BORDEAUX POPULATION HEALTH

Research Center - U1219

YEAR BOOK 2023

RÉPUBLIQUE FRANÇAISE
*Liberté
Égalité
Fraternité*

Inserm
La science pour la santé
From science to health

université
de BORDEAUX

CONTENTS

Created in January 2016, under the direction of
Prof. Christophe Tzourio, the Bordeaux Population Health
Research Centre is a Mixed Research Unit (UMR) affiliated to
the National Institute of Health and Medical Research INSERM
and the University of Bordeaux. The Centre and its teams are
evaluated for renewal every five to six years on the basis of the
quality of their activity and the relevance of their scientific
projects.

Since January 2022, the centre is directed by Prof.
Stéphanie Debette.

FROM THE DIRECTION

Stéphanie Debette

Director, Bordeaux
Population Health research center, 2022-2024

Stéphanie Debette, MD PhD, is Professor of Epidemiology at University of Bordeaux and practicing Neurologist at Bordeaux University Hospital. She serves as current director of the BPH. Prof. Debette has been coordinating large genomic and epidemiological studies on stroke, cognitive traits, and imaging markers of brain aging, especially cerebral small vessel disease, aiming to decipher underlying molecular mechanisms and to improve prevention and treatment of stroke and dementia. Prof. Debette is PI of a national investment for the future grant (RHU-SHIVA) on cerebral small vessel disease and has been leading an ERC grant on the genomics of early structural brain alterations in young adults and the EU-JPND BRIDGET initiative on genomics and epigenomics of MRI-markers of brain aging. She received a number of prizes and awards for her work (Claude Pompidou Foundation and Marie-Paule Burrus prizes, European Stroke Organization and Hans Chiari scientific excellence awards). A former Fulbright and Bettencourt-Schueller fellow and adjunct associate professor at Boston University, she was a visiting professor at Kyoto University. She serves in the research steering committee of the Cohorts for Heart and Aging Research in Genomic Epidemiology (CHARGE) consortium, on the advisory board of LMU university in Munich, and chaired the International Stroke Genetics Consortium (ISGC, 2017-2019). A former vice-president for external relations at the University of Bordeaux (2018-22), she chaired the board of directors of the ENLIGHT European University Alliance.

It is a great pleasure to introduce the third Yearbook of the Bordeaux Population Health research center (BPH). Besides a presentation of the research teams and 2023 research highlights, the following pages also include a few facts and figures describing the center and its environment. Co-hosted by the University of Bordeaux and INSERM, the BPH brings together approximately 500 staff members with a common goal: to explore and address major public health challenges and priorities with a multidisciplinary perspective and robust methodological approaches. Our mission is to generate high-quality scientific evidence to better understand disease mechanisms, prevent disease occurrence in the population and provide optimal care to patients. The center comprises 10 research teams, as well as a scientific coordination across teams covering (i) brain health across the lifecourse, (ii) data science (AI, omics, longitudinal data, real world health data research), (iii) infectious diseases and global health, (iv) aging and resilience, and (v) environmental and social determinants of health, with research objects ranging from observational studies to interventions.

I would like to seize the opportunity of these introductory words to extend my thanks to all BPH researchers and staff members for their outstanding commitment and achievements throughout 2023. I am most grateful to my colleagues from the BPH steering committee, Dr. Carole Dufouil, Dr. Hélène Jacqmin-Gadda, Dr. Olivier Marcy, Prof. Antoine Pariente, and Dr. David-Alexandre Tregouët, for their precious advice and support. Many thanks also to all team directors and deputy directors (presented in this document) for their dedication and much appreciated investment for the BPH community. Over the past year, one new deputy team director was nominate : Geneviève Chêne (PHARes team).

Warm thanks also to the BPH administrative team, directed by Isabelle Bely, whose daily support and efficient work are much appreciated, to Lucie Bonnafous-Besse, who has skillfully helped coordinate many important events and programs, to Christine Lopes-Monteiro and Ludivine Christophe for their huge support in handling our ever increasing demands in terms of grant management and human resources, to Marie-Hélène Carere, Sandrine Darmigny and Nadine Simon for their longstanding support to the BPH central office.

Special thanks to Valérie Garcia for her help in preparing this third edition of the BPH yearbook and to Nicolas Koskas for keeping our website alive and active and helping us disseminate our research. Learn more about us at https://www.bordeaux-population-health.center/!

This year, the BPH has secured extensive additional funding support to pursue ambitious programs spanning its diverse areas of expertise. These include European programs with a coordinating role, such as the Decide-TB HORIZON Europe EDCTP3 project, Integrate, an adaptive platform trial to fight lassa fever in Africa ; national programs such Drug-Safe 2 renewed in 2023, on medical drugs-administrative databases from health insurance claims; and interdisciplinary as well as international initiatives funded by the university of Bordeaux initiative of excellence and the national Health Data Hub, such as the Interdisciplinary observatory on digital technologies for surveillance in democracy and the EHDS-FR-FIN study comparing health trajectories between France and the Nordic countries. Lean more about these in our Yearbook!

Moreover, the BPH has successfully coordinated an application to launch a new Institute on Precision and Global Vascular Brain Health (VBHI), funded for 10 years by the France 2030 investment plan, involving over 150 research from the BPH and beyond. The VBHI aims at setting up an ambitious precision public health program targeting vascular brain diseases, with the objective to implement next-generation prevention approaches for stroke and dementia in order to reduce the burden of this condition in France and worldwide. Co-founded by the university of Bordeaux, Bordeaux University Hospital, Inserm, Inria and Nouvelle-Aquitaine region, the VBHI builds on complementary expertise in public health, neuroscience and cardiovascular research in Bordeaux. As I am privileged to be the inaugural director of this institute, a change in leadership of the BPH is scheduled for 2024, stay tuned!

BPH General Meeting; december 2022

ORGANIZATION

Director: Prof. Stéphanie Debette
Secretary General: Isabelle Bely

The BPH brings together over 477 staff members with a common goal: to explore and address major public health challenges and priorities with a multidisciplinary perspective and robust methodological approaches. As one of the largest public health research centers in France, the BPH is internationally recognized for its cutting-edge research, the unique, deeply phenotyped cohorts it has created and followed for up to 30 years, the seamless collaboration between data scientists, epidemiologists and clinicians, its leadership role in international consortia, and strong partnerships with the Global South.
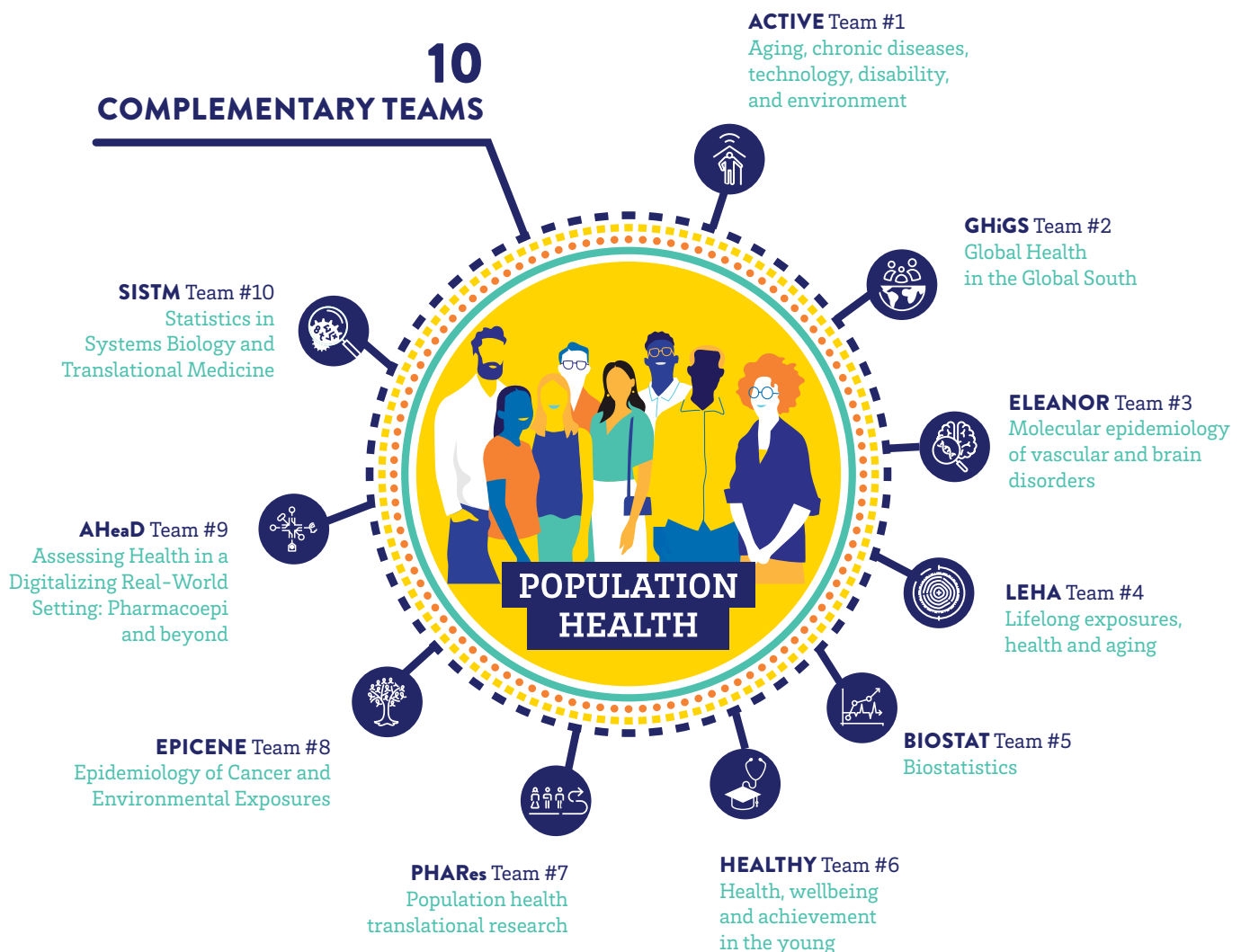
Mission and research organization

The BPH is devoted to producing innovative research based on robust methodology to address a wide range of public health challenges. The Center is composed of 10 complementary research teams gathering basic and clinician scientists, healthcare professionals, technicians and engineers, post-doctoral fellows, PhD and undergraduate students who work together towards a common goal.

DOMAINS OF RESEARCH

Areas of research and teams

The 10 BPH research teams cover a wide array of research domains. "Historical" topics covered since inception include biostatistics, neuroepidemiology, epidemiology of infectious diseases, cancer, aging, nutrition, and trauma prevention. Subsequently this focus was broadened to encompass public health data science with artificial intelligence dimensions, real world data in pharmacoepidemiology and beyond, genetic and molecular epidemiology, global health including for non-communicable diseases, social determinants of health, health economics, and methodological research in prevention.

10 COMPLEMENTARY TEAMS

POPULATION HEALTH

ACTIVE Team #1
Aging, chronic diseases, technology, disability, and environment

GHiGS Team #2
Global Health in the Global South

ELEANOR Team #3
Molecular epidemiology of vascular and brain disorders

LEHA Team #4
Lifelong exposures, health and aging

BIOSTAT Team #5
Biostatistics

HEALTHY Team #6
Health, wellbeing and achievement in the young

PHARes Team #7
Population health translational research

EPICENE Team #8
Epidemiology of Cancer and Environmental Exposures

AHeaD Team #9
Assessing Health in a Digitalizing Real-World Setting: Pharmacoepi and beyond

SISTM Team #10
Statistics in Systems Biology and Translational Medicine

Scientific coordination across research teams

BPH research organization is also based on major cross-sectional research themes with the aim of :
- Increase international visibility of the center's areas of excellence
- Create opportunities for collaboration across its 10 teams
- Prioritize themes linked with Horizon Europe topics
- Organize weekly seminars around these cross-sectional themes
- Support early career researchers

This scientific coordination across research teams is under the overall coordination of Dr. Hélène Jacqmin-Gadda, scientific director of Biostatistics team. She oversees the organization of cross-disciplinary scientific seminars around the 5 strategic themes representing the major focus of BPH research. These themes are also aligned with Horizon Europe's strategic themes and aim to contribute to the United Nations' sustainable

5 Major cross-sectional research themes

1. • Brain Health across the Lifecourse, co-led by Christophe Tzourio & Cécile Delcourt
2. • Infectious Diseases and Global Health, led by Xavier Anglaret
3. • Environmental & Social Determinants of Health, co-led by Isabelle Baldi & Jérôme Wittwer
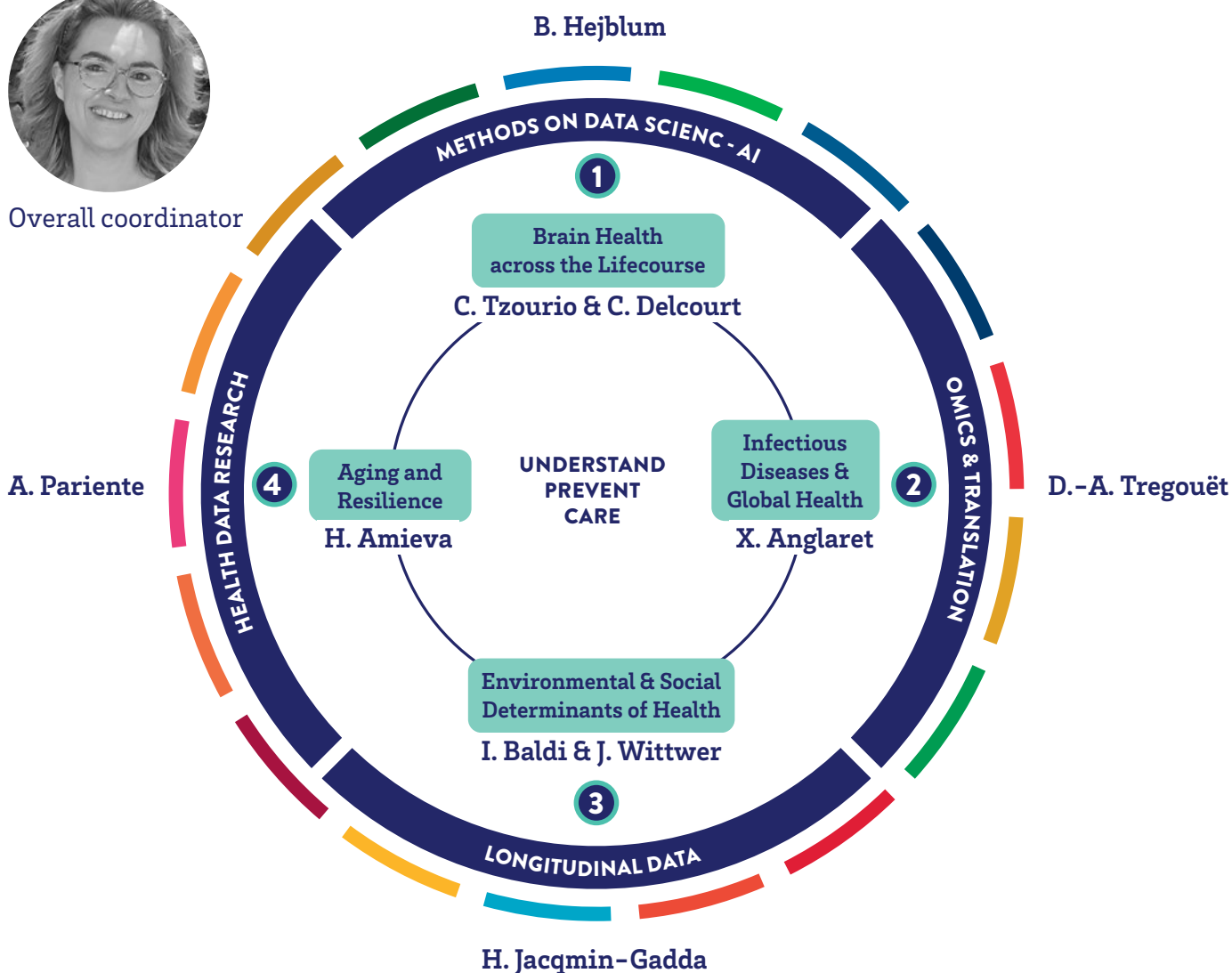4. • Ageing and Resilience, led by Hélène Amieva

5. **1 data science cross-cutting theme with 4 sub-themes:**
   - Methods on data science - AI, led by **Boris Hejblum**
   - Omics & translation, led by **David-Alexandre Tregouët**
   - Longitudinal data, led by **Hélène Jacqmin-Gadda**
   - Health data research, led by **Antoine Pariente**

H. Jacqmin-Gadda

Overall coordinator

B. Hejblum

METHODS ON DATA SCIENC - AI

1 Brain Health across the Lifecourse
C. Tzourio & C. Delcourt

2 Infectious Diseases & Global Health
X. Anglaret

OMICS & TRANSLATION

D.-A. Tregouët

A. Pariente

HEALTH DATA RESEARCH

4 Aging and Resilience
H. Amieva

UNDERSTAND PREVENT CARE

Environmental & Social Determinants of Health
I. Baldi & J. Wittwer

3

LONGITUDINAL DATA

H. Jacqmin-Gadda

2023 KEY FIGURES

GRANTS AND FUNDINGS

| 64 | 33 | 3 |

~26 M€
Yearly budget

64 % from research grants (17 M€/yr)
- 33% European or other international grants (NIH...)
- 18% investment for the future grants RHU, cohorts
- 49% other national grants
- <1% donations

33%
from salaries of permanent staff

3 %
state allocation

GRANTS AND FUNDINGS

143
Contracts including...

126
National public grants

7
European grants

3
International grants (outside Europe)

7
Grants from foundations and charities or private entities (ARC, FRM, etc...)

STAFF MEMBERS

477
staff
including...

104
Researcher or
teacher clinician
researchers

119
PhD students

27
Hospital
practitioners

24
Post-docs

36
Permanent
supporting staff
(study & research
engineers,
technicians &
administrative staff)

167
Non-permanent
supporting staff

BIBLIOMETRIC INDICATORS

TOP
10

604
scientific papers

18 %
in top 10%
most cited
worldlwide

42,3 %
in top 10% journals

64,1 %
in Open Access
journals

51,1 %
co-authored
with institutions
in other
countries/regions

KEY FIGURE for past period (2016-2021)

2958
scientific papers

TOP 10

21 %
publications

3,04 %
normalised citation index for the 2013-19 period

300
others outcomes

>120
scientific books or monographs

42
software contributions

13
patents

3
start-ups

>120
general public communications

24
covid projects

> 25
Prizes and/or distinctions

157
National public grants which 102 in coordination

9
National invesment for the future initiative grants (PIA), among which 3 in coordination

42
Local grants (regional governement, among which 30 in coordination

28
European grants among which 7 in coordination

36
International grants (outside Europe), among which 15 in coordination

68
Grants from foundations and charities or private entities (ARC, FRM, etc...) among which 56 in coordination

THE BPH WITHIN THE COMMUNITY

The BPH is co-hosted by the Inserm and the University of Bordeaux. Two BPH research teams have a third host institution: the INRIA (SISTM team) and the IRD (GHiGS team). The centre is located within the campus of the University of Bordeaux (one of the largest in Europe), specifically the Carreire biomedical campus. The BPH is located within walking distance of the Bordeaux University Hospital, with which it has strong connections.

RESEARCH-BASED TEACHING
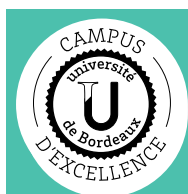
The University of Bordeaux was one of the first four universities in France to receive the Initiative of Excellence label from the Investments for the Future scheme (PIA). It is recognised as a world-class cluster of excellence in higher education and scientific research.

Public health teaching
We are located near the teaching premises of the ISPED Bordeaux School of Public Health, directed by Prof. Simone-Mathoulin-Pelissier, who is also a researcher at the BPH. All ISPED teachers conduct their research in a BPH team and 51 researchers from the BPH teach at the ISPED on a regular basis. ISPED delivers training courses in epidemiology, biostatistics, health promotion, occupational and environmental health, global health, management of medical and medico-social organisations, public health data science, and medical informatics.

Graduate programs and summer schools
BPH researchers have developed an international research-based teaching offer supported by PIA3 funding (EUR), including the Digital Public Health Graduate Program (DPH) and an interdisciplinary graduate program to address current and future public health challenges in Africa (EUR@AFRICA). BPH researchers also contribute to the ISPED summer school programs and co-lead several international summer school programs (e.g. Neurepiomics, Africa's populations by 2050: Challenges and potentials) and methodological seminars (e.g. Melodem).

