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Are area-level and individual-level socioeconomic factors associated with self-rated health in adult urban citizens? Evidence from Slovak and Dutch cities

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Background: Evidence shows that living in disadvantaged areas is associated with poor health. This may be due to the socioeconomic (SE) characteristics of both these residents and the areas where they live. Evidence regarding this on Central European (CE) countries is scarce. Our aim was to assess whether the prevalence of poor self-rated health (SRH) was higher in deprived urban areas, whether this can be explained by individual SE status (SES) and whether this differed between Slovakia and the Netherlands per age group. **Methods:** We examined the association of urban-level data and individual-level SE factors from different urban areas in different countries (Slovakia, the Netherlands) using comparable urban health indicators and area indicators. We also obtained unique data from the EU-FP7 EURO-URHIS 2 project. **Results:** Multilevel logistic regression showed that poor SRH was associated with area deprivation in both countries. Regarding age by country, poor SRH occurred more frequently in the more deprived areas for the younger age group (≤64) in the Netherlands but for the older age group (≥65 years) in Slovakia. Moreover, Slovak citizens reported poor SRH significantly more often than Dutch residents. Individual SES was significantly associated with poor SRH in both age groups and both countries for most area-level SE measures. **Conclusion:** Individual SES is associated with SRH more strongly than area deprivation. Therefore, it is important to account for relative deprivation at an individual level when considering health-enhancing activities. Moreover, the effect of urban-area deprivation seems to differ between CE and WE countries.

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Introduction

With an ever-increasing number of urban citizens, the context of cities has become of a particular importance. Studies on urban neighbourhood differences have shown that living in disadvantaged areas is associated with poor health.[1–6] This may be due to the socioeconomic (SE) characteristics of both these residents[7] and of the areas where they live.[2,8–10]

Area-level SE differences in Western European (WE)[6,9,11–16] and Central European (CE) countries[17–20] are well documented. Studies on urban-level effects on health outcomes are mostly performed in the United States,[21] Canada,[4] the United Kingdom[22] and WE countries.[8] Findings of studies from Central-Eastern European (CEE) countries indicate that health of urban citizens might be worse in these countries in comparison with WE countries.[23–25] A comparison on urban-level SE health differences between CE and WE countries is lacking.

Slovakia and the Netherlands are typical examples of a CE and a WE country, respectively. Regarding Slovakia, to our knowledge, the only available study is that of Rosicova *et al.*,[18–20] who found in a series of ecological studies that SE and ethnic indicators predicted the standardized mortality rate and alcohol-related mortality rate among districts in Slovakia in men aged 20–64 years, as well as perinatal and infant mortality. Regarding the Netherlands, the effect of areas on health have been studied much more intensively.[2,3,7,10,15,26,27]

Our study examined the impact of area-level and individual-level SE factors on the prevalence of poor self-rated health (SRH) among urban citizens in Slovakia and in the Netherlands. Our aim was to assess whether the prevalence in poor SRH was higher in deprived areas, whether this can be explained by individual SE status (SES) and whether this differed between Slovakia and the Netherlands per age group. We analysed younger and older age groups separately (19–64 years and 65 years and older), assuming different trends in SRH and area deprivation.[28]

Methods

Sample and procedure

The 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)[29] and in two comparable Dutch cities, Amsterdam (capital; 779 808 inhabitants in 2010) and Utrecht (311 367 inhabitants in 2010).[30]

A representative sample regarding age and gender comprised 1600 persons from each city was equally stratified by age groups (19–64 years and ≥65 years) and gender. In both countries, all respondents received identical self-administered postal questionnaires 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. Sample sizes were determined to be able to estimate a prevalence of 30% with a 95% confidence interval (CI) of ±5%, i.e. from 25 to 35%: this leads to a sample of minimally 340 per age group in each country. In practice, we aimed at a total sample of 800 respondents stratified by the two age groups (19–64 and ≥65 years). Power calculations were done for all cities participating in EURO-URHIS 2 jointly, by the EURO-URHIS 2 team.

Regarding the Slovak cities, a representative sample was randomly selected by the Population Registry Office of the Slovak Republic. To motivate respondents, a raffle and gift incentives (a bookmark with calendars) were used. Non-respondents were contacted repeatedly by two postal reminders and by telephone. Data collection in Slovakia lasted from September 2010 to March 2011 and in the Netherlands from September 2010 to January 2011.

