

# Health-risk behaviours in deprived urban neighbourhoods: a comparison between Slovak and Dutch cities

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Received: 2 September 2013 / Revised: 28 October 2013 / Accepted: 9 December 2013 / Published online: 21 December 2013  
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## Abstract

**Objectives** International comparisons of the associations of area-level socioeconomic position (SEP) and health-risk behaviours (HRBs) are for the most part lacking. The aims of this study were to compare Slovakia and the Netherlands regarding differences in the prevalence of HRBs by neighbourhood and individual deprivation, and to determine whether area differences could be explained by the SEP of residents.

**Methods** We obtained data on residents aged 19–64 from Slovak and Dutch cities from the FP7 EURO-URHIS2 project and employed multilevel logistic regression.

**Results** The association between neighbourhood-level unemployment and HRBs differed between countries. In

the Netherlands, the prevalence of almost all HRBs was higher in deprived areas, except for the consumption of fruits and vegetables. These area effects diminished after controlling for individual-level SEP. In Slovakia, no area effects were observed, although Slovak residents showed a higher risk for most HRBs. At the individual level, an inverse SE gradient was found for almost all HRBs in both countries.

**Conclusions** Local analyses of small area health differences and health determinants are critical for efficient implementation of neighbourhood-based interventions.

**Keywords** Health-risk behaviours · Area deprivation · Socioeconomic inequalities · Urban health

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## Introduction

Health-risk behaviours (HRBs), such as smoking, excessive alcohol consumption, lower physical activity levels and poor dietary habits, contribute to health inequalities between European countries (Mackenbach 2006). Evidence further shows that HRBs have been associated with both individual- and area-level socioeconomic disadvantage (Lakshman et al. 2010; Fukuda et al. 2005; Naimi et al. 2009; Wilson et al. 2010; Santana et al. 2009; Stafford et al. 2010). However, only few studies have examined the link between area socioeconomic position (SEP) and HRBs in the context of international comparisons (Wilson et al. 2010; Dragano et al. 2007). Such comparisons are important, because the effect of area deprivation on HRB may differ between countries. For example, a study on health behaviours in neighbourhoods in Glasgow (Scotland) and Hamilton (Canada) showed that for some outcomes high SEP neighbourhoods in Glasgow displayed distributions

similar to those found in low SEP neighbourhoods in Hamilton (Wilson et al. 2010).

Health-endangering lifestyles, together with environmental factors, have been proposed as part of the explanation of differences between higher mortality and morbidity indicators between Central Eastern European (CE) and Western European (WE) countries. Thus far, little attention has been paid to the effects of socioeconomic area deprivation on HRBs in CE countries. Only one study (Dragano et al. 2007) compared the Czech Republic (a CE country) and Germany (a WE country) in regard to the association of urban neighbourhood SEP with cardiovascular risk factors. It showed that neighbourhood effects were much more pronounced in Germany than in the Czech Republic, even after adjusting for individual SEP.

Differences between CE and WE countries regarding HRBs and area deprivation might be associated with the differences in the SEP of individuals, but evidence on this topic is still fully lacking. Such evidence is important, because behavioural risk factors are essentially modifiable. Information on the prevalence of risk factors among urban citizens may thus identify high risk areas within cities and offer local governments and public health authorities the opportunity to target interventions. In some cities, local governments have already acknowledged the importance of interventions on a city level in deprived communities (Phillips et al. 2012).

A comparison of socioeconomically and culturally distinct countries may provide information on the effects of both individual- and area-SEP on HRBs. Slovakia, as a Central European and “new” EU member country (joined in 2004), and the Netherlands as a Western European and “old” EU member country offer a good possibility for exploring this issue. Thus, the main aims of this study were (1) to examine whether the prevalence of HRBs was higher in deprived neighbourhoods and among deprived people; (2) whether the association of HRBs with area deprivation differed by country; (3) whether this could be explained by the socioeconomic characteristics of citizens; and (4) whether the association of socioeconomic characteristics of citizens and HRBs differed by country.