Health sciences and medical curriculum
BPH researchers also make significant contributions to university curricula by teaching (research-based) courses in various disciplines: Health Sciences (Medical Science Faculty, Pharmaceutical Science Faculty) and Social Sciences (Psychology Faculty, Social sciences, Anthropology and Ethnology Faculty).

UB2030-CAP Digital Health
The kick-off meeting of the project with the ANR took place on December 11th, 2023. The UB 2030 CAP Digital Health project has been organised with a large consortium including the University of Bordeaux, IQVIA, Simforhealth and the GIP ESEA (E-santé en action). The project is also supported by Bordeaux University Hospital, the Nouvelle-Aquitaine region and AFNOR, as well as the two local e-health competency clusters ALLIS-NA and Digital Aquitaine. The aim is to offer innovative training courses in the field of digital health: acculturation training for health students and professionals, and more specialised training in data science for scientific profiles. The UB 2030 CAP Digital Health project is one of the 70 projects selected by the AMI CMA (call for expression of interest in future skills and professions) of the "France 2030" national plan.
Coordinated by Rodolphe Thiébaut, head of the BPH-SISTM team (Inserm-Inria-University of Bordeaux)

2nd European Public Health Leadership Course
Public health leadership is crucial to prepare the next generation of leaders to meet complex health challenges. It involves clear communication of public health concepts, raising public awareness, motivating policy-makers to integrate health into their decisions and committing stakeholders from all sectors. Such leaders should have a broad vision, in-depth knowledge and strong commitment to public health, while maintaining high ethical and professional standards.
The 2023 edition of the European Public Health Leadership Course was developed in collaboration with the WHO, the University of Bordeaux (ISPED, "Graduate program Digital Public Health"), Inserm BPH and Maastricht University. It welcomed 55 selected participants from 32 European and African countries and focused on "transformational leadership in public health" by promoting the practice and management of change and strengthening interpersonal and communication skills. The design of this course includes a continuous contribution to the annual edition, with a new meetup planned in Bordeaux in 2025. Many other courses are under consideration, especially for doctoral students. The prospects for collaboration with the Maastricht team on teaching and research in this area are also very promising.

Bordeaux University Hospital (CHUB) is one of the largest French University Hospitals in terms of activity, with a total capacity of 3,000 beds.

CLINICAL RESEARCH

The link with the clinical sector of the University Hospital of Bordeaux (CHUB) is reinforced by the strong involvement of many BPH researchers in the main methodological and operational structures for clinical and epidemiological research.

Many clinicians (neurologists, psychiatrists, infectious disease specialists, oncologists, emergency medicine specialists, etc.) are also involved in BPH research projects, some of them as directors or deputy directors of the research teams.

Hospital units led by BPH researchers
• Departments of Medical Informatics
• Occupational Health Unit for Research Organisations
• Hospital Unit for Innovation in Prevention (UHIP) at CHU Saint-André.

Health Data Warehouse EDS@NOVA
Since 2020, several academic and medical researchers from the BPH's SISTM team have been involved in the creation of a Health Data Warehouse (Entrepôt de Données de Santé EDS) at Bordeaux University Hospital, open to clinical epidemiology research. In 2022, the EDS@NOVA, which brings together partner establishments in the Nouvelle-Aquitaine region, was submitted to a national call for projects for the creation of hospital health data warehouses as part of France's strategy to promote digital health. This programme aims to strengthen regional cooperation and encourage the development of projects between partners.

Methodological structures
• CIC-EC (Centre for Clinical Investigations – Clinical Epidemiology)
• Population-based cancer registries
• Clinical trial units in various domains:
   - **EUCLID** (EUropean CLInical Trials Platform & Development) F-CRIN (French Clinical Research Infrastructure Network) platform for international trials
   - **USMR** (Methodological support unit for clinical and epidemiological research) for clinical research at Bordeaux University Hospital.
   - The **UMS 54 MART** Joint Service Unit (Inserm/University of Bordeaux) has taken over from the former CMG-EC (Centre de Méthodologie et de Gestion des Essais Cliniques Inserm/ANRS) for research on HIV and hepatitis.
   - **MEREVA** (Methodology and monitoring of clinical research on HIV and other infectious diseases in developing countries) for clinical research in low-income countries.

LARGE-SCALE RESEARCH PROJECTS AND PARTNERSHIPS

BPH researchers are leading several ambitious research projects funded by:

the **French government's "Investissements d'avenir" program (PIA3)**, including **BCube** (Biobank and Brain Health in Bordeaux, a population-based study among young seniors for deep phenotyping of cerebral aging: https://cohorte-b-cube.fr/) and **RHU SHIVA** ("Recherche Hospitalo-Universitaire en santé" on small cerebral vessel diseases)

the **"Initiative d'Excellence" of the University of Bordeaux, including large research programs** (GPR "Grands Programmes de Recherche"), among which: IPORA (coordinator), Interdisciplinary Policy-Oriented Research on Africa; **HOPE** (WP lead), Understanding Human Well-being and Behavior for better Policies & Societies; Impulse program **PHDS** (coordinator), Public Health Data Science Bordeaux Network.

In 2023, BPH researchers developed new ambitious research projects with a coordinating role:

European programs including **Drug-Safe 2** renewed in 2023 (ANSM), focusing on the risks of medical drugs, **Decide-TB** 2023 HORIZON-EDCTP3, aiming to integrate an adaptive platform trial for the development of new interventions to fight Lassa fever in Africa (selected in the HORIZON-JU-GH-EDCTP3-2022-01 call), **NIH, International epidemiology Databases to Evaluate AIDS (IeDEA) in Western Africa**.

EHDS-FR-FIN study

The aim of this study, coordinated by the BPH-AHeaD team together with the French Health Data Hub, is to compare health trajectories between France and the Nordic countries (Norway, Denmark and Finland) leading to cardio-metabolic diseases on a national scale, to assess the interoperability of European health data. The first objective is to establish a dictionary of disease assessment criteria, based on data from the French National Health Data System (SNDS), and compare them with the Finnish and Danish equivalents. The second objective is to build predictive models for cardio-metabolic diseases based on the health pathways of French people, using statistical and artificial intelligence approaches from the SNDS (12 million individuals) and compare them with the Nordic models (around 12.5 million individuals).

The Cardiometabolic Disease Trajectory project is among five programs which have been selected to elaborate the second pilot of the European Health Data Space, the HealthData@EU Pilot https://ehds2pilot.eu/

The aim is to contribute to the European Commission's ongoing debate on the access to and sharing of health data.

Co-coordinated by Gayo Diallo and Julien Bezin, AHeaD.

Research at the University of Bordeaux is divided into 11 departments, each bringing together various research structures (joint research units, university teams, platforms, etc.). The department of Public Health, directed by Prof. Antoine Pariente, comprises the Bordeaux Population Health Research Centre with its 10 research teams, the Clinical Investigation Centre (CIC 14.01), and, since September 2022, the service unit MART (Methods and Applied Research for Trial).

The Interdisciplinary observatory on digital technologies for surveillance in democracy

This new interdisciplinary and exploratory research project funded by the University of Bordeaux in 2023 aims to monitor and catalogue techniques used by both private and public entities for population surveillance, a practice that has appeared owing to societal computerization, global security concerns, and the rise of data economy since the 1960s. Health crises (Covid19 pandemics) and international gatherings, such as the Paris 2024 Games, have accelerated the need for efficient surveillance tools. Although necessary, they raise questions about their impact on democratic principles, especially privacy and personal data processing. Understanding the economic, social and political stakes behind these tools, as well as technical aspects such as data processing and artificial intelligence, is crucial to assess their effects on individuals and society. This requires interdisciplinary collaboration between humanities, social sciences, IT and public health. The goal is to set a framework for the ethical use of surveillance devices to ensure the sustainability of democracy in the 21st century, considering both societal needs and technological possibilities. https://observatoire-surveillance-democratie.fr/

Co-coordinated by Gayo Diallo, AHeaD deputy director.

Decide-TB project

Funded by the European Union, Decide-TB is a research project aiming to improve the diagnosis and management of tuberculosis in children by using treatment decision algorithms (TDAs). The latter help clinicians to make rapid and consistent decisions for the treatment of tuberculosis in children.

The project will be implemented from 2023 to 2027 in Mozambique and Zambia, two countries with a high TB burden in sub-Saharan Africa.

Coordinated by Olivier Marcy, GHiGS Team Director.

New France 2030 investment plan : VBHI Precision and global Vascular Brain Health Institute, the first IHU to focus on precision public health applied to cerebrovascular diseases.

The VBHI University Hospital Institute project, led by Debette Stéphanie coordinated by Bordeaux University and supported by Bordeaux Hospital, Inserm, Inria et Nouvelle-Aquitaine region, has been awarded by Health Innovation France 2030 program on Tuesday May 16th 2023. It was announced by the French government. The VBHI IHU is one of the 16 new programmes of excellence endorsed to accelerate research and innovation in health. **The Precision and Global Vascular Brain Health Institute (VBHI IHU)** will be dedicated to the brain vascular health. VBHI will develop a new paradigm integrating precision population health and therapeutic innovation to fight the most common neurological diseases, stroke, dementia, and covert cerebral small vessel disease, and to promote healthy brain aging. At the heart of an emerging global dynamic focused on innovation and inclusion, this new IHU will strive to maximise the scientific, medical and socio-economic impact of cerebrovascular health research, at national and international levels.

By bringing together world-renowned researchers, clinicians and industrial partners in a state-of-the-art facility, the future IHU aims to establish a new paradigm for preventing stroke and dementia on a local and global scale. This is summarised in five missions:

- Develop **cutting-edge fundamental and translational science** to decipher the mechanisms of cerebrovascular diseases and identify effective prevention and treatment strategies;
- Provide **a new paradigm for transforming stroke and dementia prevention** through organisational and technological innovations;
- Deliver **education and training based on the real-life challenges** faced by practitioners, including precision public health for stroke and research excellence;
- Create **a hub for innovation and impact in a dedicated building**, hosting initiatives that promote public-private partnerships, technology watch, business creation and the emergence of innovative methods to facilitate the translation of research results into health policies and clinical practice;
- Establish **a national and international coalition**, including countries in the global South, for cerebrovascular health to strengthen and broaden the impact of research and stimulate innovation.
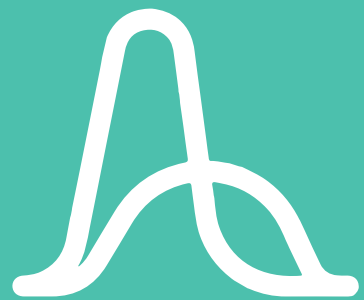
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RESEARCH

RESEARCH TEAMS
RESEARCH HIGHLIGHTS
IN 2022

BIOSTATISTICS

Team

BIOSTAT

MIXED RESEARCH TEAM

Inserm   université *de* BORDEAUX

Dr. Hélène Jacqmin-Gadda
PhD, BIOSTAT Director

Hélène Jacqmin-Gadda obtained the "Habilitation à Diriger des Recherches" (HDR) in Biostatistics in 2002 at Bordeaux University (France). She is Director of Research at the French National Institute of Health and Medical Research (Inserm) and head of the Biostatistics team at the BPH since 2014. Her research focuses on statistical methods for the analysis of longitudinal data with complex observation schemes and especially, models for multivariate longitudinal data and joint models for longitudinal data and time-to-event, as well as evaluation of predictive abilities of these models. Her main motivation is the study of cognitive aging and dementia. Other fields of application are HIV and cancer. She has advised 23 master students and 10 PhD students. She has co-authored about 130 publications in peer-review journals and two books about biostatistical models in epidemiology published in 2015. She is currently associate editor of *Statistics in Medicine and the International Journal of Biostatistics* and she was associate editor of Biometrics from 2003 to 2014.

Dr. Cécile Proust-Lima
PhD, BIOSTAT Deputy Director

Cécile Proust-Lima is a Director of Research in Biostatistics at the French National Institute of Health and Medical Research (Inserm). Her research mainly focuses on the development of longitudinal statistical methodologies to describe, explain and predict chronic disease progression. She has specialized over the years in latent class and latent process models for the joint analysis of correlated longitudinal markers and event time history with applications notably in cerebral aging and neurodegenerative diseases (Alzheimer's Disease and related dementias, Multiple System Atrophy). The works of her group, made available through open-source software (e.g., R packages lcmm, DynForest), are intended to address Public Health research questions through close collaborations with epidemiologists and clinicians and the analysis of large epidemiological cohort studies.

The main objective of the team is the development of statistical methods for time-dependent data coming from either observational cohort studies, clinical trials or casecontrol studies, with the aim of answering clinical and public health questions regarding chronic diseases: future burden, risk factors, individual prediction, underlying pathological mechanisms, and treatment effects.
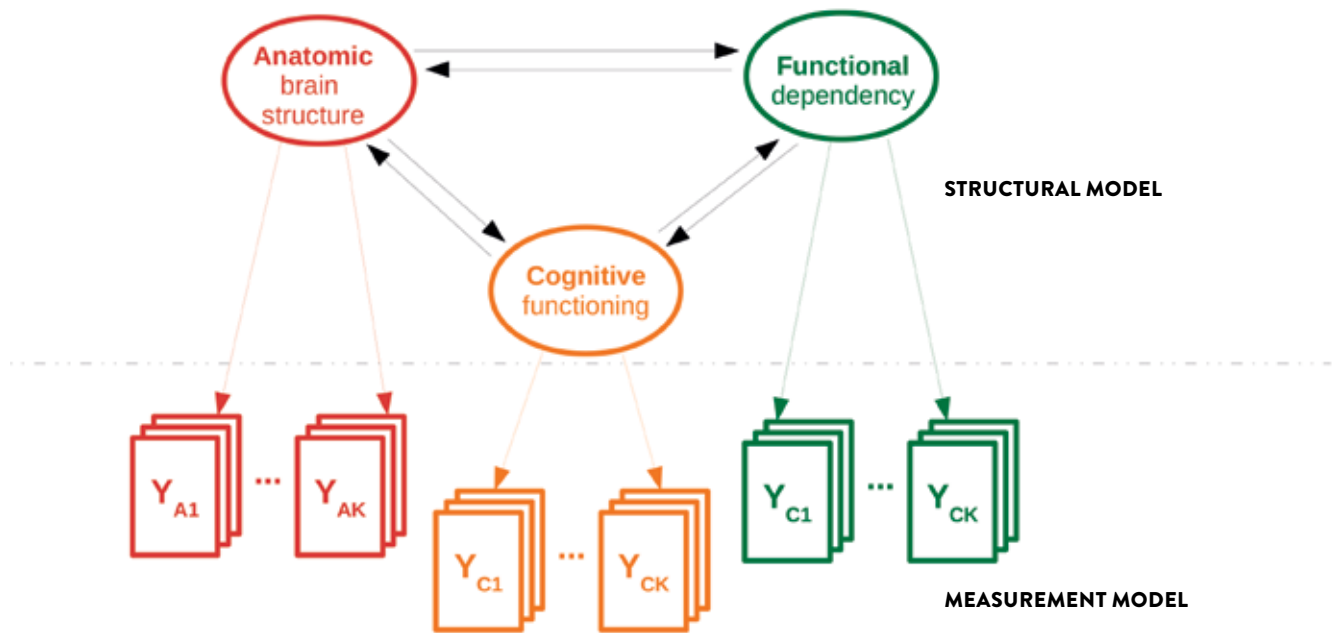
Over recent years the team has worked on two main topics: multivariate models for time-dependent data and model-based estimation of public health indicators. Our main domain of research focuses on the development of multivariate dynamic models for the analysis of censored time-to-events and/or repeated measures of longitudinal data accounting for complex observation schemes. These works are motivated by the study of the natural history of chronic diseases such as Alzheimer's disease or Multi-System Atrophy, the investigation of the impact of time-dependent exposures, or the validation of surrogate markers for clinical trials in cancer research. Parametric and semiparametric estimation procedures for frailty models for correlated time-to-events, clustered data and/or recurrent events as well as joint models for event times and longitudinal markers were implemented in the R-package Frailtypack. Another field of research is the extension of mixed models using latent classes and/ or latent processes for the analysis of multiple longitudinal outcomes with non-standard distributions in heterogeneous populations. We proposed the R-package LCMM, which enables the estimation of latent class mixed models, joint latent class mixed models and mixed models for curvilinear univariate or multivariate longitudinal outcomes. These models were motivated by the analysis of cognitive decline in cohort studies. They account for population heterogeneity and issues raised by the metrologic properties of measurement tools of cognition and autonomy (high correlation between markers measuring one or several underlying processes, ordinal data, non-standard asymmetric distributions with floor and/or ceiling effects and unequal sensitivity to changes). We also designed methods for the estimation of Illness-Death model accounting for interval-censoring (Package SmoothHazard). Tools for computing individual prediction and evaluating predictive abilities of these models were also developed. Relying on multi-state methodology, we propose several approaches to forecast the future burden of neurologic and cardio-vascular diseases and

STRUCTURAL MODEL

MEASUREMENT MODEL

assess the expected impact of intervention scenarios, targeting their modifiable risk factors. Depending on the complexity of the investigated scenarios, the indicators for the future burden of the disease are computed analytically or using micro-simulations.

Our current projects particularly focus on causal questions and big-data issues in the framework of dynamic models. On the one hand, causal questions are related to our research about the mechanism underlying pathological processes in chronic diseases, the evaluation of surrogate markers, the role of long-term exposure and the impact of social inequalities in health. We investigate the causal interpretation of the multivariate models we developed and we propose new methods for studying causality for censored time-to-events, repeated measures of time-dependent outcome and/or time-dependent risk factors. On the other hand, as technological progress helps collect large amounts of data (genetics, biology, imaging, IoT data), we develop new approaches that tackle high-dimensionality issues with respect to the number of time-dependent predictors, markers and outcomes.

2023 Key publications

• Alencar de Pinho N, Prezelin-Reydit M, Harambat J, Couchoud C, Glaudet F, Combe C, Rondeau V, Leffondre K. Arteriovenous access creation and hazards of hospitalization and death in patients starting hemodialysis. Nephrol Dial Transplant. 2023. https://doi.org/10.1093/ndt/gfad251

• Chauvet J, Rondeau V. A flexible class of generalized joint frailty models for the analysis of survival endpoints. Stat Med. 2023;42(8):1233-62. https://doi.org/10.1002/sim.9667

• Devaux A, Helmer C, Genuer R, Proust-Lima C. Random survival forests with multivariate longitudinal endogenous covariates. Stat Methods Med Res. 2023;32(12):2331-46. https://doi.org/10.1177/09622802231206477

• Jacqmin-Gadda H, Philipps V, Guillet F, Tzourio C, Helmer C, Joly P. Impact of interventions scenarios targeting three main vascular risk factors on the future burden of dementia in France. Eur J Epidemiol. 2023;38(4):435-43. https://doi.org/10.1007/s10654-023-00974-w

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MOLECULAR EPIDEMIOLOGY OF VASCULAR AND BRAIN DISORDERS

Team

ELEANOR
MIXED RESEARCH TEAM

Inserm   université BORDEAUX

Dr. David-Alexandre Trégouët
PhD, ELEANOR director

Holder of a PhD in Public Health (1999), with strong emphasis on genetic epidemiology, his research career started with the development of statistical methods to analyze family data as well as genetic polymorphisms in the context of candidate association studies. He then turned to the development and application of statistical/ bioinformatics tools for the analysis of high-throughput microarray and next generation sequencing data. In parallel to these methodological developments, he is participating in the design and the analysis of several epidemiological studies aiming at identifying molecular determinants of cardiovascular diseases, his specialty being venous thrombosis (VT). He is joint coordinator of the French EOVT, FARIVE, MARTHA, MARFAST and PILGRIM studies, and joint convener of the International Network of Venous Thrombosis (INVENT) consortium, aimed at identifying genetic factors for VT. Within the F-CRIN supported INNVOTE network that brings together all French clinicians working in the field of VTE, he supervises the re search programs on VT genomics. Over recent years, his interests have extended to molecular epidemiology integrating epigenetics marks, microRNA and proteomic profiling in order to develop a research program on precision medicine in thrombotic disorders.

Pr. Stéphanie Debette
MD, PhD, BPH Director,
ELEANOR Deputy Director

The purpose of our research is to identify groups of individuals who are at high risk of developing three common and tightly linked neurological and vascular conditions: (dementia, stroke and venous thrombosis), to discover novel etiological factors and therapeutic targets, and to propose more personalized preventive strategies through improved risk stratification.

