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## The effect of neighbourhood unemployment on health-risk behaviours in elderly differs between Slovak and Dutch cities

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**Background:** Health-risk behaviours (HRB) increase the risk of disability and chronic diseases at an older age. This study aimed to compare Slovakia and the Netherlands regarding differences in the prevalence of HRB by neighbourhood and individual deprivation and to determine whether area differences could be explained by the socio-economic position (SEP) of the residents. **Methods:** We obtained data on non-institutionalized residents aged ≥65 years from the EU-FP7: EURO-URHIS 2 project from Slovak ( $N=665$ , response rate 44.0%) and Dutch cities ( $N=795$ , response rate 50.2%). HRB concerned daily smoking, binge drinking, physical activity, consumption of fruits and vegetables and body mass index. Area deprivation was measured by the neighbourhood unemployment rate. Individual SEP was measured by education and household income with financial strain. We used multilevel logistic regression. **Results:** In Slovakia, no HRB was associated with either neighbourhood unemployment or individual SEP. The elderly in the Netherlands from the least favourable neighbourhoods were more likely to be daily smokers [odds ratio (OR) 2.32; 95% confidence interval (CI) 1.25, 4.30] and overweight (OR 1.84; 95% CI 1.24, 2.75) than residents from the most favourable ones. For the Dutch elderly the gradients varied per HRB and per individual-level SEP indicator. Individual SEP explained country differences in the association of area unemployment with smoking and lack of physical activity but not that with overweight. **Conclusion:** Countries differed in the associations with HRB of both neighbourhood unemployment and individual SEP among the elderly urban residents. The local importance of socio-economic factors on both levels should be considered when developing health-promotion activities for the elderly.

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## Introduction

The European population is ageing,<sup>1</sup> leading to an increase in morbidity. It is projected that the number of people aged >65 years will almost double in the coming decades in the European Union, rising from 85 million in 2008 to 151 million in 2060.<sup>2</sup> Maintaining good health in older age is central to the global response to population ageing.<sup>3,4</sup> The likelihood that a person will age successfully increases if he or she adheres to recommendations regarding exercise, alcohol, smoking, diet and body mass index (BMI).<sup>5</sup> The compression of morbidity may also be achieved by targeting lifestyle factors. Even modest improvements

in health behaviours could substantially decrease the risk for disability.<sup>6,7</sup>

Evidence on factors affecting health-risk behaviours (HRB) in elderly populations aged >65 years is needed, as their context differs substantially from that of other age categories. First, the ageing process might be difficult for some elderly individuals, as it may be accompanied by a loss of spouse, fewer social contacts or changes in financial circumstances, which may act as triggers for HRB. Second, the transition from work to retirement is frequently associated with changes in lifestyle.<sup>8</sup> Third, because HRB usually co-occur (i.e. smoking habit with drinking, fewer physical activity with obesity), they may influence the elderly individual's existing or

future morbidity. Owing to co-occurrence, adverse health effects may also cluster in certain deprived groups. Finally, a significant number of the elderly individuals have a low income,<sup>9</sup> and economic resources in aging populations have been shown to be associated with HRB.<sup>10</sup>

Evidence shows that both individual- and area-level deprivation<sup>11–14</sup> are associated with HRB in elderly populations. For example, higher levels of smoking and lower levels of physical activity were found in more deprived neighbourhoods among elderly British women.<sup>12</sup> In the UK, multiple HRB were more common in the elderly with lower socio-economic position (SEP).<sup>15</sup> Particularly nowadays, in a period of economic recession and austerity,<sup>16</sup> it is important to assess the effect of area deprivation on the HRB of residents. Exploring this issue may reveal areas within cities that need to be targeted specifically with health promotion.