## Methods

### Sample and procedure

Data were collected within the European urban health indicators project (EURO-URHIS 2) in the two largest cities in Slovakia—Bratislava (capital; 432,801 inhabitants in 2010) and Kosice (233,886 inhabitants in 2010)—and in two comparable Dutch cities, Amsterdam (capital; 779,808 inhabitants in 2010) and Utrecht (311,367 inhabitants in

2010). We restricted our analysis to people aged 19–64 years. In each city, a representative sample of 800 persons aged 19–64 years was approached, stratified by gender. All respondents received identical self-administered postal questionnaires in their own language along with a stamped return envelope. Questionnaires were accompanied by a cover letter informing about the project and a confidentiality statement on each returned questionnaire. The overall response rate in Slovakia was 44.5 % ( $N = 631$ ) and in the Netherlands 42.6 % ( $N = 673$ ). Further details of the survey were reported previously (Behanova et al. 2013).

### Measures

The original questionnaire of EURO-URHIS 2 was translated from English into Slovak and Dutch and back translated afterwards.

#### *Individual-level data*

We used five indicators of HRBs: daily smoking, binge drinking, physical exercise, consumption of fruits and vegetables and body mass index (BMI).

*Daily smoking* was assessed from a question on smoking status (EHIS SK1, modified): “Do you currently smoke” with answering options (1) yes, daily; (2) yes, occasionally; (3) I used to smoke but I do not now; and (4) never smoked. The variable was dichotomized as smoking daily (option 1) and not smoking daily (options 2–4).

*Drinking behaviour* was assessed from a set of questions on consumption of alcoholic drinks. Binge drinking [FINBALT 2004, Question 49 (1)] was assessed from the question “How often do you drink six portions or more of alcohol at once (one portion consists of a bottle of beer or equivalent, or a glass of wine, or a restaurant-portion of spirits)?” with answering options (1) never, (2) less than once a month, (3) once a month, (4) once a week and (5) daily or nearly daily. The answers were dichotomized and different criteria were set for men (once a week) and for women (once a month) (Helasoja et al. 2007).

*Physical exercise* for at least 30 min was assessed by a question “In your leisure time, how often do you do physical exercise for at least 30 min which makes you at least mildly short of breath or perspire?” (FINBALT 2004, Question 56) with answering options (1) daily, (2) 4–6 times a week, (3) 2–3 times a week, (4) once a week, (5) 2–3 times a month, (6) a few times a year or less, (7) I cannot exercise because of an illness and (8) I cannot exercise because of a disability. The variable was dichotomized as follows: options 1–3 were coded as twice a week or more and options 4–8 as less than twice a week. The grouping of options was roughly based on the WHO

guidelines for healthy exercising (150 min/week moderate exercise or 75 min/week vigorous exercise) (WHO 2011) and the Dutch standard for healthy exercise (5 × 30 min moderate/week or 3 × 20 min intensive/week) (Statistics Netherlands 2013).

*Daily frequency of consumption of fruits and vegetables* (SF Diet Questionnaire in North West Public Health Observatory Lifestyle Survey and Methods) was assessed from separate open-ended questions: “On average, how many portions of fruit/vegetables do you eat a day? Please write your number in the space provided”. Dietary intakes were compared with those recommended by the World Health Organisation (WHO) and with Dutch guidelines; the grouping of answers was roughly based on Dutch guidelines for fruit/vegetable consumption. The variable was dichotomized with options (1) less than four servings and (2) four or more servings.

*BMI* is a global index of nutritional status (WHO 2013). BMI (European Health Interview Survey 2006) was calculated from a self-reported height and weight. We dichotomized BMI as normal weight and overweight with the following cut-off points of: BMI <25 and ≥25, respectively.

*Socioeconomic position* of respondents was measured by educational level, household income and economic activity. Education (European Health Interview Survey 2006) was assessed by a question on the highest educational level attained. Responses were divided into three categories. No formal education and primary education were categorised as low educational level. The other two groups represent respondents with secondary and university education, respectively.