Our research program relies on major components:
1/ large-scale epidemiological and clinical cohorts coupled with biosamples;
2/ the deployment of cutting-edge high-throughput technologies for deep molecular phenotyping;
3/ the application of advanced statistical methodologies;
4/ a group of experts in molecular-clinical epidemiology and
5/ a widespread network of collaborators that enables us to contribute to the functional characterization of the identified biomarkers.
Our project is focusing on three inter-related clinical outcomes, cognitive impairment / dementia, stroke, and thrombosis and is organized around 4 themes:

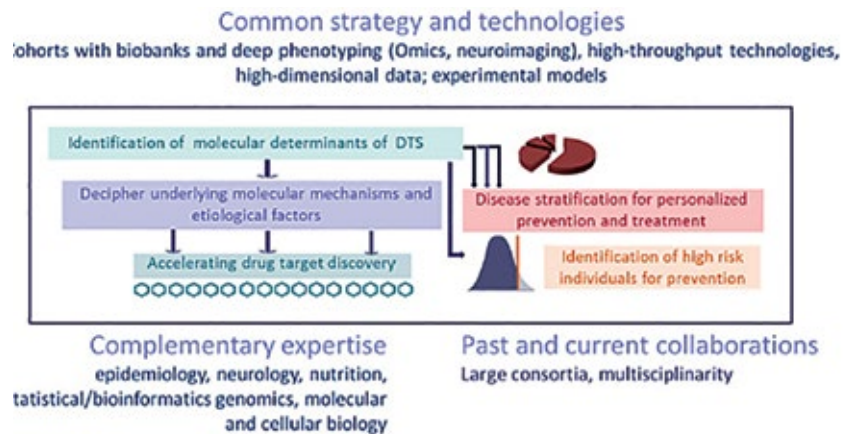### Molecular epidemiology of vascular brain aging, (PI: Stéphanie Debette)
Using collaborative genome-wide association study meta-analyses and next generation sequencing data we are studying the genetic underpinnings of stroke and MRI-markers of covert cerebral small vessel disease (SVD). We have a growing interest in cross-ancestry studies, as these are crucial to enhance genomic discovery and make results more representative. Through the ERC SEGWAY we are taking a lifespan approach to explore early determinants of brain aging and the impact of genes predisposing to stroke, dementia and SVD on brain microstructure in young adults (i-Share cohort). In the RHU SHIVA project (national investment for the future funding), following up on efforts that we initiated in the EU-JPND BRIDGET program, we are now expanding our explorations to other omics approaches (epigenomics, transcriptomics, proteomics and metabolomics), focusing in particular on deciphering the molecular underpinnings of covert SVD and its contribution to stroke and dementia. Finally, we are engaged in leveraging these molecular epidemiology studies to accelerate drug discovery and improve risk prediction/stratification for targeted prevention. Our group is also involved in European therapeutic guideline coordination.

Common strategy and technologies

Cohorts with biobanks and deep phenotyping (Omics, neuroimaging), high-throughput technologies, high-dimensional data; experimental models

- Identification of molecular determinants of DTS
- Decipher underlying molecular mechanisms and etiological factors
- Accelerating drug target discovery
- Disease stratification for personalized prevention and treatment
- Identification of high risk individuals for prevention

Complementary expertise
epidemiology, neurology, nutrition, statistical/bioinformatics genomics, molecular and cellular biology

Past and current collaborations
Large consortia, multisciplinarity

Exposome of brain aging and dementia (PI: Cécilia Samieri)

The network and dynamics of environmental factors leading to age-related brain diseases has yet to be elucidated, in order to identify the most impactful targets for prevention. This exposome research axis leverages molecular epidemiology, brain imaging and advanced statistical approaches deployed to population-based cohorts with biobanks in order to investigate: (1) the exposome of brain health at key ages, and (2) the underlying pathways and life-course dynamics. The general aims are to: refine assessment of already-known exposures (eg, diet biomarkers); explore novel exposures (eg, chemical mixtures); investigate beyond individual exposures (eg, microbiome interactions); and eventually model the global exposome network, to improve etiological modeling of age-related brain diseases. We will capitalize on existing data (e.g. the 3C cohort) and target younger populations, building a new population-based cohort of 2000 participants aged 55-80 years from the community living in Bordeaux metropole, the B cube (Biobank and Brain Health in Bordeaux) study.

Precision Medicine for better prophylaxis & better knowledge on venous thrombosis (PI: David-Alexandre Trégouët)

After spending several years to identify common genetic factors for venous thrombosis (VT) in the general population, we are now embarking into a more integrative analysis of various molecular determinants (genes; epigenetic marks, proteins,...) on specific subgroups of individuals at higher risk of VT including women under oral contraceptives, patients with a previous history of VT and patients with viral infections.

In parallel, building on our recent successes, we will continue our genetic investigations of rare forms of unexplained inherited VT through the application of whole exome/genome sequencing in familial cases.

Integrative approach for vascular and brain disorders (all PIs)

The deep characterization and understanding of the biology of a complex disease requires to integrate results/data from others diseases as they very often share common risk factors and pathophysiological mechanisms. By capitalizing on the existence of complementary and synergistic expertise and bioresources brought by ELEANOR's PIs in different but interrelated diseases, we are implementing an integrative research strategy to optimize the identification and the characterization of molecular determinants associated with some of the most common age-related diseases.

2023 Key publications

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HEALTH, WELLBEING AND ACHIEVEMENT IN THE YOUNG

HEALTHY

MIXED RESEARCH TEAM

Inserm   université ~BORDEAUX

Pr. Cédric Galera
MD, PhD, HEALTHY Director

Cédric Galera is a pediatric psychiatrist and epidemiologist. He was resident in child psychiatry at the University of Bordeaux between 2000 and 2004. He did a research fellowship in Montreal (Canada) in 2003 and a clinical fellowship in Montevideo (Uruguay) in 2005. He is professor of Child and Adolescent Psychiatry at the University of Bordeaux and hospital practitioner at Charles Perrens hospital and at Bordeaux University Hospital. He has been a researcher at the BPH since 2008 and an associate researcher at the Research Unit on Children's Psychosocial Maladjustment (Cana da) since 2017.

Pr. Christophe Tzourio
MD, PhD, HEALTHY Deputy Director

Christophe Tzourio is a neurologist and epidemiologist. He is the immediate past director of the BPH. Prof. Tzourio trained as a resident at the Paris Hospitals and Chief of Clinic in Neurology at the Lariboisière Hospital. He joined INSERM in 1994 as a Research Associate and was promoted to Research Director in 2000. In 2005, he became Director of a new INSERM U708 research unit at the Pitié-Salpêtrière Hospital in Paris. In 2013, he was appointed Professor of Epidemiology at the University of Bordeaux and hospital practitioner at the Bordeaux University Hospital. From 2013 until 2021 he was director of the Bordeaux Population Health research center, Inserm U1219, at the University of Bordeaux.

The research focus of our team is to understand and prevent mental health problems in youths.
We aim to:
1. **Investigate the risk and protective factors of Mental, Neurological and Substance use (MNS) problems in young people using a lifespan perspective**
2. **Test the efficacy of strategies to prevent Mental, Neurological and Substance use problems and build resilience to stressors in youths / parents**

Over the past five years, our team has provided relevant evidence on the early contribution of social environment and biological factors on youth mental health (cognition, externalizing behaviors, internalizing problems, ADHD and risk for suicide). Team members have studied the modulation of biological factors by the social environment in relation to externalizing problems and ADHD and the relative contributions of genes and environment on the developmental course of the ADHD phenotype and suicide risk, from the peri-conceptional period to adolescence. Team members have also found that cytokine patterns in the cord blood are associated with childhood anxiety/depression symptoms. Regarding interventions aiming at improving mental health, cognitive development and social outcomes, the team has shown the benefits of early non-parental care and evidenced the moderate efficacy of a multicomponent early intervention program on behavior, cognition and health, in an Irish sample. Team members have developed eHealth tools to be used for MNS in youths, particularly in students. These findings provide key elements to inform public policies and tailor our experimental interventions. Research of our team members takes advantages of various cohorts, including birth cohorts (ex: ELFE and ELDEQ) and young adult cohorts (iShare and CONFINS).

Our future research will rely on 3 axes:
Axis 1 Mental health epidemiology in the youths: understanding the risk and protective factors underlying MNS problems (Cédric Galera)
The HEALTHY team is particularly interested in quantifying (1) the putatively protective role that psychosocial services play on the prevention of MNS problems; (2) the impact of MNS problems on individual functioning, including educational and professional achievement; and (3) the biological and social

COHORTS USED TO INVESTIGATE MECHANISMS UNDERLYING MNS AND THEIR SEQUELAE

i-Share	> 21 000 students	19 y.	27 y.
CONFINS	3 500 participants 2 000 students	19 y.	27 y.
ELDEQ	1 000 females 1 000 males	5 m.	21 y.
EDEN	800 females 800 males	Pregnancy	12 y.
ELFE	18 000	Pregnancy	9 y.
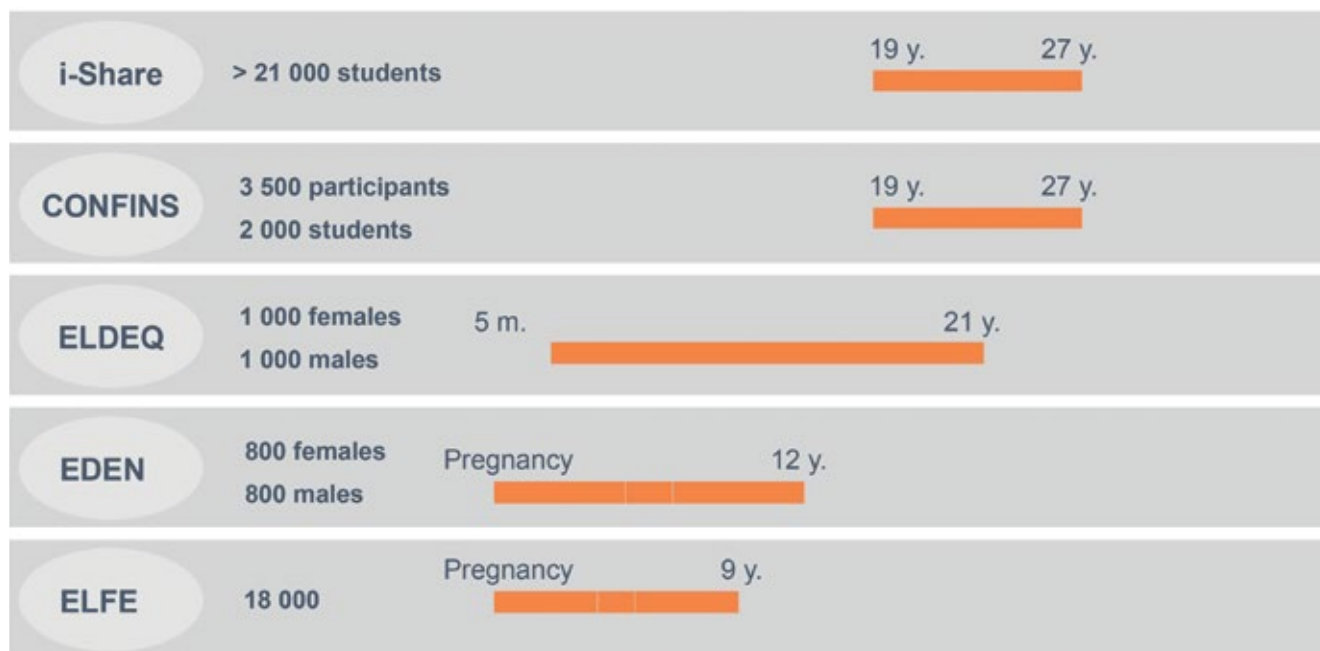
mechanisms underlying specific mental health disorders and problems like ADHD, depression, suicidality, pathological low levels of self-esteem, etc.

Axis 2 Exploring social and behavioral features of mental health in the youths (Ilaria Montagni, Christophe Tzourio) This axis will aim at describing and analyzing health behaviors/lifestyle, health representations, and health literacy of young people, relying on sociological and communication approaches (Humanities and Social Sciences) and mixed-methods studies.

Axis 3 Designing, testing and evaluating interventions preventing MNS problems and promoting mental health in the youths (Cédric Galera, Ilaria Montagni, Christophe Tzourio) We will conduct (1) specific interventions focusing on a defined mental health problem or disorder (selective and indicated interventions); and (2) general-population interventions targeting health behaviours, e.g., health literacy, healthy lifestyles, life-skills training, psycho-education (universal interventions).

2023 Key publications

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LIFELONG EXPOSURES, HEALTH AND AGING

Team

LEHA

MIXED RESEARCH TEAM

Inserm   université de BORDEAUX

Dr Cécile Delcourt
PhD, LEHA Director

Cécile Delcourt has a PhD in statistics and public health and is a senior researcher at Inserm U1219-Bordeaux Population Health Research Centre, where she leads the LEHA (Lifelong Exposures, Health and Aging) research group. She has a strong expertise in the epidemiology of eye diseases (in particular AMD, cataract and glaucoma). She is internationally renowned in the identification of risk factors for major eye diseases (in particular smoking, light exposure and nutrition). She has led two major population-based epidemiological studies in the field, since 1995 (POLA and Alienor studies). She has founded and led from 2011 to 2018 the "European Eye Epidemiology" consortium, gathering 32 teams from 12 European countries, and has been workpackage leader in two European projects (Eye-Risk and Sense-Cog), granted in the Horizon 2020 framework. She has published more than 200 scientific articles, with a Factor H of 41. She received the Achievement Award of the American Academy of Ophthalmology in 2019.

The objective of team LEHA is to study age-related diseases, in particular those of the brain (dementia, Alzheimer's disease) and of the eye (age-related macular degeneration, glaucoma), using a lifelong approach and focusing on shared mechanisms and exposures, in order to define strategies for the prevention of age-related functional loss and the promotion of healthy aging

We study populations of different ages (elderly, middle-aged, young) in prospective designs allowing for the study of slow long-term processes, using early biomarkers (in particular eye and brain imaging) allowing for the early detection of health related effects of exposures. As age-related diseases share common mechanisms and consequences and interact with each other, aging is considered as a global state promoting the occurrence of diseases. Models of aging are mainly neurological diseases (cognitive decline and dementia/ Alzheimer's) and eye diseases (mainly age-related macular degeneration (AMD) and glaucoma), but also extend to other health endpoints, such as diabetes, kidney disease or physical performance.

Our research is based on population-based cohorts that we have been conducting in elderly populations for more than 30 years: the PAQUID cohort (n=3777, followed since 1988) and the 3C Study (n=9294 including 2104 in Bordeaux, followed since 1999), and its ancillary ophthalmological study in Bordeaux Alienor (n=963, followed since 2006). We also participate in population-based cohort studies (i-Share, 20,000 students, PI C. Tzourio), Constances (220,000 adults aged 18-69 years, followed since 2012, PI M. Zins, Inserm U1018, Villejuif) and B cube (planned 2000 aged 55-80 years in Bordeaux, PI C Samieri), in particular by generating cutting edge ophthalmological phenotypic information and several ranges of biomarkers. Finally, we collaborate with European and American cohorts, individually or within collaborative projects. Overall, these studies collect information on many aspects of aging (functions, chronic and degenerative diseases, disability) and their determinants (clinical factors, nutrition, environmental exposures, genetics), which allow a very comprehensive study of the epidemiology of health and aging in older adults, but also offer a scope for a broader lifelong approach, thanks to the epidemiological and clinical studies conducted in younger individuals.

EXPOSOME AND AGE-RELATED DISEASES

METABOLIC, INFLAMMATORY, VASCULAR AND NEURODEGENERATIVE PROCESSES
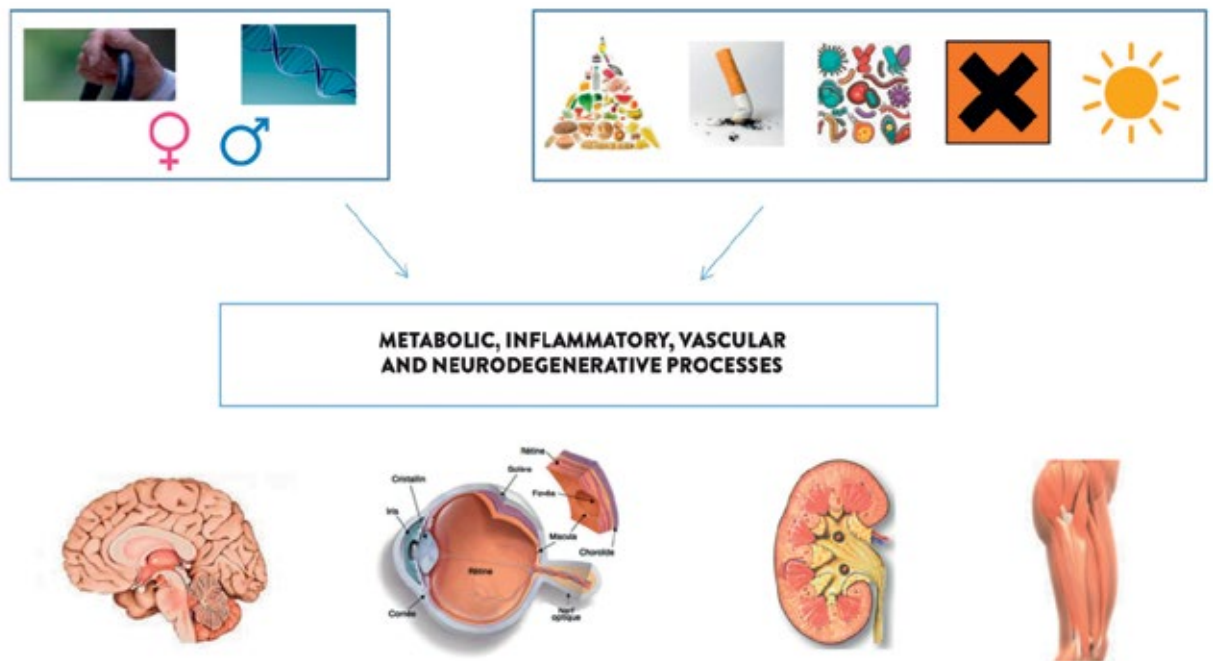
Our research activity is divided in 3 axes:
- Burden of age-related and chronic disorders, which aims at documenting the frequency of age-related and chronic diseases and characterize their burden, in terms of loss of autonomy, impaired quality of life, as well as medical and non-medical costs.
- Mechanisms and processes of age-related diseases, which aims at finely characterizing aging processes, by collecting detailed clinical, imaging and functional data over long periods of time, with major interest in degenerative and vascular processes as well as inflammatory mechanisms.
- Determinants of healthy aging, which focuses mainly on the role of nutrition and lifestyle, as well as environmental exposures (sunlight exposure, air pollution…). With regard to nutrition, our approach combines interest in specific dietary intakes and patterns with the use of innovative measurements (lipidomics, metabolomics, gut microbiota…).

2023 Key publications

• Bardinet J, Pouchieu C, Chuy V, Helmer C, Etheve S, Gaudout D, Samieri C, Berr C, Delcourt C, Cougnard-Gregoire A, Feart C. Plasma carotenoids and risk of depressive symptomatology in a population-based cohort of older adults. J Affect Disord. 2023;339:615-23. https://doi.org/10.1016/j.jad.2023.07.076

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STATISTICS IN SYSTEMS BIOLOGY AND TRANSLATIONAL MEDICINE

Team

SISTM

MIXED RESEARCH TEAM

Inserm Inria université de BORDEAUX

Pr. Rodolphe Thiebaut
MD, PhD, SISTM Director

Rodolphe Thiebaut is a medical doctor specialised in Public Health. He holds a PhD in Biostatistics from Bordeaux University. He started his research career at the Institut National de Santé et de la Recherche Médicale (INSERM) as a research scientist between 2002 and 2009 and as research director between 2010 and 2013. He was a research fellow in the Immunobiology Division of the Institute of Child Health (London, UK) in 2007. He is now Professor in Public Health / Biostatistics at the University of Bordeaux. He leads a research group (SISTM-Statistics in Systems Biology and Translational Medicine) devoted to the modelling and analysis of high-dimensional data mainly applied to immunology through the French Vaccine Research Institute (https://vaccine-research-institute.fr/en/). This group, which is embedded in the INSERM U1219 Research Centre (https://www.bordeaux-population-health.center/), has been recognised as an INRIA project team since January 2015 (https://www.inria.fr/fr/sistm). He is in charge of the medical information department of the Bordeaux University Hospital. He is also the Director of the Graduate School of Digital Public Health, coordinator of the Master of Public Health Data Science at ISPED (Institut de Santé Publique d'Epidémiologie et de Dévelopement).

