁸ after extensive meta-analysis showed that unemployed people have experienced more distress, depression, and anxiety. A comprehensive review by Goldman-Mellor et al. (2010)¹⁹ concluded that loss of employment significantly has decreased mental health of person

and raised the risk for suicide and violence. Results from the Moving to Opportunity experiment suggest that subjective well-being is especially sensitive to the economic and social characteristics of the local community²⁰. Perhaps, the most common stressors are personal finances, jobs, and economic conditions²¹.

Lithuania restored independence in 1990 and became a country member of European Union since the 2004.

Since then, the main economic indicators were improving in general, but analysis of the economic development of Lithuania in 1990–2011 identified three financial crises that affected the country’s economy: internal Banking crisis at 1995, Russian financial crisis at 1998, and the Global financial crisis at 2008²². It was estimated that the latter one had the greatest impact on the economy of Lithuania and occurred as real estate bubble, debt crisis, also

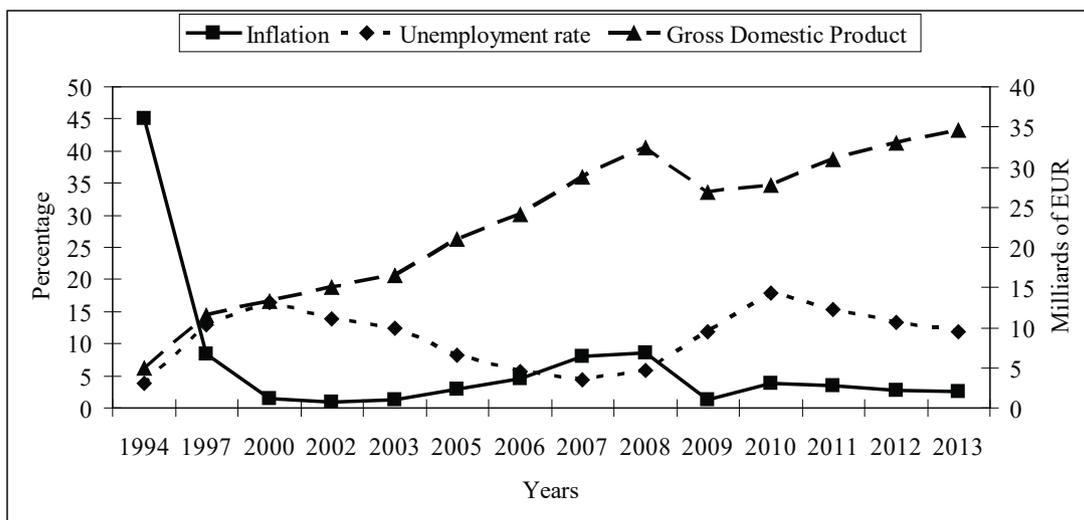


Fig. 1. Dynamics of the main economic indicators in Lithuania during the 1994-2013 (according to the data of Statistics Lithuania: <http://osp.stat.gov.lt>).

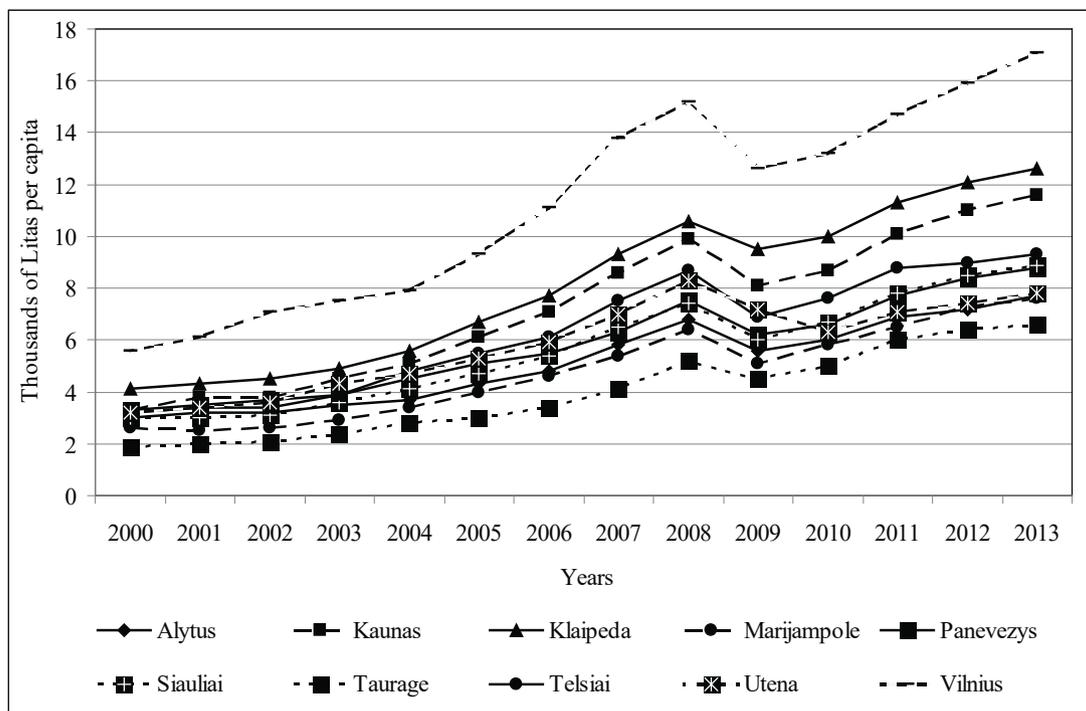


Fig. 2. Dynamics of the Gross Domestic Product (GDP) per capita in districts of Lithuania during the 2000-2013 (according to the data of Statistics Lithuania: <http://osp.stat.gov.lt>).

