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

Lisa Wandschneider1*, Odile Sauzet1,2, Jürgen Breckenkamp1, Jacob Spallek3 and Oliver Razum1

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

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