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Geographical variation in male premature mortality in Belarus, Lithuania, Poland and Russia

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Background

Excessive male premature mortality in Eastern Europe has been a major public health issue for decades. Existing evidence is mainly based on national-level data or large regions within one country.

Little is known about mortality variations across smaller geographical units, especially about mortality patterns crossing national boundaries.

Belarus, Lithuania, Poland, and Russia create a very fascinating context in terms of a common past and the quite distinct present.

Questions

How does geographical distribution of male premature mortality in Belarus, Lithuania, Poland, and Russia look like? What are common features?

What about geographical mortality gradients and cross-borders continuities?

What are explanations (hypotheses) for the observed patterns?

Importance:

- 1) Identifying the most disadvantaged geographical areas, which could be targeted by specific policies.
- 2) Better understanding of the role of historical and sociocultural local contexts in shaping contemporary differences in mortality.

Data and Methods

Mortality data

Original data by 5-year age groups and causes of death, and corresponding population estimates at the district level. [For Russia, 2010 Census population counts].

Cause-of-death classification

Belarus: abridged (277 items) list based on the ICD-10

Lithuania: full ICD-10 list (4 digit)

Poland, Russia: full ICD-10 list (3 digits)

Period of analysis

Belarus, Russia: 2008-2012 (5-year average)

Lithuania: 2011-2014 (4-year average)

Poland: 2006-2010 (5-year average)

Data and Methods (cont.)

Population sub-group

males 20-64.

Reasons:

- 1) excessive mortality of this group is the major public health issue
- 2) generally more reliable statistics compared to older ages, especially with respect to CoD

Units of analysis (districts, cities, and towns): 1209

Belarus: 131

Lithuania: 60

Poland: 379

Russia: 639

For Russia we consider only **four** economic regions: Central, Northwestern, Central Black Soil, and Kaliningrad. In total, there are 21 oblast' plus Moscow and St. Petersburg.

Administrative division of Belarus, Lithuania, Poland and Russia (selected regions)



Data and Methods (cont.)

Theil index (T) to measure and decompose the variance across all units of the analysis into between- and within-country components (T_B and T_w):

$$T = \overbrace{\sum_{c=1}^{\omega} s_c \log(n / n_c s_c)}^{T_B} + \overbrace{\sum_{c=1}^{\omega} s_c \sum_{i \in c} s_{i,c} \log(n_c s_{i,c})}^{T_w}$$

$$s_{i,c} = y_{i,c} / \sum_{i=1}^{n_c} y_{i,c}$$

$$s_c = \sum_{i \in c} y_{i,c} / \sum_i y_i$$

n - number of observations i , y - mortality from a specific cause, c - country.

Standardized Mortality Ratio (SMR) as a mortality measure:

$$SMR^{ij} = \frac{D_{obs}^{ij}}{D_{exp}^{ij}} = \frac{D_{obs}^{ij}}{\sum_x (M_x^{Sj} E_x^i)}$$