The two main objectives of the SISTM team are: 1) to accelerate the development of vaccines by analyzing all the information available in early clinical trials and optimizing new trials 2) to develop new data science approaches to analyze and model big/ omics data.

The team is organized around three axes sharing a common objective. It is embarked in a double challenge of developing methods to deal with high dimensional data with low sample size and a main application for accelerating vaccine development.

Hence in Axis 1, the relevant information is extracted from big data. This information is used to estimate mechanistic model parameters in Axis 2. Mechanistic models can then be used for simulating the optimal vaccine strategies to be evaluated in the next clinical trials. All this work is done in collaboration with our partners from the Vaccine Research Institute, EUCLID/ANRS-MIE CMG platform and the Bordeaux Hospital.

Axis 1 High Dimensional Statistical Learning
- To develop and apply methods for discovering complex relationships between high dimensional data (multiblock analysis for data integration)
- To reduce data redundancy by i) high dimensional reduction ii) deconvolution
- To visualize high dimensional data through statistically sound approaches
- To infer cell populations abundance through gene expression data by deconvolution approach

Axis 2 Mechanistic learning
- To infer ordinary differential equations (ODE) systems parameters by using high dimensional data
- To compare and implement control strategies through various approaches belonging to statistical control, stochastic control, reinforcement learning

Axis 3 Translational vaccinology
- To accelerate vaccine development by in silico trials
- To accelerate vaccine development by new adaptive designs
- To accelerate vaccine development by in depth analysis of data generated in early clinical trials

SISTM Axis 2:
Mechanistic modelling
(Mélanie Prague)

SISTM Axis 3:
Translational vaccinology
(Laura Richert)

SISTM Axis 1:
High dimensional
statistical learning
(Boris Hejblum)

CTU
(Linda Wittkop)
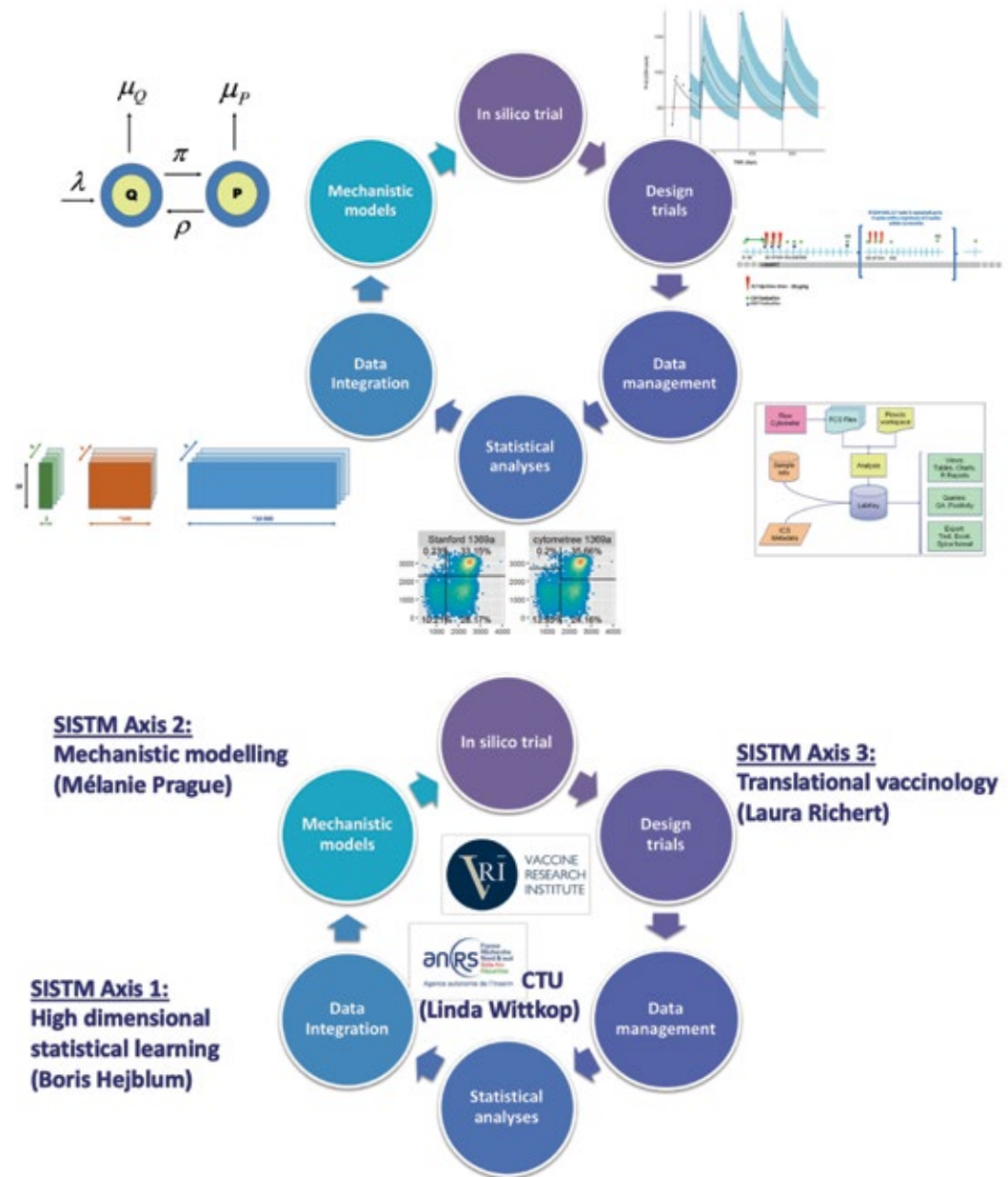
2023 Key publications

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• Blengio F, Hocini H, Richert L, Lefebvre C, Durand M, Hejblum B, Tisserand P, McLean C, Luhn K, Thiebaut R, Levy Y. Identification of early gene expression profiles associated with long-lasting antibody responses to the Ebola vaccine Ad26.ZEBOV/MVA-BN-Filo. Cell Rep. 2023;42(9):113101. https://doi.org/10.1016/j.celrep.2023.113101

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• Dong L, Moodie EEM, Villain L, Thiebaut R. Evaluating the Use of Generalized Dynamic Weighted Ordinary Least Squares for Individualized Hiv Treatment Strategies. Ann Appl Stat. 2023;17(3):2432-51. https://doi.org/10.1214/22-aoas1726

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AGING, CHRONIC DISEASES, TECHNOLOGY, DISABILITY, AND ENVIRONMENT

Team

ACTIVE

MIXED RESEARCH TEAM

Inserm   université ~BORDEAUX

Pr. Hélène Amieva
PhD, ACTIVE Director

Hélène Amieva has a PhD in neurosciences. After one year of post-doctoral fellowship at the Psychology Department of Aberdeen University (UK), she has been working at the CNRS as a permanent researcher for nine years. She is currently Professor of psychogerontology at Bordeaux University.

Her main expertise is in the field of epidemiology and neuropsychology of aging, dementia and Alzheimer's disease, in particular psychosocial factors modulating clinical trajectories and cognitive decline in aging. She has also been involved in clinical studies assessing non-drug treatments. She has conducted the ETNA3 study, a national trial assessing the efficacy of non-pharmacological therapies in Alzheimer's disease, involving 653 patients followed up for three years in 40 French hospital centers. Currently, she is the principal investigator of the study assessing the impact of the French Alzheimer Village in South-western France, an innovative experiment for people suffering from Alzheimer's disease. She is the author or co-author of about 190 articles published in international journals.

She is co-director of the Master of "Psychogerontology and Public Health" at Bordeaux University. Since 2021, she is the general secretary of the French speaking society of Neuropsychology relying on a community of physicians, psychologists, speech therapists and researchers working in French-speaking countries and actively involved in the field of neuropsychology.

Most of the researches conducted within the ACTIVE team aim at studying: (1) intrinsic capacities of individuals and environmental factors contributing to develop / maintain/ reduce functional capacity in the context of acute/chronic disease, disability, and/or old age; and (2) innovative strategies based on the optimization of such factors. The team is composed of epidemiologists, psychologists, cognitive scientists, geriatricians, physical therapists, neurologists and a psychiatrist.

The first research axis is coordinated by Karine Pérès. It investigates to what extent intrinsic capacity and environments contribute to develop / maintain / reduce functional ability. Functional trajectories associated with aging process are studied through a continuum distinguishing robustness, pre-frailty, frailty, and activity limitation. We examine their determinants through a multidimensional approach considering intrinsic capacities (cognition, depression, sensory impairments, personality traits...) and environmental factors (family support, social network, (un)adapted home, professional assistance, digital technologies) that may influence the sequence and speed of functional deterioration. The heterogeneity of these trajectories is explored in several prospective population-based and clinical studies (PAQUID, AMI, 3C, CONSTANCES, COGLOC...). More recently, taking advantage of the ongoing cohort studies, the PA-COVID survey, set up very shortly after the first COVID-19 lockdown in France, aims at providing valuable knowledge on older adults' social and psychological experiences of the COVID-19 crisis and its impact on cognitive, mental and functional health.

The second research axis coordinated by Hélène Sauzéon focuses on innovative strategies based on the optimization of individuals' intrinsic capacity and/or environments. As an example of strategies based on optimized environments, the French Alzheimer village is an experimental accommodation facility for older adults with Alzheimer's disease built like a traditional village. The team is currently conducting an ambitious multidimensional research program evaluating whether this innovative model is relevant compared to traditional nursing homes (see below). Other researches involve interventions relying on digital technologies. They generally address two main health issues: rehabilitation access and patient agentivity (i.e., active role of the patient). A research

Le village Alzheimer de Dax

project is being conducted on patients with vascular aphasia to evaluate the benefits of tele-rehabilitation compared to a conventional face-to-face rehabilitation. Another research stresses the role of self-determination in cognitive rehabilitation by leveraging recent technological advances. The program includes a large panel of individuals of various ages and with various disability conditions. The goal is to study the impact of the technology properties of adaptability (self-configuration of objectives/ contents of the intervention by the care recipient) and/or adaptivity (self-configuration of intervention by machine learning algorithms) on rehabilitation results.

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• Molina-Donoso M, Parrao T, Meillon C, Thumala D, Lillo P, Villagra R, Ibanez A, Cerda M, Zitko P, Amieva H, Slachevsky A. Assessing subjective cognitive decline in older adults attending primary health care centers: what question should be asked? J Clin Exp Neuropsychol. 2023;45(3):313-20. https://doi.org/10.1080/13803395.2023.2221399

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ASSESSING HEALTH IN A DIGITALIZING REAL-WORLD SETTING PHARMACOEPI & BEYOND

AHeaD

MIXED RESEARCH TEAM

Inserm université BORDEAUX

Pr. Antoine Pariente
MD, PhD, AHEAD Director

Professor Antoine Pariente, a renowned expert in pharmacoepidemiology, headed the Bordeaux Pharmacovigilance Centre from 2016 to 2021 and chaired the European Medicines Agency's PRAC interest group on the Impact of Regulatory Measures. Coordinator of the DRUGS-SAFE platform from 2015 to 2019, he transformed this initiative into the DRUGS-SAFER Centre, designated by the authorities to provide real-world evidence on the use and safety of medicines. Currently, as director of the BPH AHeaD team, a merger of the Pharmacoépi, ERIAS, and IETO teams, he continues to play a key role in population health research.

Pr. Gayo Diallo
PhD, AHeadD Deputy Director

Professor Gayo Diallo is full professor in computer science at Bordeaux University and is based at ISPED. He is deputy director of the AHeaD (Assessing Health in a Digitalizing Real-World Setting Pharmacoepi & beyond) research team at the BPH Inserm-1219 and previously, he was the group leader of ERIAS an emerging team of BPH. He holds an Habilitation to Supervise Research from the University of Bordeaux and a PhD in Computer Science from the University of Grenoble Joseph Fourier (Grenoble Alpes). He joined the University of Bordeaux in 2009 after working at City University London and the Laboratoire d'Informatique Appliquée du Futuroscope in Poitiers. He was a Visiting Professor at the University of Minnesota (USA) in 2022. His research focuses on symbolic AI approaches for health data management and ICT for societal development.

We are interested in better understanding healthcare real-world setting and better assessing medicines in this observational environment. In particular, we aim to investigate trajectories of care and their determinants, with a specific interest into emergency care use from one side, and trajectories of care for patients with chronic diseases relating to cardiovascular health or mental health from the other.

AHeaD results from the merging of three different teams ("Pharmacoepidemiology-Pharmacoepi"; "Injuries-IETO"; "Informatics in Health-ERIAS"). The collaborations we developed over the years ultimately concentrated most of our teams' research efforts around the secondary use of electronic databases for the study of health and medicines in a real-world setting. In anticipation of the research challenges that will emerge from the multiplication, diversification, and complexification of digital health data, we decided to join forces with the AHeaD team project. This will combine our originating teams' expertise in electronic health records databases (HERs), hospital data warehouses, ontologies, data visualization, knowledge representation, machine learning and natural language processing for health research, thus constituting a tremendous research opportunity. The way to answer the questions regarding health assessment in real-world settings is likely to change dramatically. In the coming years, the use of electronic health databases, that developed tremendously over the past 30 years, will need to be complemented using information from other sources that will help strengthen and substantiate the real-world evidence provided. Building bridges between applied health research, already widely using EHRs, and informatics appears as a necessity when envisioning the future development of health assessment in real-world settings.

The research will divide into three axes corresponding to different objectives and methods. The research will divide into three axes corresponding to different objectives and methods:

1. Data & Signals: Structuring and bridging data for hypothesis generating in real-world assessment

Safety signal or repurposing hypotheses are mostly presented or generated from the results obtained from one data source/ type of information analysis. We intend to go further by developing approaches that will combine various types/sources of information for hypothesis-generating research from realworld data.
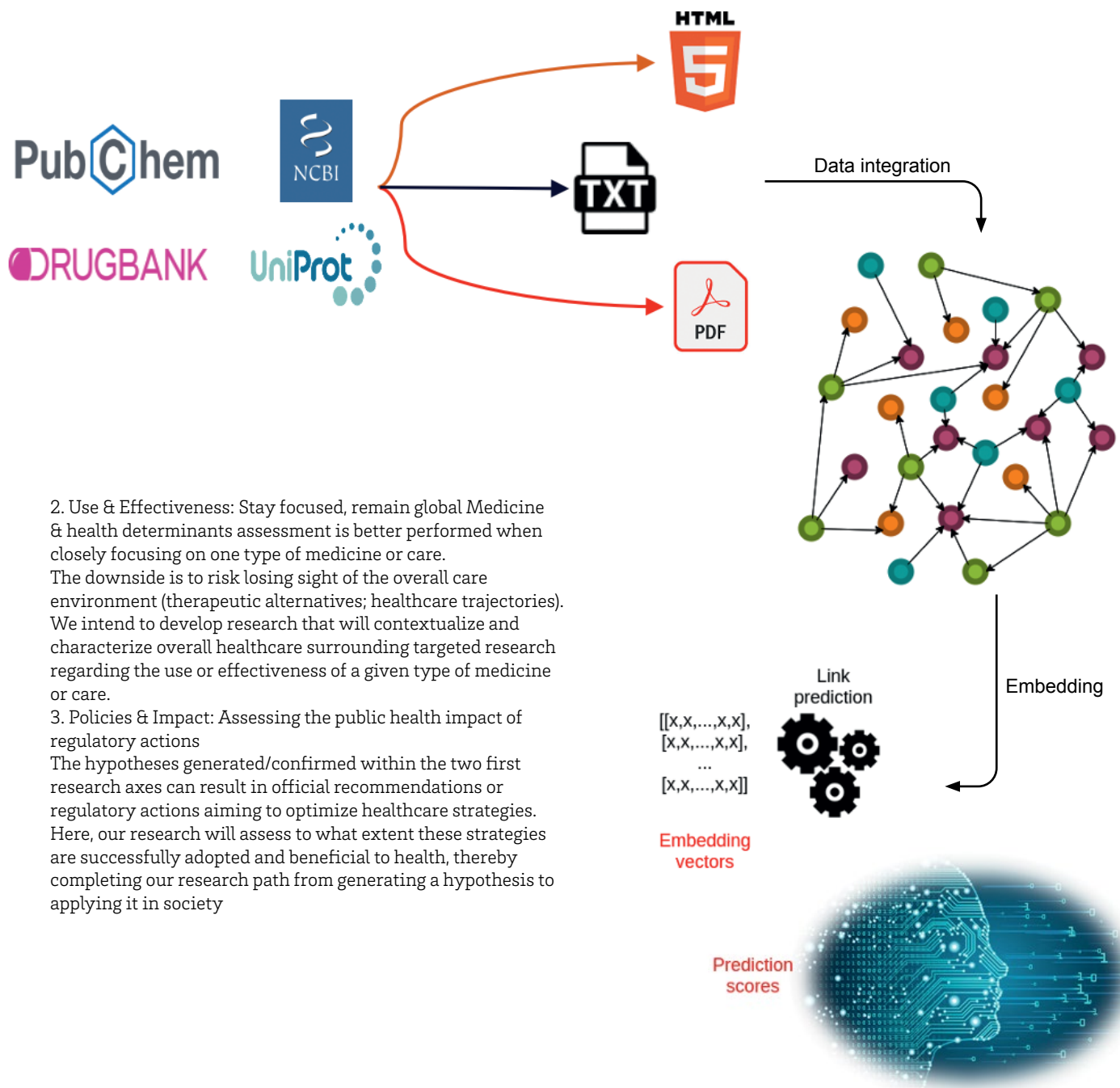
2. Use & Effectiveness: Stay focused, remain global Medicine & health determinants assessment is better performed when closely focusing on one type of medicine or care.
The downside is to risk losing sight of the overall care environment (therapeutic alternatives; healthcare trajectories). We intend to develop research that will contextualize and characterize overall healthcare surrounding targeted research regarding the use or effectiveness of a given type of medicine or care.

3. Policies & Impact: Assessing the public health impact of regulatory actions
The hypotheses generated/confirmed within the two first research axes can result in official recommendations or regulatory actions aiming to optimize healthcare strategies. Here, our research will assess to what extent these strategies are successfully adopted and beneficial to health, thereby completing our research path from generating a hypothesis to applying it in society

2023 Key publications

• Allouchery M, Tomowiak C, Singier A, Puyade M, Dari L, Pambrun E, Pariente A, Bezin J, Perault-Pochat M-C, Salvo F. Bleeding risk with concurrent use of anticoagulants and ibrutinib: A population-based nested case-control study. Br J Haematol. 2023;203(2):311-8. https://doi.org/10.1111/bjh.18995

• Bezin J, Gouverneur A, Penichon M, Mathieu C, Garrel R, Hillaire-Buys D, Pariente A, Faillie J-L. GLP-1 Receptor Agonists and the Risk of Thyroid Cancer. Diabetes Care. 2023;46(2):384-90. https://doi.org/10.2337/dc22-1148

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• Chenais G, Gil-Jardiné C, Touchais H, Avalos Fernandez M, Contrand B, Tellier E, Combes X, Bourdois L, Revel P, Lagarde E. Deep Learning Transformer Models for Building a Comprehensive and Real-time Trauma Observatory: Development and Validation Study. JMIR AI. 2023;2:e40843. https://doi.org/10.2196/40843

• Chenais G, Lagarde E, Gil-Jardine C. Artificial Intelligence in Emergency Medicine: Viewpoint of Current Applications and Foreseeable Opportunities and Challenges. J Med Internet Res. 2023;25:e40031. https://doi.org/10.2196/40031

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• Perino J, Demourgues M, Ramaroson H, Bezin J, Micallef J, Miremont-Salame G, Frauger E, Gilleron V, Ong N, Daveluy A. Increase in hospitalisation-associated methadone intoxication in France following first COVID-19 lockdown. Public Health. 2023;223:1-6. https://doi.org/10.1016/j.puhe.2023.07.004

• Tournier M, Benard-Laribiere A, Jollant F, Hucteau E, Diop P-Y, Jarne-Munoz A, Pariente A, Oger E, Bezin J. Risk of suicide attempt and suicide associated with benzodiazepine: A nationwide case crossover study. Acta Psychiatr Scand. 2023;148(3):233-41. https://doi.org/10.1111/acps.13582

EPIDEMIOLOGY OF CANCERS AND ENVIRONMENTAL EXPOSURES

EPICENE

MIXED RESEARCH TEAM

Inserm   université de BORDEAUX

Pr. Isabelle Baldi
MD, PhD, EPICENE Director

Isabelle Baldi is a Professor in Occupational Health at Bordeaux University, and a member of the Environmental and Occupational Health department at Bordeaux University Hospital. Her research aims at assessing long-term effects of occupational & environmental pesticide exposure through epidemiological studies (especially on cancer and neurological outcomes). She has developed new tools for pesticide exposure assessment, such as crop exposure matrices (PESTIMAT, PESTIPOP) and algorithms (PESTEX-PO, CANEPA) based on field observations, using several epidemiological projects. She is co-leader of the AGRICAN cohort (https://www. agrican.fr/) and responsible for the neurological subgroup of the AGRICOH international consortium (https:// agricoh.iarc. fr/). She is involved in the European SPRINT program (https:// sprint-h2020.eu/). She also heads the Registry of Central nervous system tumors, implemented in Gironde in 1999.