The majority of studies on the area effect on lifestyle in elderly populations are conducted in Western European (WE) countries, and evidence regarding this aspect from Central European (CE) countries is lacking. From a European perspective, where policies on healthy aging should be tailored to a country's needs, evidence from comparative studies may be useful. We compared Slovakia (a CE country) and the Netherlands (a WE country); these two countries differ not only socio-economically and culturally but also in healthy life expectancy, a quantitative measure of disability. At age 65 years, Slovak citizens can expect the fewest healthy life years among all European Union countries, whereas the Netherlands is among the high-scoring countries.<sup>17</sup>

In this article, we aim to answer four research questions: (i) Is the prevalence of HRB higher in deprived neighbourhoods and among deprived people?; (ii) Do countries differ in the association of HRB with area unemployment?; (iii) Could this be explained by the socio-economic characteristics of citizens?; and (iv) Do countries differ in the association of socio-economic characteristics of citizens and HRB?

## 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 (the 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  $\geq 65$  years. In each city a representative sample of 800 persons aged  $\geq 65$  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 explaining the project and a confidentiality statement on each returned questionnaire.

Regarding the Slovak cities, the sample was randomly selected by the Population Registry Office of the Slovak Republic. To motivate respondents, a raffle (nine gift vouchers of €10) and gift incentives (a bookmark with calendars) were used. Non-respondents were contacted repeatedly by two postal reminders and by telephone. Data collection lasted from September 2010 to March 2011. Invalid addresses ( $n=58$ ), deaths ( $n=4$ ) and incapacities to complete the questionnaire with living/working abroad ( $n=26$ ) were deducted from the original Slovak sample size. Thus, the overall response rate in Slovakia was 44.0% ( $n=665$ ); refusals comprised 33.1% ( $n=500$ ) and other non-responses 22.9% ( $n=347$ ). Respondents did not differ from non-respondents regarding gender (Cohen's  $W$  0.03).

In the Dutch cities, the sample was randomly selected from the municipal population register in each city. As an incentive to participants, a raffle (four gift vouchers of €50) was used in Amsterdam

and a lottery (two vouchers of €100) was used in Utrecht. Non-respondents in Amsterdam were contacted in two additional mailings and in Utrecht also approached by phone calls. Data collection lasted from September 2010 to January 2011.

The overall response rate in the Netherlands was 50.2% ( $n=795$ ), after invalid addresses ( $n=4$ ), deaths ( $n=5$ ) and incapacities to complete the questionnaire ( $n=6$ ) were subtracted. Refusals represented 24.0% ( $n=380$ ) and non-respondents 25.9% ( $n=410$ ). Respondents did not differ from non-respondents regarding gender (Cohen's  $W$  0.001).

Our analysis concerned non-institutionalized residents aged  $\geq 65$  years.

### Measures

The original EURO-URHIS 2 questionnaire was translated from English into Slovak and Dutch and back translated afterwards. Differences between the original and back translations were discussed by the research team to optimize the translation and to respect the cultural and linguistic usage differences between the two populations.

### Individual-level data

We used five indicators of HRBs: daily smoking, binge drinking, physical activity, consumption of fruits and vegetables and BMI.

'Daily smoking' was assessed from a question on smoking status (The European health interview survey, 2006, modified): 'Do you currently smoke', with four answering options. The variable was dichotomized as smoking daily and not smoking daily.

'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 five answering options. The answers were dichotomized and different criteria were set for men (once a week) and for women (once a month).<sup>18</sup> Harmful alcohol consumption among older people deserves attention.<sup>19,20</sup>

'Physical activity' for at least 30 minutes 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 eight answering options. The variable was dichotomized as twice a week or more vs. less than twice a week. The grouping of options was roughly based on the World Health Organization (WHO) guidelines for healthy exercising (150 min/week moderate exercise or 75 min/week vigorous exercise)<sup>21</sup> and the Dutch Standard for Healthy Exercise (5  $\times$  30 min moderate/week or 3  $\times$  20 min intensive/week).<sup>22</sup>

'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 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: (i) less than four servings and (ii) four or more servings.