Regarding Dutch cities, a representative sample was obtained from the municipal population registry in each city. As an incentive to participants, a raffle (4 gift vouchers of €50) was used in Amsterdam and a lottery (2 vouchers of €100) was used in Utrecht. Non-respondents in Amsterdam were contacted in two mailings and in Utrecht also approached by phone calls.

Invalid addresses ($n = 215$), deaths ($n = 9$) and incapacities to complete the questionnaire with living/working abroad ($n = 46$) were deducted from the original Slovak sample size. Thus, the overall response rate in Slovakia was 44.2% ($n = 1296$), with refusals accounting for 26.0% ($n = 761$) and non-respondents for 29.8% ($n = 873$). Respondents did not differ from non-respondents regarding age ($F = 134.7$, $t = -0.77$, $P = 0.44$) and gender ($\chi^2 = 1.92$, $P = 0.17$). The overall response rate in the Netherlands was 46.9% ($n = 1484$), after invalid addresses ($n = 26$), deaths and the incapacity to complete the questionnaire ($n = 9$) were subtracted. Refusals represented 16.3% ($n = 517$) and non-respondents 36.8% ($n = 1164$). Differences between respondents and non-respondents regarding two age groups (Cohen's $W = 0.07$) and gender (Cohen's $W = 0.06$) were trivial.

Measures

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

Individual-level data

SRH was measured by a single question: How is your health in general? (The European health interview survey, 2006) Answering options were very good (1), good (2), fair (3), bad (4) and very bad (5). The answers were dichotomized as poor ((very) bad, fair) and (very) good health.

The SES of individuals was measured by educational level, household income and financial strain. 'Education' was assessed by a question on the highest educational level attained (The European health interview survey, 2006). Responses were divided into three categories. No formal education and primary education were grouped together 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 (The European health interview survey, 2006). 'Composition of the household' was measured by asking for the number of adults aged 18 years and older and children aged 0–17 years who live in household. The income per capita was adjusted for the household size by using the OECD modified scale and dividing the number of adults and children in the household.[31] It was then divided into tertiles, with low, medium and high income category.

'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 or no.

Neighbourhood-level data

Unemployment rates and the proportion of primary and university educated residents were used to describe the SES of neighbourhoods.

Slovak neighbourhoods concerned local administrative units on the lower level (the LAU 2 level) as defined by Eurostat.[32] This level is the smallest geographical unit for which Slovak Census data are available. Dutch neighbourhoods concerned areas based on postcode sectors.

We used Census data for Slovak[33] and municipality data for Dutch neighbourhoods[34] for the total proportion of unemployed people (unemployed ≥ 16 years looking for their first job or having worked before). Area-level indicators on primary and university educated residents were constructed from the EURO-URHIS 2 survey. Area-level indicators for the educational level of residents were constructed as follows: we constructed weighting factors by two age groups (19–64 years, ≥65 years) per city and gender. We then calculated the weighted proportion of residents by areas and divided them into tertiles according to the proportion of primary and university educated residents. Data regarding neighbourhoods were split into tertiles of deprivation: least favourable, medium and most favourable.

Statistical analyses

First, we assessed differences in poor SRH by area deprivation using chi-square tests. Second, we employed multilevel analyses to assess differences in SRH by area deprivation. We computed the odds ratio for tertiles of neighbourhood deprivation measures, crude and adjusted for age, sex and their interactions. We then added country to the model and assessed the interaction of country with area deprivation. Third, we added the measures of individual SES to the model and assessed whether they explained differences in SRH. Next to the crude model (with one of the area measures included), we adjusted for the various measures of individual-level SES separately and jointly. Finally, median odds ratios were calculated as interpretable measures of neighbourhood-level variance.[35] Poor SRH was modelled as a binary outcome variable in logistic regression models of citizens (level 1) nested within neighbourhoods (level 2). Multilevel regression analyses were performed in MlwiN 2.02.[36] We also used SPSS 18.

