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Inequalities in the health of newborns in the Czech Republic: Birth cohort 1994–1998

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Abstract: There is evidence that infant quality (adjusted odds ratio of congenital anomaly) is determined by macro-level factors as well as individual risk factors. Using data for 475 834 infants in the Czech Republic in 1994–98, this study considers horizontal and vertical locality level determinants for newborn health. The biodemographic and social characteristics of infants and their mothers, infant birth weight, birth order, as well as mothers age, marital status and education level are found to be independently associated with infant health, but do not fully explain differences between geographical areas.

Keywords: infants, quality of health, regional differences

Introduction

A number of studies have shown that major health inequalities exist between different geographical areas within the Czech Republic. Patterns of social and regional inequality in reproductive health in the Czech population have also been identified. The health of newborns has often been considered a sensitive indicator of certain levels of social development. Differences in Czech infant mortality have been described in many analyses of routine data (Rychtaříková, 2001; Gerylovová, 1997). However, there has been some debate over the mechanisms underlying area-related health differences during the first stage of the human life. One way of explaining these differences is to look at individual infant records of congenital anomalies in the regions studied. Many studies argue that individual socio-economic factors can explain most differences in health. On the other hand, other studies hypothesize that ecological or environmental effects on health exist independent of individual levels factors. Furthermore, many studies point out inequalities in infant survival within a population according to biological, social and behavioral factors (Rychtaříková, J., 1999).

Despite recent progress in prenatal diagnostics, congenital malformations continue to be one of the main causes of infant mortality. They are also important in terms of the quality of a new generation from a life course perspective. The consequences of congenital malformations constitute a problem for society at large, and a significant burden for affected families. Continuous, long-term monitoring of such malformations provides the information necessary for regional planning and health status assessments, and makes it possible to develop strategies to mitigate the negative impacts of the environment on population health. The monitoring of congenital malformations has a long history in the Czech Republic, dating back to the early 1960's; thus we are provided with uninterrupted observations dating back nearly 40 years.

Infant mortality has declined in the past years because of advances in public health and clinical medicine, though infant mortality attributable to birth defects has not declined as rapidly as overall infant mortality (Rosano, 2000). Congenital anomaly-related deaths are the leading cause of infant mortality, and are examples of the potential adverse effects of behavior and environment on reproductive health. Main reproduction models are changing in practically all of Europe due to demographic changes and medicinal technology (total fertility decrease, childbearing post-ponement, increasing maternal age, a growing number of surviving infants with constantly lower birth weight, and spreading assisted reproduction). The quality of children and reproductive health is changing.

The purpose of this study is to investigate differences in infant risk of congenital anomaly in the Czech Republic. We used individual data from 3 certifications (databases) to investigate if existing: Congenital anomaly differences between areas (macroregions) are explained by local individual risk profiles of infants and their mothers, or are other factors, i.c. environmental having an increasing effect.

Incidences of congenital anomalies in the Czech Republic after 1965

An assessment of the trends in the incidence of congenital malformations registered after 1965 makes it possible to detect two distinct periods corresponding to different phases in the Czech population's reproductive behavior; before 1975 and after 1975. While 1965–1975 was a period that saw a continually increasing birthrate, post-1975 period saw a gradual decline. In 1974 and 1975 the registered number of births reached their maximum after 1965 (194 000 and 191 000, respectively). The absolute amount of detected congenital malformations peaked as well, surpassing 3000 in 1975. Although in the following years there was a decline in congenital anomalies, it was less pronounced than the corresponding decline in births. The incidence rate therefore increased, particularly in the period after 1990. In 1988, over 3000 congenital malformations were diagnosed – an amount equal to that registered in 1975. However the underlying number of live births was only half of the 1975 figure. In fact, the incidence of congenital malformations rose markedly during the period under consideration: from less than 1 % in 1965 to almost 3 % in 1998. Given the near-linear increase over the last 35 years, it can be expected that the proportion of children born with congenital anomalies will continue to grow in the Czech Republic (Dzúrová, D., Šípek, A., 2001).