'BMI' is a global index of nutritional status.<sup>23</sup> BMI (European health interview survey, 2006) was calculated from the self-reported height and weight (body weight in kilograms divided by the square of the body length in meters). For analytical purposes we dichotomized BMI as normal weight ( $<25$ ) and overweight ( $\geq 25$ ).

'SEP' of respondents was measured by educational level, household income and financial strain. 'Education' (The 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 categorized as low educational level. The other two groups represent respondents with secondary and university education, respectively.

'Composition of the household' concerned the number of adults aged  $\geq 18$  years and children aged 0–17 years who lived in the household.

'Living arrangements' were assessed by asking respondents about living with or without a partner.

'Household income' was measured by self-reported annual household income (The 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.<sup>24</sup> This was then divided into tertiles of adjusted household income (low, medium, high) and was separately categorized for Slovakia and for the Netherlands.

'Financial strain' (EURO-URHIS 2, 2011) was assessed by asking respondents 'Do you have enough money for daily expenses, e.g. accommodation, travel, clothing, food?', with answer options of yes and no.

## Neighbourhood-level data

Neighbourhood-level unemployment was chosen as the measure of area deprivation; it has also been used previously in other studies on area deprivation.<sup>25–28</sup> High neighbourhood-level unemployment reflects individual-level income-based deprivation and implies a lack of basic skills and competencies in a given community.<sup>28</sup>

Slovak neighbourhoods involved local administrative units on the lower level (the LAU 2 level) as defined by Eurostat.<sup>29</sup> Dutch neighbourhoods were areas based on postcode sectors. We used Census data for Slovak neighbourhoods<sup>30</sup> and registered unemployment municipality data for Dutch neighbourhoods<sup>31</sup> for the total proportion of unemployed residents (Unemployed,  $\geq 16$  years of age, 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 categorized for Slovakia and for the Netherlands.

## Statistical analyses

First, we used the Chi-squared significance test to assess the association of HRB with area deprivation in each country. Second, we used multilevel analyses to assess the neighbourhood-level variance in HRB and to assess differences by tertiles of area deprivation. We computed odds ratios (ORs) for tertiles of deprived neighbourhoods, crude and adjusted for age, sex and their interactions and ethnicity (Model 1). We then added the country into the model and the interaction of the country with area deprivation. Third, we added the measures of individual SEP to the model (education, household income, financial strain). Finally, we added the interaction of the country with the measures of individual SEP into Model 1.

Each HRB was 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, Illinois, USA) via generalized estimating equations. We also used MlwiN 2.02<sup>32</sup> to compute median odds ratios (MOR), which is an interpretable measure of neighbourhood-level variance.<sup>33</sup>

## Results

### Characteristics of the sample

The Slovak sample comprised 644 respondents from 30 neighbourhoods. The mean age of the residents was 72.9 years (SD = 6.1); 54.7% were men. The Dutch sample comprised 760 respondents living in 102 neighbourhoods. The mean age of the residents was 74.5 years (SD = 7.0); 50.7% were men. Respondents' background

characteristics with the main study variables per country are described in table 1.

The occurrence of HRB by tertiles of neighbourhood unemployment differed between the countries. In the Netherlands in the least favourable neighbourhoods in terms of the unemployment rate, the prevalence of overweight residents was 63.7% compared with 48.9% in the most favourable neighbourhoods. The prevalence of daily smoking also significantly differed between neighbourhoods, with the lowest daily smoking observed in the most favourable neighbourhoods (7.9%). In Slovakia, no significant differences were observed in the occurrence of HRB between urban neighbourhoods.