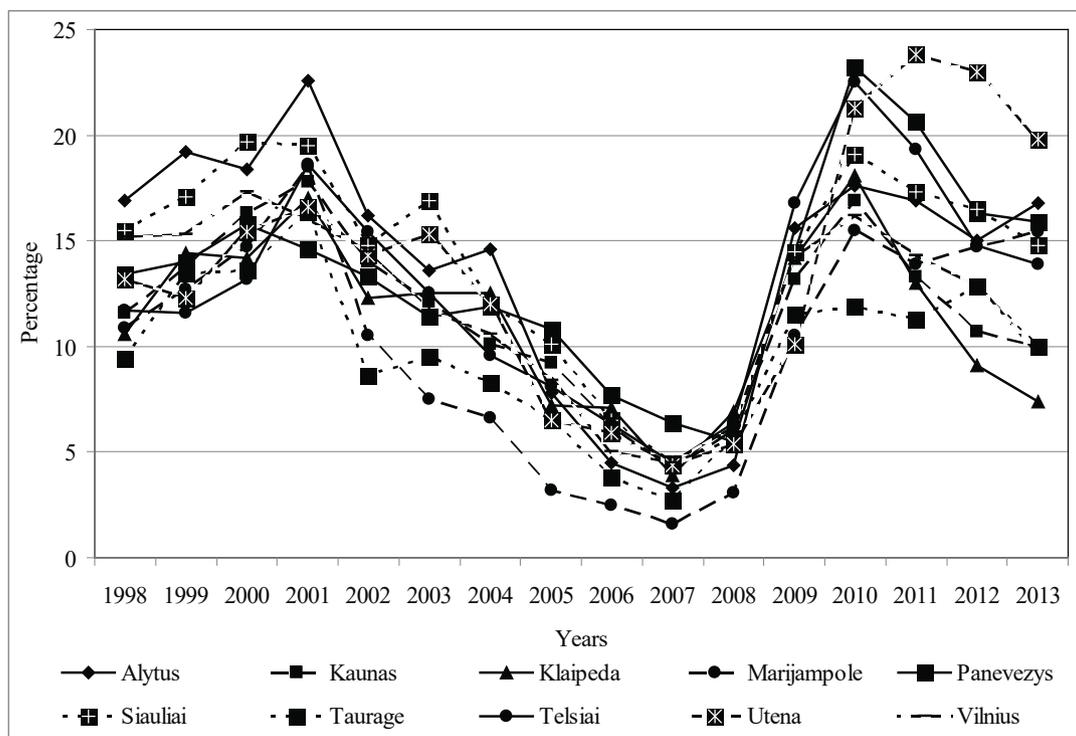


Fig. 3. Dynamics of the unemployment rate in districts of Lithuania during the 2000-2013 (according to the data of Statistics Lithuania: <http://osp.stat.gov.lt>).

banking crisis. All financial crises had a major effect on gross domestic product (GDP) growth, labor market, and budget balance²². Within one year (2008–2009), in Lithuania GDP per capita decreased by more than 20%, and the unemployment rates had more than tripled by the 2010 in comparison to 2007, reaching almost 18%²³. However, the economy in Lithuania after the global crisis, in general,

has already been recovering step by step (Figure 1), but relatively large differences between the regions of Lithuania have existed during the entire period of independence (Figures 2 and 3). It is evident, that some regions were growing much faster (Vilnius, Klaipeda, Kaunas), and the unemployment rates in these towns have been lower if to compare to the other regions.

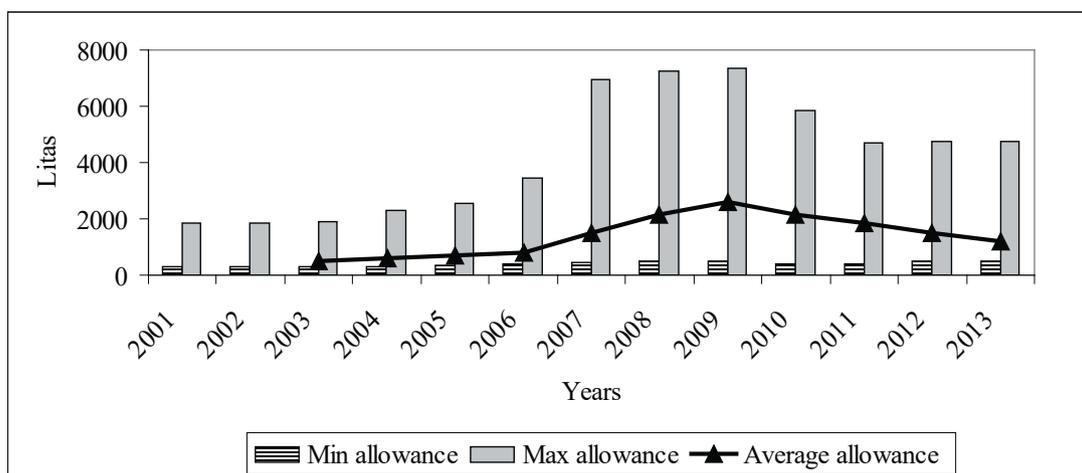


Fig. 4. Governmental maternity support in the 2001-2013 (in litas: 1 Eur=3.4528 Lt). Data about maternity support was obtained by personal communication with the staff of SODRA (State Social Insurance Fund Board under the Ministry of Social Security and Labor). Min – minimum, Max – maximum.