*Household income* was measured by self-reported annual household income (European Health Interview Survey 2006). The income per capita was adjusted for household size using the OECD modified scale by dividing by the number of adults and children in the household (OECD 2011). This was then divided into tertiles of adjusted household income (low, medium, high) and was separately categorised for Slovakia and for the Netherlands.

*Economic activity* of respondents was measured by a question about their occupational category, which comprised (1) employed, (2) unemployed, (3) housewives, (4) students, (5) long-term work disabled and (6) pensioners. Respondents answering with option 1 were tracked as economically active and with options 2–6 as economically inactive.

A semi-open question on ethnic background resulted in 23 different replies. Therefore, in statistical analyses, we dichotomised this item as indigenous and non-indigenous residents. Indigenous residents comprised a white European type of background. Non-indigenous residents comprised all other types of background.

### *Neighbourhood-level data*

We chose neighbourhood-level unemployment as the measure of area deprivation. It has been used quite frequently as a direct measure of area deprivation (Fukuda et al. 2005; Dragano et al. 2007; Naimi et al. 2009).

Slovak neighbourhoods concerned local administrative units on the lower level (the LAU 2 level) as defined by Eurostat (2010). Dutch neighbourhoods concerned areas based on postcode sectors. We used Census data for Slovak neighbourhoods (Statistical Office of the Slovak Republic 2002) and registered unemployment municipality data for Dutch neighbourhoods (UWV WERKbedrijf 2010) for the total proportion of unemployed residents (unemployed ≥16 years looking for their first job or having worked before). Data were split into tertiles of deprivation (least favourable, medium and most favourable) and were separately categorised for Slovakia and for the Netherlands.

### Statistical analyses

First, we cross-tabulated HRBs by tertiles of area deprivation in each country; statistical significance was tested using Chi-square tests. Second, we employed multilevel analyses to assess differences in HRB by area deprivation. We computed odds ratios for tertiles of deprived neighbourhoods, crude and adjusted for age, sex, and their interactions and ethnicity (Model 1). We then added country to the model and the interaction of country with area deprivation. Third, we added the measures of individual SEP to the model (education, household income, economic activity), both separately and jointly. Finally, we added the interaction of country with measures of individual SEP to Model 1.

Occurrences of HRB were modelled as binary outcome variables in multilevel logistic regression models of citizens (level 1) nested within neighbourhoods (level 2).

We performed the analyses in SPSS 20 for Windows (IBM company, Chicago, IL, USA) via generalised estimating equations. We redid the analyses regarding Model 1 in MLwiN 2.02 (Rasbash et al. 2005) to compute median odds ratio (MOR). The MOR is an interpretable measure of neighbourhood-level variance (Merlo et al. 2006). However, multilevel effects were not further needed in subsequent steps because of the lack of random effects (no random variance was observed across neighbourhoods).

## Results

### Characteristics of the sample

The Slovak sample comprised 622 respondents from 31 neighbourhoods. The Dutch sample comprised 665

respondents from 99 neighbourhoods. Respondents' background characteristics outcomes per country are described in Table 1.

The occurrence of HRB by tertiles of area unemployment differed between the countries. In the Netherlands, the rates for daily smoking, binge drinking and overweight were significantly higher in more unemployed neighbourhoods. In Slovakia, no significant differences were observed in the occurrence of HRB between neighbourhoods.

On the other hand, the rates of unfavourable HRB were mostly higher in Slovakia than in the Netherlands (Table 2).

Adjustment for age/sex, their interactions and ethnicity showed that in the Netherlands citizens from the least favourable areas were more likely to smoke daily [odds ratio (OR) 1.90, 95 % confidence interval (CI) 1.05–3.45] and were more often overweight than residents from the most favourable areas (OR 1.87, 95 % CI 1.20–2.92). Compared with residents from the most favourable areas, residents from the medium favourable areas binge drank more often (OR 2.22, 95 % CI 1.49–3.30), and citizens from the least favourable areas were significantly less likely to be physically active less than twice a week (OR 0.64, 95 % CI 0.44–0.94). The consumption of fruits and vegetables was not associated with area unemployment (Table 3).