The prevalences of unfavourable HRB were mostly higher in Slovakia than in the Netherlands. Compared with the Netherlands, more citizens in Slovakia were overweight or obese (69.0 vs. 57.2%) and did not meet recommendations for daily proportions of fruit and vegetables (67.5 vs. 34.4%). The overall prevalence of daily smoking was significantly higher in the Netherlands (13.2%) than in Slovakia (7.4%) (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 [OR 2.32; 95% confidence interval (CI) 1.25, 4.30] and had a higher odds for overweight than residents from the most favourable areas (OR 1.84; 95% CI 1.24, 2.75). Differences between Slovakia and the Netherlands for the most favourable tertiles were observed for a lack of physical activity ( $P$ -value of the interaction with country;  $P = 0.045$ ) and overweight ( $P = 0.017$ ). For example, Slovak citizens from the most favourable neighbourhoods had a 2.37 higher odds of being overweight compared with Dutch citizens (OR 2.37; 95% CI 1.52, 3.70) from the same type of areas. Binge drinking, lack of physical activity and low consumption of fruits and vegetables was not associated with neighbourhood unemployment in either country.

Clustering of HRB within neighbourhoods was found for daily smoking, overweight and insufficient consumption of fruits and/or vegetables. For example, for smoking the median odds of being a daily smoker for an individual living in a more deprived area was 1.43 times greater than for an individual in a less deprived neighbourhood when randomly selecting two persons from different neighbourhoods. Additional adjustment for individual SEP explained country differences in the association of area unemployment with smoking and lack of physical activity but not with overweight. Overall, Slovak elderly individuals were more likely to be physically inactive, overweight and consume fewer fruits and vegetables (table 3).

With regard to the association of individual-level deprivation with HRB, in the Netherlands a low income status increased only the likelihood for overweight (OR 2.23; 95% CI 1.26, 3.94). In contrast, low education increased the odds for all HRB, except low consumption of fruits and vegetables. Financial strain increased the odds for overweight and low consumption of fruits and vegetables. None of these three indicators of SEP was associated with HRB in Slovakia. However, between both countries, differences in gradients were found for overweight, income, education and financial strain. Slovak elderly individuals with a high income level, with a university education and without financial strain had a higher likelihood of overweight than their Dutch counterparts (table 4).

## Discussion

In this comparative study we found that Slovak and Dutch elderly populations differed in the association of HRB both by neighbourhood and by individual deprivation. In Slovakia, none of the studied HRB was associated either with neighbourhood unemployment or individual-level SEP. In the Netherlands, daily smoking and overweight occurred more frequently in more deprived neighbourhoods. Furthermore, for Dutch elderly individuals, the gradients varied per HRB per individual-level SEP indicators. Individual-level SEP

**Table 1** Background characteristics of the samples per country, age range  $\geq 65$  years,<sup>a</sup> Slovakia and the Netherlands, 2010/2011

	Slovakia (N=644)		The Netherlands (N=760)		<i>p</i> <sup>b</sup>
Age					
Mean age ( $\pm$ standard deviation)		72.9 ( $\pm$ 6.1)		74.5 ( $\pm$ 7.0)	
Variables	N	%	N	%	
Sex					n.s.
Men	352	54.7	385	50.7	
Adjusted household income (€)	6504.2		24711.7		<0.001
Mean ( $\pm$ SD)	(3312.6)		(19341.5)		
Household income <sup>c</sup>					
Low	191	34.0	180	35.0	
Medium	185	32.9	167	32.5	
High	186	33.1	167	32.5	
Educational level					<0.001
Low	92	14.3	184	25.1	
Secondary	324	50.4	384	52.5	
University	227	35.3	164	22.4	
Ethnic background					<0.001
Non-indigenous	5	0.8	54	7.2	
Financial strain					<0.001
Yes	187	29.4	64	8.7	
No	448	70.6	675	91.3	
Daily smoking					<0.001
Yes	47	7.4	99	13.2	
No	586	92.6	651	86.8	
Binge drinking					n.s.
Yes	60	11.5	78	14.1	
No	462	88.5	475	85.9	
BMI					<0.001
Normal or underweight	197	31.0	306	42.8	
Overweight, (very) severely overweight	438	69.0	409	57.2	
Physical activity					n.s.
Less than twice a week	247	40.0	281	38.3	
Twice a week or more	371	60.0	452	61.7	
Consumption of fruits/vegetables					<0.001
Fewer than four portions/day	395	67.5	250	34.4	
Four or more portions/day	190	32.5	477	65.6	

a: Percentages do not always add up to 100% because of rounding.