There were huge changes in the policy of maternity allowance during the independence period (Figure 4). The maternity allowance (up to 18 months of child’s age) was about one minimal living wage (50-125 Lt; 1 Eur = 3.4528 Lt) in 1991-1995. In 1995-2000 it was restricted up to 1 year and compounded 60 % of the average monthly wage, but not less than minimal monthly wage (e.g. not less than 430 Lt in 1999). Since the 2001, maternity allowance percentage has been related to the former average monthly wage and insured income, max allowance was determined as well. Percentage of compensated past average monthly wage was growing till the 2009. Maternity leave was prolonged up to 2 years of child’s age in 2008, besides, maternity allowance became equal to average monthly wage of the mother on the first year of child’s age and compounded 85% of the former salary - on the second year. However, percentage of maternity allowance was decreased until

75% on the second year of child’s age in 2009 (then the economic crisis increased), and even more in 2010 – up to 70% in the first year and up to 40% in the second year. Data about maternity support was obtained by personal communication with the staff of SODRA (Data of State Social Insurance Fund Board under the Ministry of Social Security and Labor).

The Medical Data of Births Information System is functioning in Lithuania since the 1st of January, 1993. The analysis of medical data of births was initiated by the Department of Neonatology of Vilnius Perinatology Centre. The first publication of Lithuanian Medical Data of Births Register was issued in 1995²⁴. Lithuanian national and regional register data on neonatal body size were not summarised, and the tendencies in weight changes were not analyzed with respect to economic and regional factors.

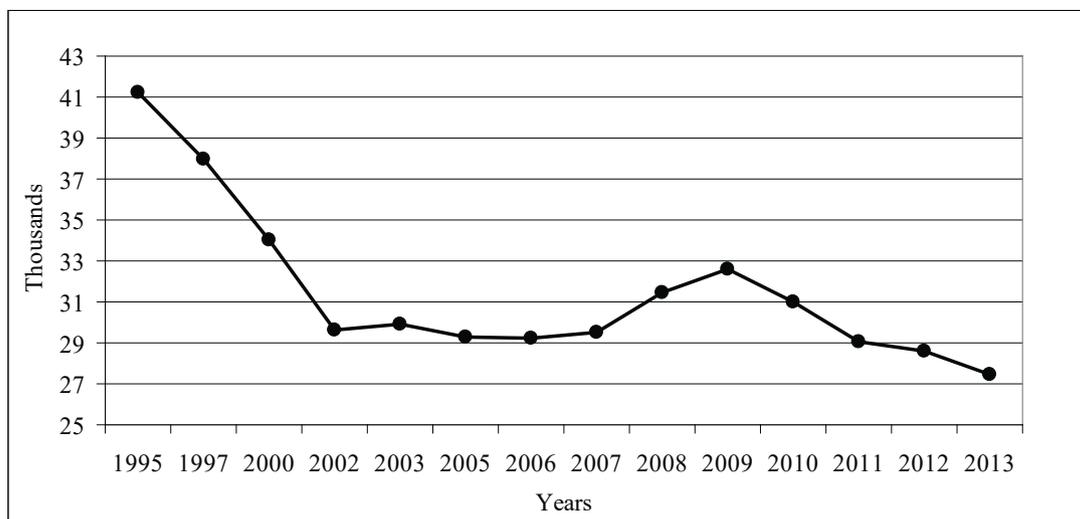


Fig. 5. Total number of births in Lithuania during the 1995-2013 (according to the data of Lithuanian Medical Data of Births Register).

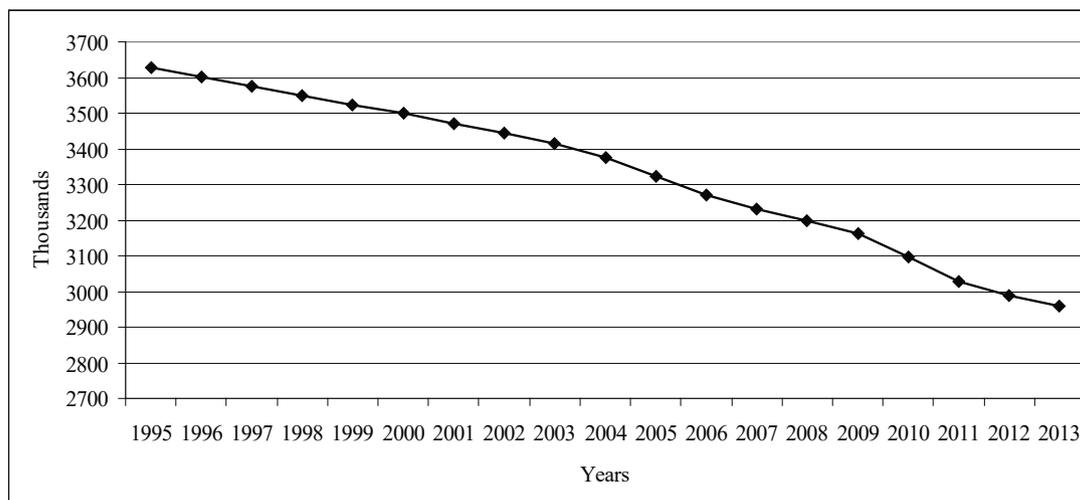


Fig. 6. Changes in number of citizens in the 1995-2013 (according to the data of Statistics Lithuania: <http://osp.stat.gov.lt>).