Materials and Methods

Study population

The present study is based on individual anonymous records of births, congenital anomalies, and infant deaths. The three datasets, include both medical and social variables, and provide a unique opportunity to study, at an individual level, the association between geo-demographic factors, congenital anomalies, and deaths during the first year of life. For the purpose of this study, a specific data set was created. A total of 475 834 infants (live births and stillbirths) in the Czech Republic from 1994–98 were matched with congenital anomalies records from 1994–99, and infant death records from 1994–99. The linked congenital anomaly file contains 11 528 records, and the death file contains 3307 records. The infant mortality rate in the data set is 6.3 infant deaths per 1000 newborns, and the birth defects incidence rate is 24.2 per 1000 newborns. The official national personal identification system allowed linkage between the datasets. The data was linked at the Institute of Health Information and Statistics of the Ministry of Health, and provides extensive information on infants by combining information from birth, death, and congenital anomaly certificates.

Variables

Multilevel analysis is based on the two sets of explanatory variables: individual biodemographic and social characteristics of infants and their mothers, and geographic structure (in both the horizontal and vertical sense). The three records were combined into a unified data set, and use factors that appear in those records were used. This limits attention to biosocial characteristics of newborns and mothers only. The base philosophy for insertion of variables was formulated according to the theory that the effect on health in individual positions in the social structure may be mediated by the environment in which a resident lives. Because those of a lower socio-economic position are more likely to live in deprived localities than individuals of a higher position, areas of residence may be the causal pathway between individual social position and health (M. Stafford et al., 2001).

Area horizontal-level determinants for newborn health were considered. For the purpose of our study, self-governing regions (NUTS III level) were used. On the horizontal level in the Czech Republic there are a total of 14 units, called *"macroregions"*. The vertical level was usually divided into 7 categories according to *population of locality size,* considering permanent inhabitant living in the units of settlements (under 2000 inhabitants, 2001 to 5000 inhabitants, 5001 to 10 000 inhabitants, 10 001 to 20 000 inhabitants, 20 001 to 50 000 inhabitants, 50 001 to 100 000, and over 100 000 inhabitants). The following individual biosocial variables were investigated: mother's age, mother's education[1], marital status, birth order, birth weight, locality size, and region of residence. The variables were categorized for the purpose of subsequent multidimensional analyses. All five biosocial variables were divided into three classifications. *Mother's age* at the birth of child: 19 years or below; 20–34 years, and over 35 years. *Mother's education* at the birth of her child: those who completed elementary school education (Basic), high school education (Secondary), and post high school (University). *Marital status* was classified as: unmarried (single)[2], married, and other (divorced/widowed). Variables for the child were: *Birth order:* first born, second born, or higher, and *Birth weight* of: under 1499 grams, 1500–2499 grams, and over 2500 grams.

Statistical Methods

The purpose of the analyses is to model the inequalities of newborns and the differentials (high versus low-risk) of birth defects in the current Czech Republic. Multidimensional statistical analyses was carried out using the logistic procedure of SPSS to estimate odds ratios through logistic models. The model implemented was constructed at this stage: a multinomial Logistic Regression was contracted to include the indicators

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[1] Education is only one dimension of socio-economic status, and it would be desirable to have data on income also. Nevertheless, in the absence of data on income, education level was included in this study as the best available measure of socio-economic status.

[2] Unmarried mothers are women who have never been married.

successively in order to estimate direct effect. Adjusted odds ratios (exp(B)) were obtained by using all the independent variables in the model, and 95% confidence intervals are given for the adjusted odds ratios (OR). The main-effects model measures the effect of each variable in the model while controlling for the remaining variables. Independent variables were used as factors (categorical variables). The last subgroup was used as a reference, with an Odds ratio value of 1.00. Consider a dichotomous response variable with outcomes event (congenital anomaly YES) and *nonevent* (congenital anomaly No) was considered, and a dichotomous risk factor variable X that takes the value 1 if the risk factor is present, and 0 if the risk factor is absent. The odds ratio is defined as the ratio of the odds for those with the risk factor (X=1) to the odds for those without the risk factor (X=0). The Likelihood Ratio Test[3] was used for model significance testing, which includes the maximum likelihood estimate of the parameter, and the estimated standard error of the parameter estimate, computed as the square root of the corresponding diagonal element of the estimated covariance matrix. In order to test if regions moderated the relationship between sizes of locality, we included interaction terms (M5=M4+interaction terms). We created a custom model with factor interactions (regions and locality size) and covariates (significant factors from model M4).