b: Chi-square test for categorical and *t*-test for continuous variables.

c: Categories of adjusted household income (in Euros): for Slovakia low <5120.00, medium 5120.01–6720, high >6720.01; for the Netherlands low <16 000, medium 16 000–25 000, high >25 000.01.

**Table 2** Prevalence of HRB by tertiles of area unemployment rate in urban neighbourhoods in Slovakia (Bratislava, Kosice) and in the Netherlands (Amsterdam, Utrecht) among residents aged  $\geq 65$  years, 2010/2011

Risk behaviour (cases/population; (percentage)	Country (overall prevalence)	<i>p</i> <sup>a</sup>	Area unemployment			<i>p</i> <sup>b</sup>
			Most favourable	Medium favourable	Least favourable	
Daily smoking	Slovakia (7.4%)	<0.0001	19/230 (8.3)	14/193 (7.3)	14/210 (6.7)	0.81
	The Netherlands (13.2%)		22/277 (7.9)	40/223 (17.9)	37/249 (14.9)	0.003
Binge drinking	Slovakia (11.5%)	0.20	21/195 (10.8)	23/156 (14.7)	16/171 (9.4)	0.29
	The Netherlands (14.1%)		29/226 (12.8)	25/158 (15.8)	24/168 (14.3)	0.71
Lack of physical activity <sup>c</sup>	Slovakia (40.0%)	0.54	97/224 (43.3)	69/191 (36.1)	81/203 (39.9)	0.33
	The Netherlands (38.3%)		93/271 (34.3)	89/218 (40.8)	98/243 (40.3)	0.24
Overweight	Slovakia (69.0%)	<0.0001	158/231 (68.4)	136/196 (69.4)	144/208 (69.2)	0.97
	The Netherlands (57.2%)		129/264 (48.9)	130/216 (60.2)	149/234 (63.7)	0.002
Low consumption of fruits and/or vegetables <sup>d</sup>	Slovakia (67.5%)	<0.0001	136/206 (66.0)	121/185 (65.4)	138/194 (71.1)	0.42
	The Netherlands (34.4%)		87/268(32.5)	85/219 (38.8)	78/239 (32.6)	0.26

a: Chi-square test for differences between countries.

b: Chi-square test for differences between tertiles per country.

c: Frequency of physical exercise less than two times per week.

d: Frequency of consumption of fruits and/or vegetables less than four portions a day.

explained country differences in the association of area unemployment with smoking and lack of physical activity but not with overweight.

In Slovakia, neither neighbourhood unemployment nor individual-level SEP was associated with unfavourable health

behaviours. A recent urban study from Switzerland in people aged 65–70 years<sup>10</sup> found a similar lack of area effects on HRB. But contrary to our study, these authors found the risk of HRB (except alcohol consumption) to be increased in low-income elderly. The lack of area effect in our study may be related to

**Table 3** ORs with 95% CIs for HRB by tertiles of area unemployment in urban neighbourhoods in the Netherlands (Amsterdam, Utrecht) and in Slovakia (Bratislava, Kosice) in residents aged  $\geq 65$  years, 2010/2011