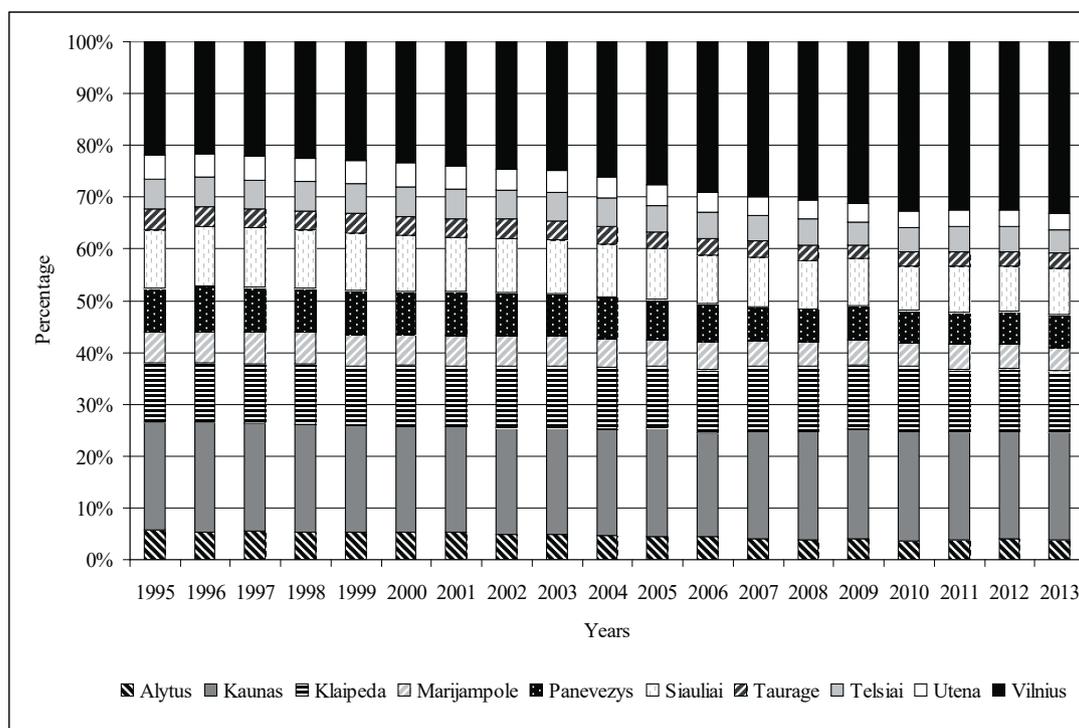


Fig. 7. Changes in prevalence of births (%) by districts in the 1995-2013 (according to the data of Lithuanian Medical Data of Births Register).

The aim of this study was to changes of total number of births and birth weight in Lithuanian newborns in relation to economic, political and regional factors.

Materials and Methods

The present results were based on the data from Lithuanian Medical Data of Births Register (total number of births during the 1995-2013 was $N=614\ 605$). There is discrepancy between the total number of births at Medical Data of Births Register and the data of Statistics Lithuania. The latter provides cumulated number of newborns born in Lithuania and in the families living abroad. It was the reason, why we choose to analyze the total number of births, not the birth rate (this index is provided only by Statistics Lithuania and is not included to the Register).

Data on live born newborns (sex, number of fetuses, birth weight) and mother's living place were analyzed – in total body weight of newborns from 10 districts of Lithuania (Alytus, Kaunas, Klaipeda, Marijampole, Panevezys, Siauliai, Taurage, Telsiai, Utena, and Vilnius – the capital of Lithuania) were compared. Only data of single newborns of identifiable sex, whose mothers were citizens of Lithuania, were included into the present analysis, and total number of analysed cases was $N=597091$. Analyzed birth weights were divided into the following categories: extremely low weight – below 999 g, very low – 1000-1499 g, low – 1500-2499 g, suboptimal – 2500-2999 g, normal – 3000-3999 g, high – 4000-4499 g, and very high weight – above 4500 g.

Data on changes in the main economic indicators (GDP – gross domestic product per capita and unemployment rate) in all Lithuania and at the different regions were withdrawn from the website of Department of Statistics under the government of the Republic of Lithuania²⁵.

Statistical analysis of data was performed using standard statistical programs (SPSS 17.0, EXCEL). The major procedures of descriptive statistics and one-way ANOVA were performed. T test with arcsinus transformation was used to compare proportions. The comparison of results of present study with the data of other Baltic states^{26,27} was made. A p value of <0.05 was considered to indicate a statistically significant difference.

Results

During study period, the total number of births diminished dramatically during the 1996-2002, stabilized in 2003-2007, increased slightly in 2008-2009 and dropped to the lowest point in the 2013 (Figure 5). The curve of changes in total number of births was in parallel to the shifts in socioeconomic indicators, especially, coincided with the fluctuations in unemployment rate (Figure 1). Diminishing number was in line to decrease in Lithuanian population (Figure 6). It seems that changes in the maternity allowance policy influenced the total number of births positively: after the maternal allowance has been related to the average monthly wage in the 2001, the index had stabilised in 2003-2006, and increased in 2007-2009,