**Table 1** Background characteristics of the samples per country, age-range 19–64 years, Slovakia and The Netherlands, 2010/2011

	Slovakia ( <i>N</i> = 622)		Netherlands ( <i>N</i> = 665)		<i>p</i> <sup>a</sup>
	<i>N</i>	%	<i>N</i>	%	
Age					
Mean age (±SD)	46.2	(±11.8)	40.1	(±12.2)	
Sex					n.s.
Men	260	41.8	284	42.7	
Adjusted household income (€)	11,912.0		38,072.8		<0.001
Mean (±SD)	(9,965.2)		(49,755.2)		
Household income <sup>b</sup>					
Low	181	33.4	173	33.3	
Medium	182	33.6	173	33.3	
High	179	33.0	173	33.3	
Educational level					<0.001
Low	30	4.8	44	6.7	
Secondary	297	47.8	229	34.9	
University	294	47.3	384	58.4	
Ethnic background					<0.001
Non-indigenous	1	0.2	71	10.8	
Economic activity					<0.001
Economically inactive	217	35.1	161	24.5	
Daily smoking					n.s.
Yes	113	18.3	115	17.3	
No	505	81.7	548	82.7	
Drinking behaviour					<0.001
Binge drinking	44	7.2	148	22.7	
No binge drinking	497	80.8	404	61.9	
Do not drink alcohol	74	12.0	101	15.5	
Body mass index					<0.001
Normal or underweight	287	46.7	422	65.7	
Overweight (very) severely overweight	327	53.3	220	34.3	
Physical exercise					<0.001
Less than twice a week	332	54.0	255	38.7	
Twice a week or more	283	46.0	404	61.3	
Consumption of fruits/vegetables					<0.001
Less than 4 portions/day	395	64.9	258	40.2	
4 or more portions/day	214	35.1	383	59.8	

Percentages do not always add up to 100 % due to rounding

<sup>a</sup> Chi-square test for categorical and *t* test for continuous variables

<sup>b</sup> Categories of adjusted household income (in €): for Slovakia low <5,820.00, medium 5,820.01–9,333.33, high >9,333.33; for the Netherlands low <17,692.31, medium 17,692.32–33,333.33, high >33,333.33

**Table 2** Prevalence of health-risk behaviours by tertiles of area unemployment rate in urban neighbourhoods in Slovakia (Bratislava, Kosice) and in the Netherlands (Amsterdam, Utrecht) among 19–64 years old, 2010/2011

Risk behaviour (cases/population; percentage)	Country (overall prevalence)	$p^\dagger$	Area unemployment			$p^\ddagger$
			Most favourable	Medium favourable	Least favourable	
Daily smoking	Slovakia (18.3 %)	0.66	55/250 (22.0)	28/174 (16.1)	30/190 (15.8)	0.16
	The Netherlands (17.3 %)		28/223 (12.6)	40/227 (17.6)	47/210 (22.4)	
Binge drinking	Slovakia (8.1 %)	<0.0001	19/211 (9.0)	10/159 (6.3)	14/167 (8.4)	0.62
	The Netherlands (26.8 %)		41/196 (20.9)	76/208 (36.5)	31/146 (21.2)	
Lack of physical exercise <sup>a</sup>	Slovakia (54.0 %)	<0.0001	118/250 (47.2)	79/172 (45.9)	85/189 (45.0)	0.90
	The Netherlands (38.7 %)		92/219 (42.0)	91/227 (40.1)	71/210 (33.8)	
Overweight	Slovakia (53.3 %)	<0.0001	126/148 (50.8)	85/171 (49.7)	115/191 (60.2)	0.076
	The Netherlands (34.3 %)		66/220 (30.0)	64/220 (29.1)	89/199 (44.7)	
Low consumption of fruits and/or vegetables <sup>b</sup>	Slovakia (64.9 %)	<0.0001	151/245 (61.6)	112/171 (65.5)	130/189 (68.8)	0.30
	The Netherlands (40.2 %)		84/218 (38.5)	96/221 (43.4)	78/199 (39.2)	