Adjustments	Daily smoking	Binge drinking	Lack of physical activity	Overweight	Low consumption of fruits and/or vegetables
<b>Adjusted for age/sex, ethnicity<sup>a</sup></b>					
Area unemployment					
Most favourable	1	1	1	1	1
Medium	<b>2.61</b> (1.42–4.82)	1.30 (0.72–2.34)	1.34 (0.93–1.93)	<b>1.56</b> (1.04–2.32)	1.39 (0.95–2.03)
Least favourable	<b>2.32</b> (1.25–4.30)	1.19 (0.66–2.13)	1.23 (0.86–1.77)	<b>1.84</b> (1.24–2.75)	1.00 (0.68–1.47)
Country					
The Netherlands	1	1	1	1	1
Slovakia	0.97 (0.46–2.07)	0.80 (0.46–1.38)	<b>1.55</b> (1.11–2.16)	<b>2.37</b> (1.52–3.70)	<b>4.34</b> (2.91–6.46)
Slovakia by area unemployment					
Most favourable	1	1	1	1	1
Medium	<b>0.35</b> (0.12–1.03)	0.98 (0.47–2.04)	<b>0.60</b> (0.37–0.99)	0.60 (0.31–1.16)	0.73 (0.41–1.30)
Least favourable	<b>0.30</b> (0.10–0.88)	0.66 (0.31–1.39)	0.70 (0.41–1.18)	0.55 (0.29–1.05)	1.34 (0.75–2.42)
MOR	1.43	1.00	1.00	1.27	1.05
<b>Adjusted for individual-level SEP<sup>b</sup></b>					
Area unemployment					
Most favourable	1	1	1	1	1
Medium	1.89 (0.87–4.12)	1.78 (0.90–3.52)	1.20 (0.76–1.92)	1.21 (0.66–2.22)	1.29 (0.81–2.06)
Least favourable	1.65 (0.74–3.70)	0.99 (0.43–2.30)	1.12 (0.72–1.74)	<b>1.83</b> (1.14–2.95)	1.08 (0.69–1.70)
Country					
The Netherlands	1	1	1	1	1
Slovakia	0.90 (0.36–2.21)	0.82 (0.42–1.60)	<b>1.56</b> (1.08–2.72)	<b>2.30</b> (1.57–3.38)	<b>4.83</b> (2.98–7.84)
Slovakia by area unemployment					
Most favourable	1	1	1	1	1
Medium	0.38 (0.10–1.42)	0.63 (0.25–1.54)	0.65 (0.37–1.15)	0.78 (0.39–1.53)	0.85 (0.47–1.54)
Least favourable	0.45 (0.13–1.59)	0.92 (0.33–2.55)	0.64 (0.37–1.11)	<b>0.55</b> (0.31–0.98)	1.24 (0.63–2.41)
MOR	1.59	1.00	1.00	1.00	1.00

a: Adjusted for age, sex and their interactions, ethnicity and country, interaction of country with area unemployment.

b: Adjusted for age, sex and their interactions, ethnicity and country, interaction of country with area unemployment, and SEP (income status, educational level, financial strain).

Statistical significance at  $P < 0.05$  is indicated in **bold**.

the housing conditions in the past. In line with the urban development policy in CE in 1960s–1990s, which aimed to meet the demand for housing, large scale high-rise blocks of flats were built. These ‘ensured’ some social mixing.<sup>34</sup> The fact that residential mobility is decreasing with age and that this feature holds true also for CE cities<sup>35</sup> may explain the observed lack of an area-level effect in Slovak cities. An explanation for the lack of individual-level socio-economic differences might be that in the past the communist system ensured more equal exposure to adverse circumstances during working ages, which continues to be visible when the cohort concerned gets older. Furthermore, the health-care system in this era was on one hand successful in combating infectious diseases but certainly did not encourage health-promotion and individual responsibility for health and did not implement any effective intervention programmes in this field. This cohort also had to face new challenges after communism—a transition period—accompanied by rising socio-economic differences, unemployment and loss of social norms and values.<sup>36</sup> In the Netherlands, the educational level of the elderly was the most consistent predictor for the studied adverse lifestyle behaviours. In contrast, in the British ageing population, Shankar et al.<sup>15</sup> found that total accumulated wealth and subjective social status were more consistently related to HRB than education. These findings for the Netherlands and the UK mostly fit with the epidemiological transition theory, whereas in Slovakia the communist-free market transition seems to have overruled the effects of the epidemiological transition.