Dr. Fleur Delva
MD, PhD, EPICENE Deputy Director

Fleur Delva is a medical doctor specialized in public health and hospital practitioner at the Bordeaux University Hospital and co-director of the INSERM EPICENE "Cancer environment" team. She obtained a PhD in epidemiology in 2014 and obtained an accreditation to supervise PhD research in 2019. Today, her activity is divided between hospital activity where she coordinates the ARTEMIS Centre, an environmental health prevention platform for patients with reproductive disorders, and a research activity on the environment and reproduction themes, with significant research and leadership experiences within global organizations in cancer surveillance, epidemiology and public health.

EPICENE's research is focused on cancers and environmental and occupational determinants of health. Our projects address methodological challenges in a multidisciplinary approach with the aim of expanding knowledge on cancer survival and its determinants, developing new approaches to estimate life-long environmental exposures (Exposome concept), understanding the role of the environment and the occurrence of certain cancers.

Theme 1: Cancer survival: improving knowledge, detecting frail individuals, identifying surrogate endpoints
Although survival rates have improved for the main cancers over the past decades, they remain highly variable depending on the cancer site and on many more individual parameters. We strive to further understand the factors associated with better survival for cancer patients. Thanks to our involvement in population based cancer registries, we generate new data on cancer survival and its determinants (treatments, comorbidities, care practices, palliative care) for several cancer types (hematological cancers, breast cancer…). We pay particular attention to frail people, for whom efforts of detection and prevention are strongly needed, including elderly people whose number will rapidly increase in the coming decades. We develop new tools for detection programs and we investigate cancer literacy in elderly cancer patients. Our efforts also focus on improving cancer screening strategies (including organized mass screening). We also develop new biostatistical approaches to assess treatment efficacy and patient survival in randomized controlled trials and in real-life settings

Theme 2: Methods in environmental and occupational exposures: the exposome knowledge
Our research aims to improve the knowledge of levels and determinants of exposure to major contaminants with field measurements in order to identify the main determinants of exposure (usable in retrospective questionnaires and in large population cohorts). Our research on pesticide exposures started 25 years ago and continues to provide many original data through the PESTEXPO program. We now aim to document baseline levels for "everyday" contamination on a farm and explore pesticide exposures in non-farming jobs (i.e., gardening, wood industry…). We also explore the exposures of the general population living near treated fields. We combine field measurements and ergonomic observations. Levels and determinants of exposures to other pollutants are also studied, such as nanoparticles in the occupational and environmental settings, antineoplastic drugs in healthcare workers, electromagnetic fields… We also develop indirect exposure assessment tools, such as Job Exposure Matrices (PESTIMAT, MATPUF) and spatial modeling. Usable retrospectively in large populations with minimal collection of data (job or residential calendars), they are very useful to our epidemiological studies.

Theme 3: Environmental Etiology of Cancer
For more than 20 years, we have studied the etiology of CNS tumors, hematological malignancies and mesothelioma thanks to registries that we set up in this domain and our

LOCAL LEVEL

- ISPED — Training by research
- BPH — Other teams
- LABEX — Cote
- EPICENE Team — ENVIRONMENT CANCER
- SIRIC BRIO — Site de recherche Intégrée sur le Cancer
- TIGA — VITIREV
- ONCOSPHERE
- CIC-EC 1401 — Axes cancer et environnement
- GPR
- Bordeaux Hospital
- Institut Bergonié

NATIONAL LEVEL

- ANSES — Réseau National de Vigilance et de Prévention des Pathologies Professionnelles
- Other Research Units — U1085 Rennes ; U1086 Caen, U955 Créteil ; INERIS, IGN
- Ligue Nationale Contre le Cancer — Labellisation ELLA PACAN
- Santé Publique France — Département Santé Travail Environnement Équipe ESSAT
- EPICENE Team — ENVIRONMENT CANCER
- FRANCIM — French registries' Network
- UNICANCER
- Santé Publique France

INTERNATIONAL LEVEL

- SPRINT European project on Sustainable Transition for Plant Protection
- International Consortium AGRICOH
- International Consortium INTERLYMPH
- EUROCARE — Survival of cancer patients in Europe
- International Study of Asthma and Allergies in Childhood
- European Network of Cancer registries
- EPICENE Team — ENVIRONMENT CANCER
- European Community Respiratory Health Survey
- International Concord Program

EPICENE's collaborations

Pr Isabelle Baldi 0.3

Dr Alain Monnereau — Contrat Interface INSERM 0,8

- Epidemiology
- Occupational Health
- Statistics
- Ergonomics
- Ethics
- Toxicology
- Clinicians (pneumol /geriatrician)

Researchers: 17 permanent, 8 HDR, 4 ADT, 7.3 FTE

Name	Field	Role	FTE
B Amadeo	Epidemiology	Assistant Professor	0,5
C Bellera	Statistics	Associate researcher	0,3
G Bouvier	Epidemiology	Assistant Professor	0,5
P Brochard	Occupational Health	Professor Emeritus	0,3
M Canal-Raffin	Toxicology	Assistant Professor	0,5
C Carles	Epidemiology/Occupational Health	Assistant Professor	0,3
G Coureau	Epidemiology	Assistant Professor	0,3
F Delva	Epidemiology	Associate researcher	0,3
S Darquy	Ethics	CR Inserm	1,0
A Garrigou	Ergonomics	Professor	0,5
A Lacourt	Epidemiology	CR Inserm	0,5
S Leguyader-Peyrou	Epidemiology	Associate researcher	0,3
S Mathoulin-Pelissier	Epidemiology	Professor	0,3
C Raherison	Epidemiology	Professor	0,3
B Vacquier	Epidemiology	Associate Researcher	0,3

Postdocs (2) + Administrative staff (2), Engineers Technicians (4)
PhDs

+ 2 Specific infrastructures:
Registries & Associated Team (surveillance on occupational health)

collaborations at both national and international levels. Recently, we also developed studies on sarcomas. As etiological research, including the role of the environment, remains scarce for most rare cancers, we intend to analyze the role of environmental determinants in the occurrence of these cancers, for which the role of environmental factors is suspected. Our efforts rely on cohorts (AGRICAN, LUCSO, REALYSA), case-control studies (CERENAT, ETIOSARC), and data from international consortia (AGRICOH, INTERLYMPH). We attempt to better understand cancer risks in specific populations, suspected to be more vulnerable because of individual conditions or comorbidities (e.g., allergies, immunological disorders), genetic characteristics (polymorphisms of detoxification genes,…) or specific exposures (women, smokers…

2023 Key publications

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• Duchange N, Poiseuil M, Rollet Q, Piette C, Cosson M, Quertier M-C, Moutel G, Darquy S. How do women comply with cancer screenings? A study in four regions of France. BMC Womens Health. 2023;23(1):190. https://doi.org/10.1186/s12905-023-02311-5

• Frasca M, Jonveaux T, Lhuaire Q, Bidegain-Sabas A, Chanteclair A, Francis-Oliviero F, Burucoa B. Sedation practices in palliative care services across France: a nationwide point-prevalence analysis. BMJ Support Palliat Care. 2023;13(e3):e1326-34. https://doi.org/10.1136/spcare-2023-004261

• Galvin A, Amadeo B, Frasca M, Soubeyran P, Rondeau V, Delva F, Peres K, Coureau G, Helmer C, Mathoulin-Pelissier S. Association between pre-diagnosis geriatric syndromes and overall survival in older adults with cancer (the INCAPAC study). J Geriatr Oncol. 2023;14(6):101539. https://doi.org/10.1016/j.jgo.2023.101539

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GLOBAL HEALTH IN THE GLOBAL SOUTH

GHiGS

MIXED RESEARCH TEAM

Inserm · IRD · université de BORDEAUX

Dr Olivier Marcy
MD, PhD, GHiGS Director

Olivier Marcy is a clinical epidemiologist and researcher at the University of Bordeaux and research director at the IRD (French Institute for Research and Sustainable Development). He worked for more than 10 years as a clinician and public health program manager in sub-Saharan Africa (Republic of Congo) and South East-Asia (Cambodia). His research focuses on diagnosis of tuberculosis (TB) in children and TB-HIV co-infection in adults and children. He is the project leader of the Unitaid-funded TB-Speed project on childhood TB diagnosis with research ranging from decentra lisation and implementation challenges to accuracy of diagnostic algorithms for vulnerable children. He is the current chair of the NIAID-funded TB-SRN international cohort on pulmonary TB in adults. He is also involved in the IPORA interdisciplinary and policy-oriented research platform where he is developing research on impact of air-pollution on respiratory health in urban settings in Africa.

Dr Renaud Becquet
PhD, GhiGS Deputy director

Renaud Becquet, senior scientist at Inserm, has a PhD and a HDR in epidemiology (University of Bordeaux). After his PhD in Abidjan, Côte d'Ivoire, and a two-year post-doctoral fellowship at the University of KwaZulu Natal, South Africa, he was recruited in 2008 as senior scientist at the Bordeaux Population Health Research Centre. His early research focused on the prevention of mother-to-child transmission of HIV in Africa. He later created a research platform with humanitarian organisation ALIMA to develop innovative and transformative research in sub-Saharan Africa, focusing on improving maternal and child health outcomes in complex situations. He authored and co-authored about 100 articles published in internatio nal journals. He has served as an expert in various committees and guideline development groups (WHO, UNICEF, UNAIDS). He is currently the coordinator of the Master Global Health in the Global South at the Bordeaux School of Public Health.

The objectives of the GHiGS team are:
- **to produce data on diseases affecting the Global South, their epidemiology, risk factors and consequences;**
- **to use these findings to design and evaluate innovative interventions at both individual and population levels, which are effective, equitable and sustainable, and contribute to the advancement of global health.**

Per the definition of Koplan et al. (The Lancet 2009; 373(9679): 1993–5), global health is an area for study, research, and practice that places a priority on improving health and achieving equity in health for all people worldwide. Global health emphasizes transnational health issues, determinants, and solutions; it involves many disciplines within and beyond health sciences and promotes interdisciplinary collaboration; and it is a synthesis of population-based prevention with individual-level clinical care.

Per the definition of the World Bank, the Global South is made up of Africa, Latin America and the Caribbean, Pacific Islands, and the developing countries in Asia, including the Middle East.

Scientific orientations of the research team

The GHiGS team aims to contribute to improving health at both individual and population levels in countries from the Global South and to contribute to reducing health inequities between and within countries. Low-and middle-income countries, particularly in Sub-Saharan Africa, are going through major changes including epidemiologic, sociodemographic, economic, agronomic, technological and climatic transitions. At the same time, they are carrying the triple burden of:

1/ infectious disease (including HIV), tuberculosis, malaria, hepatitis and a number of other emerging infectious disease threats (including hemorrhagic fevers and other epidemics);

2/ growingly prevalent non-communicable diseases (NCDs; diabetes, cancers, hypertension, obesity),

and 3/ unprecedented outdoor pollutions and environmental threats. The GHiGS team aims to respond to these major transitions and new challenges through integrated, multi-level and inter-disciplinary research approaches in the context of the Global South.

Among the key highlights of the past five years, the GHiGS team contributed to a major revision in the international HIV treatment guidelines issued by the World Health Organisation and was among the rare research teams worldwide to have conducted a treatment trial to reduce mortality during the Ebola epidemic in West Africa.

In the coming years, the GHiGS team will strengthen and expand two key research themes, i.e., infectious diseases and mother and child health issues, to address new challenges in the field of diagnosis, care, and treatment. NCD research, previously addressed by the team in relation with infectious diseases (HPV-and HBV-related cancers, cardiovascular and metabolic HIV-comorbidities), will become a standalone research theme. Major challenges in implementing evidence-based interventions will be addressed within a cross-sectional and structural research axis on "Models of care, implementation and health systems". Finally, beyond the
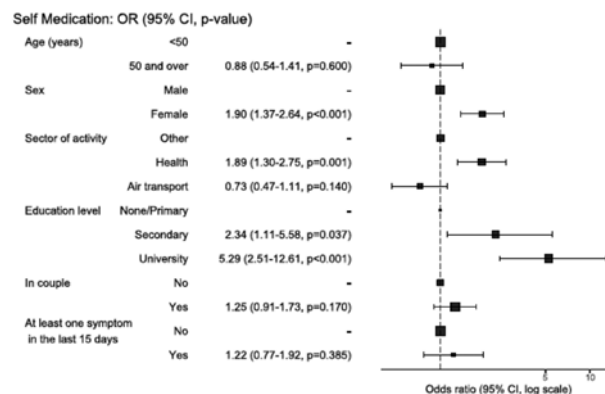
FIGURE 1 shows factors associated with self-medication to prevent the infection to SARS-CoV-2 in high-risk populations, Lomé, Togo in a binary logistic multivariable model. These associations were expressed as adjusted odds ratios.
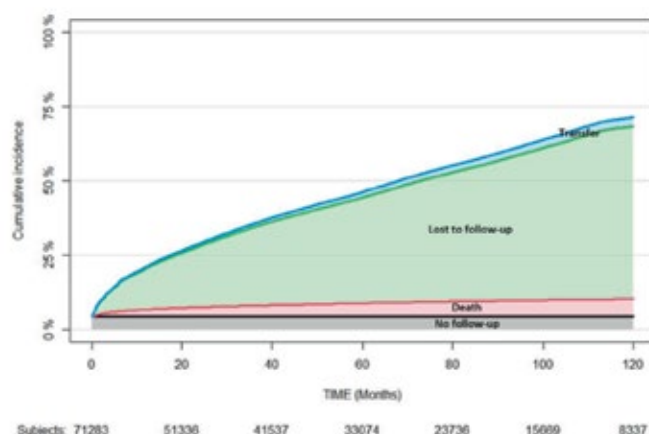Self-medication was coded as a binary variable (=1 if intake of at least one product and = 0 if not)

FIGURE 2. Ten-year stacked plot of cumulative incidence function of attrition by attrition types. IeDEA West Africa Collaboration, 2002 to.

individual and health system levels, the GHiGS team will explore the impact on health (NCDs, emerging epidemics,...) of global forces and environmental changes (climate change, bacterial ecosystem, resistance to antimicrobials, pollution...), as part of the "People in their environment" axis. Research by the GHiGS team will be built on equal partnership and co-construction with scientific partners, clinicians, policy-makers from the Global South countries. Through its expanded research program and strengthened collaborations and partnerships, the ambition of the GHiGS team is to contribute to the achievement of the Sustainable Development Goal #3 on Health and Well-Being.

Structuration of the research team The GHiGS activities will be organised around 3 research themes (infectious diseases; maternal and child health; non-communicable diseases) which correspond to major global health challenges; and 3 cross-sectional axes (Prevention, diagnosis and treatment; models of care, implementation, and health systems; people in their environment) that will structure research efforts, collaborations, and development of methods and scientific engineering capacities.

2023 Key publications

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POPULATION HEALTH TRANSLATIONAL RESEARCH

PHARes

MIXED RESEARCH TEAM

Inserm   université de BORDEAUX

Dr. Carole Dufouil
PhD, PHARes director

Carole Dufouil PhD is a research director at Inserm and lead the PHARes team. She is also deputy director for international and overseas relations at Bordeaux School of Public Health (ISPED). She has received training in biostatistics and public health. Her early publications were on methods to handle missing data in longitudinal studies. More recently, her research has focused on the determinants of neurological diseases, including Alzheimer's disease. She is particularly interested in the role of vascular risk factor exposure and cognitive stimulating activities, and imaging markers (PET, MRI) of brain aging and disease. She is co-PI of the 3C-Dijon study and co-PI of the MEMENTO study, a national clinical cohort, which was set up in the context of the French Alzheimer Plan 2008-2013, and aims to improve the understanding of the natural course of Alzheimer's disease and related disorders. She is also strongly involved in international scientific programs such as the Framingham Heart study, or co-leading of the Melodem initiative which aims at harmonizing analytical approaches in longitudinal studies on dementia (www. melodem.org).

Pr Geneviève Chêne
MD-PhD, PHARes Deputy director

Geneviève Chêne, MD, PhD, is a professor of medicine in public health at the University of Bordeaux and Bordeaux University Hospital. She is co-PI of the Memento cohort, aimed at improving our understanding of the progression from cognitive complaints or disorders to Alzheimer's dementia. Her interests also extend to leveraging health or environmental and social data for public decision-making. As the deputy director of the Vascular and Brain Health Institute (IHU VBHI, France 2030), she actively contributes to its strategic development. During the Covid-19 pandemic, she held the position of Director General of Public Health France. Previously, she led the School of Public Health (ISPED) at the University of Bordeaux, as well as the Public Health Department of Bordeaux University Hospital. She also contributed to the development of the 2013-2017 national health strategy and served as director of the Inserm Public Health Institute.

The PHARes Team aims to improve our understanding of and act upon the greatest risks and threats to population health, representing a large share of morbidity and mortality as well as social determinants of health and healthcare expenditure. Through this translational approach, We seek to reduce, the impact of these risks and treats (taking into account social and environmental inequalities, including inequalities in access to healthcare) by

- improving risks factors and inequalities measurement with real-world data and methods developed for and applied to observational studies and thus providing the evidence based for a critical building block for action,
- developing innovative methods (observational and experimental) for the development and evaluation of complex population health interventions,
- analysing of social and political processes underlying the unequal distribution of risks and health inequities in order to influence decision-making.

The team works on five principal research axes:
1. Methods for population health intervention research.
This axis involves conducting research on research (meta-research), on concepts and methods for the evaluation of prevention and health promotion interventions. The questions cover all stages of the approach, from the development to the scaling-up of interventions
2. Social determinants, migration dynamics, environment & health.
This research axis relies on a strong interdisciplinary convergence on the cross-cutting themes of social inequalities, deprived populations, environmental risks and their relation to population health and health inequalities. Our research addresses the following issues:
- Social determinants of maternal, child, sexual & reproductive health among vulnerable populations
- Health status and healthcare access of vulnerable populations.
- Innovative approaches to improve health and health equity in decision-making processes at the territorial level.
3. Pathways and determinants of health.
The concept of pathway has been developed to respond to the need to make our health system and society evolve in the face of increased life expectancy, chronic illnesses and the complexity of managements. The identification of interventions to improve pathways and reduce inequalities in access to care is another major issue, leading to significant improvements in population health and focusing on three main goals :
- Characterization of pathways
- Identification of determinants of health
- Optimisation of care pathways and reduction of health inequalities,
4. Innovations for prevention in the healthcare system.
The growing prevalence of chronic diseases is a major challenge for the sustainability of health systems. There is a need to transform health systems by increasing prevention and by implementing innovative organisations in the management of these diseases. This transformation will require the development and the analysis of research-and field-based

TRANSLATIONAL RESEARCH IN THE TEAM

TO OBSERVE AND CHARACTERISE

Observation and evaluation of health status, determinants and inequity

- Life and care pathways
- Health determinants
- Determinants of health events: stroke , IAM sequelae, dementia, cognitive decline...
- Determinants of inequalities in care access

TRANSLATION FROM AND TO "FUNDAMENTAL" RESEARCH

Knowledge translation

TO ACT AND SUPPORT PUBLIC HEALTH POLICIES

Population health intervention research

- Individual, collective and environmental population health Intervention development
- Intervention evaluation

TRANSLATION FROM AND TO PRACTICE

TO RETHINK EPISTEMOLOGICAL BOUNDARIES AND METHODS

Meta-research

- Theory and system intervention thinking
- Research methods adapted to the complexity of intervention
- Scaling up and transferability issues

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interventions. Transforming the health system also requires transferring innovative models into public decisions and practice. The objective of this theme is to identify, develop and/or evaluate technological (such as mobile health in prevention strategies) and organisational innovations (such as interprofessional collaboration to improve professional practice and health-care outcomes) in terms of prevention (or "preventive clinical practices"), at the hospital or in outpatient healthcare. Research covers all stages of innovation, from development to scale-up.

