

## BIG DATA IN ENVIRONMENTAL AND OCCUPATIONAL EPIDEMIOLOGY: THE BEEP PROJECT

*M. Stafoggia (1), C. Gariazzo (2), P. Michelozzi (1), F. Forastiere (3), C. Silibello (4), S. Fasola (3), S. Maio (5), S. Baldacci (5), G. Viegi (3,5)*

(1) Department of Epidemiology, Lazio Regional Health Service / ASL Roma 1, Rome, Italy; (2) INAIL-Research Center, Monteporzio Catone, Rome, Italy; (3) Institute of Biomedicine and Molecular Immunology (CNR-IBIM), Palermo, Italy; (4) ARIANET Srl, Milan, Italy; (5) Institute of Clinical Physiology (IFC-CNR), Pisa, Italy

Presenting author email: [m.stafoggia@deplazio.it](mailto:m.stafoggia@deplazio.it)

### Summary

The analysis of big data is an emerging topic in environmental health that may help scientists to get insights from a large amount of structured and unstructured information. The ongoing BEEP (Big data in Environmental and occupational Epidemiology) project is presented. BEEP aims to collect, link and analyse a large amount of data coming from different sources to support exposure assessment and epidemiology studies. The health effects of environmental factors in the general population and workers will be investigated at different levels ranging from the national to the urban scale.

### Introduction

One of the big challenges of the modern environmental epidemiology is to collect and link a huge amount of heterogeneous geographic, environmental and health data to get ensemble information otherwise not available. The general objective of the BEEP project is to estimate, using Big Data, the health effects of air pollution, noise and meteorological parameters on the Italian general population, and to evaluate the risk of occupational injuries in sub-populations of workers. The Project started on June 2017 and will last two years. It is structured in Specific Objectives focused on different spatial domains, from the whole national territory to the urban micro-scale. A special focus will be devoted to the risk of hospitalizations and mortality at the national level and within the major metropolitan areas, the risk of occupational injuries and road accidents related to environmental factors, population mobility and extreme meteorological conditions.

### General and specific objectives

#### General Objective:

1. To estimate the health effects of several environment risk factors (air pollution, noise, meteorological conditions) on the Italian population;
2. To evaluate the risk of injuries in sub-populations of workers in relation to environmental exposures

#### Specific Objectives

1. To estimate the exposure of the Italian population to different environmental risk factors and their health effects, in terms of hospitalizations or occupational accidents on a national scale, using the municipality as the spatial unit;
2. To evaluate the risk of non-accidental and cardio-respiratory mortality induced by different environmental exposures among the residents of five Italian regions, at the municipality level;
3. To evaluate the adverse effects of air pollution and extreme temperatures on mortality and occupational accidents within six urban metropolitan areas, at the census block spatial resolution;
4. To evaluate the joint short-term and long-term health effects of environmental exposures at the individual level in the longitudinal Studies of Rome and Pisa-Cascina.

#### Expected data to be used and/or produced:

- Satellite data at high spatiotemporal resolution
- Environmental monitoring data
- Land use data
- Dynamic population distribution derived from mobile phone traffic data
- Modelling of environmental parameters at national, regional, urban and address levels
- Mortality and hospitalizations data
- Follow-up of cohorts of resident population
- Data on occupational injuries and road accidents while commuting
- Data on road accidents with injuries

### Expected results

- National level relational database containing information on geographic, meteorological, demographic, air pollution and noise exposures at high spatiotemporal resolution;
- High-resolution daily maps of air pollutants concentration at national level;
- High-resolution daily maps of air temperature at national level;
- Effects of air pollution and extreme temperatures on hospitalizations and cause-specific mortality at national and municipality levels;
- Acute effects of environmental exposures on occupational accidents;
- Estimation of urban population mobility based on mobile phone traffic data;
- Effects of mobile phone use on the risk of road accidents;
- Short-term and long-term health effects of environmental exposure in five metropolitan areas at census-block level;
- Effects of heavy rain and extreme temperatures on the risk of road accidents and injuries in Rome

### Conclusions

Results provided by the BEEP project, in addition to address new directions in the scientific research, will provide relevant indications to decision makers in the fields of air quality, urban planning and public health.

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