<sup>†</sup> Chi-square test for differences between countries

<sup>‡</sup> Chi-square test for differences between tertiles per country

<sup>a</sup> Frequency of physical exercise <2×/week

<sup>b</sup> Frequency of consumption of fruits and/or vegetables <4 portions/day

The relationship between daily smoking, binge drinking and physical activity and area unemployment differed between countries, as shown by the statistically significant interaction of area unemployment by country. Residents of the most favourable areas in Slovakia were more likely to be daily smokers (OR 1.98, 95 % CI 1.07–3.69), physically inactive (OR 2.34, 95 % CI 1.68–3.27) and were less likely to binge drink (OR 0.41, 95 % CI 0.20–0.83) than respondents from the same type of neighbourhoods in the Netherlands. Mutual adjustment for individual SEP explained area differences in smoking, physical activity and overweight, but not in binge drinking.

The associations of HRBs with individual-level SEP showed that in both countries residents with low and secondary education had higher odds of being daily smokers compared with university educated residents (OR 5.50, 95 % CI 2.37–12.76 and OR 3.11, 95 % CI 1.97–4.91, respectively). Further, residents with low income status and who were economically inactive had nearly double the odds of being overweight (OR 1.81, 95 % CI 1.06–3.09 and OR 1.68, 95 % CI 1.07–2.66, respectively) than citizens with high income status who were economically active (Table 4). The consumption of fruits and vegetables was not influenced by individual SEP, and this was the same for both countries (Table 4).

Statistically significant interactions by country were found for daily smoking with income status and for physical activity and overweight with educational level. Slovak residents with a medium income status had a lower risk of smoking daily compared with Dutch residents having the same income status (OR 0.82, 95 % CI 0.47–1.44) (further

results not shown). Slovak residents with a secondary education had a lower chance of exercising less than twice a week (OR 0.78, 95 % CI 0.58–1.06) and were less likely to be overweight (OR 0.90, 95 % CI 0.70–1.15) compared with Dutch residents having the same educational level (further results not shown) (Table 4).

## Discussion

We found that the association between area-level unemployment and HRB differed between Slovakia and the Netherlands; also, the patterns of HRB differed between both countries. In the Netherlands, the prevalence of almost all HRB was higher in areas with a high unemployment rate compared with those with a low rate, except for the consumption of fruits and vegetables. However, these area effects diminished after controlling for individual-level SEP. In Slovakia, we did not observe area effects on HRB, but Slovak residents generally had a higher risk for most HRB. At the individual level, we found an inverse socio-economic gradient for all examined HRB, except for the consumption of fruits and vegetables. The interaction of individual SEP with country was significant for overweight, physical activity and smoking.

The occurrence of daily smoking was significantly associated with area unemployment in both countries due to the SEP of the residents concerned. At the individual level, a lower educational level was associated with a higher likelihood of daily smoking in both countries. In line with our results, a study from Czech Republic showed

**Table 3** Odds ratios with 95 % confidence intervals for health-risk behaviours by tertiles of area unemployment in urban neighbourhoods in the Netherlands (Amsterdam, Utrecht) and in Slovakia (Bratislava, Kosice) in residents 19–64 years old, 2010/2011

