UNEMPLOYMENT AND LUNG CANCER INCIDENCE IN THE PROVINCE OF OPOLE

BRIEF REPORT

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SUMMARY

In this geostatistical analysis we present the results of interrelation between unemployment rate and lung cancer incidence ratios in the Province of Opole, Poland. In the study, unemployment statistics and population data were analyzed together with the registered (histopathologically confirmed) lung cancer cases (C34, ICD10) in sex-stratified working age population (18–65 years). The data were collected in the years 2006–2008 in the Statistical Office in Opole and Opole Cancer Registry, Poland. The statistically significant positive correlation/interrelation between unemployment rate and lung cancer incidence ratios in male population was established; in females, this effect was statistically insignificant. The obtained results are consistent with the most up-to-date reports supporting the thesis that a higher burden of disease is observed in more deprived areas. The statistics may have practical relevance in terms of improving health status of the local population following economic reforms.

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INTRODUCTION

Unemployment itself is not considered to be a risk factor, however, low pay, exposure to hazards associated with job insecurity and the adoption of a lifestyle in which a higher degree of risk is accepted may induce a health damaging behaviour that can lead to a wide range of diseases, including psychological disorders and cancer (1). Research has considerably advanced our understanding of these interrelations (2). For example, unemployment was associated with an increased risk of suicide and death from undetermined causes (3), and especially individuals aged 36–44 were at the greatest excess risks (2). However, some authors have reported that unemployment is associated mainly with minor psychological disorders (1) and most studies have failed to find a positive association between depressed mood due to joblessness and a higher risk of developing cancer later in life. However, it is estimated that unemployed men compared to employed men have a 40% to 70% excess risk of lung cancer as well as an almost 25% excess cancer mortality compared to men in the labour force (4). Thus, unemployed men seem to have an excess lung cancer risk due to smoking habit (4–6).

However, opposite results can also be found in recent literature (7). Data from one study indicate that unemployment contributes to healthier dietary and exercise behaviour in addition to healthier smoking and drinking habits. When total consumption decreases, consumption of expensive goods (like tobacco and alcohol) also tends to decrease. Healthier lifestyle habits reduce incidence rates of some types of cancer as well as mortality during and after recessions. The percentage of people who die from certain cancers falls as unemployment rises. The author suggests that a one-percentage-point increase in unemployment will result in about 3,500 fewer deaths nationwide from lung cancer in the following years (7).

As regards other cancers, unexpectedly high unemployment is associated with reduced odds ratios for the registered breast tumors in San Francisco Bay Area. It is explained that fear of job loss may distract women from breast self-examination and the identification of suspicious breast signs. The authors also appeal that breast cancer control efforts should be intensified during periods of unexpectedly high unemployment (8). In Ireland cancer atlas (9), we can find the information that wards and electoral divisions (EDs) with the highest levels of unemployment had a 10% higher risk of male bladder cancer than those with the lowest levels. Moreover, sex inequalities of socioeconomic gradient (including unemployment) in lung cancer mortality were also reported (10) – the socioeconomic gradient of mortality in men was negative for Barcelona and positive for São Paulo, whereas for women the gradient was positive in both cities.

The purpose of this paper is to estimate the association between unemployment rate and lung cancer incidence ratios. This association is examined for men and women, separately. We focus on Opole Province, Poland, with a population of one million, since reliable data are available for this area.

MATERIALS AND METHODS

Information on unemployment and the population were acquired from the Statistical Office in Opole, Poland (a thematic map of the average unemployment levels in particular adminis-

trative units of the region within the analyzed period is showed in Figure 1).

The rural (western) territories of Opole Province are more threatened by job insecurity than the industrial (eastern) part of the region (Fig. 1). Lung cancer cases (C34, ICD10) stratified by age and sex were obtained from the Opole Cancer Registry, Poland, and covered the period from 1 January 2006 to 31 December 2008. Totally, in patients of working age (18–65 years), 487 histopathologically confirmed cases in males and 182 in females were registered.

The conditional autoregressive (CAR) model (11) for disease mapping and risk assessment (12, 13) was used in the study. Since we focused on a relatively short period and incidence based on very few cases, the standardized incidence ratios (SIRs) were smoothed using the Markov chain Monte Carlo simulation method (14) in the WinBUGS software (15). To evaluate a covariate (unemployment) effect on SIR, a random-effects Poisson regression model (allowing for spatial correlation) was adopted with associated regression coefficient. To achieve convergence, two parallel chains were run and the first 1,000 samples of each

were discarded as burn-in, while the following 10,000 cycles (production run) of the Gibbs sampler were used to estimate each quantity of interest (an equilibrium state of the value stream was established via examination of the within-chain autocorrelation and comparison of the results of chains started with over dispersed initial values, including the Gelman-Rubin statistic available within the software) (14).

RESULTS

The estimated SIRs in males and females were displayed graphically in combined thematic maps in Fig. 2.

Estimators of the regression coefficients of unemployment effects on lung cancer incidence in males and females are reported in Table 1.

