



# Small-Area Factors and Their Impact on Low Birth Weight—Results of a Birth Cohort Study in Bielefeld, Germany

Lisa Wandschneider<sup>1\*</sup>, Odile Sauzet<sup>1,2</sup>, Jürgen Breckenkamp<sup>1</sup>, Jacob Spallek<sup>3</sup> and Oliver Razum<sup>1</sup>

<sup>1</sup> Department of Epidemiology and International Public Health, School of Public Health, Bielefeld University, Bielefeld, Germany, <sup>2</sup> Center for Statistics, Bielefeld University, Bielefeld, Germany, <sup>3</sup> Department of Public Health, Faculty of Social Work, Health, and Music, Brandenburg University of Technology Cottbus–Senftenberg, Senftenberg, Germany

## OPEN ACCESS

### Edited by:

Stéphane Cullati,  
University of Fribourg, Switzerland

### Reviewed by:

Nadine Reibling,  
University of Siegen, Germany  
Kevin John Denny,  
University College Dublin, Ireland

### \*Correspondence:

Lisa Wandschneider  
lisa.wandschneider@uni-bielefeld.de

### Specialty section:

This article was submitted to  
Inequalities in Health,  
a section of the journal  
Frontiers in Public Health

Received: 21 January 2020

Accepted: 03 April 2020

Published: 28 April 2020

### Citation:

Wandschneider L, Sauzet O,  
Breckenkamp J, Spallek J and  
Razum O (2020) Small-Area Factors  
and Their Impact on Low Birth  
Weight—Results of a Birth Cohort  
Study in Bielefeld, Germany.  
Front. Public Health 8:136.  
doi: 10.3389/fpubh.2020.00136

**Introduction:** The location of residence is a factor possibly contributing to social inequalities and emerging evidence indicates that it already affects perinatal development. The underlying pathways remain unknown; theory-based and hypothesis-driven analyses are lacking. To address these challenges, we aim to establish to what extent small-area characteristics contribute to low birth weight (LBW), independently of individual characteristics. First, we select small-area characteristics based on a conceptual model and measure them. Then, we empirically analyse the impact of these characteristics on LBW.

**Material and methods:** Individual data were provided by the birth cohort study “Health of infants and children in Bielefeld/Germany.” The sample consists of 892 eligible women and their infants distributed over 80 statistical districts in Bielefeld. Small-area data were obtained from local noise maps, emission inventory, Google Street View and civil registries. A linear multilevel analysis with a two-level structure (individuals nested within statistical districts) was conducted.

**Results:** The effects of the selected small-area characteristics on LBW are small to non-existent, no significant effects are detected. The differences in proportion of LBW based on marginal effects are small, ranging from zero to 1.1%. Newborns from less aesthetic and subjectively perceived unsafe neighbourhoods tend to have higher proportions of LBW.

**Discussion:** We could not find evidence for negative effects of small-area factors on LBW, but our study confirms that obtaining adequate sample size, reliable measure of exposure and using available data for operationalisation of the small-area context represent the core challenges in this field of research.

**Keywords:** low birth weight, small-area analysis, multilevel analysis, virtual audit, noise pollution, fine particulate matter, socioeconomic deprivation, cohort study