5. Economics and management of healthcare organizations. The aim of this axis is to conduct research projects that evaluate health policies and interventions using an applied and multidisciplinary approach, involving economists, management researchers, health professionals (doctors and nurses and other social science researchers with expertise in health services. This research relies on a variety of perspectives, depending on the object studied (healthcare utilisation, healthcare pathways, technological or organisational innovations ...), the relevant evaluation outcome (take-up of public programs, efficiency, healthcare access inequalities, staff turnover, rehospitalisation...), the available data and the appropriate methods (econometrics using administrative data, experimental studies, medico-economic modelling of clinical data and registry data, qualitative interviews...).

Our team conducts research that takes into account:
- the characteristics of surveillance of health determinants (including social, environmental and cultural factors),
- the system in which the interventions are implemented, whether they are in or out of the health care environment (public domain: media, opinions, policies, professional practices, etc.),
- the complex nature of population health interventions (individual, ecological, collective, regulatory). Within this framework, our team focuses on 3 research objects that we believe to be at the heart of translational population health research:

1. Health status, health determinants and social inequalities (Research object "TO OBSERVE AND CHARACTERISE")
2. Population health interventions, whether they be policy, outreach, or organisations within and outside the healthcare setting (Research object "TO ACT ON AND SUPPORT PUBLIC HEALTH POLICIES")
3. Methodological research to better apprehend the complexity of the two first objects (Research object "TO RETHINK EPISTEMOLOGICAL BOUNDARIES AND METHODS") The association of these three research objects (observational, interventional and meta-research) is fundamental to the development of translational research and mobilizes the principles of knowledge transfer between disciplines and between researchers and decision-makers to make it work.

2023 Key publications

- Alla F, Cambon L, Ridde V. La recherche interventionnelle en santé des populations - Concepts, méthodes, applications: IRD Editions; 2023 2023. 190 p.

- Barger D, Hessamfar M, Neau D, and al. Factors associated with poorer quality of life in people living with HIV in southwestern France in 2018-2020 (ANRS CO3 AQUIVIH-NA cohort: QuAliV study). Sci Rep. 2023;13(1):16535. https://doi.org/10.1038/s41598-023-43434-x

- Burtin A, Clet E, Stevens N, Kervran C, Frevol M, Ratel R, Moysan P, Alla F, group AQ-N. Factors associated with the implementation of the 5As model of smoking cessation support during pregnancy: A scoping review. Tob Induc Dis. 2023;21:110. https://doi.org/10.18332/tid/169623

- Estevez M, Oppenchaim N, Rezzoug D, and al. Social determinants associated with psychological distress in children and adolescents during and after the first COVID-19-related lockdown in France: results from the CONFEADO study. BMC Public Health. 2023;23(1):1374. https://doi.org/10.1186/s12889-023-16284-5

- Mondeilh A, Brabant G, Haidar S, and al,. Health status, healthcare use and child MMR vaccination coverage in Travellers according to their environmental and living conditions in Nouvelle-Aquitaine, France, 2019-2022. Eur J Public Health. 2023;33(6):1194-9. https://doi.org/10.1093/eurpub/ckad175

- Planche V, Bouteloup V, Pellegrin I, and al. Validity and Performance of Blood Biomarkers for Alzheimer Disease to Predict Dementia Risk in a Large Clinic-Based Cohort. Neurology. 2023;100(5):e473-e84. https://doi.org/10.1212/WNL.0000000000201479

- Richard E, Vuillermoz C, Lioret S, Berrocal RR, Guyavarch E, Lambert Y, Azria E, Leffondre K, Vandentorren S. Social determinants of inadequate prenatal care utilization in sheltered homeless mothers in the Greater Paris area in France. Front Public Health. 2023;11:1080594. https://doi.org/10.3389/fpubh.2023.1080594

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2023
RESEARCH
HIGHLIGHTS

2023 RESEARCH HIGHLIGHTS

Towards a network of European Alzheimer Villages
Large scale partnership - Innovative health interventions

ACTIVE / Aging, Chronic diseases, Technology, disability, and Environment

Since the opening of the Village Landais Alzheimer Henri Emmanuelli in 2020, the ACTIVE team is conducting an evaluation of this innovative and unique facility. The study involves a prospective follow up of the villagers, family caregivers and healthcare professionals and includes a medico-economic substudy (in collaboration with Jérôme Wittwer of the PHARes team). The leitmotiv of Alzheimer Villages, which are still very scarce worldwide, is to promote the quality of life and well-being of residents, by offering an environment resembling an ordinary living environment without visual stigma reminding a medical Institution, and by optimizing interactions and social links. Last September, researchers from the ACTIVE team went to Monza to visit the Italian Alzheimer Village. The objective of this visit is to connect the Alzheimer Villages and associated Research teams in order to ultimately build a European network of Alzheimer Villages and expand the research beyond the French Village experience. Hélène Amieva and Damien Krier obtained an ANR MRSEI (Montage de Réseaux Scientifiques Européens ou Internationaux) funding in September 2023 to support the development of a European network of Alzheimer Villages. This visit opens up great prospects for further collaborations.

The Italian Alzheimer Village at Monza

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AXE AGING AND RESILIENCE

Could fighting hypertension, diabetes and a sedentary lifestyle reduce the burden of dementia? Major publication

Biostatistics

This study uses micro-simulations to quantify the potential impact of intervention scenarios aimed at reducing the prevalence of risk factors for dementia. The interventions envisaged target the prevention of hypertension, dia-betes and sedentary lifestyles. The results show that eliminating hypertension, diabetes and a sedentary lifestyle in France by 2020 could reduce the prevalence of dementia by 33% in men and 26% in women by 2040, and in-crease dementia-free life expectancy by 3.4 years (men) and 2.6 years (women). Hypertension prevention would be the most effective. An open-source software package is proposed, enabling this approach to be applied to other interventions, countries or pathologies.

Jacqmin-Gadda, H., Philipps, V., Guillet, F., Tzourio, C., Helmer, C., & Joly, P. (2023). Impact of interventions sce-narios targeting three main vascular risk factors on the future burden of dementia in France. European Journal of Epidemiology, 38(4), 435-443

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AXE DATA SCIENCE

When biostatistical models meet random forests
Major publication - Sofware - Awards

Predicting the individual risk of clinical events using the complete patient history is a major challenge in personalized medicine. Analytical methods have to account for a possibly large number of time-dependent predictors, which are often measured at irregular timings, with error and are truncated early by the event. Joint models of the predictors and the time-to-event are the dedicated method for this. However, they rapidly reach critical limitations when the number of predictors increases. Assuming biostatistical models could benefit from machine learning techniques, we developed random survival forests that handle time-varying noisy predictors. The method called DynForest combines the flexibility of random forests for predictions in large dimensional context with mixed models for handling imperfect longitudinal data. This work was the core of the PhD of Anthony Devaux, co-supervised by Cécile Proust-Lima (BIOSTAT) and Robin Genuer (SISTM). The paper describes the methodology, and demonstrates its performances in simulation. The DynForest R package has also been released on the CRAN with a companion paper.

This joint work between the BIOSTAT team and SISTM team has received the student conference award at the International Society of Clinical Biostatistics in 2022.
Student Conference Award at ISCB 2022
Logiciel : Package R DynForest
Devaux, A., Helmer, C., Genuer, R. & Proust-Lima, C. Random survival forests with multivariate longitudinal endogenous covariates. Stat Methods Med Res 09622802231206477 (2023)

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AXE
DATA SCIENCE

DRUGS-SAFE® Centre renewal
Large scale partnership

At the end of 2018, the ANSM and the Caisse Nationale de l'Assurance Maladie (Cnam) created the EPI-PHARE scientific interest group, a structure for public expertise in pharmaco-epidemiology epidemiology and health safety. To carry out its work program, EPI-PHARE develops collaborations with academic teams. In 2019, it launched a call to fund a maximum of 2 partner centers in health product epidemiology. Following this call, only one application was selected, that of the DRUGS-SAFE® partner center, which was funded for a 4-year period and an annual amount of around €500,000. At the end of the agreement signed in 2019, EPI-PHARE implemented an evaluation of the DRUGS-SAFE® Center conducted by an Evaluation Committee. The Committee underlined the impressive quality of the work performed and unanimously recommended the renewal of the DRUGS-SAFE® funding agree-ment for a further 4 years. The new agreement will start in January 2024.

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AXE
DATA SCIENCE

IA / Emergencies / Automatic language processing / Knowledge graphics / Drug repurposing
Major publication

AHeaD / Assessing Health in a Digitalizing Real-World Setting

The AHeaD team is structured around the common challenge of developing methods and potentialities of the sec-ondary use of data and information to improve health knowledge and medicines and care evaluation in real-world setting. This has led to significant research in computational science, automated language processing, machine learning and artificial intelligence, with three main fields of application: emergency care, use of unstructured data in hospital data warehouses, and therapeutic drug repurposing. This year, these developments have resulted in three publications in leading journals in the field of data use/ artificial intelligence for healthcare research.

1. Chenais G, Lagarde E, Gil-Jardiné C. Artificial Intelligence in Emergency Medicine: Viewpoint of Current Applications and Foreseeable Opportunities and Challenges. J Med Internet Res. 2023 May 23;25:e40031.

2. Chenais G, Gil-Jardiné C, Touchais H, Avalos Fernandez M, Contrand B, Tellier E, Combes X, Bourdois L, Revel P, Lagarde E Deep Learning Transformer Models for Building a Comprehensive and Real-time Trauma Observatory: Development and Validation Study. JMIR AI 2023;2:e40843

3. Boudin, M., Diallo, G., Drancé, M. et al. The OREGANO knowledge graph for computational drug repurposing. Sci Data 10, 871 (2023)

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AXE DATA SCIENCE

Modeling the kinetics of the neutralizing antibody response against SARS-CoV-2 variants after several administrations of Bnt162b2. Major publication

SISTM / Statistics in Systems biology and Translational Medicine

Because SARS-CoV-2 constantly mutates to escape from the immune response, there is a reduction of neutralizing capacity of antibodies initially targeting the historical strain against emerging Variants of Concern (VoC)s. That is why the measure of the protection conferred by vaccination cannot solely rely on the antibody levels, but also requires to measure their neutralization capacity. Here we used a mathematical model to follow the humoral response in 26 individuals that received up to three vaccination doses of Bnt162b2 vaccine, and for whom both anti-S IgG and neutralization capacity was measured longitudinally against all main VoCs. Our model could identify two independent mechanisms that led to a marked increase in measured humoral response over the successive vaccination doses. In addition to the already known increase in IgG levels after each dose, we identified that the neutralization capacity was significantly increased after the third vaccine administration against all VoCs, despite large inter-individual variability. Consequently, the model projects that the mean duration of detectable neutralizing capacity against non-Omicron VoC is between 348 days (Beta variant, 95% Prediction Intervals PI [307; 389]) and 587 days (Alpha variant, 95% PI [537; 636]). Despite the low neutralization levels after three doses, the mean duration of detectable neutralizing capacity against Omicron variants varies between 173 days (BA.5 variant, 95% PI [142; 200]) and 256 days (BA.1 variant, 95% PI [227; 286]). Our model shows the benefit of incorporating the neutralization capacity in the follow-up of patients to better inform on their level of protection against the different SARS-CoV-2 variants.

Clairon Q, Prague M, Planas D, Bruel T, Hocqueloux L, Prazuck T, Schwartz O, Thiébaut R*, Guedj J. Modeling the kinetics of the neutralizing antibody response against SARS-CoV-2 variants after several administrations of Bnt162b2. PLoS Computational Biology. 2023;19:e1011282

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AXE INFECTIOUS DISEASES AND GLOBAL HEALTH
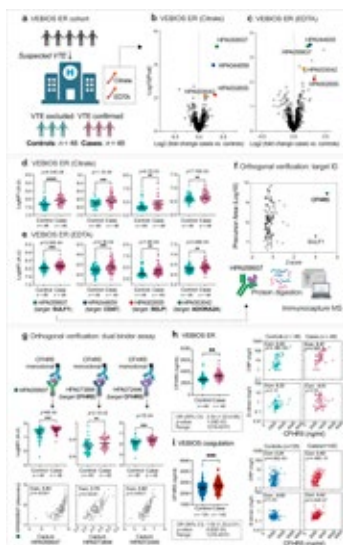
AXE DATA SCIENCE

Publication of the results of a GWAS analysis of ~52,000 participants with suspected acute venous thromboem–bolism (VTE) could open the way for a new diagnostic and/or risk predictor tool
Major publication

ELEANOR / Molecular Epidemiology Of Vascular And Brain Disorders

nature communications

Using an integrated approach involving high–throughput plasma proteomics and genetics, this international collaboration has demonstrated that the CFHR5 protein of the complement cascade is involved in the patho–physiological mechanisms of venous thromboembolism. Measuring blood levels of this protein could help in the diagnosis of venous thrombosis, as well as predicting the risk of recurrence.

Elevated plasma complement factor H related 5 protein is associated with venous thromboembolism.

Iglesias MJ, Sanchez-Rivera L, Ibrahim-Kosta M, Naudin C, **Munsch G,** Goumidi L, Farm M, Smith PM, Thibord F, Kral-Pointner JB, Hong MG, Suchon P, **Germain M**, Schottmaier W, Dusart P, Boland A, Kotol D, Edfors F, Koprulu M, Pietzner M, Langenberg C, Damrauer SM, Johnson AD, Klarin DM, Smith NL, Smadja DM, Holmström M, Magnusson M, Silveira A, Uhlén M, Renné T, Martinez-Perez A, Emmerich J, Deleuze JF, Antovic J, Soria Fernan-dez JM, Assinger A, Schwenk JM, Souto Andres JC, Morange PE*, Butler LM*, **Trégouët DA***, Odeberg J*. Nat Commun. 2023 Jun 7;14(1):3280.
> PMID: 37286573

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Plasma proteomics profiling identifies CFHR5 associated with VTE.

AXE DATA SCIENCE

Publication of the first GWAS meta–analysis of dilated perivascular spaces, an emerging marker of cerebral small vessel disease, on 50,000 participants from the general population
Major publication

ELEANOR / Molecular Epidemiology Of Vascular And Brain Disorders

nature medicine

Perivascular space (PVS) burden is an emerging, poorly understood, magnetic resonance imaging marker of cerebral small vessel disease, a leading cause of stroke and dementia. Genome-wide association studies in up to 40,095 participants (18 population-based cohorts, 66.3 ± 8.6 yr, 96.9% European ancestry) revealed 24 ge–nome–wide significant PVS risk loci, mainly in the white matter. These were associated with white matter PVS already in young adults (N = 1,748; 22.1 ± 2.3 yr) and were enriched in early-onset leukodystrophy genes and genes expressed in fetal brain endothelial cells, suggesting early-life mechanisms. In total, 53% of white matter PVS risk loci showed nominally significant associations (27% after multiple-testing correction) in a Japanese population-based cohort (N = 2,862; 68.3 ± 5.3 yr). Mendelian randomization supported causal associations of high blood pressure with basal ganglia and hippocampal PVS, and of basal ganglia PVS and hippocampal PVS with stroke, accounting for blood pressure. Our findings provide insight into the biology of PVS and cerebral small vessel disease, pointing to pathways involving extracellular matrix, membrane transport and developmental processes, and the potential for genetically informed prioritization of drug targets.

Duperron MG, Knol, [...], Joutel A, Lathrop M, [...], Seshadri S, Adams H, Debette S. Genomics of perivascular space burden unravels early mechanisms of cerebral small vessel disease. Nat Med. 2023; 29:950-62

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AXE DATA SCIENCE

BRAIN HEALTH ACROSS THE LIFECOURSE

Blood biomarkers for age-related macular degeneration (BIOMAC) project
Project launch

anr
agence nationale de la recherche
AU SERVICE DE LA SCIENCE

Age-related macular degeneration (AMD) is a major cause of blindness. In addition to aging and genetic suscepti-bility, nutrition and smoking are major drivers of this complex disease. The main objectives of this project are : 1) to develop and validate a combination of blood nutritional and smoking biomarkers strongly associated with pro-gression to advanced AMD; 2) to determine whether this combination of biomarkers can improve the predictive performance of a multidimensional model; 3) to investigate the associations of these blood biomarkers with cut-ting-edge retinal imaging biomarkers. In the future, the identified biomarkers will represent a major asset for the development of personalized preventive strategies, helping to target, tailor and monitor lifestyle interventions. This project is coordinated by Cecile Delcourt, in collaboration with CSGA-Inrae (Dijon) and LERES-EHESP (Rennes) and was awarded a grant by the National Research Agency (ANR) in July 2023.

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AXE
BRAIN HEALTH
ACROSS THE LIFECOURSE

Air pollution and retinal neurodegeneration in residents of Bordeaux
Major publication

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Chronic exposure to air pollution may have adverse effects on neurodegenerative diseases. In the prospective Alienor cohort of elderly residents of Bordeaux, we evidenced an accelerated thinning of the retinal nerve fiber layer (RNFL) in participants exposed to higher levels of air pollution, in particular to fine particulate matter (with a diameter inferior to 2.5 microns). RNFL is a biomarker of retinal neurodegeneration, and the hallmark of glaucoma. These results further document the effects of air pollution on neurodegenerative processes, as previously observed in studies on brain aging.

Gayraud L, Mortamais M, Schweitzer C, de Hoogh K, Cougnard-Gregoire A, Korobelnik JF, Delyfer MN, Rougier MB, Leffondre K, Helmer C, Vienneau D, Berr C, Delcourt C. Association of long-term exposure to ambient air pollution with retinal neurodegeneration: the prospective Alienor study. Environ Res. 2023;232:116364.

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AXE
BRAIN HEALTH
ACROSS THE LIFECOURSE

NUPPIA project: Made-to-measure intraoral protection to limit dental trauma, from research, to marketing, until the 2024 Olympic games

Project launch - Innovative health interventions

ACTIVE / Aging, Chronic diseases, Technology, disability, and Environment

In 2019, Philippe Poisson transferred an innovative intra-oral protection resulting from his research to the French group Decathlon, which markets it today. In 2021, intraoral protections have been optimised thanks to a new manufacturing technique making it possible to produce made-to-measure intra-oral protections. If the made-to-measure intra-oral protection is recognized as the most effective, it only represents 10% of those used by athletes, as it is costly and requires numerous sessions and qualified professionals (dental surgeon, dental prosthetist). To facilitate the access to tailor-made intra-oral protections in sports, a new approach based on the combination of scanning and 3D printing has been developed. This procedure makes it possible to develop protections according to the specific constraints of each sport, while improving the athlete's comfort at an affordable price. This intra-oral protection was chosen by the organizing committee of the Paris 2024 Olympic Games. It will be worn by some athletes, such as boxers. Philippe Poisson studies the user experience in high-level athletes in an ongoing research project called NUPPIA.

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AXE BRAIN HEALTH ACROSS THE LIFECOURSE

Publication of the third edition of the Reference Book of Neuropsychology

Major publication - Neuropsychology

ACTIVE / Aging, Chronic diseases, Technology, disability, and Environment
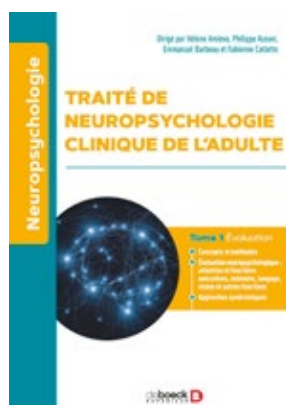
The « Traité de neuropsychologie clinique de l'adulte » is a reference book in Neuropsychology. Written by more than seventy specialists, this third edition published in may 2023 presents the theoretical frameworks, methods and techniques for evaluating cognitive, socio-emotional and behavioral disorders in neurological diseases and brain injury. It is among the top best-selling books within the French-speaking neuropsychology community.
Hélène Amieva was part of the coordinating editors of this book.
Amieva H, Azouvi P, Barbeau E, Collette F. Traité de Neuropsychologie Clinique de l'Adulte, 3e édition. Editions De Boeck, 2023. 800 pages. ISBN 978-2-8073-3515-8

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AXE BRAIN HEALTH ACROSS THE LIFECOURSE

Suicidal behavior among students : risk analysis and modeling in the i-Share cohort.

