Does maternal country of birth matter to understanding offspring’s birthweight in Sweden? A multilevel analysis of individual heterogeneity

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Background

Birthweight:

- **Child: Predictor of their future wellbeing**
Mortality, cardiovascular diseases, 'white coat' Hypertension, coeliac diseases, obesity, IQ, disability pension, labor market...

- **Mother: Reproductive health outcome**
  (e.g., Bolúmar et al. 1992; Adam and Melvin 1998; González 2005; Salihu and Wilson, 2007; Shiono et al. 1997; Malmqvist et al 2011; Juárez and Merlo, 2013...)
Genes, nutritional status, health, age, marital status, lifestyles, socioeconomic conditions, air pollution, smoking...
Background

Migration and birthweight: mixed results

- Adverse results
  (e.g., Rasmussen, 1995; Li et al. 2012; Malin et al. 2009…)

- ’Healthy migrant effect’
  (e.g., Fuentes Afflick at al, 1999; Guendelman et al. 1999; Hessol and Fuentes-Afflick, 2000; Speciale and Regidor, 2010; Juárez, 2011)
Background

Migration and perinatal health outcomes: ‘country and outcome-specific’ (Urquia et al. 2012)

- Spain

- Germany

- Sweden
  Juárez SP, Revuelta-Eugercios BA. (submitted) Exploring the ‘healthy migrant paradox’ in Sweden. A cross sectional study focused on perinatal outcomes
Background

Migration and perinatal health outcomes: ‘country and outcome-specific’ (Urquia et al. 2012)

- Spain

  EU-27, Sub-Saharan Africa and the Caribbean had both a higher risk of delivering preterm and post-term births and Sub-Saharan Africa a higher risk of having both LBW and macrosomic babies

- Sweden
  Juárez SP, Revuelta-Eugercios BA. (submitted) Exploring the ‘healthy migrant paradox’ in Sweden. A cross sectional study focused on perinatal outcomes

  Icelandic mothers have a higher risk of delivering both LBW and macrosomic babies, and African women show a higher risk of delivering both preterm and post-term births.
Background

Why does the country of origin matter?

Common economic, social, cultural and biological background and environmental influences (Beckman et al. 2004; Merlo et al. 2009)

Previous studies have exclusively estimated between-country differences (population-average association) but none of them have estimated within-country variation (or individual heterogeneity).
Background

Population-average association

Between countries of origin [ecological studies]

Individual variation

Variance partition coefficient = VPC
The % of the total variance that is explained at the country level

Intra-class correlation = ICC
To what extent people who belong to a same country are similar in the outcome

VPC=ICC=Discriminatory accuracy
(Merlo and Wagner, 2013; Merlo, 2014)
Background

Population-average association

Between countries of origin [ecological studies]

<table>
<thead>
<tr>
<th>Countries</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
<th>C6</th>
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<tbody>
<tr>
<td>Birthweight</td>
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<tr>
<td>ICC=100%</td>
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</table>

Individual variation

Within countries of origin

<table>
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<th>Countries</th>
<th>C1</th>
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<td>Birthweight</td>
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<tr>
<td>ICC=50%</td>
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</tbody>
</table>
Background

Population-average association

Between countries of origin [ecological studies]

Individual variation

Within countries of origin

ICC=100%

ICC=2%
Background

The SAME differences between means BUT different scenarios of individual variance AROUND the means

Population-average association

Between countries of origin [ecological studies]

ICC=100%

C1 C2 C3 C4 C5 C6

Countries

Birthweight

Individual variation

Within countries of origin

ICC=2%

C1 C2 C3 C4 C5 C6

Countries

Birthweight

C0
Background

The SAME differences between means BUT different scenarios of individual variance AROUND the means

**EFFICIENT** scenario for public health intervention

**DANGEROUS** scenario for stigmatization
Research question

Does maternal country of origin matter to understand individual birthweight differences?

• High variance at the country level (VPC)

• High intra-class correlation at the country level (ICC)
Data

Population-based registers:

Swedish Medical Birth Register (MBR) 1987-1993
Register of the total population of Sweden
1990 Swedish population Census.
Methods

Multilevel linear regression model
Dependent variable: birthweight (gr)

Strategy:

<table>
<thead>
<tr>
<th>Levels</th>
<th>Null model</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Countries</td>
<td>N=68</td>
<td></td>
<td>Country economies (Based on GDP World Bank classification)</td>
</tr>
<tr>
<td>Mothers</td>
<td>N=537,093</td>
<td>Age, marital status, education, household income, smoking</td>
<td>Age, marital status, education, household income, smoking</td>
</tr>
<tr>
<td>Children</td>
<td>N=757,811</td>
<td>Sex, birth order, gestational age</td>
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</tbody>
</table>

We first used RIGLS method and MCMC estimations
Models were run with STATA 12.0 and MLWIN 2.26
We estimate shrunken residuals and CI-95%, VPC, ICC and BDIC as a measure of fitness of the model
Main Result

Graph 1. Differences in average birthweight between maternal country of origin. Shrunken residuals and CI-95%. Full model
Main Result

Graph 1. Differences in average birthweight between maternal country of origin. Shrunken residuals and CI-95%. Full model

Only 2% of the individual differences in birthweight are explained at the maternal country level while 48 and 49% at the mother and child levels, respectively.
Main Result

Graph 2. Total individual variance in birthweight by maternal country of birth
Conclusion

Maternal country of origin explains only 2% of the individual differences in birthweight.

- There is no empirical support for the most common assumption that the country of origin exerts a general effect.

- Country of birth is not valid (i.e., accurate) information to understand individual birthweight differences.

- We may be over-interpreting population-average associations.

- We may contribute to stigmatizing the foreign population.
Thank you for your attention!

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