TABLE 1
DISTRIBUTIONS OF BIRTHS IN DIFFERENT WEIGHT CATEGORIES DURING THE 1995-2013

Year	Frequencies in weight categories, percentage (%)						
	Extremally low	Very low	Low	Suboptimal	Normal	High	Very high
1995	0.1	0.4	3.1	11.0	71.7	11.8	1.9
1996	0.2	0.4	3.0	11.1	70.8	12.3	2.1
1997	0.2	0.4	2.9	10.9	71.4	12.2	2.1
1998	0.2	0.4	3.1	10.6	70.7	12.8	2.2
1999	0.3	0.4	3.0	10.8	70.7	12.7	2.1
2000	0.3	0.4	3.2	11.1	69.7	13.2	2.2
2001	0.2	0.4	3.2	11.8	70.1	12.3	1.9
2002	0.2	0.4	3.5	11.5	70.6	11.9	1.9
2003	0.3	0.4	3.1	11.5	70.6	12.1	2.0
2004	0.2	0.4	3.3	11.0	70.7	12.6	1.9
2005	0.3	0.4	3.3	11.3	69.9	12.6	2.4
2006	0.3	0.3	3.1	11.4	69.8	12.8	2.2
2007	0.3	0.3	3.1	11.3	70.4	12.4	2.3
2008	0.2	0.3	3.1	10.3	70.2	13.5	2.4
2009	0.2	0.3	2.9	10.5	70.2	13.6	2.4
2010	0.2	0.3	2.9	10.8	71.0	12.7	2.2
2011	0.2	0.4	3.0	10.8	71.0	12.4	2.2
2012	0.3	0.4	3.1	11.0	70.6	12.6	2.0
2013	0.2	0.4	3.2	11.0	71.0	12.1	2.0

when maternity benefits were increased very evidently (Figure 4).

Redistribution in frequencies of deliveries by districts was observed (Figure 7). During the 1995-2013, the total number of deliveries has increased only in two districts (11.2 % in Vilnius district and 0.6 % in Klaipeda district), while it decreased in all other districts, especially (more than 2 %), in Panevezys, and Siauliai districts. These changes have coincided with the regional fluctuations in socioeconomic indicators (Figures 2 and 3) and total number of citizens within the country and in different regions (Figures 6 and 8).

Some annual differences in weight of live born singleton boys and girls during the 1995–2013 were detected (Figure 9). One-way ANOVA showed the significant differences in changes of mean birth weight by year: the decrease in boys' weight was detected in the 2001-2003 ($p < 0.05$), and the decrease in girls' weight was detected in the 1995-1996 ($p < 0.05$), and in the 2001-2003 ($p < 0.05$). However, the increase in weight of both sexes was observed in the 2008-2010 (right after raised maternal allowance; $p < 0.05$). The difference between minimal and maximal average weight in girls was insignificantly slightly bigger than in boys (52.57 g and 48.74 g – respectively). The most evident changes in mean birth weight coincided with the changes in socio-economic indicators that decreased in the 2000-2002 and increased in the 2007-2008 (Figures 1 and 9).

The distribution of births in different weight categories was analyzed as well (Table 1). The prevalence of extreme-

ly low (0.1-0.3 %) and very low (0.4-0.3 %) birth weights was almost the same during the all analyzed years, and changes were statistically insignificant. The prevalence of low birth weight was the highest in the 2002 and the lowest – in the 2009-2010 years (the biggest difference was 0.6 %; $p < 0.05$). The prevalence of suboptimal weight was the highest in the 2002 and the lowest – in the 2008 years (the biggest difference was 1.5 %; $p < 0.001$). The number of high birth weight deliveries was the highest in the 2009, and the lowest – in the 1995 and 2002 years (the biggest difference was 1.8 %; $p < 0.001$). Very heavy babies were born most frequently in the 2005 and the 2009-2010, the least frequently – in the 1995 and 2001-2002 years (the biggest difference was 0.5 %; $p < 0.05$).

The annual changes of mean newborn weight in different Lithuanian regions were analyzed all together (not splitting data by sex). Regional mean birth weights fluctuated similarly to mean birth weights of all the country, despite that the lowest and the highest values in various districts were more widely distributed in time (Figure 10). The most stable mean of newborns' weight was detected in Kaunas district (min/max value difference was 34.84 g; $p < 0.05$), the most labile mean weight was in Alytus (min/max value difference was 85.07 g; $p < 0.001$). The biggest mean birth weight had newborns from Western part of Lithuania (Klaipeda, Telsiai districts) and the smallest – from South-East districts (Utena, Marijampole, Alytus). Mean birth weight of newborns from Vilnius district was very close to the average of all the country, especially during the last ten years.