2nd National Thesis Prize for "Public Health Policies and Interventions": Mélissa Macalli awarded by the Direction Générale de la Santé (French Ministry of Health)
Awards

HEALTHY / Health, Well-Being and Achievement in the Young

From left: Guillaume CROZET (Special "One Health" prize), Salam ABBARA (3rd prize), Dr Grégory Emery (Director General of Health-Chairman of the Jury), **Mélissa MACALLI** (2nd prize), Marie POISEUIL (1st prize) – © Ministères sociaux/ DICOM /Philémon Henry / Sipa

This thesis prize is the first and only in France to specifically recognize the work of young researchers in public health. It rewards the authors of theses whose results are particularly enlightening or promising for the imple-mentation of innovative public policies and the evaluation of public policies.

With more than 80 theses submitted following the call for applications issued in November 2022, this first edition is a success. Chaired by Dr Grégory Emery, Director General of Health, the jury is made up of 12 members desig-nated from within the DGS, health agencies or research organizations under the supervision of the Ministry of Health and Prevention, as well as from

French scientific figures in the field of public health. After deliberation, the members of the jury decided unanimously and awarded the 2nd prize to Mélissa MACALLI for her thesis obtained at the University of Bordeaux on suicidal behavior among students: analysis and modeling of risk in the i –Share cohort.

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AXE BRAIN HEALTH ACROSS THE LIFECOURSE

Scientific article on the comorbidity between Attention Deficit Hyperactivity Disorder and physical health – The relationship between mental and physical health

Major publication

HEALTHY / Health, Well-Being and Achievement in the Young

THE LANCET Child & Adolescent Health

Galera C, Collet O, Orri M, Navarro M, Castel L, Galesne C, Reed C, Brandt V, Larsson H, Boivin M, Tremblay R, Côté S, Cortese S. Prospective associations between ADHD symptoms and physical conditions from early child-hood to adolescence: a population-based longitudinal study. Lancet Child Adolesc Health. 2023 Dec;7(12):863-874. PMID: 37973252
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AXE BRAIN HEALTH ACROSS THE LIFECOURSE

CHILD-MHL Project (Child mental health literacy: co-creating and evaluating a whole-school intervention and developing and validating an ad hoc scale)

Major publication - Mental health, children, health communication, mental health literacy
Contribution to public health - Development of an intervention in schools

Children's mental health is a public health priority. Mental health literacy is defined as the knowledge, information and beliefs about mental health, and, as such, it is a determinant of mental health. The project aims to (1) promote mental health literacy in children through a co-created and evidence-based intervention, and (2) develop and validate a mental health literacy scale for children. We will involve schools in Gironde (rural and urban areas/ priority or not education areas) for collecting data for the scale and evaluate the intervention through a cluster randomized controlled trial. Parents, teachers, mental health professionals and children will work with research-ers through a participatory approach. Both quantitative and qualitative data will be analysed according to mixed-methods. The project counts on an international consortium including the McGill University, the University of Cadiz and the Monash University plus several national partners, ex. Université Lumière Lyon 2.
250K euros funding obtained by IReSP
Francis-Oliviero F, Loubières C, Grové C, Marinucci A, Shankland R, Salamon R, Perez E, Garancher L, Galera C, Gaillard E, Orri M, González-Caballero JL, Montagni I
Improving Children's Mental Health Literacy Through the Cocreation of an Intervention and Scale Validation: Protocol for the CHILD-Mental Health Literacy Research Study
JMIR Res Protoc 2023;12:e51096

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**AXE
BRAIN HEALTH
ACROSS THE LIFECOURSE**

Publication of the third edition of the Reference Book of Neuropsychology

Major publication

Knowledge of impact on health of ultrafine particles is still limited, due to difficulties in properly assessing expo-sure in epidemiological studies. In this context, the objective of this study was to provide a complete summary of indoor exposure to ultrafine particles in highly industrialised countries by examining the domestic activities that influence such exposure. A hierarchy of domestic activities and related processes leading to ultrafine particle ex-posure is provided, along with average exposure concentrations at home.
Audignon-Durand S, Ramalho O, Mandin C, Roudil A, Le Bihan O, Delva F, Lacourt A. Indoor exposure to ul-trafine particles related to domestic activities: A systematic review and meta-analysis. Sci Total Environ. 2023 Dec 15;904:166947. Epub 2023 Sep 9. PMID: 37690752.

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**AXE
ENVIRONMENTAL AND SOCIAL
DETERMINANTS OF HEALTH**

Fabienne Goutille Winner of the Gestes 2023 thesis prize

Thesis prize awarded by the *Groupe d'études sur le travail et la santé au travail* (Gestes), an interdisciplinary scientific network

EPICENE / Epidemiology of cancer and environmental exposures

Produced from testimonials, images and pesticides metrology, recorded for the purposes of the Prevexpo inter-vention research (Preventing risks together in a wine-growing environment based on real exposure conditions), the thesis and the movy whose is coming with, allow us to understand the work activity of vine from several points of view. Winegrowers and researchers from various scientific backgrounds (ergonomists, anthropologists, toxi-cologists, metrologists, agronomists, chemists and epidemiologists) meet and compare their points of view within wine farms, working together to transform a toxic work environment (Oddone et al., 1999).

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> Rémanences available :

AXE
ENVIRONMENTAL AND SOCIAL DETERMINANTS OF HEALTH

Marie POISEUIL won 1st prize in the "Public Health Policy and Intervention" by the French Department of Health for her dissertation on participation in breast cancer screening in women and survival after breast can-cer according to screening and socio-demographic inequalities
Awards

EPICENE / Epidemiology of cancer and environmental exposures

From left: Guillaume CROZET (Special "One Health" prize), Salam ABBARA (3rd prize), Dr Grégory Emery (Director General of Health-Chairman of the Jury), Mélissa MACALLI (2nd prize), **Marie POISEUIL** (1st prize) – © Ministères sociaux/ DICOM / Philémon Henry / Sipa

Breast cancer is the most common cancer in women worldwide. In 2019, the take-up rate for organised screening in France was 48.9%. This participation rate remains low compared with the rate recommended at European level, which could be partly explained by the concomitant presence of opportunistic screening, but also by social inequalities. Numerous social factors have been identified, as being associated with non-participation, but it seems important to provide new information in order to improve confidence in organised screening and to understand how women behave when faced with the various screening proposals they receive after the age of 50. The aim of this thesis is therefore to study the contribution of organised screening to the survival of women diagnosed with breast cancer compared with those who undergo opportunistci screening or no screening, taking into account their level of deprivation, and then to study the behaviour of women aged 56 and their reasons for not taking part.

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AXE
ENVIRONMENTAL AND SOCIAL DETERMINANTS OF HEALTH

Bordeaux doctoral school EDSP2 interdisciplinary thesis award
Awards - Ergonomics

Funded by the National Doctoral Program in Health and Work (PDNST), which promotes interdisciplinary approaches to health and work issues, our thesis aimed to develop an original approach by integrating ergonomics and law to generate knowledge on pesticide exposure situations during the use of sprayers. For this purpose, this thesis aimed at identifying and understanding a specific chain of determinants based on analysis conducted at different levels: the treatment activities, the activities of sprayer design, the regulation that applies to this design and the activities of regulation development.

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AXE
ENVIRONMENTAL AND SOCIAL DETERMINANTS OF HEALTH

SPRINT conference in Bordeaux : The SPRINT project aims to assess the impact of pesticides on the environment and human health, and to propose several transition paths.
Event

The SPRINT project will make an internationally valid contribution to assess integrated risks and impacts of pesticides on environment and human health, both at regional and European level. SPRINT will inform and accelerate the adoption of innovative transition pathways towards more sustainable plant protection in the context of a global health approach.

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AXE
ENVIRONMENTAL AND SOCIAL DETERMINANTS OF HEALTH

APPIE-LAB : a living lab dedicated to interventional research into children's well-being

Marge scale partnership - Children and young people

PHARES / Population Health
Translational Research

Dans le cadre du programme scientifique APPIE (Analyse des politiques publiques à impact sur l'enfant), financé par l'INCa et l'IReSP et piloté par Linda Cambon, a été créé le 16 janvier 2023 un living lab international, nommé le APPIE-Lab. Il reunit chercheurs, acteurs et décideurs mobilisé sur ce thème : EHESP, Chaire Unesco, Université ca-tholique de Louvain, Institut de santé globale de Lausanne, universités de Montpellier, de Toulouse, de Saint Etienne, Unité bien être de l'enfant de l'OCDE, Haute conseil de la santé publique, conférence régionale de la santé et de l'autonomie de Nouvelle Aquitaine, Ville de Bordeaux, département de Gironde, Association

des maires de France, réseau des villes santé OMS, etc. Son objectif est d'être incubateur d'expérimentations de me-sures/interventions de santé dans toutes les politiques favorables à la santé des enfants et en traduire les résultats pour les acteurs. Au sein de ce APPIE-Lab, 4 études sont actuellement en cours portant sur les impacts sur la santé des enfants des mesures de végétalisation des cours d'école APPIE-GREEN), de mixité sociale (APPIE-MIX), d'acquisition précoce du langage (APPIE-BLABLA), de stratégies spécifiques de lutte contre l'épuisement parental (APPIE PARENT).

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AXE
ENVIRONMENTAL AND SOCIAL
DETERMINANTS OF HEALTH

SO-RISP : 1st French network for intervention research in population health

Large scale partnership - Research network

PHARES / Population Health
Translational Research

In 2023, the first French intervention research network in population health was set up, bringing together the universities of Bordeaux, Toulouse, Montpellier and Saint Etienne and the field operator EPIDAURE from the Montpellier Cancer Institute, under the auspices of the INCA and IReSP. Directed by Linda Cambon of the Inserm U 1219 centre, University of Bordeaux, and Florence Cousson Gelie of the University of Montpellier, its aim is to

1/produce methodological knowledge enabling the complexity of primary prevention interventions to be assessed,
2/ structure support for researchers wishing to move into intervention research in prevention,
3/ organise knowledge transfer and support the transfer of evidence-based primary prevention interventions,
4/ produce intervention research focusing in particular on health-promoting environments.

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AXE
ENVIRONMENTAL AND SOCIAL
DETERMINANTS OF HEALTH

Deployment of the 5A-QUIT-N trial
Inauguration and launch - Prevention

The objective of the 5A-QUIT-N trial (supported by INCa, DGOS and ARS Nouvelle-Aquitaine) is to evaluate the effectiveness and conditions for effectiveness of an intervention designed to improve the organisation of smoking cessation among pregnant women. This is a stepped-wedge cluster trial involving 41 maternity hospitals in the Nouvelle-Aquitaine region, divided into 31 randomised clusters, and involving 4,000 women. A trial on this scale, the first in France for this population, follows on from a pilot with promising results (-25% of women smoking at the end of pregnancy).

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**AXE
ENVIRONMENTAL AND SOCIAL
DETERMINANTS OF HEALTH**

ACMÉ selected for the ANRS -MIE Emerging Infectious Diseases PEPR call
New project - Communication

The ACMÉ project will study the key factors influencing the acceptance and physical and psychological accessibility of measures to combat epidemics, the most important of which is vaccination. It aims to promote the development and implementation of effective countermeasures, in particular through appropriate and inclusive communication and organisation. Particular attention will be paid to building confidence in crisis situations. Ultimately, this project should make it possible to improve the effectiveness of public health initiatives more widely.
Coordination: Institut Pasteur, Paris (Judith Mueller) and BPH/PHAREs team

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**AXE
ENVIRONMENTAL AND SOCIAL
DETERMINANTS OF HEALTH**

Experience of using interpersonal group therapy to treat depression in people living with HIV in Senegal
Major publication

Depression is highly prevalent in people living with HIV (PLWH) and has negative consequences for daily life and care. We evaluated for the first time the acceptability, feasibility and benefits of group interpersonal therapy (IPT), combined with a task-shifting approach, to treat depression in PLWH in Senegal. PLWH with depression received group IPT following the World Health Organization protocol. Acceptability and feasibility criteria were defined from the literature data. The PHQ-9, the WHODAS, and the 12-item-stigma scale were used, pre- and post-treatment, including a 3-month follow-up, to assess depressive symptom severity, functioning and stigma, respectively. General linear mixed models were used to describe changes in outcomes over time. Of 69 partici-pants, 60 completed group IPT. Refusal to enroll and dropout rates were 6.6 and 12.7%, respectively. Ninety-seven percent of participants attended at least seven out of eight sessions. Patients and facilitators endorsed group IPT, with willingness to recommend it. Depressive symptoms and disability improved drastically and sus-tainably. We showed that group IPT is well accepted and feasible in Senegal as treatment for depression in PLWH. Combined with a task-shifting approach, it can narrow the gap in mental health treatment. Implementation may be enhanced by refining patient identification procedures and increasing treatment accessibility.

Bernard C, Font H, Ziadeh S, et al. Management of depression in people living with HIV/AIDS in Senegal: Acceptability, feasibility and benefits of group interper-sonal therapy. Cambridge Prisms: Global Mental Health. 2023;10:e36.

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AXE INFECTIOUS DISEASES AND GLOBAL HEALTH

Does access to nutritional supplements to prevent child malnutrition also help to improve vaccination coverage for these children?
Project launch

The GHiGS research team and the humanitarian NGO ALIMA are joining forces again to explore whether a nutri-tional mass supplementation program aimed at preventing malnutrition in children can also improve measles vaccine coverage in children aged 12-24 months after 12 months of program implementation in North-East Nige-ria.

Small-quantity lipid-based nutrient supplements (SQ-LNS) are a class of ready-to-use food supplements highly nutrient-dense and fortified designed for preventing malnutrition and improving child survival, growth, and de-velopment. SQ-LNS also holds promise in incentivizing vaccination as well as other health services.

GHiGS and ALIMA are currently implementing a parallel two-arm cluster randomized controlled trial with baseline and endline cross-sectional vaccination coverage surveys combined with three sub-studies:
a) a prospective indi-vidual follow-up sub-study,
b) a qualitative sub-study on barriers and facilitators of vaccines and SQ-LNS,
c) a cost-effectiveness sub-study.
A total of 20 cluster and 1.700 children will be included in this study.
This cluster randomized trial is funded through a 2-million USD investment from the Eleanor Crook Foundation and the global vaccine alliance GAVI.

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AXE INFECTIOUS DISEASES AND GLOBAL HEALTH

Launch of the Decide TB project on the implementation of therapeutic decision algorithms for tuberculosis in children – collaboration between national programmes and researchers to improve diagnosis
Project launch

The GHiGS team (EMR Université de Bordeaux, Inserm, IRD) in partnership with co-lead University of Zambia has launched the Decide-TB project, funded by the European Commission (EDCTP3), on April 1st, 2023. Building on pre-vious research on childhood tuberculosis (TB) diagnosis from consortium partners (including Unitaid-funded GHiGS-led TB-Speed project), Decide-TB is an implementation research project aiming to improve the diagnosis and man-agement of TB in children by using treatment decision algorithms (TDAs). These algorithms will help clinicians to make rapid and consistent decisions for the treatment of TB in children. The general objective of Decide-TB is to generate scientific evidence for the implementation of several TDAs for TB in children living in high TB-burden and resource-limited countries. The combined TDAs will include WHO suggested TDAs and will allow for a diagnosis approach that is adapted to the risk profile of children. TDAs will be used in district hospitals and primary health centers. The project aims to facilitate integration of the TDAs within practices and health policies. Project partners include national TB programs/Ministries of Health of Mozambique and Zambia, as well as research institutions from those 2 countries (Instituto Nacional de Saude, Mozambique, and University of Zambia), South Africa (Stellenbosch University), Germany (Ludwig Maximilian University, Munich), United Kingdom (Imperial College London, university of Sheffield), and France (University of Bordeaux, IRD).

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AXE INFECTIOUS DISEASES AND GLOBAL HEALTH

PHD
THESES
DEFENDED

PHD THESES DEFENDED ON 2023

ALLOUCHERY MARION
Patterns of use and safety of ibrutinib in real-life practice in onco-hematology
Pharmacology specialising in pharmacoepidemiology, pharmacovigilance option supervised by SALVO Francesco

ARHEIX PARRAS SOPHIE
Transcranial magnetic stimulation in chronic post-stroke aphasia: individualization and induced electrophysiological changes
Cognitive sciences Ergonomics option supervised by GLIZE Bertrand

AUDIGNON SABINE
Integrated approach to assess individual exposure to ultrafine particles (UFPs) in epidemiological studies
Public Health Epidemiology option supervised by LACOURT Aude

BARRY HOURERATOU
Response to Ebola vaccine and factors associated with the variability in African countries
Public Health Epidemiology option supervised by THIEBAUT Rodolphe

BLANCO INAKI
Four essays of the determinants of inequalities in access to healthcare in France
Public health specialising in health interventions and health economics option supervised by WITTWER Jérôme

CHENAIS GABRIELLE
using natural language processing techniques to study and regulate emergency department flows development and application to the study of trauma risks based on ed venues in Bordeaux
Public health specialising in computer science and health option supervised by LAGARDE Emmanuel

CHUY VIRGINIE
Diet and depressive symptomatology in older adults from the general population: longitudinal analyses in the Three-City cohort
Public Health Epidemiology option supervised by FEART-COURET Catherine

CLET ESTELLE
Improving the intergration of prevention into primary care in France: a organisational challenge
Public health specialising in health interventions and health economics option supervised by ALLA François

DUFAURE HÉLÈNE
statistical modeling of treatment response in patient-derived mouse models – application to translational research
Public Health Epidemiology option supervised by RICHERT Laura

HERNANDEZ-RUIZ VIRGILIO
Risk factors for cognitive and functional decline in older people living with HIV and other infectious diseases
Public Health Epidemiology option supervised by AMIEVA Hélène

JEAN FRANÇOIS
Relation between attention deficit hyperactivity disorder and illicit psychoactive substances
Public Health Epidemiology option supervised by GALERA Cédric

JOSHI BASANT
Feasibility and Acceptability of a Comprehensive Childhood Tuberculosis Diagnostic Package at District Hospital and Primary Health Center Level in Low-Income Settings in Africa and South East Asia
Public Health Epidemiology option supervised by ORNE-GLIEMANN Joanna

LESPINASSE JÉRÉMIE
Modeling the natural history of dementia and implications of vascular risk factors in the Memento cohort
Public Health Epidemiology option supervised by DUFOUIL Carole

LIMA REBOUCAS SARA
Nervous and vascular retinal structures: biomarkers for the brain structures?
Public Health Epidemiology option supervised by HELMER Catherine

MATHIEU CLÉMENT
Pharmacoepidemiological study of the COVID-19 epidemic's impact on cardiovascular treatments
Pharmacology specialising in pharmacoepidemiology, pharmacovigilance option supervised by PARIENTE Antoine

MATTA ROULA
Hospital acquired infections and antibiotic résistance in GRAM négatif bacilli : Study of a multicenter cohorte in lebanese hospitals.
Public Health Epidemiology option supervised by ROGUES Anne-Marie

MBWE MPOH MAURICE
The safety of antituberculosis agents used for multidrug-resistant tuberculosis
Pharmacology specialising in pharmacoepidemiology, pharmacovigilance option supervised by SALVO Francesco

MENANT MORGANE
dose-response and time-response relationships between asbestos exposure and pleural plaques characteristics in the french ardco cohort of former workers
Public Health Epidemiology option supervised by DELVA Fleur

MOLINA DONOSO MATIAS
Epidemiology of dementias and psychosocial care in clinical routine in the city of Santiago de Chile.
Psychology supervised by AMIEVA Hélène

MOULIN FLORE
psychiatric impact of the covid-19 pandemic: role of lockdowns and social inequalities
Public Health Epidemiology option supervised by GALERA Cédric

MUNSCH GAËLLE
Statistical methodologies for the analysis of genetic determinants of venous thromboembolic disease and its complications
Public Health Biostatistics option supervised by TREGOUET David-Alexandre

NEUFFER JEANNE
nutrition, lifestyle and prevention of brain aging: characterization of combinations, mechanisms and risk groups using molecular epidemiology.
Public Health Epidemiology option supervised by SAMIERI Cécilia

NIANGORAN BESSEKON
Contribution of statistical data monitoring in the management of multicenter clinical trials in Africa
Public Health Biostatistics option supervised by ALIOUM Ahmadou

NLATE NTEN LOUIS STÉPHANE
« Early childhood and health in Africa ». An anthropology of local childhood illnesses in the face of endogenous knowledge and care practices in Sangmélima (Cameroon).
Ethnology specialising in social and cultural anthropology supervised by KOTOBI Laurence

PECH MARION
Detection of risk situations in daily life in frail older adults using artificial intelligence methods: experimentation of a device in the general population
Psychology supervised by AMIEVA Hélène