All analyses were performed using SPSS statistical software.

Results

In step one, the reproductive quality of birth cohort was descriptively analysed. The distributions of individual biosocial and geographic variables were demonstrated for two subgroups of infants, those born with a congenital anomaly (CA), and those born without. Table 1 summarises the unadjusted associations between births with and without congenital anomaly, demographic characteristics, maternal age, education, marital status, birth order, birth weight, and geographic characteristic, locality size, and macroregion. The number of infants born without CA was 464 306 (97.6%), and with CA was 11 528 (2.4%). The infants born with congenital anomaly had a higher proportion of mothers older than 35 years (2.7%), with a basic education (2.7%), and who were unmarried (2.7%). Children born later in the birth order, and with lower birth weight, also had higher frequencies of CA (2.6% and 7%). Regarding the structure of Czech settlement, shares in incidences of CA was higher for infants from the localities sized 5000–10 000 and 50 000–100 000 (2.7%), and also from the Karlovarský region (4.1%).

Compositional and contextual effects of geographic factors

Multilevel analysis was used to study variations in birth quality between areas (and possibly due to area level factors). Macroregional level effects on risks of BD were estimated by calculation of the odds ratio (probability of births with CA) and a 95% confidence interval (CI). Table 2 shows the crude odds ratio and the adjusted odds ratio of congenital anomaly for the covariates considered. The base model (M1 in Table 2) documents that unadjusted or crude (occurrence/exposure) ratio varies according to the

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[3] The chi-square statistic is the difference in -2 log-likelihood between the final model and a reduced model. Omitting an effect from the final model forms the reduced model. The null hypothesis is that all parameters of that effect are 0.

area of infant residence. Model M2 shows the relative macroregional risk. All macroregions are adjusted according to reference level, to the region with the lowest probability of risk (Olomoucký region equal 1.000; all the other regions adjusted -divided by 1.649). The OR outputs from model M2 allows comparison of the effects on the risk of BD between regions expressed in percentages. The range of lowest and highest regional risk was 2.61. Newborns from the Karlovarský region had a 2.61 times higher risk of BD than infants from the Olomoucký region; this ranged from 2.32 to 2.95 for the central 95% of the region. The corresponding values for the Prague region, with the second lowest risk level of birth defects, was 1.10 (95% CI 0.98 to 1.23).

Contextual vertical settlement effects are investigated in model M3 (Table 2). When locality sizes were included, there were some important changes in variations between regions: (i) a narrowing of the OR range and (ii) an increase of OR in the Prague region. The difference between the regions with the lowest and highest risk was reduced (from 2.61 to 2.53). The risk level decreased in eight regions. The biggest increase in risk effect (OR) was detected in the Prague region. The risk of congenital anomaly increased, from level 1.10 to 1.40 (95% CI 1.23 to 1.60). The expansion of risk (after adjusted by locality size) caused the Prague region to move from position two to position six.

Compositional and contextual effects of individual biosocial factors

Other contextual effects are investigated in model M4 (Table 3). Presented there are the results from the full main-effect regression model. The probability of birth defect occurrence was estimated for each of the five biosocial characteristics and two geographical characteristics. The Likelihood Ratio Tests indicate that three of the five biosocial variables, and both geographical variables, had statistically significant effects on the adjusted newborns probability of incidence of birth defect rate (p-values in Table 3). Maternal education level and marital status were not as an important a risk (p-value 0.386 and 0.788). The highest variability of risk level (OR) was confirmed for the Birth weight variable. Infants born with a birth weight below 1500 grams had a 3.3 (95% CI 2.91 to 3.69) times higher risk of CA than newborns with a birth weight above 2500 grams, but prospective output: Result and Reason. The next important variable in birth defect variation was validated among the biosocial factors: *Maternal age and Birth order*. Risk of CA occurrence rises with the age of the mother. Infants born to mothers over 35 years had a 1.17 times higher risk of congenital anomaly (95% CI 1.05 to 1.29) than those with a mother age below the age of 19 years. An interesting finding, in full model M4, is the confirmation of the importance of regional effects on the risk of congenital anomaly. The model confirmed an extremely high risk of CA for infants from the Karlovarský region (2.47 times higher risk than in Olomoucký, a reference region). The greatest range between lowest and highest risk factors in newborns (OR=1.37) was confirmed to be in towns of mid-sized populations, 20 000–50 000 inhabitants (95% CI 1.26 to 1.50).