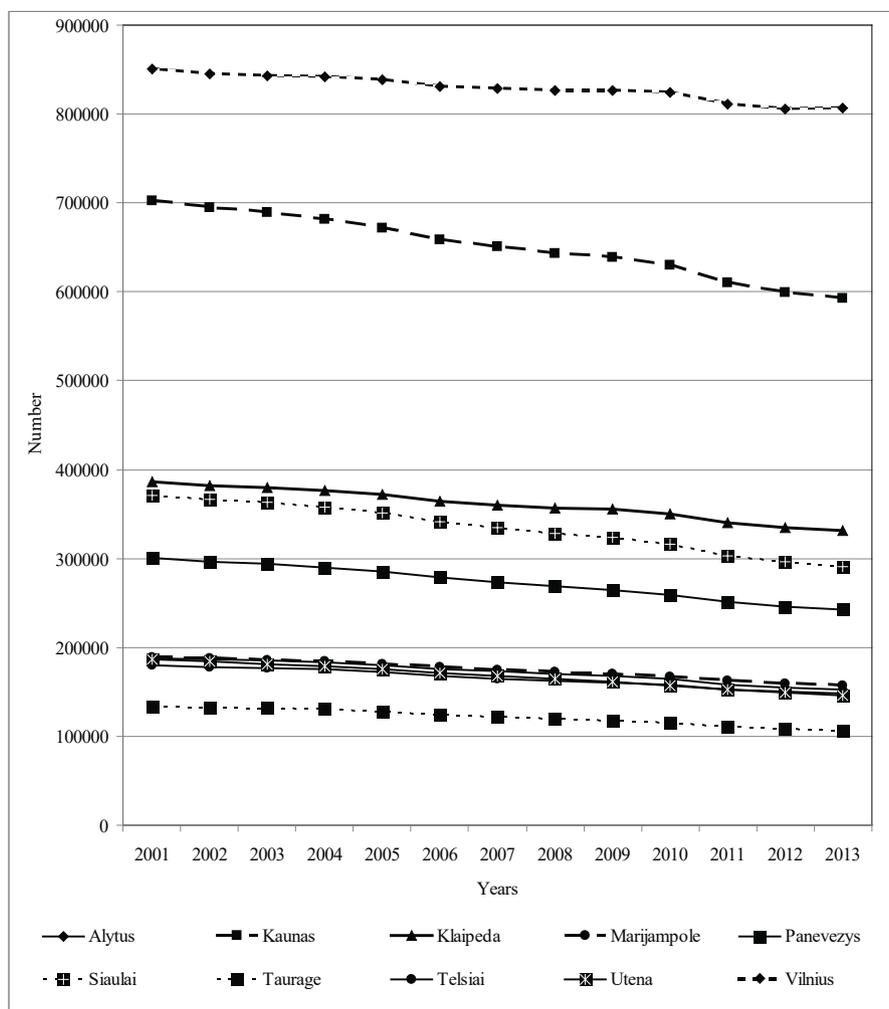


Fig. 8. Changes in number of citizens by districts in the 2001-2013 (according to the data of Statistics Lithuania: <http://osp.stat.gov.lt>).

Discussion and Conclusion

Two evident declines in total number of births during the 1995-2013 were estimated: the first lasted from the 1995 to 2002 and the second – from the 2009 to 2013 (Figure 5). Both decreases coincided with the changes in socioeconomic indicators (Figure 1) and the decrease in total Lithuanian population as well (Figure 6). The period of stabilization and increase in total number of births was observed in the 2003-2009, and that was in parallel not only with the improving economic situation of the country, but also with the changes in maternity allowance policy, which positively influenced the index: the maximum number was detected at the period of peak maternity benefits (Figure 4). Besides the other reasons, the growing emigration from Lithuania played very important role in decrease of population size and total number of births during the study period (Figure 11). That led to discrepancy between the total number of births at Medical Data of Births Register and the data of Statistics Lithuania which provides total number of newborns born in Lithuania and

in the families of emigrants. Number of babies, who were born abroad was growing year by year since the 2001 (Figure 12, data of Statistics Lithuania), but data on those babies were missing in Medical Data of Births Register. It is important to emphasize that during the study period the crude number of deliveries has increased only in two districts (by 11.2% in Vilnius and by 0.6% – in Klaipeda district; Figure 7), while it had decreased in the other districts. These demographic changes reflected the economic situation in Lithuania during the last decades – life in the capital city Vilnius and port town Klaipeda was improving while the economic welfare in the other regions was falling behind leading to huge regional differences.

The total number of births in Lithuania was compared with the same indices at the other two Baltic countries during the 1992-2013 (Figure 13, data from Estonian and Latvian databases^{26,27}). All three Baltic countries have demonstrated very similar demographic crises, but the extent of the problem had differed: during the study period, total number of births in Lithuania had decreased by 48%, in Latvia – 35%, and in Estonia – by 25%.

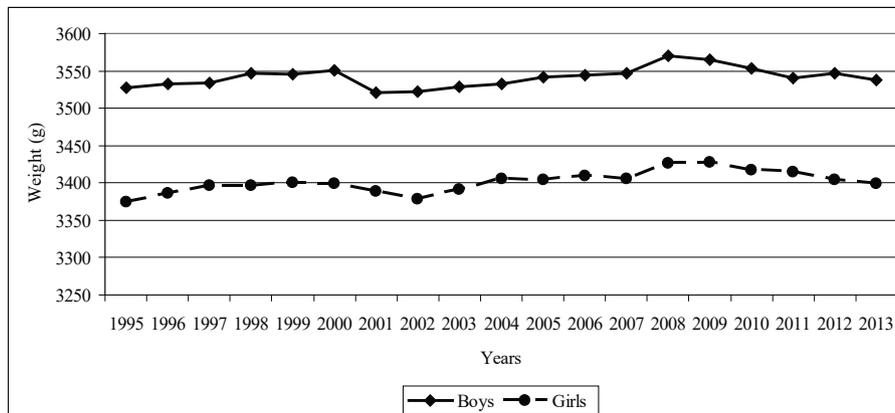


Fig. 9. Changes of the mean weights of live singleton newborns during the 1995-2013. g – grams.

