

## Ocean health in Belgium: Living near the coast is associated with better health

Hooyberg Alexander<sup>1</sup>, Everaert Gert<sup>1</sup>, Grellier James<sup>2</sup>, Elliott Lewis<sup>2</sup>, Lonneville Britt<sup>1</sup>, White Mathew<sup>2</sup>, Michels Nathalie<sup>3</sup>, De Henauf Stefaan<sup>3</sup>, Roose Henk<sup>4</sup> and Vandegehuchte Michiel<sup>1</sup>

<sup>1</sup> Flanders Marine Institute (VLIZ), InnovOcean site, Wandelaarkaai 7, 8400 Oostende, Belgium  
E-mail: [Alexander.Hooyberg@vliz.be](mailto:Alexander.Hooyberg@vliz.be)

<sup>2</sup> The European Centre for Environment & Human Health (ECEHH), University of Exeter Medical School, Knowledge Spa, Royal Cornwall Hospital Truro, Cornwall, TR1 3HD, United Kingdom

<sup>3</sup> Ghent University, Faculty of Medicine and Health Sciences, Department of Public Health, Corneel Heymanslaan 10, UZ-4K3, 9000 Ghent, Belgium

<sup>4</sup> Ghent University, Faculty of Political and Social Sciences, Department of Sociology, Korte Meer 3, 9000 Ghent, Belgium

Positive effects of natural environments such as green space and blue space on human health and wellbeing received considerably more attention in the last decade. Benefits from the coast and marine ecosystems mainly arise through 4 mechanisms, i.e. stress reduction, elevated physical activity, healthier social interactions and better environmental quality. However, evidence linking residential proximity to the coast with human health and wellbeing is scarce. Therefore, we investigated whether Belgian citizens living closer to the coast report better health.

Data from the Belgian Health Interview Survey (n = 60,939 representative for the Belgian population, taken in 1997, 2001, 2004, 2008 and 2013) were used to investigate whether proximity to the coast is associated with the health of Belgian citizens. Human health and wellbeing were quantified by three metrics, i.e. overall subjective health, psychological stress (GHQ-12 score), and vitality (SF-36 score). In a linear regression model analysis, we tested whether people residing in proximity of the sea feel better in general, i.e. obtained a better evaluation for one of these metrics. Proximity to the coast was calculated as fastest driving distances between the domicile address and the Belgian coast. These driving distances were divided in eight categories, i.e. >250 km, 200-250 km, 150-200 km, 100-150 km, 50-100 km, 20-50 km, 5-20 km and 0-5 km from the coast. The outcomes of our analyses are normalized based on potential confounding factors, such as for example, the age of the respondent, having a chronic disease, having a paid job, income, smoking status, physical activity, the appreciation of social interactions, the amount of blue space and green space in the area and the air quality in the area (PM<sub>10</sub> and NO<sub>2</sub> concentrations).

Proximity to the coast is associated with higher scores for subjective health, vitality and psychological stress. Most strikingly, people living at 0-5 km from the coast report 3.7 % better subjective health than people living elsewhere (p = 0.011). Besides this local effect, large scale trends were observed in the psychological stress and vitality. For example, a pronounced gradual increase in vitality occurred towards the coast (p ≤ 0.002). This increase in vitality was most substantial for people living at 20-50 km from the coast, which were 12.3 % more vital than people living in the hinterland. Our results indicate that these changes in health and wellbeing associated with distance to the coast are in the same order of magnitude as the relations of for example smoking behavior or income with health.

Next to the important role of the sea, also the appreciation of social interactions and having a chronic disease correspond with large changes in health and wellbeing, as hypothesized prior to this study. Health was always less strongly related with the environment (amount of blue space and green space, air quality) than with personal variables (e.g. physical activity).

Our study provides the first evidence of a positive association between proximity to the coast and the physical and mental human health and wellbeing in Belgium. Potential mechanisms were explored, and remain a matter for further research.

### **Acknowledgments**

We would like to thank the providers of the data, i.e. Scientific Institute of Public health, OD Public health and surveillance (2015). Health Interview Survey 2013 [Data file and code book]. Obtainable under condition from the WIV-ISP Web site: [https://his.wiv-isp.be/SitePages/Acces\\_microdata.aspx](https://his.wiv-isp.be/SitePages/Acces_microdata.aspx)

Keywords: Blue space; Coast; Health; Well-being