Results

Characteristics of the sample

The Slovak sample comprised 1248 respondents from 61 neighbourhoods. The Dutch sample comprised 1404 respondents living in 201 neighbourhoods. The distribution of respondents' background characteristics and area characteristics with the main study variables, with means and standard deviations for two age groups per country, is described in Table 1.

Respondents from the least favourable neighbourhoods for each type of area deprivation reported poor health more often than other respondents (Tables 2 and 3, Model 1). The prevalence of poor health was significantly higher for both age groups in the least favourable neighbourhood regarding university education and further in the age group of 65 years and above with the area indicator for primary education. Applying multilevel regression, we found that poor SRH was associated with area deprivation but that the results differed by type of area indicator and by age group.

Differences in SRH, 19–64-year olds

In 19-to 64-year olds, the relationship between SRH and area deprivation differed between countries as shown by the statistically significant interactions of area indicators (university and primary education) by country (Model 2) (Table 2). In the Netherlands, respondents from the least favourable areas regarding university

Table 1 Individual background characteristics and area characteristics for two age groups per country[a]

	19–64 years (*N* = 1268)			65+ years (*N* = 1384)		
	Netherlands (*N* = 655)	Slovakia (*N* = 613)	*P*[b]	Netherlands (*N* = 749)	Slovakia (*N* = 635)	*P*[b]
Individual characteristics						
Age: mean age (±SD)	40.1(±12.3)	46.1 (±11.8)	<0.001	74.4 (±6.9)	72.9 (±6.1)	<0.001
Sex: men (*N*, %)	280 (42.7)	257 (41.9)	NS	381 (50.9)	346 (54.5)	NS
Self-rated health (*N*, %)			<0.001			<0.001
Poor	139 (21.2)	205 (33.4)		360 (48.1)	440 (69.3)	
Household income (*N*, %)			<0.001			0.007
Low	132 (25.6)	86 (16.1)		211 (41.4)	279 (50.3)	
Medium	139 (27.0)	162 (30.3)		205 (40.2)	202 (36.4)	
High	244 (47.4)	286 (53.6)		94 (18.4)	74 (13.3)	
Adjusted household income (€) Mean (±SD)	49 752 (±38 037)	11 936 (±9977)	<0.001	24 707 (±19 335)	6501 (±3314)	<0.001
Education (*N*, %)			<0.001			<0.001
No formal or primary	42 (6.5)	30 (4.9)		183 (25.2)	91 (14.4)	
Secondary	226 (34.8)	292 (47.7)		381 (52.5)	320 (50.5)	
University	382 (58.8)	290 (47.4)		162 (22.3)	223 (35.2)	
Financial strain (*N*, %)			<0.001			<0.001
Yes	74 (11.4)	134 (22.0)		64 (8.7)	182 (29.1)	
Area characteristics						

Number of respondents per neighbourhood (mean)	Number of neighbourhoods					
	Netherlands (*N* = 201)			Slovakia (*N* = 61)		
1–4 (2)	66			20		
5–14 (9)	122			14		
15–39 (20)	13			16		
Over 40 (80)	0			11		

The missing cases for variables are as follows: adjusted household income (Slovakia 12.7%, Netherlands 27.0%), education (Slovakia 0.2%, Netherlands 2.0%) and financial strain (Slovakia 1.0%, Netherlands 1.5%).
a: Percentages do not always add up to 100% due to rounding.
b: Chi-square test for categorical and *t*-test for continuous variables.

education [OR: 2.95, 95% CI: 1.79–4.84], primary education (OR: 2.83, 95% CI: 1.74–4.61) and unemployment (OR: 1.81, 95% CI: 1.13–2.91) (Model 2) reported poor SRH more often than respondents from the most favourable neighbourhoods. These area differences between countries diminished after inclusion of indicators of individual SES. Overall, in the fully adjusted models, Slovak respondents reported poor SRH significantly more often than Dutch respondents in areas characterized by high proportions of primary educated and unemployed residents (OR: 2.06, 95% CI: 1.20–3.53 and OR: 2.09, 95% CI: 1.22–3.60, respectively) (Model 3). Indicators of individual SES were significantly associated with SRH in the models regarding all three measures of neighbourhood deprivation.