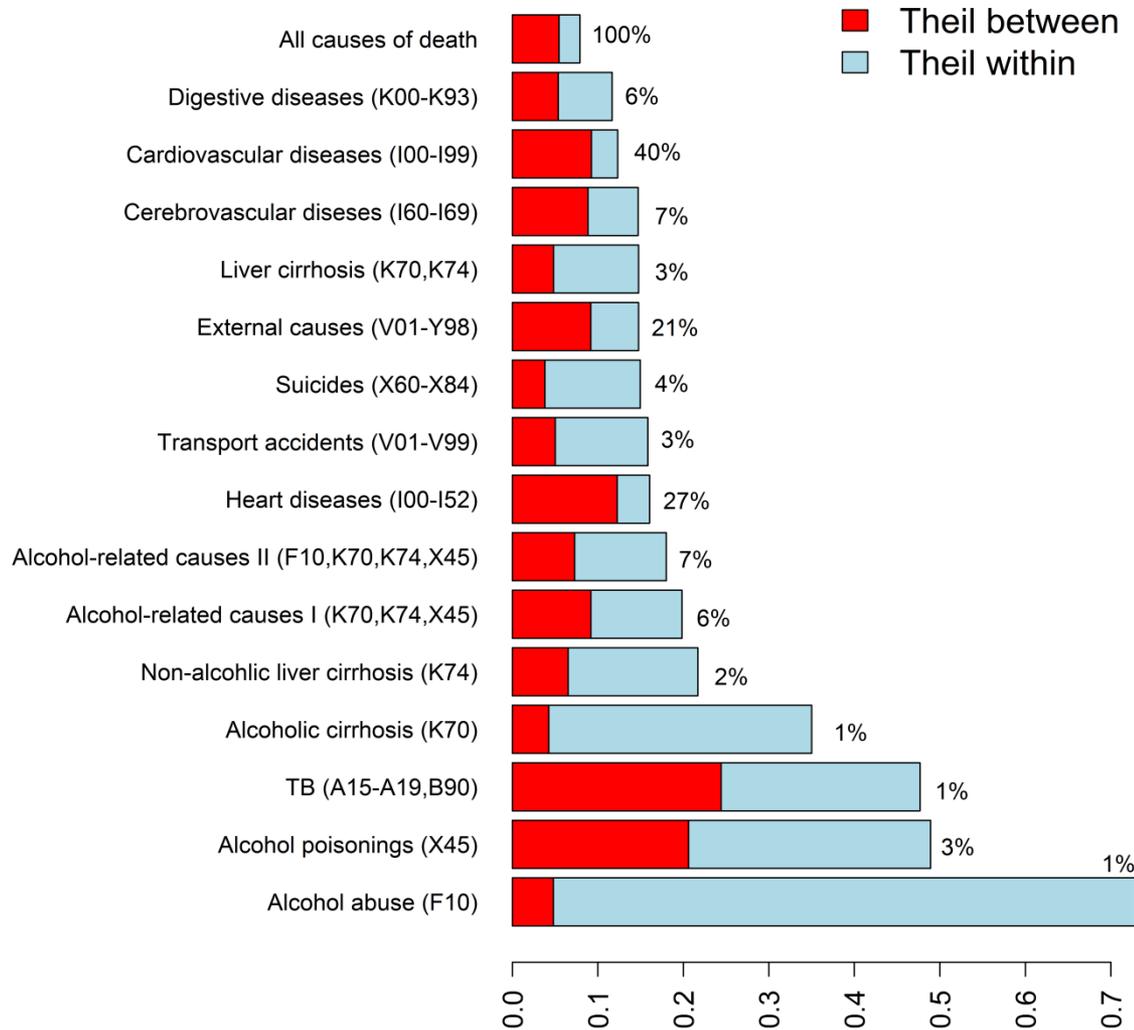
D_{obs}^{ij} and D_{exp}^{ij} - total number of *observed* and *expected* deaths from cause j in area i ;

E_x^i - population size by age (x) in area i ;

M_x^{Sj} - age-specific mortality rates from cause j in the population chosen as the standard