The output of this full model (M4 in Table 3) confirms the importance of birth quality variability of biosocial factors in seven regions (the level of OR decrease in model M4 below level in model M3), but especially in two regions (Karlovarský and Ústecký). After the inclusion of biosocial factors to the model, there was a narrowing of risk variability between regions (maximal level decreased in model M3 from 2.53 on 2.47 in M4; Table 2 and 3).

Table 1. Selected biodemographic, social and geographic variables of birth cohort (number + percent distribution for newborns with and withouth CA)

	Births			Births	
Individual characteristic (Biodemographic+social factors)	without CA	with CA	**Area characteristics (Geographical factors)**	without CA	with CA
Mother's age			***Locality size***		
–19	78 981 (97.5)	2 024 (2.5)	–1 999	122 624 (97.5)	3 170 (2.5)
20–34	363 220 (97.6)	8 893 (2.4)	2 000–4 999	50 749 (97.5)	1 300 (2.5)
35+	22 105 (97.3)	611 (2.7)	5 000–9 999	43 503 (97.3)	1 186 (2.7)
Total	**464 306 (97.6)**	**11 528 (2.4)**	10 000–19 999	42 786 (97.5)	1 080 (2.5)
Mother's education			20 000–49 999	59 010 (97.4)	1 594 (2.6)
Basic	62 994 (97.3)	1 780 (2.7)	50 000–99 999	52 190 (97.3)	1 447 (2.7)
Technical	359 098 (97.6)	8 821 (2.4)	100 000+	93 444 (98.2)	1 751 (1.8)
Academic	42 208 (97.9)	927 (2.1)	***Macroregion***		
Marital status			Pražský	45 936 (98.2)	835 (1.8)
Unmarried	57 024 (97.3)	1 579 (2.7)	Středočeský	48 502 (97.7)	1 125 (2.3)
Married	386 983 (97.6)	9 423 (2.4)	Budějovický	29 025 (97.7)	673 (2.3)
Others	20 299 (97.5)	526 (2.5)	Plzeňský	24 076 (97.3)	661 (2.7)
Birth order			Karlovarský	14 430 (95.9)	622 (4.1)
1	218 464 (97.5)	5 600 (2.5)	Ústecký	39 710 (96.8)	1 300 (3.2)
2	176 515 (97.7)	4 088 (2.3)	Liberecký	20 303 (97.9)	437 (2.1)
3+	69 327 (97.4)	1 840 (2.6)	Královéhradecký	25 384 (97.2)	718 (2.8)
Birthweight			Pardubický	24 098 (97.8)	536 (2.2)
–1499	4 038 (93.0)	303 (7.0)	Jihlavský	25 394 (97.2)	738 (2.8)
1500–2499	21 764 (94.6)	1 237 (5.4)	Brněnský	50 138 (97.7)	1 201 (2.3)
2500+	438 504 (97.7)	9 988 (2.3)	Zlínský	26 801 (97.5)	698 (2.5)
			Olomoucký	29 230 (98.3)	482 (1.6)
			Ostravský	61 279 (97.6)	1 502 (2.4)

Table 2. Crude, relative and adjusted odds ratios of congenital anomaly, models: M1–M3

