

Junior Professor Chair (JPC)

Supporting institution/organization: Inserm

Name of the head of the institution/organization: Gilles Bloch

Academic region : Ile de France

Partner institutions/organizations: *Sorbonne University*

Research Unit: Institut Pierre Louis d'Epidémiologie et de Santé Publique (IPLESP) UMRS-1136.

Project title: Causal Inference in Public Health using large Observational health Databases (CIPHOD)

Keywords: Public health, causal inference, big data, statistical learning, epidemiology

Duration: 36 months

Scientific domain: Public health

CNU/CSS: 4604/CSS6

Institution strategy:

Sorbonne University is a world-class research university, presenting the comprehensive disciplinary range of arts, humanities, social sciences, natural sciences, engineering and medicine. It is at the crossroad of diverse disciplines and is engaged in responding to the intellectual and scientific challenges of the 21st century. Its strategic plan focuses on the internationalization of the establishment and in placing Sorbonne University as the strategic player where research, education and innovation are combined and structured to support one another. In this regard, the field of Public Health, and in particular that of causal inference, emerges as a promising scientific discipline where the university wishes to become a leading player. Causal inference is a promising new field for which the university does not have already a dedicated group. Indeed, causal inference is expected to have a major impact in the field of medicine, for example, in activities associated with clinical research. The recruitment of a high-level researcher in this promising field of public health fits with the goals of the university by consolidating the university role in a competitive and engaging scientific field, and by promoting the activities of research, education and innovation that are at the core of the university's mission. It is also very much in line with Inserm strategy in the field of public health, given the increasing role of causal inference in epidemiology and clinical research.

Host laboratory strategy:

The Pierre Louis Institute of Epidemiology and Public Health brings together all the research strengths in epidemiology and public health within Sorbonne University. Our overall common objective is to produce original knowledge on the most pressing public health issues and on the effectiveness of related interventions, particularly in the field of emerging

infectious diseases, chronic diseases, environmental and mental health. The Institute covers the main domains of epidemiology, whether clinical, populational or social, as well as pharmacoepidemiology, biostatistics, statistical and mathematical modelling, clinical research, social determinants of health. Our most prominent specificities are to use innovative design and analytical methods to ensure the highest level of evidence for our findings and our capacity to integrate and exploit a huge amount of data from various sources. In this respect, counterfactual methods of causal inference to analyze observational data is at the heart of our research activities. This emerging topic is the subject of very dynamic and active research at the international level. IPLESP aims at recruiting a high-level researcher in this field who can strengthen, coordinate and structure the research activities in causal inference in the different teams. This chair is fully in line with the strategy of the IPLESP, whose challenge is to set up a team capable of developing its own research in an innovative scientific field while interacting with the other teams of the Institute to provide the necessary expertise.

Summary of the scientific project:

The project will mostly be centered on evaluating and developing innovative statistical approaches in causal inference for identifying exposure effect including treatment effect on health from observational data. The increasing availability of health data (i.e. medico-administrative data, electronic medical records, large cohort studies) opens up the possibility of evaluating treatments and biomarkers in real life for many pathologies, particularly in infectious diseases, chronic diseases and mental health. In this context, the development of causal inference methods makes it possible to evaluate the effect of exposure factors from observational data in a rigorous and robust manner. Emulating target clinical trials from health data, integrating interventional research results with real-life data analysis to evaluate the effectiveness of treatments are research objectives made possible by causal inference. The junior professor will use her/his expertise to generate causal methods and analyze data to identify the best strategies for the treatment and prevention of infectious and non-infectious diseases. Among others, the comparison of various alternative models to link drug exposure in terms of cumulative duration/dose to a beneficial or adverse effect using data from the national health insurance database (SNDS), the emulation of a target trial from electronic medical records with machine (deep) learning methods, the estimation of the causal effect of a biomarker on the prognosis of subjects in a large cohort study, are topics that could be studied.

Summary of the teaching project:

IPLESP is strongly committed to academic and professional training and coordinates the doctoral school of public health, the master's degree in public health and other training courses in epidemiology and biostatistics at Sorbonne University. Thanks to her or his skills in causal inference methods, epidemiology, biostatistics with/without health economics, the junior professor will be able to develop or coordinate teaching units or courses on causal methods, in particular in the "statistics, modelling and health data sciences (SMSDS)" courses of the Master of public health. She/he will animate and lead an annual workshop for PhD students affiliated to the Public Health doctoral school (ED 393) on the use and implementation of causal methods. She/he will be

involved in other courses on causal inference at Sorbonne University. She/he will be supervising Master degrees and PhD students. The junior professor will be encouraged to submit a proposal for a PhD to ED393, which will be open to application for a PhD contract at Sorbonne University

Budget summary:

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| Total funded on JPC (including ANR package) | 200 000€ |
| Co-financing | |
| Welcome package Faculty of Medicine – Sorbonne Université | 10 000€ |
| - Doctoral fellowship | |
| - Research Unit endowment | 33 000 |
| Total | 243 000€ |

Scientific dissemination:

The junior professor will publish her or his major results in the best peer-reviewed journals.

Open science:

This project is fully in line with the open science approach promoted by Inserm and Sorbonne University. All accepted articles will be published on open archives (Hal), all computer codes of the developed methods will be accessible on a free software hosting and management service (github). The data will also be published where appropriate, in compliance with French regulations and the GDPR.

Science and society:

The ultimate products of IPLESP are not only peer-reviewed scientific papers, but also to produce relevant information to guide changes in clinical practice and healthcare organisations and to advise public health and policy makers, patient organisations and the general public. In this context and depending on the subject, the original results obtained thanks to the methods developed by the junior professor may be communicated to the general public or to patient associations through the mainstream media.

Indicators:

- number of papers published in peer-reviewed journals
- number of research contracts obtained in national, European and international calls for tender
- number of students supervised in Master, thesis or other postgraduate courses