Results

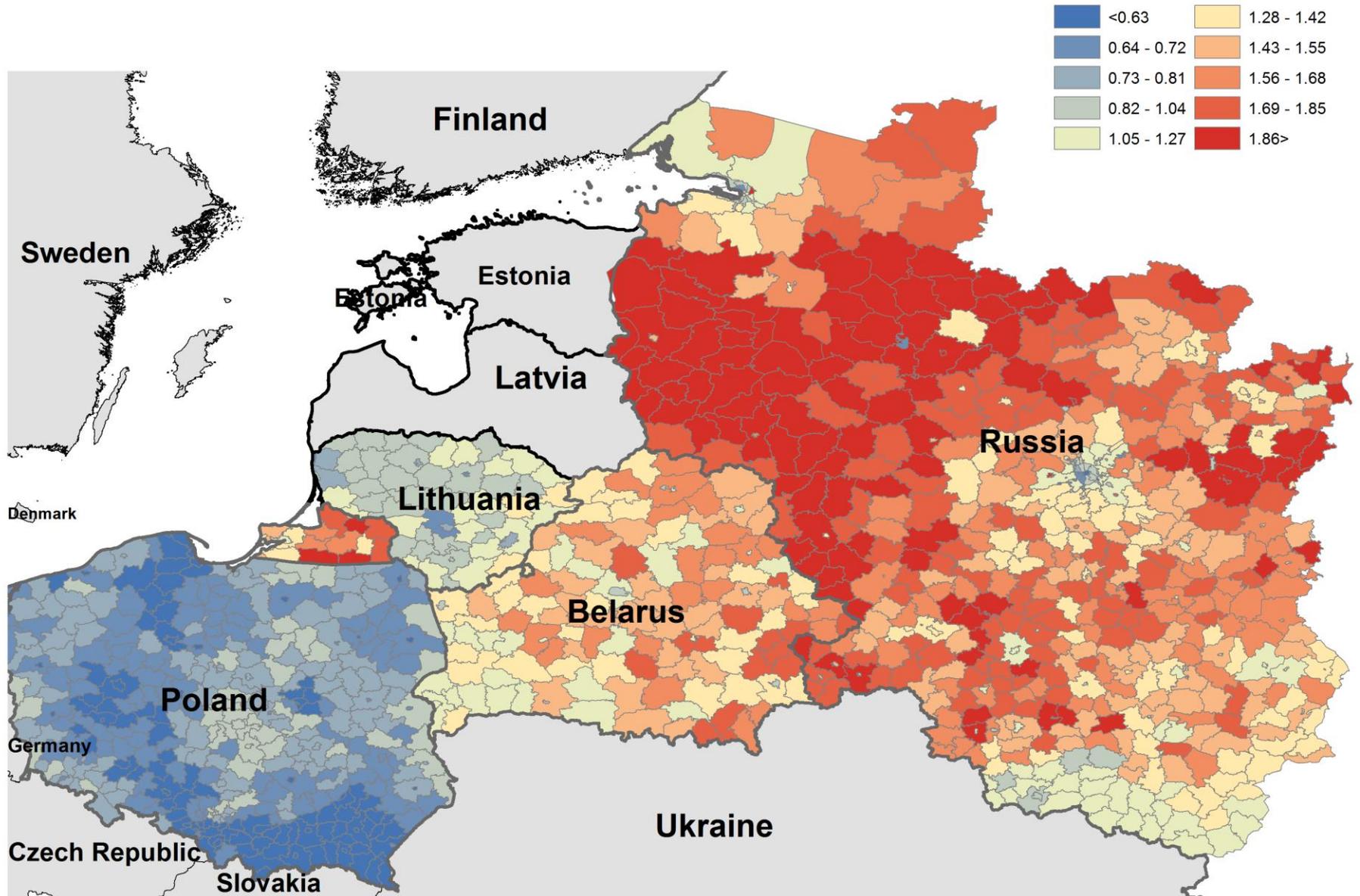
Mortality variation by selected CoD



**based on SMR*

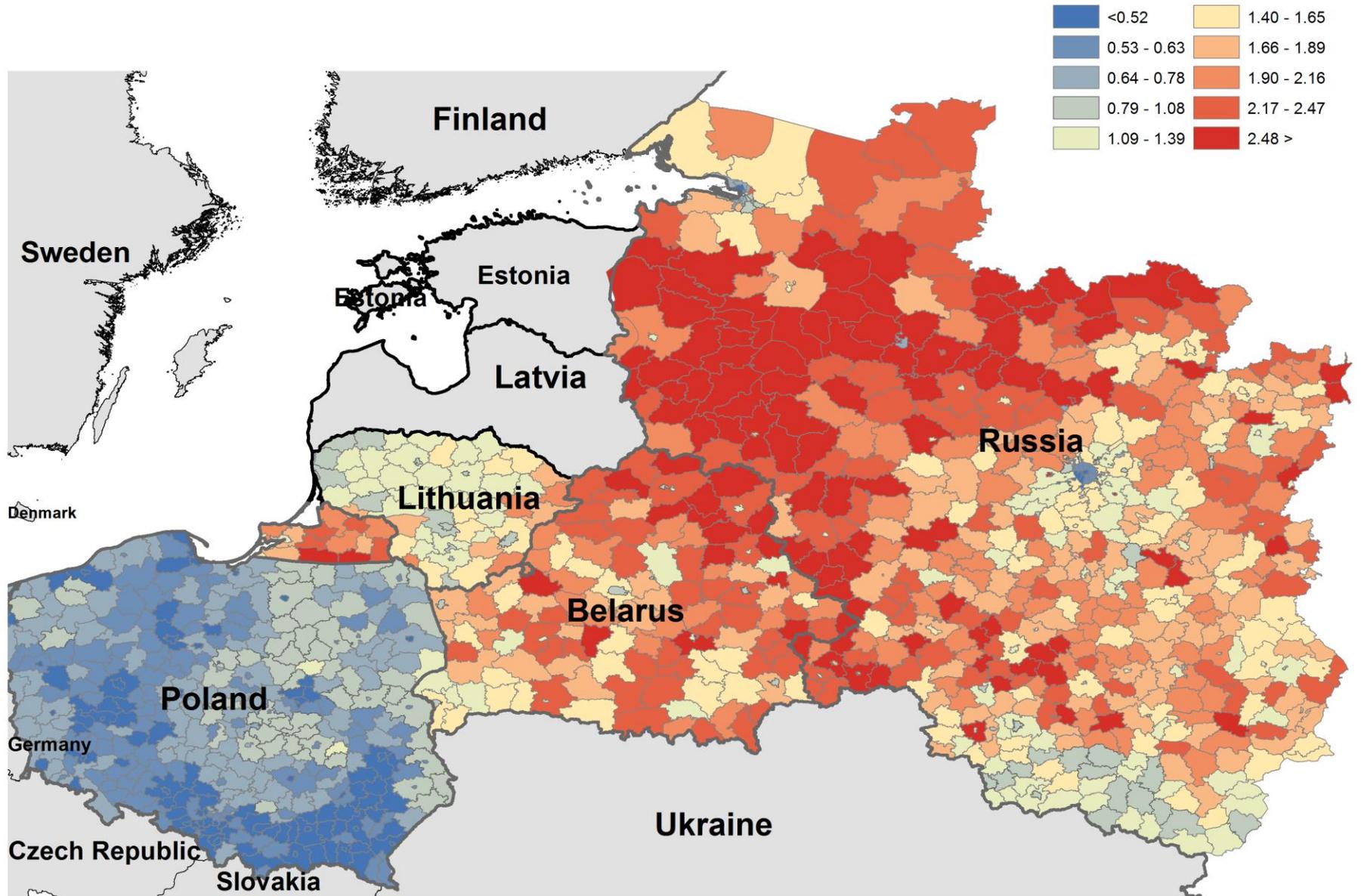
***numerical values next to the horizontal bars indicate the share of particular CoD in overall mortality*

Standardized Mortality Ratio (SMR)* in Belarus, Lithuania, Poland, and Russia males, 20-64 [all causes combined]