	Daily smoking	Binge drinking	Lack of physical exercise	Overweight	Low consumption of fruits and/or vegetables
Adjusted for age/sex, ethnicity <sup>a</sup>					
Area unemployment					
Most favourable	1	1	1	1	1
Medium	1.44 (0.76–2.71)	<b>2.22</b> (1.49–3.30)	0.93 (0.67–1.30)	0.93 (0.62–1.41)	1.21 (0.82–1.79)
Least favourable	<b>1.90</b> (1.05–3.45)	1.04 (0.61–1.76)	<b>0.64</b> (0.44–0.94)	<b>1.87</b> (1.20–2.92)	1.02 (0.70–1.47)
Country					
The Netherlands	1	1	1	1	1
Slovakia	<b>1.98</b> (1.07–3.69)	<b>0.40</b> (0.21–0.78)	<b>1.66</b> (1.20–2.30)	<b>2.12</b> (1.56–2.88)	<b>2.61</b> (1.70–4.00)
Slovakia by area unemployment					
Most favourable	1	1	1	1	1
Medium	<b>0.47</b> (0.22–1.00)	<b>0.32</b> (0.15–0.68)	1.16 (0.74–1.83)	0.98 (0.62–1.56)	0.95 (0.56–1.61)
Least favourable	<b>0.36</b> (0.18–0.72)	0.81 (0.24–2.66)	<b>1.85</b> (1.14–3.02)	0.72 (0.42–1.23)	1.39 (0.80–2.38)
+Adjusted for individual-level SEP <sup>b</sup>					
Area unemployment					
Most favourable	1	1	1	1	1
Medium	1.09 (0.61–2.22)	<b>1.88</b> (1.17–3.00)	1.04 (0.69–1.56)	0.93 (0.62–1.39)	1.30 (0.84–2.02)
Least favourable	1.16 (0.56–2.11)	0.95 (0.52–1.74)	0.97 (0.63–1.50)	1.44 (0.62–1.39)	1.06 (0.70–1.61)
Country					
The Netherlands	1	1	1	1	1
Slovakia	1.34 (0.70–2.56)	<b>0.41</b> (0.20–0.83)	<b>2.34</b> (1.68–3.27)	<b>1.88</b> (1.28–2.75)	<b>2.86</b> (1.70–4.23)
Slovakia by area unemployment					
Most favourable	1	1	1	1	1
Medium	0.68 (0.29–1.56)	<b>0.32</b> (0.14–0.73)	0.94 (0.60–1.49)	0.97 (0.59–1.59)	0.97 (0.51–1.84)
Least favourable	0.66 (0.30–1.42)	0.81 (0.22–2.99)	1.11 (0.66–1.87)	0.86 (0.46–1.62)	1.24 (0.67–2.30)

Statistical significance at  $p < 0.05$  is indicated in bold

<sup>a</sup> Adjusted for age, sex and their interactions, ethnicity and country, interaction of country with area unemployment

<sup>b</sup> Adjusted for age, sex and their interactions, ethnicity and country, interaction of country with area unemployment, and socioeconomic position (income status, educational level, economic activity)

**Table 4** The effect of country, individual-level socioeconomic position and interaction of country by individual-level socioeconomic position on health-risk behaviours in deprived neighbourhoods regarding unemployment rates in the Netherlands (Amsterdam, Utrecht) and in Slovakia (Bratislava, Kosice) in residents aged 19–64 years in odds ratios with 95 % confidence intervals; adjusted for age/sex, ethnicity and area unemployment, 2010/2011