The estimates given in Table 1. provide evidence of statistically significant (indirect) impact of unemployment rate on lung cancer incidence in males in the region. A simple calculation delivers information that 10% growth in joblessness level results in $[\exp (0.024)^{10}-1]*100\% = 27\%$ increment in lung cancer risk in economically weak regions. However, interrelation in female population is statistically insignificant (Table 1).

DISCUSSION

The economic background of health status has a long history starting from John Graunt and his Bills of Mortality (1662). In principle, no other justification of our research is needed but that one behind economic epidemiology.
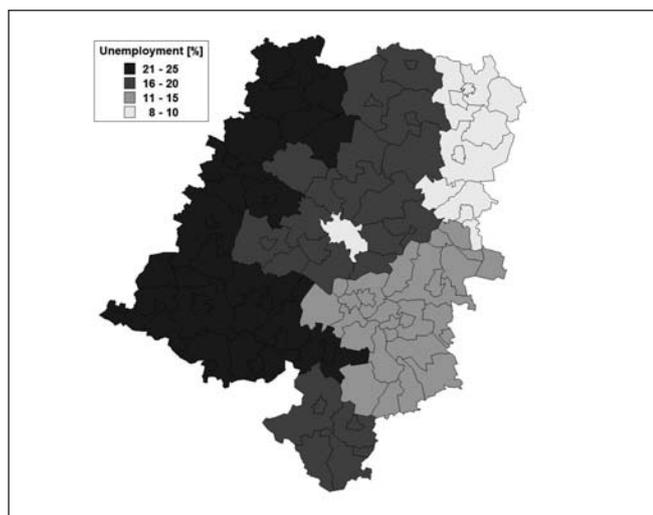

Fig. 1. *Unemployment in Opole Province (2006–2008).*

Table 1. *Poisson regression coefficients (unemployment effect)*

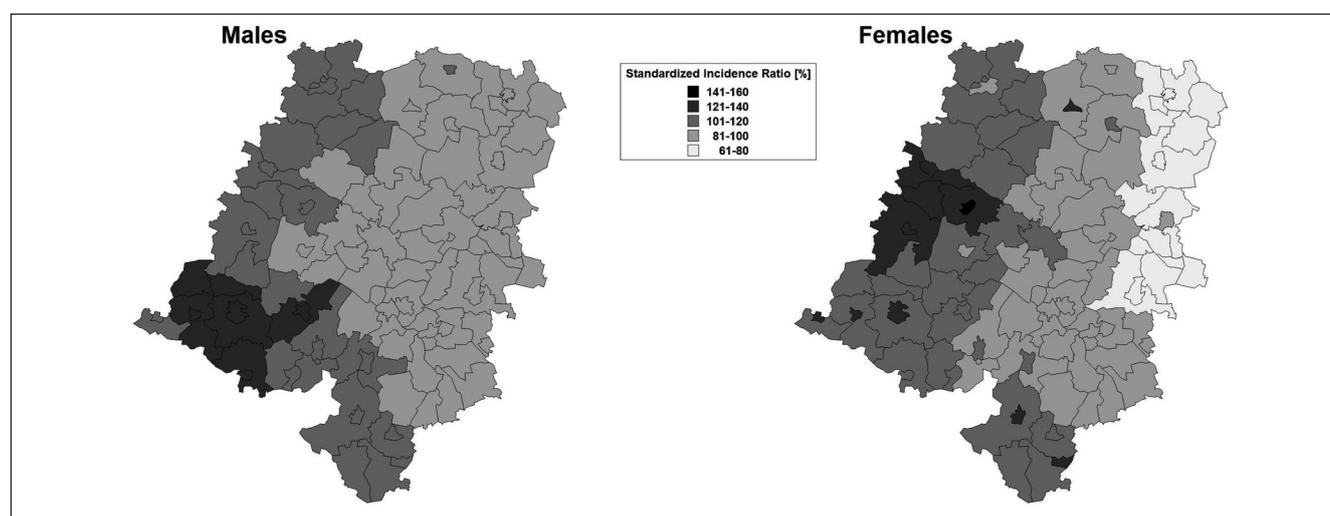| Sex	Mean	SD	Credible 95% interval	p-value (one-sided)
Males	0.024	0.009	(0.007, 0.041)	0.0043
Females	0.010	0.020	(–0.036, 0.044)	0.2674

Fig. 2. *SIR of lung cancer (C34) in Opole Province in males and females (2006–2008).*

Discussing the possible impact of different factors on incidence rate of particular cancer in geographically defined population, we should take into account two basic groups of reasons: problems associated with cancer registration and cancer risk factors. There is a negligible impact on cancer incidence, but real influence on numbers. Again, these problems can be divided into two subgroups: poor activity of cancer registry and/or diagnostic problems. As far as this study area is concerned, the poor work of cancer registry ought to be discounted; we would rather expect under-registration in poorer, rural regions than in industrial ones. The diagnostic deficit could be imaginable, exhaustion and/or chronic work overload might shrink time which can be dedicated to health observation. This theory, indeed, seems to be very risky in the context of local labour reality (the working time limits, relatively rich region). As registry related issues have been excluded, we can focus on lung cancer risk factors. The only one robust, well known, proven, and worldwide accepted lung cancer risk factor is smoking, therefore, in order to explain the positive correlation between the disease incidence and an unemployment rate we should look for relations between smoking and the lack of job. At first glance, such dependency does not look to be logical, but taking into account the social infrastructure, lifestyle and habits in Central Europe, we can find some explanation for this connection. In economically weak, rural regions with limited access to organized entertainment, people usually share their time between work and leisure at home. In the case of unemployed men, the abundance of free time could be (and probably is) filled with smoking and/or drinking (or other addictions).