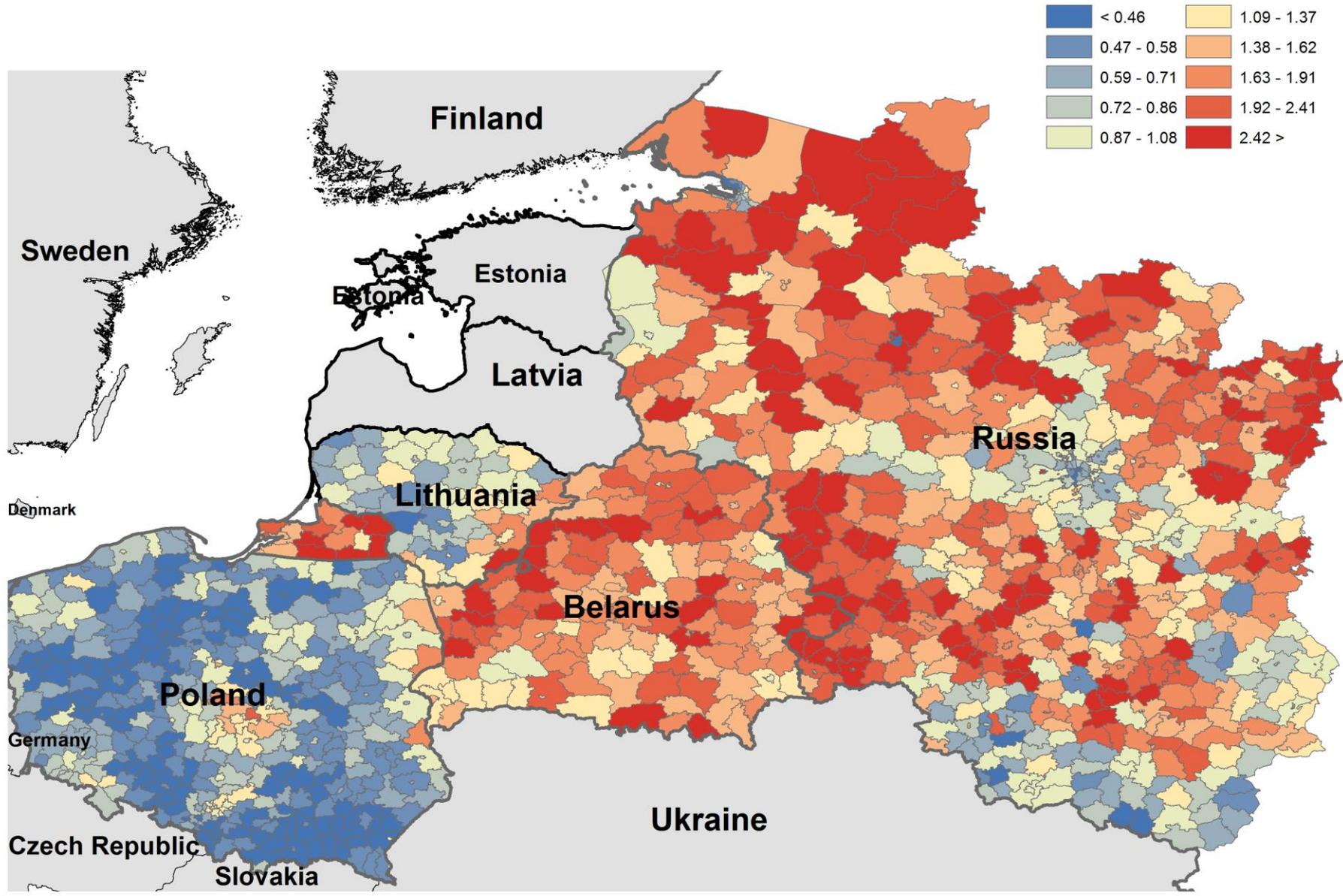
* relatively to average of the combined territory of the four countries

Standardized Mortality Ratio (SMR)* in Belarus, Lithuania, Poland, and Russia males, 20-64 [external causes]