	Daily smoking	Binge drinking	Lack of physical exercise	Overweight	Low consumption of fruits and/or vegetables
<b>Measures of individual SEP</b>					
Income status	1	1	1	1	1
High	<b>1.91</b> (1.12–3.24)	0.86 (0.47–1.57)	0.78 (0.52–1.17)	1.22 (0.72–2.07)	0.74 (0.47–1.15)
Medium	1.66 (0.81–3.39)	1.11 (0.61–2.04)	0.71 (0.43–1.17)	<b>1.81</b> (1.06–3.09)	0.90 (0.57–1.44)
Low	1	1	1	1	1
Country	<b>1.84</b> (1.01–3.37)	<b>0.18</b> (0.07–0.47)	<b>2.17</b> (1.43–3.29)	<b>2.27</b> (1.40–3.66)	<b>2.97</b> (2.01–4.37)
<b>Slovakia by income status</b>					
High	1	1	1	1	1
Medium	<b>0.42</b> (0.20–0.90)	1.51 (0.38–5.94)	1.22 (0.68–2.18)	0.87 (0.45–1.68)	1.19 (0.65–2.15)
Low	0.65 (0.30–1.41)	2.02 (0.65–6.33)	0.97 (0.52–1.82)	0.64 (0.30–1.36)	0.84 (0.48–1.44)
<b>Educational level</b>					
University	1	1	1	1	1
Secondary	<b>3.11</b> (1.97–4.91)	1.15 (0.76–1.72)	<b>1.46</b> (1.04–2.05)	<b>1.93</b> (1.33–2.79)	1.31 (0.93–1.83)
Low	<b>5.50</b> (2.37–12.76)	1.30 (0.34–4.94)	0.97 (0.49–1.93)	<b>2.54</b> (1.09–5.88)	1.27 (0.61–2.62)
Country	1	1	1	1	1
<b>The Netherlands</b>					
Slovakia	1.02 (0.54–1.92)	<b>0.21</b> (0.11–0.39)	<b>2.71</b> (2.00–3.68)	<b>2.60</b> (1.33–2.79)	<b>2.96</b> (2.15–4.09)
<b>Slovakia by educational level</b>					
University	1	1	1	1	1
Secondary	0.97 (0.42–2.20)	1.20 (0.49–2.92)	<b>0.52</b> (0.33–0.82)	<b>0.48</b> (0.31–0.75)	0.88 (0.57–1.36)
Low	1.89 (0.60–5.89)	4.12 (0.89–19.08)	0.74 (0.28–1.97)	0.42 (0.14–1.23)	0.61 (0.19–1.95)
<b>Economic activity</b>					
Active	1	1	1	1	1
Inactive	1.36 (0.83–2.25)	<b>0.63</b> (0.41–0.99)	0.74 (0.48–1.15)	<b>1.68</b> (1.07–2.66)	1.11 (0.73–1.69)
Country	1	1	1	1	1
<b>The Netherlands</b>					
Slovakia	1.09 (0.71–1.66)	<b>0.24</b> (0.14–0.41)	<b>2.21</b> (1.69–2.89)	<b>2.04</b> (1.56–2.66)	<b>2.73</b> (2.06–3.62)
<b>Slovakia by economic activity</b>					
Active	1	1	1	1	1
Inactive	1.07 (0.58–1.97)	1.48 (0.60–3.66)	0.95 (0.58–1.56)	0.67 (0.37–1.21)	1.01 (0.59–1.72)

Statistical significance at  $p < 0.05$  is indicated in bold  
Adjusted for age, sex and their interactions

that smoking was more common in areas with higher unemployment and that education had a strongly inverse relation to smoking (Spilkova et al. 2011). Our results further indicate that Slovak residents were at higher risk of daily smoking than residents in the Netherlands. One of the possible explanations for this may be the lower awareness of Slovak citizens about the health consequences of smoking. As the monitoring of MPOWER policies in 2011 by WHO shows, Slovakia, in contrast to the Netherlands, did not implement a national mass media campaign regarding smoking during 2009 or 2010 (Mackenbach and McKee 2013).

We found binge drinking to be associated with area unemployment in both countries. In Slovakia, it had already been shown that the district unemployment rate was associated with higher regional alcohol-related mortality (Rosicova et al. 2011). However, residents from the medium deprived urban neighbourhoods in the Netherlands had a higher risk of binge drinking than residents from the most favourable areas, even after adjustment for the SEP of residents concerned. This is an interesting finding, as the recent study by Kuipers et al. (2013) found that the prevalence of heavy drinking was lower in deprived neighbourhoods than in the rest of the Netherlands. Within the EU, at least one-quarter of the difference in life expectancy between newer and older Member States is linked to alcohol (Zatonski 2008 cited in Mackenbach and McKee 2013). However, in this study, binge drinking was more prevalent in the Netherlands than in Slovakia. This may be due to more liberal attitudes and norms regarding drinking, including heavy drinking, in the Netherlands (Caetano and Clark 1999 cited in Bernstein et al. 2007).