Indicators of individual deprivation had a different association with HRB in Slovakia and in the Netherlands. Slovak elderly individuals with a high income status, with university education and without financial strain, had a higher likelihood of overweight than their Dutch counterparts. This clearly confirms that inequalities between CE and WE residents are present for risk factors as well, independent of relative SES. This finding suggests that a higher SEP

in one country does not offer the same health benefits as in the other one.

Overall, Slovak elderly individuals had higher odds of being physically inactive, overweight and consuming fewer fruits and vegetables compared with their Dutch counterparts. Some elderly might thus be unable to exercise in the recommended frequency owing to illness or disability.<sup>37</sup> However, repeating the analyses with adjustment for this led to only minor changes in ORs (results not shown).

We previously reported that among people aged 19–64 years old,<sup>38</sup> Slovak urban residents similarly showed a higher risk for most HRBs and no area effects. With regard to the Netherlands, in this age group, the prevalence of almost all HRBs was higher in deprived areas, except for the consumption of fruits and vegetables. This may also be due to Slovak housing policies in the past. Whether this continues to be so for the younger ages may be questioned as well and is deserving of additional study.

### Study strengths and limitations

Standardized sampling, recruitment and data collection protocols developed within the EURO-URHIS 2 project, together with applied multilevel analyses, are important strengths of our study. To our knowledge, this is the first study that provides evidence on HRB among urban elderly populations from a CE country benchmarked to a WE country.

We are aware of a number of limitations too, however. A first limitation is the relatively low response rate, although no differences between respondents and non-respondents were detected (Cohen’s  $W$  in both countries was  $< 0.01$ ). Moreover, the methods of data collection and the resulting response rates were similar in both countries. We were not able to compare respondents with non-respondents by individual-level or area-level socio-economic indicators, as information on these characteristics was not

**Table 4** The effect of country, individual-level SEP and interaction of country by individual-level SEP on HRB in deprived neighbourhoods regarding unemployment rates in the Netherlands (Amsterdam, Utrecht) and in Slovakia (Bratislava, Kosice) in residents aged  $\geq 65$  years in ORs with 95% CIs; adjusted for age/sex,<sup>a</sup> ethnicity and area unemployment, 2010/2011