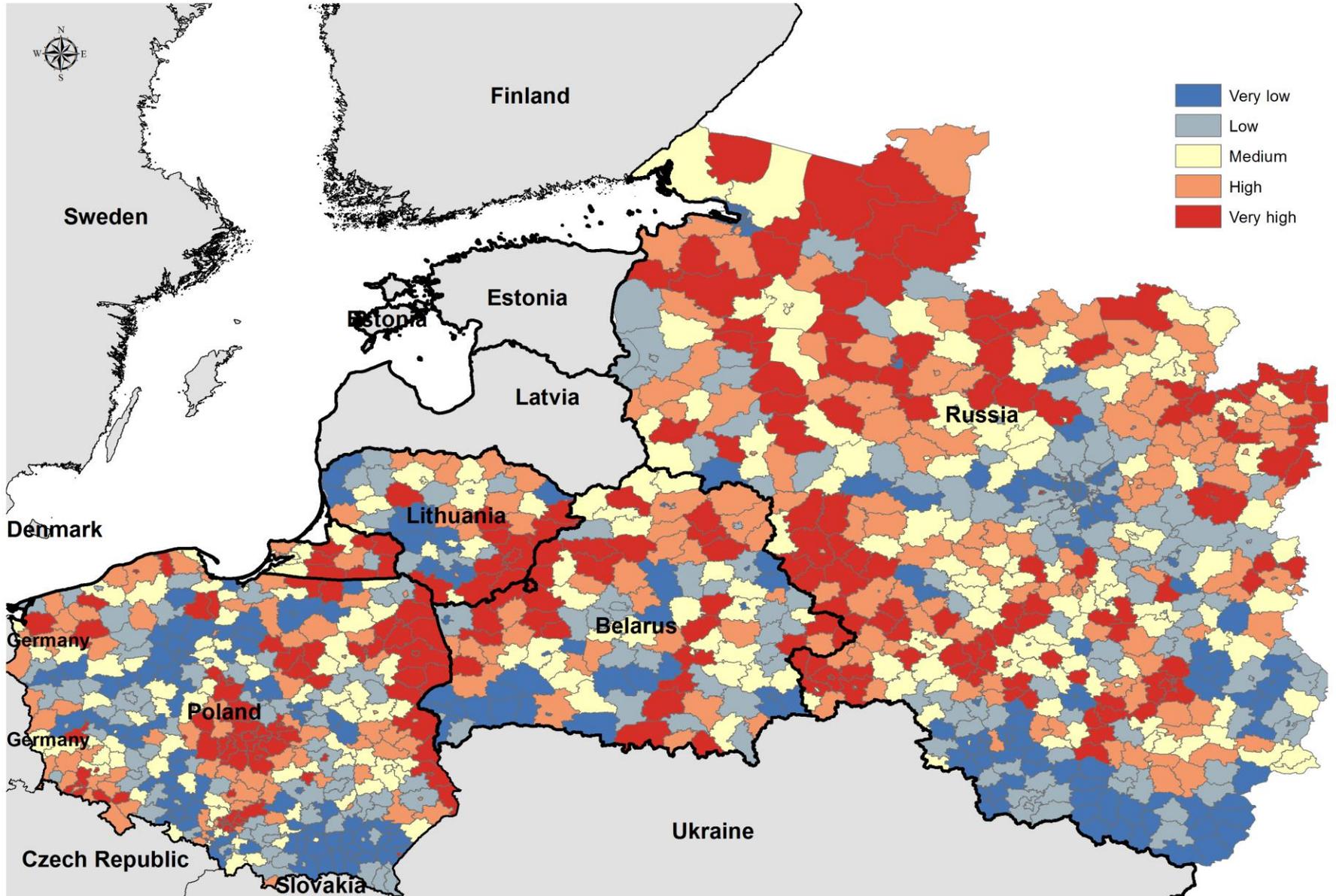
* relatively to average of the combined territory of the four countries

Standardized Mortality Ratio (SMR)* in Belarus, Lithuania, Poland, and Russia males, 20-64 [CoD fully attributable to alcohol: F10, K70, K74, X45]



* relatively to average of the combined territory of the four countries

Standardized Mortality Ratio (SMR)* in Belarus, Lithuania, Poland, and Russia males, 20-64 [CoD fully attributable to alcohol: F10, K70, K74, X45]



* relatively to the national level

Conclusion

There is a mortality gradient from the North-West of Russia to the South of Poland. It shows no discontinuity at the border between Belarus and Russia but a clear divide at the border between Belarus and Poland.

Mortality clusters within national populations:

| | Clusters of high mortality | Clusters of low mortality |
|------------------|--|--|
| Belarus | Northeastern districts bordering Russia | Southwestern districts bordering Poland (<i>Western Polesie</i>) |
| Lithuania | Southeastern municipalities bordering Belarus | Central and northwestern parts |
| Poland | Central and eastern parts (<i>Greater Poland</i> ; former <i>East Prussia</i>) | Southern regions bordering Slovakia (<i>Lesser Poland</i>) |
| Russia | Northwestern part except St. Petersburg | Central Black Soil region, Moscow, St. Petersburg |

Conclusion (cont.)

Main explanations/hypotheses for the observed patterns:

- 1) Selective migration (past and present)
- 2) Socio-cultural and historical contexts
- 3) Differences in contemporary socioeconomic conditions