For physical exercise we observed that Slovak residents were more physically inactive than Dutch residents. These differences may be partially attributable to a generally higher prevalence of cycling in the Netherlands (Pucher and Buehler 2008). Although cycling is used mostly for transport rather than in leisure time (Kramer et al. 2013), it may be possible that Dutch respondents also reported this kind of activity as vigorous exercise.

For overweight we found that in the Netherlands residents from the least favourable areas had a higher risk than residents from the medium or most favourable areas, which was mainly due to the socioeconomic profile of the residents. This contrasts to UK findings showing that residence in a more deprived neighbourhood contributed to a higher initial BMI independent of the individual SEP and also to a greater weight gain over time in women (Stafford et al. 2010). Although we did not find an increase of risk for obesity by area deprivation in Slovakia, Slovak respondents were generally almost twice as likely to be obese than Dutch respondents. We also found individual-level socioeconomic differences in obesity. Respondents with low

income status, low educational level and who were economically inactive had a higher risk of obesity, confirming previous findings (Black and Macinko 2008).

For the consumption of fruits and vegetables, we did not find any relationship with area unemployment or with individual-level socioeconomic characteristics for either of the countries, which is in contrast with the findings of a previous systematic review (Kamphuis et al. 2006) on this topic. Notwithstanding, we did find country-level differences. Citizens in Slovakia were less likely to consume fruit and vegetables than citizens in the Netherlands. A previous study on dietary habits in urban settings in three Central and Eastern European countries (Czech Republic, Poland, Russia) (Boylan et al. 2011) also reported lower consumption of fruits and vegetables than recommended by the WHO.

### Study strengths and limitations

Important strengths of our international comparative study are that we used standardised sampling, recruitment and data collection protocols developed within the EURO-URHIS2 project. One of the limitations of this study is that Slovak and Dutch neighbourhoods varied regarding the number of respondents and residents, which may have possibly biased our results. However, evidence regarding small areas suggests that the choice of the geographical classification level has only a small impact on the size of health differences by area deprivation (Reijneveld et al. 2000). Another limitation is the relatively low response rate, although the differences between respondents and non-respondents were trivial or small (Cohen's  $W$  in both countries was  $<0.15$ ) and the response rates were rather similar in both countries. Next, university educated residents in both countries were somewhat overrepresented while Roma in Slovakia and some non-western ethnic groups in the Netherlands were underrepresented. This may have affected our results, but is less likely to affect between-country comparisons as it affected both countries. Moreover, measurements were based on self-reports, which may have introduced some social desirability. Self-reporting tends to underestimate smoking (Fendrich et al. 2005) and alcohol use (Ekholm et al. 2011).

### Implications

Different public health strategies should be applied in Slovakia and in the Netherlands. In Slovakia, where no area differences in HRB were observed, it may be relevant to target public health strategies aimed at promoting healthy lifestyle programmes at the community level in any type of neighbourhood. Moreover, youth and adolescents should be targeted early as a recent study shows (Pitel et al.

2013) that they already participate in risky behaviours. In the Netherlands, the effect of area unemployment was strong for all HRBs. Community intervention approaches combined with interventions on the individual level may provide a means to counteract this adverse position. Furthermore, assessment of the effect of other indicators of socioeconomic disadvantage would be helpful to decide on further health policies.

Our findings regarding a lack of neighbourhood-unemployment effects on HRB in Slovakia need to be confirmed by other studies from Central to Eastern Europe. Finally, further longitudinal research needs to explore how the neighbourhood-unemployment rate contributes to health behaviours of residents.

**Acknowledgments** This research project has been supported by the European Commission under the 7th Framework Programme through the Collaborative Project FP7-HEALTH-2007-B Contract No. 223711 (20 %). Furthermore, this work was supported by the Slovak Research and Development Agency under Contract Nos. APVV-0220-10 (70 %) and DO7RP-0035-11 (10 %). The authors would like to thank Henriëtte Dijkshoorn for providing data for Amsterdam and for her comments on the manuscript.

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