	M1: Base model	**M2: Model with regions**				**M3: M2+locality size**			
	OR^a	Sig.	OR^b	95% CI for OR		Sig.	OR^c	95% CI for OR	
	(not adjusted)			Lower	Upper			Lower	Upper
Locality size									
-999						0.000	1.333	1.232	1.442
1 000–4 999						0.000	1.304	1.193	1.424
5 000–9 999						0.000	1.352	1.234	1.481
10 000–19 999						0.000	1.240	1.128	1.363
20 000–49 999						0.000	1.359	1.247	1.482
50 000–99 999						0.000	1.312	1.198	1.437
100 000+							**1.000**		
Macroregion									
Pražský	1.818	0.091	0.102	0.984	1.234	0.000	1.403	1.232	1.598
Středočeský	2.319	0.000	1.407	1.263	1.567	0.000	1.361	1.222	1.517
Budějovický	2.319	0.000	1.406	1.250	1.582	0.000	1.347	1.196	1.517
Plzeňský	2.745	0.000	1.665	1.479	1.875	0.000	1.724	1.530	1.942
Karlovarský	4.310	0.000	2.614	2.317	2.949	0.000	2.528	2.239	2.854
Ústecký	3.274	0.000	1.985	1.786	2.206	0.000	1.923	1.726	2.142
Liberecký	2.152	0.000	1.305	1.145	1.488	0.000	1.304	1.144	1.486
Královéhradecký	2.829	0.000	1.715	1.526	1.928	0.000	1.696	1.508	1.906
Pardubický	2.224	0.000	1.349	1.191	1.527	0.000	1.307	1.154	1.482
Jihlavský	2.906	0.000	1.762	1.569	1.979	0.000	1.692	1.506	1.901
Brněnský	2.395	0.000	1.453	1.306	1.616	0.000	1.505	1.352	1.676
Zlínský	2.604	0.000	1.579	1.405	1.776	0.000	1.517	1.349	1.707
Ostravský	2.451	0.000	1.486	1.340	1.649	0.000	1.518	1.367	1.685
Olomoucký	1.649		**1.000**				**1.000**		

OR^a Crude OR – birth with CA per 100 newborn without CA for each region, unadjusted for other factors.
OR^b Relative OR – crude OR divided by reference category (Olomoucký region).
OR^C Adjusted OR – relative OR adjusted by multiple standardization with no interactions, (crude OR for both category divided by crude OR for reference category of each predictor; proportional hazards).

Table 3. Biodemographic, social and geographical level effects on congenital anomaly adjusted odds ratios, estimated using multilevel model: M4

Full model M4	Sig.	OR	95% Conf. Interval for OR	
	Biodemographic and social characteristics			
Mother's age (p-value 0.010)				
35+	0.003	1.167	1.053	1.293
20–34	0.031	1.063	1.006	1.123
Ref.–19		**1.000**		
Mother's education (p-value 0.386)				
Basic	0.172	1.063	0.974	1.161
Technical	0.258	1.041	0.971	1.117
Ref. Academic		**1.000**		
Marital status (p-value 0.788)				
Unmarried	0.492	1.038	0.934	1.154
Married	0.594	1.025	0.935	1.125
Ref. Others		**1.000**		
Birth order (p-value 0.000)				
3+	0.197	1.040	0.980	1.104
1	0.000	1.111	1.063	1.160
Ref. 2		**1.000**		
Birthweight (p-value 0.000)				
–1499	0.000	3.276	2.909	3.690
1500–2499	0.000	2.462	2.316	2.618
Ref. 2500+		**1.000**		
	Areas vertical and horizontal characteristics			
Locality size (p-value 0.000)				
–1 999	0.000	1.352	1.249	1.464
2 000–4 999	0.000	1.325	1.212	1.448
5 000–9 999	0.000	1.367	1.248	1.498
10 000–19 999	0.000	1.254	1.140	1.379
20 000–49 999	0.000	1.373	1.260	1.497
50 000–99 999	0.000	1.315	1.200	1.441
Ref. 100 000+		**1.000**		
Macroregion (p-value 0.000)				
Pražský	0.000	1.392	1.222	1.587
Středočeský	0.000	1.342	1.205	1.496
Budějovický	0.000	1.340	1.190	1.509
Plzeňský	0.000	1.709	1.517	1.926
Karlovarský	0.000	2.465	2.182	2.785
Ústecký	0.000	1.863	1.671	2.076
Liberecký	0.000	1.276	1.119	1.455
Královéhradecký	0.000	1.699	1.511	1.910
Pardubický	0.000	1.306	1.152	1.480
Jihlavský	0.000	1.715	1.526	1.927
Brněnský	0.000	1.510	1.356	1.681
Zlínský	0.000	1.520	1.351	1.711
Ostravský	0.000	1.514	1.363	1.681
Ref. Olomoucký		**1.000**		

Table 4. Interactive effects of locality size and regions on congenital anomaly occurance