Differences in SRH, 65 years old and over

The relationship between two area indicators—university and primary education—and poor SRH did not differ between countries (Model 2) (Table 3). However, it differed for the third area indicator—neighbourhood unemployment: Dutch elderly from the least favourable neighbourhoods had higher odds of reporting poor health (OR: 1.93, 95% CI: 1.36–2.75) than Slovak residents from the same type of neighbourhoods (OR: 0.61; multiplication of the interaction effect by the main effect, i.e. 0.32 × 1.93 = 0.61). After inclusion of all SES indicators, this relationship changed and Slovak elderly from the most favourable neighbourhoods were more likely to report poor health (OR: 3.65, 95% CI: 2.38–5.61) (Model 3) than Dutch residents from the same type of neighbourhoods.

Furthermore, in the fully adjusted model, a stronger gradient relationship between the area indicator university education and SRH was observed in Slovak elderly than in Dutch elderly (Model 3). In elderly, all individual SES indicators were significantly associated with SRH in all three types of neighbourhood deprivation (Model 3).

Discussion

This study explored the impact of area-level and individual-level SE factors on the prevalence of poor SRH among urban citizens in Slovakia (Bratislava and Kosice) and in the Netherlands (Amsterdam and Utrecht) in two age groups (19–64 year olds and 65 years and over). We had four main findings. First, in both countries, poor SRH was associated with area deprivation, but the results differed by type of area indicator and by age group. Second, Slovak citizens reported poor SRH significantly more often than Dutch residents. Third, the pattern differed by country and age group regarding the association between poor SRH and area deprivation. In the younger age group, a strong association between poor SRH and area deprivation was found for all three area-level indicators in the Netherlands but not as much in Slovakia. The reverse was observed for the elderly. For Slovakia, we found a strong association among the elderly, but this was weak for the Netherlands. Fourth, individual SE factors were significantly associated with poor SRH in both age groups and both countries.

In line with previous studies,[1–6] our results confirmed the association of poor health with area deprivation. The risk of reporting poor health was higher for Slovak residents than for the Dutch. This supports the conclusions of Bobak *et al.*[37] that the high frequency of poor SRH in CEE is unlikely to be an artefact. CE countries have repeatedly been shown to have worse health outcomes than WE countries.[38,39] Overall, in both countries, a part of the poor SRH was explained by inclusion of demographic and individual-level SE characteristics. This indicates that these individual factors account for a part of the area characteristics, i.e. that an aggregation effect occurs, and this holds similarly for WE and CE countries.

We further observed that in the 19–64-year-old age group, the risk of reporting poor SRH was higher for Slovak residents than for the Dutch, particularly in areas characterized by a high proportion of

Table 2 Odds ratios with 95% CIs and prevalences (in brackets) of poor self-rated health for deprivation tertiles of urban neighbourhoods in Slovakia (Bratislava, Kosice) and in the Netherlands (Amsterdam, Utrecht) regarding respondents aged 19–64 years