Measures of individual SEP	Daily smoking	Binge drinking	Lack of physical activity	Overweight	Low consumption of fruits and/or vegetables
<b>Income status</b>					
High	1	1	1	1	1
Medium	1.70 (0.87–3.33)	1.51 (0.74–3.07)	1.00 (0.64–1.54)	<b>1.82</b> (1.16–2.85)	1.09 (0.71–1.68)
Low	1.52 (0.77–3.01)	0.82 (0.36–1.87)	1.27 (0.85–1.88)	<b>2.23</b> (1.26–3.94)	1.06 (0.69–1.64)
<b>Country</b>					
The Netherlands	1	1	1	1	1
Slovakia	0.67 (0.27–1.70)	0.58 (0.24–1.42)	1.11 (0.77–1.60)	<b>3.26</b> (1.97–5.38)	<b>4.48</b> (2.94–6.82)
<b>Slovakia by income status</b>					
High	1	1	1	1	1
Medium	0.60 (0.21–1.71)	1.23 (0.41–3.68)	1.10 (0.59–2.06)	<b>0.42</b> (0.21–0.82)	1.29 (0.65–2.58)
Low	0.84 (0.28–2.58)	1.84 (0.51–6.62)	1.04 (0.64–1.69)	<b>0.40</b> (0.19–0.83)	0.92 (0.55–1.54)
<b>Educational level</b>					
University	1	1	1	1	1
Secondary	1.68 (0.89–3.16)	1.36 (0.84–2.22)	<b>1.73</b> (1.16–2.59)	<b>1.68</b> (1.17–2.43)	1.36 (0.88–2.10)
Low	<b>2.47</b> (1.15–5.32)	<b>4.79</b> (2.55–9.02)	1.43 (0.90–2.25)	<b>2.76</b> (1.75–4.37)	1.24 (0.77–1.98)
<b>Country</b>					
The Netherlands	1	1	1	1	1
Slovakia	0.87 (0.38–1.98)	0.76 (0.39–1.49)	1.39 (0.88–2.19)	<b>2.43</b> (1.63–3.62)	<b>4.85</b> (3.03–7.77)
<b>Slovakia by educational level</b>					
University	1	1	1	1	1
Secondary	0.52 (0.19–1.39)	1.22 (0.57–2.62)	0.82 (0.47–1.46)	0.67 (0.40–1.12)	0.85 (0.50–1.43)
Low	<b>0.17</b> (0.03–0.82)	0.43 (0.14–1.32)	1.16 (0.64–2.11)	<b>0.49</b> (0.27–0.89)	1.26 (0.61–2.61)
<b>Financial strain</b>					
No strain	1	1	1	1	1
Strain	1.92 (0.87–4.22)	1.25 (0.44–3.56)	1.01 (0.60–1.71)	<b>2.67</b> (1.24–5.78)	<b>1.77</b> (1.06–2.97)
<b>Country</b>					
The Netherlands	1	1	1	1	1
Slovakia	<b>0.43</b> (0.24–0.78)	<b>0.59</b> (0.39–0.90)	0.99 (0.79–1.25)	<b>1.77</b> (1.37–2.30)	<b>4.40</b> (3.35–5.77)
<b>Slovakia by financial strain</b>					
No strain	1	1	1	1	1
Strain	0.86 (0.33–2.25)	1.37 (0.41–4.59)	1.76 (0.94–3.29)	<b>0.37</b> (0.15–0.94)	0.60 (0.29–1.21)

a: Adjusted for age, sex and their interactions. Statistical significance at  $P < 0.05$  is indicated in **bold**.

available. Second, better educated elderly individuals are over-represented in the survey. Third, the cross-sectional design of our study did not allow us to establish causality between area deprivation and HRB. Finally, all HRB were self-reported, which may have caused an influence of social desirability. Regarding self-reporting, cross-cultural differences may affect between-country comparisons too, which we largely reduced by a clear control of the translation process but cannot fully exclude.

### Implications

Our findings suggest that improving the health behaviour of the elderly in Slovakia and in the Netherlands requires different preventive strategies. In Slovakia, where no area differences in HRB were observed, it may be relevant to target public health strategies that aim at promoting healthy lifestyles in the community to any type of neighbourhood. In the Netherlands, the effect of area unemployment was strong for daily smoking and overweight. Community intervention approaches with individualized components may provide a means to counteract this adverse position. Moreover, in both countries all health-promoting strategies should also take into account the aspect of health literacy<sup>39</sup> to deliver stimulating information in a language with which the elderly feel comfortable.

Further comparative studies are needed to better tailor policies for healthy aging in European countries. Such studies should take into account the diversity of European countries both from historical perspectives (i.e. post-communist countries) and types of welfare regimes to account for peers and contextual effects on HRB. Finally, assessment of the effect of other indicators of area deprivation would be helpful for deciding on further health

policies requiring a standardization of area measures across countries.

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### Key points

- International comparison on the effect of individual- and area-level deprivation in urban elderly populations is scarce.
- In Slovakia (a CE country), none of the studied HRBs was associated with either neighbourhood unemployment or individual SEP.
- In the Netherlands (a WE country), daily smoking and overweight occurred more frequently in more deprived neighbourhoods.
- Preventive strategies in Slovakia should be applied in the community to any type of neighbourhood.
- In the Netherlands, community intervention approaches with individualized components may provide a means to counteract the adverse position of neighbourhood.

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