Odds ratios adjusted for mother's age, birth order and birthweight							
M5 = M4+interaction terms	*Locality size*						
Macroregions	–999	–4 999	–9 999	–19 999	–49 999	–99 999	100 000+
Pražský							2.474
Středočeský	3.154	2.691	3.461	3.014	3.380	3.770	
Budějovický	3.396	2.917	3.822	2.852	3.487		
Plzeňský	3.797	3.596	3.767	3.549	4.718		3.638
Karlovarský	5.960	5.656	5.796	5.447	6.085	5.247	
Ústecký	4.789	4.846	4.969	3.075	5.036	4.120	
Liberecký	3.281	2.445	3.253	1.997	2.615	2.577	3.076
Královéhradecký	4.333	2.901	3.449	4.215	2.106	7.621	3.553
Pardubický	2.956	2.669	3.287	2.786	3.388	3.231	
Jihlavský	4.016	4.290	3.946	4.232	3.803	4.516	
Brněnský	3.503	3.622	4.356	2.561	3.904		2.478
Zlínský	3.536	3.808	3.528	4.316	3.342	3.443	
Ostravský	3.978	4.007	3.302	3.434	3.982	3.016	2.490
Olomoucký	2.360	2.570	3.103	2.596	2.752	1.761	**1.000**

Unadjusted occurrence of congenital anomaly (percent)							
	Locality size						
Macroregions	–999	–4 999	–9 999	–19 999	–49 999	–99 999	100 000+
Pražský							1.818
Středočeský	2.291	1.962	2.526	2.206	2.508	2.878	
Budějovický	2.288	2.474	2.144	2.795	2.088	2.541	
Plzeňský	2.782	2.628	2.768	2.616	3.459		2.701
Karlovarský	4.552	4.265	4.357	4.164	4.527	3.876	
Ústecký	3.575	3.646	3.752	2.328	3.785	3.138	
Liberecký	2.416	1.839	2.444	1.466	1.995	1.887	2.249
Královéhradecký	3.125	2.104	2.514	3.060	1.558	5.534	2.567
Pardubický	2.168	1.983	2.421	2.078	2.450	2.436	
Jihlavský	2.848	3.057	2.831	3.108	2.717	3.254	
Brněnský	2.513	2.606	3.138	1.877	2.863		1.839
Zlínský	2.548	2.733	2.533	3.120	2.448	2.521	
Ostravský	2.898	2.910	2.421	2.528	2.968	2.221	1.847
Olomoucký	1.701	1.862	2.337	1.918	2.018	1.331	0.735

Exploring interaction effects in more detail

Exploring interaction effects in greater detail allows for other modeling processes. The final model M5 (Table 4) includes interaction effects and main effects. Model M5 was a custom with factor interactions (region and locality size) and covariates (significant factors from model M4; *Mother's age, Birth order and Birth weight).* The top cross-level part from Table 4 presents the levels of the adjusted Odds ratios, and the bottom part of the table is unadjusted risk of congenital anomaly. The odds values are in range from 1 (Olomoucký region + locality size 100 000 and more) to 7.06 (locality size with 50 000–100 000 residents from Královéhradecký region), but this finding requires another detailed study (attributable odd deviation). A cause for concern is that all categories of the locality size from Karlovarský region had a minimally 5.3 times higher risk of congenital anomaly than the reference category. On the other hand, the OR values did not cross in five macroregions (Středočeský, Budějovický, Liberecký, Pardubický, and Olomoucký) in no category size limit 4 times. Cross-locality size was confirmed in all categories with large variations of OR values, except for the top category. This positively amounts to lower risk effects for infants born in the Moravian part, inclusive of the Ostravský industrial region.

Discussion and Conclusion

This study of the quality of the Czech birth cohort 1994–98 principally confirms the significance of territorial aspects, both horizontal and vertical. Similar horizontal results were found by Dzúrová (2001), using the direct standardization technique, and the national figures of live births by mothers' age as the standard. These researchers also found the highest values of adjusted occurrence/exposure rates of CA in the extreme western part of Bohemia (more than twice the means level of the districts of Sokolov and Cheb), and the lowest values in Central Moravia (Olomouc and Prostějov). A significant level of congenital anomaly risk was also detected in the same territory based on the presented individual data. The adjusted risk gap (OR) between the Olomoucký region and the Karlovarský region was 2.5 times. After analyzing the interaction effects between regions and locality sizes, the risk effect increased in the Karlovarský region to a value of 6.1 for the 20 000–50 000 residents localities. Similar regional patterns in the Czech Republic were found in the study of mortality by Blažek (2000). The regions with a higher level of mortality for cancer associated very closely with regions having a high level of CA risk.