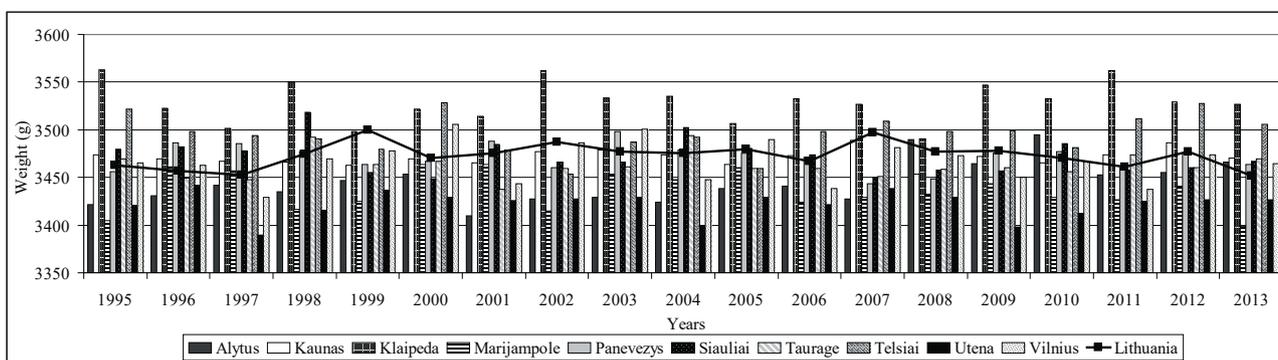


Fig. 10. Changes of the mean weights of live singleton newborns during the 1995-2013 in different districts. g – grams.

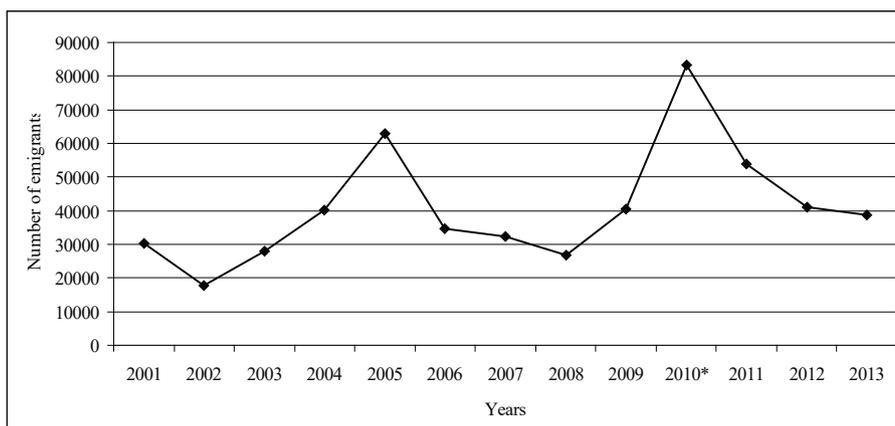


Fig. 11. Emigration in the 2001-2013 (according to the data of Statistics Lithuania: <http://osp.stat.gov.lt>). * It is argued that a striking increase in emigration numbers in 2010 and 2011 was partly due to an introduced mandatory health insurance contribution applicable to all permanent residents of Lithuania. This encouraged those, who had emigrated earlier, to declare their departure in 2010 in order to avoid payments. Therefore, the number of emigrants in 2010 and 2011 potentially includes those who emigrated earlier.

Birth weight is the most widely available measure of foetal health, and is often treated as a summary measure, that reflects not only the biological situation of the mother’s

organism, but also the societal welfare²⁸⁻³⁰. Our findings showed that the most evident changes of the mean birth weight coincided with the changes in socio-economic indi-

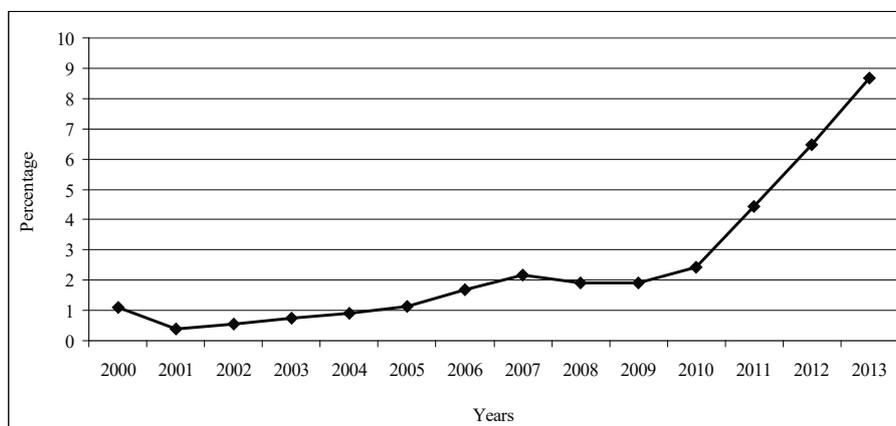


Fig. 12. The number of children born abroad and registered in Lithuanian civil institutions in the 2000-2013 (according to the data of Statistics Lithuania: <http://osp.stat.gov.lt>).