	Model 1, age, gender[a]	Model 2, M1+country*area deprivation	Model 3, M2+income, education, financial strain
Measure of area deprivation: university education			
Most favourable (20.1%)[b]	1	1	1
Medium (24.7%)	1.27 (0.90–1.80)	1.56 (0.94–2.60)	1.15 (0.60–2.21)
Least favourable (**35.2%**)	**2.04 (1.48–2.82)**	**2.95 (1.79–4.84)**	**1.96 (1.02–3.74)**
Country			
The Netherlands		1	1
Slovakia		**2.05 (1.22–3.44)**	1.83 (0.98–3.42)
Interaction area deprivation × country			
Slovakia*most favourable		1	1
Slovakia*medium favourable		0.67 (0.33–1.36)	0.86 (0.36–2.02)
Slovakia*least favourable		**0.48 (0.25–0.93)**	0.61 (0.27–1.37)
Measures of individual SES			
Medium income status (vs. high)			1.06 (0.72–1.55)
Low income status (vs. high)			**1.64 (1.04–2.60)**
Secondary education (vs. university)			**1.94 (1.37–2.76)**
Primary education (vs. university)			**2.85 (1.39–5.87)**
Financial strain (vs. no strain)			**2.96 (1.96–4.54)**
QIC	1368.9	1362.7	1003.3
Random area effect (median odds ratio)	1.00	1.00	1.00
Measure of area deprivation: primary education			
Most favourable (23.8%)[b]	1	1	1
Medium (28.3)	1.29 (0.94–1.76)	**1.93 (1.16—3.22)**	1.50 (0.81–2.78)
Least favourable (30.5)	**1.61 (1.16–2.22)**	**2.83 (1.74–4.61)**	1.57 (0.85–2.92)
Country			
The Netherlands		1	1
Slovakia		**2.53 (1.59–4.03)**	**2.06 (1.20–3.53)**
Interaction area deprivation x country		1	1
Slovakia*most favourable		**0.52 (0.27–1.00)**	0.60 (0.27–1.33)
Slovakia*medium favourable		**0.38 (0.20–0.75)**	0.61 (0.28–1.32)
Slovakia*least favourable			
Measures of individual SES			1.06 (0.73–1.56)
Medium income status (vs. high)			**1.65 (1.05–2.60)**
Low income status (vs. high)			**2.12 (1.50–2.97)**
Secondary education (vs. university)			**3.06 (1.50–6.27)**
Primary education (vs. university)			**2.95 (1.95–4.45)**
Financial strain (vs. no strain)			
QIC	1382.0	1366.7	1006.3
Random area effect (median odds ratio)	1.00	1.00	1.00
Measure of area deprivation: unemployment			
Most favourable (23.8%)[b]	1	1	1
Medium (28.3)	1.02 (0.73–1.41)	1.30 (0.81–2.10)	1.34 (0.72–2.46)
Least favourable (30.5)	1.27 (0.94–1.72)	**1.81 (1.13–2.91)**	1.72 (0.93–3.20)
Country			
The Netherlands		1	1
Slovakia		**1.94 (1.26–2.96)**	**2.09 (1.22—3.60)**
Interaction area deprivation × country			
Slovakia*most favourable		1	1
Slovakia*medium favourable		0.71 (0.36–1.39)	0.62 (0.27–1.40)
Slovakia*least favourable		0.54 (0.29–1.01)	0.54 (0.25–1.17)
Measures of individual SES			
Medium income status (vs. high)			1.06 (0.72–1.55)
Low income status (vs. high)			**1.65 (1.04–2.60)**
Secondary education (vs. university)			**2.09 (1.49–2.95)**
Primary education (vs. university)			**3.23 (1.59–6.57)**
Strain (vs. no strain)			**2.89 (1.91–4.35)**
QIC	1388.6	1381.7	1006.2
Random area effect (median odds ratio)	1.14	1.00	1.00

QIC, Quasi Likelihood under Independence Model Criterion.
a: Adjusted for age, sex and their interactions.
b: Prevalence rate of poor SRH; statistical significance at $P < 0.05$ is indicated in bold.

primary educated and unemployed residents, although no clustering effect of poor SRH was observed in this age group. On the contrary, a study by Agyemang *et al.*[10] in Amsterdam showed significant differences in SRH between neighbourhoods independent of individual-level demographic and SE factors. This discrepancy may be attributed to differences in the neighbourhood indicators used in our study. It is possible that area indicators—primary and university education—might not reflect a clustering for SRH, as opposed to a number of area indicators of psychosocial stressors (i.e. feeling unsafe, nuisance from neighbours, etc.) used by Agyemang *et al.*[10]

Our observation of a steeper gradient regarding area deprivation in the younger age group in the Netherlands may suggest that SE residential segregation is more advanced in the Netherlands than in Slovakia. This explanation may be supported by the study of Dragano *et al.*[23] who found relatively weak effects of urban neighbourhoods on health behaviours in Czech Republic than in

Table 3 Odds ratios with 95% CIs and prevalences (in brackets) of poor self-rated health for deprivation tertiles of urban neighbourhoods in Slovakia (Bratislava, Kosice) and in the Netherlands (Amsterdam, Utrecht) regarding respondents aged 65 years and older