Considering very high percentage of smoking men, relatively low price of cigarettes and tobacco products as well as their availability in Poland, an increase in smoking intensity can explain the positive correlation between unemployment rate and lung cancer incidence in men in Opole region. This situation confirms that economically deprived areas suffer from a higher burden of disease. This gradient is consistent with the most up-to-date scientific findings. Moreover, the achieved levels of this impact as well as sex inequalities are also consistent with the outcomes reported in the scientific literature. However, the insignificance of this socioeconomic effect in female population seems to be unclear. Nevertheless, the results reinforce hypothesis that the epidemiologic profile of cancer can be improved through existing prevention. From this point of view, it is apparent that socioeconomic inequalities in the studied region may contribute to access to healthcare technology as well as to the promotion of well-being and healthy lifestyles. Therefore, appropriate subregional investments and other economic interventions, which reduce unemployment, may play a crucial role in healthcare development within the disease threatened areas and in social consciousness improvement.

CONCLUSIONS

In this concise report, we support the thesis that socioeconomic background may have significant effect on the health status. According to the obtained results, we can conclude that contemporary unemployment might have influenced the elevated risk for lung cancer incidence in Opole Province, Poland. However, it is not straightforward to explain why this proportional socioeconomic gradient is found in male population but not in females. Nonetheless, continuous monitoring of the burden of disease may verify these findings and may be helpful in health management and administration as well as in improvement of the health status of local population.

Conflict of Interests
None declared

REFERENCES

1. Hammarström A. Health consequences of youth unemployment - review from a gender perspective. Soc Sci Med. 1994 Mar;38(5):699-709.
2. Bartley M. Unemployment and ill health: understanding the relationship. J Epidemiol Community Health. 1994 Aug;48(4):333-7.
3. Voss M, Nylén L, Floderus B, Diderichsen F, Terry PD. Unemployment and early cause-specific mortality: a study based on the Swedish twin registry. Am J Public Health. 2004 Dec;94(12):2155-61.
4. Lynge E. Unemployment and cancer: a literature review. IARC Sci Publ. 1997;(138):343-51.
5. Stellman SD, Resnicow K. Tobacco smoking, cancer and social class. IARC Sci Publ. 1997;(138):229-50.
6. Forbes JF, McGregor A. Male unemployment and cause-specific mortality in postwar Scotland. Int J Health Serv. 1987;17(2):233-40.
7. Galick BT. Does unemployment decrease cancer mortality? [Internet]. Saint Paul (MN): Macalester College; 2009. Honors Projects: 15; [cited 2013 Feb 4]. Available from: http://digitalcommons.macalester.edu/economics_honors_projects/15.
8. Catalano RA, Satariano WA. Unemployment and the likelihood of detecting early-stage breast cancer. Am J Public Health. 1998 Apr;88(4):586-9.
9. Northern Ireland Cancer Registry and National Cancer Registry [Internet]. Belfast: Queen's University Belfast; 2011. All Ireland Cancer Atlas 1995–2007; [cited 2013 Feb 4]. Available from: http://www.qub.ac.uk/research-centres/nicr/Publications/AllIrelandReports/.
10. Antunes JL, Borrell C, Rodríguez-Sanz M, Pérez G, Biazevic MG, Wünsch-Filho V. Sex and socioeconomic inequalities of lung cancer mortality in Barcelona, Spain and São Paulo, Brazil. Eur J Cancer Prev. 2008 Oct;17(5):399-405.
11. Besag J, York J, Mollié A. Bayesian image restoration, with two applications in spatial statistics. Ann Inst Stat Math. 1991 Mar;43(1):1-20.
12. Lawson AB, Biggeri A, Böhning D, Lesaffre E, Viel J-F, Bertollini R, eds. Disease mapping and risk assessment for public health. Chichester (UK): John Wiley; 1999.
13. Carlin BP, Louis TA. Bayes and empirical Bayes methods for data analysis. 2nd ed. Boca Raton (US): Chapman & Hall/CRC; 2000.
14. Smith AFM, Roberts GO. Bayesian computation via the Gibbs sampler and related Markov chain Monte Carlo methods. J R Stat Soc Ser B Stat Methodol. 1993;55(1):3-23.
15. Spiegelhalter D, Thomas A, Best N, Gilks W. BUGS 0.5 Manual: Bayesian Inference Using Gibbs Sampling [Internet]. Cambridge (UK): Medical Research Council Biostatistics Unit; 1996 [cited 2013 Feb 4]. Available from: http://www.mrc-bsu.cam.ac.uk/bugs/.