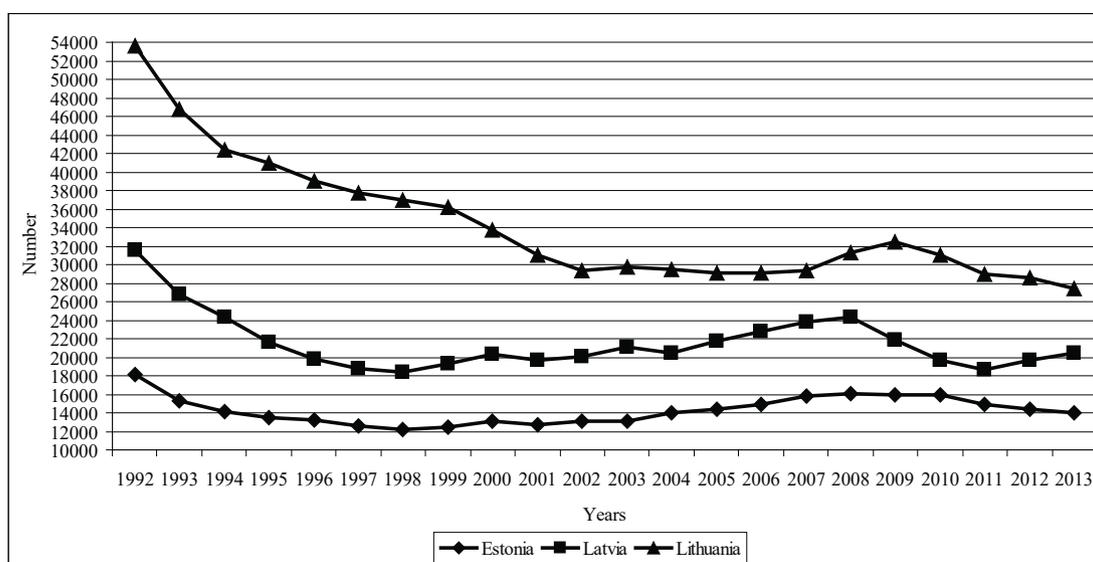


Fig. 13. Total number of births in three Baltic states during the 1992-2013 (according to the data of Lithuanian and Estonian Medical Data of Births Registers and Central Statistical Bureau of Latvia).

cators. Increasing inflation was in parallel to the most rapid growth of GDP, and few waves of increased unemployment rate were obvious (in 1997-2001 and 2009-2010) (Figure 1). Side by side to unemployment rate with approximately one-year delay the biggest decrease in birth weight has occurred in the 2001-2002 and the 2010-2011, and the obvious increase in number of births was observed in the 2007-2009 – during the peak maternal benefits (Figures 1 and 9). It is obvious that unemployment rate is very important indicator influencing birth weight. The regional data analysis supported this idea, and showed that in the settlements with the worse economic indicators the mean birth weight was lower than in the others. Several other studies have demonstrated that national economic crises had strong impact on pregnant women. For low-income

households, national economic crises evidently reduce the real household income, also food consumption²³. Pregnant women in low-income households are especially vulnerable during the economic crises, since reductions in food consumption increase the probability of adverse birth outcomes such as low birth weight. The prevalence of low birth weight cases may range widely during economic crises: from 1% (economic crisis in Argentina during the 2000-2002³¹) to 33% (economic crisis in Tanzania in the 2008¹⁴). Study of K. Carlson (2015)³² showed that only the fear to loose job might influence birth weight – mean birth weight have decreased by 15–20 g during a brief period before the large job loss event. This study suggests that the arrival of bad news may be marked by the increase in low birth weights and number of preterm births. Not only workers

losing jobs might be affected, but their family members, remaining co-workers, and the other members of the community could be affected as well.

Present knowledge of human biology as well as animal models – both supported the notion that stress during the pregnancy might create long lasting harm to offspring, and that's for antenatal leave might be considered as the population-level intervention for improving birth out-

comes^{33,34}. Our data showed the positive effect of higher maternity leave allowance not only on the increase in number of deliveries but also the positive linkage to the increase of birth weight as well. However, further studies with respect to stress influence upon birth outcomes should be expanded on the individual level with the purpose to explore complex mechanisms of interaction between fetus, mother and the external environment.

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PROMJENE U UKUPNOM BROJU ROĐENIH I VELIČINI ROĐENJA TIJEKOM 1995.–2013.: RAZMIŠLJANJE SOCIOEKONOMSKE FLUKTUACIJE U LITVI?

SAŽETAK

Cilj istraživanja bio je ispitati promjene ukupnog broja rođenih i porođajne težine litavskih novorođenčadi tijekom razdoblja od 1995. do 2013. u odnosu na nacionalnu i regionalnu socijalno-ekonomsku dobrobit i državnu potporu rodiljama. Sadašnji rezultati se temelje na litavskim medicinskim podacima rađanja. U analizu su uključeni samo podaci jedinki novorođenčadi prepoznatljivog spola, čije su majke bile građani Litve, a ukupan broj predmeta koji su anali-

zirani bio N = 597091. Ukupan broj poroda dramatično je smanjen tijekom 1995.-2002., neznatno je porastao u razdoblju od 2007. do 2009., a potom se opet smanjio za razdoblje od 2010. do 2013. godine. Smanjenje indeksa bilo je u skladu s povećanjem stope nezaposlenosti i smanjenjem ukupne populacije Litve. Povećanje broja rađanja procjenjivalo se samo u razdoblju od 2007. do 2009. godine, kada su se očigledno povećale naknade za porod. Uočene su značajne razlike u prosječnoj težini rođenja do godine: smanjenje težine dječaka otkriveno je u razdoblju od 2001. do 2003., a smanjenje težine djevojčica otkriveno je u razdoblju od 1995. do 1996. godine i od 2001. do 2003. ($p < 0.05$). Međutim, povećanje težine obaju spolova zabilježeno je u razdoblju 2008.-2010. (Odmah nakon podizanja majčinog doplatka). Prevalencija niske i suboptimalne težine rođenja bila je najviša u 2002. i najniža - u razdoblju od 2008. do 2010. godine. Procijenjene su očite regionalne razlike u promjenama ukupnog broja poroda i porođajne mase.