	Model 1, Age, gender[a]	Model 2,M1+country*area deprivation	Model 3, M2+income,education, financial strain
Measure of area deprivation: University education			
Most favourable (52.3%)[b]	1	1	1
Medium (52.9%)	1.23 (0.92–1.63)	1.02 (0.71–1.48)	0.79 (0.49–1.28)
Least favourable **(61.4%)**	**1.45 (1.12–1.88)**	1.11 (0.78–1.58)	0.84 (0.53–1.34)
Country			
The Netherlands		1	1
Slovakia		**1.83 (1.22–2.75)**	1.52 (0.93–2.48)
Interaction area deprivation × country			
Slovakia*most favourable		1	1
Slovakia*medium favourable		1.68 (0.93–3.06)	**2.06 (1.02–4.20)**
Slovakia*least favourable		1.60 (0.94–2.72)	**2.00 (1.05–3.82)**
Measures of individual SES			
Medium income status (vs. high)			**1.59 (1.05–2.39)**
Low income status (vs. high)			**2.00 (1.28–3.12)**
Secondary education (vs. university)			**1.51 (1.09–2.08)**
Primary education (vs. university)			**2.38 (1.50–3.78)**
Financial strain (vs. no strain)			**3.10 (2.01–4.78)**
QIC	1892.0	1813.1	1289.0
Random area effect (median odds ratio)	1.63	1.15	1.00
Measure of area deprivation:Primary education			
Most favourable (52.5%)[b]	1	1	1
Medium (58.6%)	1.26 (0.97–1.62)	**1.59 (1.11–2.28)**	1.09 (0.69–1.73)
Least favourable (62.9%)	**1.53 (1.17–2.00)**	**1.99 (1.39–2.85)**	1.21 (0.76–1.91)
Country			
The Netherlands		1	1
Slovakia		**3.61 (2.47–5.29)**	**2.69 (1.72–4.20)**
Interaction area deprivation × country			
Slovakia*most favourable		1	1
Slovakia*medium favourable		0.59 (0.35–1.01)	0.84 (0.45–1.58)
Slovakia*least favourable		0.69 (0.39–1.22)	1.02 (0.52–2.00)
Measures of individual SES			
Medium income status (vs. high)			**1.57 (1.04–2.36)**
Low income status (vs. high)			**1.94 (1.25–3.02)**
Secondary education (vs. university)			**1.47 (1.07–2.02)**
Primary education (vs. university)			**2.27 (1.43–3.59)**
Financial strain (vs. no strain)			**3.11 (2.02–4.78)**
QIC	1891.7	1803.8	1293.5
Random area effect (median odds ratio)	1.63	1.00	1.00
Measure of area deprivation:Unemployment			
Most favourable (57.0%)[b]	1	1	1
Medium (58.0%)	1.04 (0.81–1.35)	1.39 (0.97–1.99)	1.32 (0.83–2.08)
Least favourable (58.7%)	1.05 (0.81–1.36)	**1.93 (1.36–2.75)**	1.48 (0.93–2.34)
Country			
The Netherlands		1	1
Slovakia		**4.17 (2.92–5.95)**	**3.65 (2.38–5.61)**
Interaction area deprivation × country			
Slovakia*most favourable		1	1
Slovakia*medium favourable		0.66 (0.39–1.15)	0.69 (0.36–1.31)
Slovakia*least favourable		**0.32 (0.18–0.55)**	**0.39 (0.20–0.75)**
Measures of individual SES			
Medium income status (vs. high)			**1.51 (1.00–2.28)**
Low income status (vs. high)			**1.89 (1.22–2.95)**
Secondary education (vs. university)			**1.47 (1.07–2.02)**
Primary education (vs. university)			**2.26 (1.43–3.57)**
Financial strain (vs. no strain)			**3.07 (1.99–4.73)**
QIC	1444.0	1355.9	1287.4
Random area effect (median odds ratio)	1.65	1.00	1.00

QIC, Quasi Likelihood under Independence Model Criterion.

a: Adjusted for age, sex and their interactions.

b: Prevalence rate of poor SRH; statistical significance at $P < 0.05$ is indicated in bold.

Germany. We hypothesize, similarly as Dragano et al.,[23] that this may be due to the communist past of the Slovak Republic as post-communist cities have particular features, similarly as in Czech Republic. The communist regimes declared social equality as a priority, and cities and neighbourhoods were planned and constructed to house an equal society, where SE class differences were diminished. However, the fact that we did not detect the area differences in Slovakia does not mean that the residential segregation has not yet started. One of the possible explanations for this may be that the LAU2 level units which we used as a second level variable in Slovak cities may not reveal differences between areas because the units are too robust. We assume that although residential segregation was not found in Slovakia, it may yet be visible in the future as economic transformations proceed.