Included biosocial factors in the model (maternal education and marital status) were not confirmed as important determinants for regional occurrence of congenital anomaly. This result may correspond with the reality that women of a higher social status are exposed to lower levels of negative circumstances (in terms of employment, social background, and healthy lifestyle). On the other hand, there women may have been more aware than others of the early signs of spontaneous abortion and have been more likely to seek medical advice and comply with the medical regimen prescribed. As a result, they may have had a higher chance of giving birth to a live newborn suffering from congenital anomalies incompatible with life (Shoham-Yakubovich, 1987).

These results all indicate that the study of regional inequalities in relative risk of congenital anomaly must be oriented much more to environmental exposure than to biosocial or medical circumstances, and particularly to circumstances before conception, during pregnancy, and at the time of birth. Factors that have not yet been identified may be important. With currently available data, we can only begin to investigate some of the higher-level factors that influence infant health. Improved measures are now being collected that will allow us to characterize risk factors more accurately.

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ROZDÍLY VE ZDRAVOTNÍM STAVU NOVOROZENCŮ V ČESKÉ REPUBLICE: GENERACE 1994–98

Résumé

Cílem analýzy bylo modelování kvality/nekvality nové populace stanovením výše rizika výskytu vrozených vady v jednotlivých regionech České republiky za zařazování 3 skupin proměnných: popisujících velikostní uspořádání osídlení, bio-demografické charakteristiky (věk matky, pořadí narození a porodní hmotnost) a sociální proměnné (vzdělání a rodinný stav matky). Analýza vycházela z binární, logistické regrese statistického softwaru SPSS. Míry rizika výskytu vrozených vad (OR) ve sledovaných geografických kategoriích byly stanoveny prostřednictvím aplikace logistických modelů (M2–M5). Od úvodního modelu M1, přes model M2, upravených OR (vzhledem k referenční kategorii, resp. regionu Olomouckému), dále přes model M3 se zařazenou proměnnou velikostního uspořádání osídlení a model M4, „očišťujícím" riziko výskytu vrozených vad v regionech nejen o vliv velikostního uspořádání osídlení, ale též o vliv bio-demografických a sociálních faktorů. Výsledkem studie bylo stanovení finálního, interakčního modelu M5, který umožnil hodnotit výši rizika výskytu vrozené vady v jednotlivých regionech v kombinaci s velikostními kategoriemi osídlení za odstranění vlivu bio-demografických a sociálních faktorů.

Nejvyšší míra rizika vrozené vady byla v modelu M2 stanovena pro populaci dětí narozených v Karlovarském regionu (OR=2,6). Model M3, který umožnil hodnocení výše rizika výskytu za odstranění vlivu velikostních kategorií, potvrdil nejvyšší riziko v regionu Karlovarském (OR=2,5) a zvýšení rizika pro narozené v Praze (OR=1,4). Výsledky modelu M3, z hlediska velikostních kategorií osídlení, potvrdily nejnižší riziko výskytu vrozených vad v největších městech. Model M4, se všemi zařazenými proměnnými stanovil pro výskyt vrozených vad především velice nízkou statistickou významnost uvažovaných sociálních proměnných (rodinného stavu a vzdělání matky; 0,79 a 0,39). Hodnoty rizik výskytu vrozených vad zůstaly v modelu M4 v porovnání s hodnotami modelu předešlého bez významnějších změn, což lze zřejmě interpretovat tak, že na výskyt vrozených vad má vliv dominantní poloha, resp. že se jednotlivé regiony statisticky významně liší úrovní rizika výskytu vrozené vady, bez významnějšího vlivu na sociálního prostředí. Finální, interakční model efektů

M5 ještě zviditelnil výši rizika výskytu vrozených vad v Karlovarském regionu, zejména pak pro města s počtem 20–50 tisíc obyvatel (OR=6,1).

Zařazení sociálních proměnných do modelů nebylo potvrzeno jako statisticky významné pro regionální diferenciaci míry rizika výskytu vrozených vad. Výsledky studie tak naznačují, že pro vysvětlení regionálních rozdílů budou zřejmě více důležité podmínky prostředí přírodního než sociálního.