On the other hand, the gradient in reporting poor health for the elderly was much steeper in Slovakia than in the Netherlands. In line with this, Vignoli and De Santis[40] presented two ideas. The first is that those who have spent their adolescent and adult years in environments of relative economic deprivation are economically worse off also in their old age. Second, if economically developed areas are also more expensive, then those who are relatively worse off tend to leave them and to move towards cheaper, but also more depressed areas, where they also reside in their old age. These findings open several questions for discussion regarding differences between and within WE and CE countries in social security and healthcare systems.

Strengths and limitations

One of the strengths of this study is that we used a standardized sampling, recruitment and data collection protocols, which allowed us to make a proper and international comparison and assessment of health characteristics of the urban population. Further, we respected the hierarchical nature of the data and applied multilevel analyses. Additionally, we used neighbourhood-level variables separately in the analyses to avoid collinearity, and we examined the unique contribution of each component.[41]

We are aware of some limitations of our study. First, neighbourhoods varied somewhat regarding the number of respondents and residents. Despite the fact that we used the smallest geographical units available in both countries, it resulted in a relatively small number of units in the Slovak cities as opposed to the Dutch cities with a high number of units per city. If it were possible to use smaller units in Slovakia, then probably larger differences between Slovak urban neighbourhoods would have been found. This may have possibly biased our results, but 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.[26] Another limitation is the use of area-level indicators constructed from the individual-level variables for the primary and university area indicator. However, this is in line with previous studies.[42] A third limitation is the cross-sectional design of our study, which does not allow us to disentangle causal relationships between area deprivation and health of residents. Longitudinal designs are needed for this. A final limitation is the relatively low response rate; however, with respect to Slovakia, respondents did not differ from non-respondents in age and gender characteristics, and in the Netherlands, the differences were trivial. However, university educated residents in both countries were somewhat overrepresented. This may have led to some overestimation of mean SRH in these cities but is less likely to affect between-country comparisons as it affected both countries; the same holds for the rather similar response rates in both countries, limiting the likelihood of a confounding effect on country differences.

Implications

The observed disparities in poor SRH by area deprivation in Slovak and Dutch cities added to understanding how urban living shapes the health of urban populations in WE and CE countries.

Our finding of SE differences in SRH at both the individual- and area-level implies that area deprivation is not a fully adequate measure of individual SES, despite its frequent use as such. Our findings may be used by local policy makers in both countries in preparing policy documents with a focus on social determinants of health in local/urban settings. Moreover, policy makers from the post-communist countries should face two challenges: on one hand to keep the observed equity between the younger populations and on the other to combat the problems that the elderly might meet in deprived areas. Further research is needed particularly in Slovakia to assess more precisely area-level influence on health of the residents. This requires data about even lower units than the

LAU2-level for proper detection of neighbourhood variances. Selection of other relevant SE characteristics of areas, such as vandalism or crime in an area,[27] will also help local policy makers make better adjustment of policies on social health determinants.

Conclusion

We explored whether individual SES is associated with SRH more strongly than area deprivation. Slovak citizens reported poor SRH significantly more often than Dutch residents. Although the association between poor SRH and area deprivation in younger age groups for Slovakia was rather flat, for the Netherlands it was steeper, with a higher prevalence of poor SRH in deprived areas. In contrast, for the elderly, the association of SRH and area deprivation was steeper in Slovakia but flat for the Netherlands. Individual SES was significantly associated with poor SRH in both age groups and both countries for most area-level measures. These findings open several questions for future studies in urban-level differences between and within WE and CE countries.

Key points

- A comparison on urban-level socioeconomic health differences between Central European and Western European countries is lacking.
- Poor self-rated health (SRH) occurred more frequently in deprived areas.
- The effect of urban area deprivation differed between Slovakia and the Netherlands.
- Slovak citizens reported poor SRH significantly more often than Dutch residents.
- Individual socioeconomic factors were significantly associated with poor SRH.

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