PERINO JUSTINE
Psychoactive substances use and health consequences among young adults
Pharmacology specialising in pharmacoepidemiology, pharmacovigilance option supervised by TOURNIER Marie

RICHARD ELODIE
Effectiveness conditions of health mediation fostering healthcare utilization by underserved populations
Public Health Epidemiology option supervised by VANDENTORREN Stéphanie

SWIERCZYNSKI GUILLAUME
prevention of internal contamination in healthcare workers professionally exposed to antineoplastic drugs: a study on glove permeation and the role of gloves in healthcare workers' protective behaviors
Public Health Epidemiology option supervised by CANAL RAFFIN Mireille

TEYSSEIRE RAPHAËLLE
Exposure of people living near vineyards to pesticides
Public Health Epidemiology option supervised by DELVA Fleur

TIENDREBEOGO KISWEND-SIDA
Challenges of HIV management in West Africa in the era of Treatment for All: epidemiological analyses of the care Continuum and Health Outcomes, with a gender perspective
Public Health Epidemiology option supervised by BECQUET Renaud

27th Workshop of the International Stroke Genetics Consortium, September 2022, Bordeaux, France

EVENTS
2023

JOINT PUBLIC HEALTH SEMINARS 2023

Grand rounds jointly organized with Bordeaux School of Public Health ISPED and Public Health Department of university of Bordeaux

JANUARY

• What actions should a humanitarian NGO take in a world in transition?
Dr Claire RIEUX, Medical Director, MSF Paris

• Lost in psychiatry... Who is mental health for today: a brain, a statistical diagnosis, a thinking subject?
Bruno FALISSARD, PU-PH, Director, CESP (Centre de Recherche en Epidémiologie et Santé des Populations), U1018, INSERM, Hôpital Paul Brousse, Villejuif

FEBRUARY

• The impact of environmental lobbies on public health policies
Isabelle BALDI, University Professor, Hospital Practitioner, Director of the EPICENE (Epidemiology of Cancer & Environmental Exposure) team at the INSERM U1219 Bordeaux Population Health research center.
Ameline ANTOINE, Public Health Intern
Sylvie RABOUAN, pharmacist, Professor at the University of Poitiers

• Intentional and unintentional poisoning in the elderly
Lucie LAFLAMME, Professor Injuries Social Aetiology and Consequences (ISAC) Department of Global Public Health, Karolinska Institutet Stockholm, Sweden

MARCH

• Exposure to environmental contaminants and adiposity in children: the 'obesogenic' contaminant hypothesis
Pr Maryse BOUCHARD, PhD, Professor of Environmental Health, École de santé publique de l'Université de Montréal and Institut national de la recherche scientifique (INRS), Québec, Canada

• Participatory research: the methodological and ethical challenges of involving children and adolescents in research projects
Isabelle AUJOULAT, Faculty of Public Health and Health & Society Research Institute, UCLouvain, Belgium

• Crowdsourcing with Multi-institutional EHR to Improve Reliability of Real World Evidence – Opportunities and Challenges
Tianxi CAI, ScD, John Rock Professor of Population and Translational Data Sciences, Department of Biostatistics, Harvard T.H. Chan School of Public Health
Professor of Biomedical Informatics, Harvard Medical School, Department of Medical Biomedical Informatics, Harvard Medical School
Director, Translational Data Science Center for a Learning Health System (CELEHS), Harvard University

Co-Director of Applied Informatics Core, Massachusetts Veterans Epidemiology Research and Information Center (MAVERIC), Veterans Affairs (VA) Boston Healthcare System
Boston, Massachusetts, USA

APRIL

• Telemedicine, a tool for equitable access to healthcare and health services in sub-Saharan Africa
Pr Cheick Oumar BAGAYOKO Associate Professor of Medical Informatics, Director of the Centre for Innovation and Digital Health (Digi-Santé-Mali), University of Science, Techniques and Technology of Bamako (USTTB), Bamako, Mali

MAY

• Aligning Evaluation Approaches with Context: Reductionism, Systems thinking, and pragmatic synthesis
Pr Huey T. CHEN, PhD Professor of Public Health and Director of the Center for Evaluation and Applied Research in the College of Health Professions, Mercer University, Macon, Georgia, USA

• **Ethics at the heart of governance: a tool for reflection, arbitration and dialogue between science and society**
Pr André LACROIX, Ph.D.
Professor, Faculty of Arts and Humanities, FLSH Philosophy, applied ethics

University of Sherbrooke, Quebec, Canada

JUNE
• **Health trajectories and place of residence of the elderly: home, senior residence, EHPAD, foster family, what differences?**
Denis BOUCAUD-MAITRE, Director of Public Health and Epidemiology Research, Centre Hospitalier Le Vinatier, Lyon

• **What does our DNA say about our intellectual capacities and our medical future?**
Françoise CLERGET-DARPOUX, Emeritus Research Director INSERM

SEPTEMBER
• **Tuberculosis: toward short treatment duration**
Maryline BONNET
Epidemiologist (pulmonology), Deputy Director, TransVIHMI – Translational Research on HIV and Endemic and Emerging Infectious Diseases (UMI 233 IRD – U1175 Inserm), Montpellier

OCTOBER
• **A replication crisis in methodological research? Recent developments and remaining challenges towards reliable empirical evidence**
Anne-Laure BOULESTEIX, PhD, Institute for Medical Information Processing, Biometry, and Epidemiology, Munich, Germany

NOVEMBER
• **Public health and society: how can we work with communities to find solutions to public health problems?**
Waly DIOUF, Ph.D. Socio-anthropologist, Cheikh Anta Diop University, Dakar, Senegal

• **Pesticide exposome in a variety of sociodemographic contexts**
Dr Samuel FUHRIMANN, PhD, Assistant Professor and Research Group Leader Swiss Tropical and Public Health Institute (Swiss TPH), Department of Epidemiology and Public Health, Basel, Switzerland

DECEMBER
• **When biostatistical and actuarial methods combine to propose a right to be forgotten in Belgium**
Pr Catherine LEGRAND. Professor, President LIDAM, Louvain Institute for Data Analysis and Modeling, Institute of Statistics, Biostatistics and Actuarial Sciences, UCLouvain, Louvain-la-Neuve, Belgium

• **New edition of *Environment and public health: foundations and practices***
Pr Maximilien DEBIA, Associate Professor, School of Public Health (ESPUM), Department of Environmental and Occupational Health, Université de Montréal, Québec, Canada

BPH THEMATIC RESEARCH SEMINARS 2023

The BPH organizes 4 seminars per month to give the opportunity to understand the issues in our on the major strategic research themes, to take stock of the progress of projects in the teams and to identify new synergies at the Centre level.

AXE
ENVIRONMENTAL & SOCIAL DETERMINANTS OF HEALTH

APRIL

• **Vulnerable population accumulating unfavorable social and environmental conditions**
Séverine DEGUEN and Aude MONDEILH, PHARes team, BPH

• **Methodological approaches for estimating exposure to certain air pollutants**
Sabyne AUDIGNON, EPICENE team, BPH **and** Gayo DIALLO, AHeaD team, BPH

• **Do financial incentives for smoking cessation during pregnancy reduce social inequalities in health at birth ?**
Florence JUSOT, Professor of economics at Paris-Dauphine University, Economics and Management of Health Organisations Laboratory (LEGOS) - EA 4404

• **Characterization of environmental, social and territorial health inequities and their effects on cardio-neurovascular diseases"**
Nathan OUVRARD and Emilie LESAINE, PHARes team, BPH

NOVEMBER

• **Equity in Health and health care: An economist's view point**
Jérôme WITTWER, PHARes team, BPH

• **Exposome: introduction to the concept**
Isabelle BALDI, EPICENE team, BPH

• **Pesticide exposome in a variety of sociodemographic contexts»**
Samuel FUHRIMANN, Swiss Tropical and Public Health Institute

DECEMBER

• **Can we explain why women forgo health care more than men in France? A Oaxaca-Blinder like decomposition**
Iñaki BLANCO-CAZEAUX PHARes team, BPH

AXE
METHODS IN DATA SCIENCE"

FEBRUARY
HEALTH DATA WAREHOUSE

•**Challenges and methods for EHR integration in the context of clinical data warehouse networks: Participating to the 4CE consortium**
Vianney JOUHET, CHU de Bordeaux

•**Forecasting SARS-CoV-2 hospitalizations using EHR : from linear regression to reservoir computing**
Thomas FERTE, SISTM team, BPH

•**DNA methylation in small vessel disease**
Aniket MISHRA, ELEANOR team, BPH

MARCH
•**Crowdsourcing with Multi-institutional EHR to Improve Reliability of Real World Evidence - Opportunities and Challenges"**
Tianxi CAI, ScD John Rock Professor of Population and Translational Data Sciences, Department of Biostatistics, Harvard T.H. Chan School of Public Health
Professor of Biomedical Informatics, Harvard Medical School, Department of Medical Biomedical Informatics, Harvard Medical School
Director, Translational Data Science Center for a Learning Health System (CELEHS), Harvard University
Co-Director of Applied Informatics Core,

Massachusetts Veterans Epidemiology Research and Information Center (MAVERIC), Veterans Affairs (VA) Boston Healthcare System Boston, Massachusetts, USA

CAUSALITY
•**Mendelian randomization: principles and applications to the identification of proteins associated with small vessels disease risk**
Ilana CARO, ELEANOR team, BPH

•**Continuous-time mediation analysis for repeated mediators and outcomes**
Kateline Le BOURDONNEC, BIOSTAT team, BPH

CLUSTERING
•**Bayesian methods for identifying clusters from both longitudinal and crosssectional data : Application to Alzheimer's Disease**
Anais ROUANET, BIOSTAT team, BPH

•**Post-clustering difference testing: Valid inference and practical considerations**
Benjamin HIVERT, SISTM team, BPH

OCTOBER
•**A replication crisis in methodological research? Recent developments and remaining challenges towards reliable empirical evidence**
Anne-Laure BOULESTEIX, Institute for Medical Information Processing, Biometry and Epidemiology, Munich

RESEARCH TALES OF GAPS AND LINKS
•**The OREGANO knowledge graph for computational drug repurposing**
Marina BOUDIN, AHeaD team, BPH

•**From Inconsistency to Precision: Cleaning Patient Movement Data in the Emergency Department with Transformers**
Dylan RUSSON, AHeaD team, BPH

ZERO-INFLATED MODEL
•**Statistical models for semi-continuous trait**
Gaelle MUNSCH ELEANOR team, BPH

•**Joint modeling of zero-inflated longitudinal measurements and time-to-event outcome**
Taban BAGHFALAKI, BIOSTAT team, BPH

AI AND HEALTH
•**Impact of temporal breast density changes on the prediction of breast cancer in women from screening programs**
Kalidou BA, SISTM team, BPH

AXE
AGEING AND RESILIENCE

MAY

• **Exceptional health and longevity in Danish long-lived families**
Angéline GALVIN, EPICENE team, BPH

• **Social vulnerability and autonomy: do social resources contribute to resilience?**
Camille OUVRARD-BROUILLOU, ACTIVE team, BPH

• **Medication use and misuse in the elderly: a source of frailty/resilience?**
Pernelle NOIZE, AHeaD team, BPH

• **Health trajectories and place of residence of the elderly: home, senior residence,EHPAD, foster care, what are the differences?**
Denis BOUCAUD-MAITRE, Centre Hospitalier Le Vinatier, Lyon

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AXE
BRAIN HEALTH ACROSS THE LIFECOURSE

JUNE

• **What does our DNA say about our intellectual capacities and our medical future?**
Françoise CLERGET-DARPOUX, Emeritus Research Director INSERM

• **Blood AD biomarkers in dementia research: expectations and limits**
Vincent BOUTELOUP, PHARes team, BPH

• **Characterization of the retinal vascular network using a deep learning approach for assessing cerebro-cardiovascular health in patients**
Idris DULAU, LEHA team, BPH

• **Substance use among emerging adults: repercussions of adverse childhood experiences**
Ashlyn Nicole SCHWARTZ, HEALTHY team, BPH

• **"Joint analysis of disease progression markers and death using individual temporal recalibration : illustration on Multiple System Atrophy**
Tiphaine SAULNIER, BIOSTAT team, BPH

• **Chemical exposome of neurodegenerative diseases: literature review and perspectives"**
Sophie LEFÈVRE-ARBOGAST, LEHA team, BPH

• **Could viral infections be involved in the occurrence of neurodegenerative diseases?**
Morgane LINARD, LEHA team, BPH

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INFECTIOUS DISEASES & GLOBAL HEALTH

SEPTEMBER

•**Immunological aspects of Ebola vaccination**
Edouard LHOMME, SISTM team, BPH

• **Tuberculosis: toward short treatment duration**
Maryline BONNET, IRD, TransVIHMI, Montpellier

•**Cost-effectiveness and budget impact of decentralising childhood tuberculosis diagnosis: a mathematical modelling study in six high tuberculosis incidence countries**
Marc D'ELBÉE, GHiGS team, BPH

•**Patient acceptability of follow-up in a COVID-19 trial in West Africa**
Mélanie PLAZY & Marie-Hélène DOUCET, GHiGS team, BPH

BIOSTATISTICS SEMINARS 2023

These events are intended for researchers in statistics interested in recent developments and their methodological aspects as well as for practitioners using statistical methods in the health field.

JANUARY
- **Continuous-time mediation analysis for repeated mediators and outcomes**
Kateline LE BOURDONNEC SISTM Team BPH

- **Longitudinal measures to capture key dimensions of cognitive resilience to Alzheimer's disease and other neuropathologies**
Maud WAGNER, BIOSTAT Team BPH

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FEBRUARY
- **Human-In-The-Loop machine learning for health**
Julien MARTINELLI, Aalto University, Espoo, Finland

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MARCH
- **Dynamic prediction of an event using multiple longitudinal markers: a model averaging approach**
Taban BAGHFALAKI BIOSTAT Team BPH

- **Modeling spatial transcriptomics data at super-resolution**
Raphael GOTTARDO, Centre for Biomedical Data Science CHUV Lausanne

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APRIL
- **A functional principal component analysis framework to characterise systemic recovery from SARS-CoV-2 infection**
Hélène RUFFIEUX MRC Biostatistics Unit, University of Cambridge, UK

- **Bayesian estimators as preferred alternatives to those of frequentist**
Mojtaba GANJALI, Shahid Beheshti University | SBU Department of Statistics Tehran, Iran

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MAY
- **Bandit algorithms for early clinical trials in vaccinology**
Cyrille KONE, École Normale de Rennes et Université d'Aix-en-Provence

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JUNE
- **Tumor growth inhibition models to support decision-making in clinical development - current status and future directions**
Francois MERCIER, Biostatistics department. Roche Basel, Switzerland

JUNE
- **Prediction of antibody titres from the early transcriptomic response following vaccination in the PREVAC clinical trial**
Arthur HUGHES, Isped, university of Bordeaux

- **Correction of early diagnosis bias in the evaluation of breast cancer screening**
Marius ROBERT, Isped, university of Bordeaux

- **Machine Learning Model for Progression of Chronic Kidney Disease to Kidney Failure in European Children**
Xinbei WAN, Isped, university of Bordeaux

Dynamic Prediction Model Based on Repeated Measures of Multiple Markers for Dementia
Qin ZHANG, Isped, university of Bordeaux

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OCTOBER
- **A Two-stage Joint Modeling Approach for Multiple Longitudinal Markers and Time-to-event Data**
Taban BAGHFALAKI, BIOSTAT Team BPH

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NOVEMBER
- **Complex Heterogeneity in the Utility of a Surrogate Marker**
Rebecca KNOWLTON Department of Statistics and Data Sciences, University of Texas at Austin

- **Optimal control for parameter estimation in partially observed hypoelliptic stochastic differential equations used in neuronal modeling**
Quentin CLAIRON, SISTM Team BPH
Adeline LECLERCQ-SAMSON, University Grenoble Alpes Joseph Fourier

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DECEMBER
- **IPTW plus adjusted outcome models do not always equal doubly robust**
Erin GABRIEL, University of Copenhagen

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SUMMER SCHOOLS
AND OTHER EVENTS 2023

JANUARY

• **IPORA (Interdisciplinary Policy-Oriented Research on Africa) agreement signed in Abidjan, Côte d'Ivoire**

• **PACCI**
Renewal of the Franco-Ivorian scientific partnership between the PACCI Program in Abidjan and the BPH GHiGS team in Bordeaux

• **7ᵗʰ Session of the PoP-HealtH MOOC!** Developed by a team of teaching staff from the University of Bordeaux (ISPED) and the Inserm-Université de Bordeaux U1219 research centre, and from the UF Sciences de l'éducation), accompanied by public health professionals (experts and survey managers).

MARCH

• **The documentary film "The factory of pandemics" (2022) directed by Marie-Monique Robin : an evening movie and round table debate** in partnership with ISPED, IRD, Department of public health of university of Bordeaux

• **Seminar on the 5 year scientific ambitions of the BPH research teams** Scientific retreat with several representatives of 10 teams of the BPH center

OTHER EVENTS 2023

AVRIL

• **Conference "Mobility evaluation in healthy older adults and with physical impairments: Why and How ?"**

at the Readaptation School of Montreal University, and researcher at the Centre de Recherche Interdisciplinaire en Réadaptation (CRIR) and at the Institut universitaire sur la réadaptation en déficience physique de Montréal (IURDPM)

Sylvie Nadeau, Professor in physiotherapy teaching

MAY

• **Bordeaux Summer School - Africa's populations by 2050 : challenges and potentials- Public health, economics, political science Major Research Program - Interdisciplinary Policy - Oriented Research on Africa**

• **Young BPH researchers create the association "Blooming members of Bordeaux Population Health" (BBPH)**

• 11th Bordeaux PharmacoEpi Festival

SEPTEMBER

• **4th plenary meeting of SPRINT**

• **RFMASA33 French-speaking meetings on Alzheimer's disease**

• **Second BPH Junior Researchers' Day!**

• **2ⁿᵈ Datathon RRI : Presentations and discussions on current and upcoming projects**

NOVEMBER

• **Second WHO European Public Health Leadership Course: Enhancing competencies, embracing values and empowering evidence-based decisions to become public health leaders**
Co-developed this year by the WHO Regional Office for Europe and the University of Bordeaux, specifically its School of Public Health (ISPED) and the graduate programme on Digital Public Health (DPH), in collaboration with the Bordeaux Population Health Research Centre of the French National Institute of Health and Medical Research (Inserm) and the Care and Public Health Research Institute (CAPHRI) of Maastricht University.

SOCIETAL IMPACTS

SOCIETAL IMPACTS

The BPH is strongly committed to contributing to the **United Nations' Sustainable Development Goals** and to improving population health both locally and globally, embracing a comprehensive precision and global health approach targeting major health challenges, with a special focus on brain, vascular and infectious diseases, as well as cancer.

The research conducted at the BPH addresses sustainable development goals, mostly **SDG3** (good health) and **SDG4** (quality education), but also **SDG10** (reduced inequalities), and **SDG11** (sustainable cities & communities). The BPH is also involved in strong partnerships established between UBx research centres, graduate and doctoral degrees in various fields (public health and epidemiology, economics, political science, geography and anthropology) and several African universities and research institutions to increase knowledge and improve methodological and interdisciplinary skills in terms of **research and action in Africa**. In this context, the **Bordeaux online Summer School** AFRICAN POPULATIONS TO 2050: CHALLENGES AND POTENTIALS organised between May 30th and June 2nd 2023 by the BPH GHiGS team allowed participants to provide a critical and complementary analysis of the evolution of populations in Africa over the last 20 years, and to discuss the challenges and opportunities for the next 30 years in the context of the Sustainable Development Goals agenda.

The BPH centre has seized its responsibility in major transition challenges through its research-related activities. Since 2019, members and researchers of the BPH have been committed to climate action (SDG13) with the "Action Climat Environnement" (ACE) collective, which aims to carry out an inventory of the actions implemented in various research and teaching units on the UBx university hospital campus, and to develop joint strategies. Some of them have joined the UBx active network of student and staff ambassadors for the environmental and societal transition ('Référents Transitions') to contribute to the reflection on the university's strategy and implement concrete awareness and integration actions. In 2023, others BPH members joined the new Inserm network for Transitions and created the **BPH Public Health Transitions Committee**, who works in focus groups on various themes to reflect on new strategies (waste management, purchasing policies, neutral mobility and the impact of digital technology). In addition, social and societal concerns have become more prominent, with new themes such as equality, diversity and inclusion. In this context, Transitions' main actions in 2023 focused on raising awareness through individual and collective challenges (quizzes, videos and debates) and the organisation of an evening around a documentary entitled "La Fabrique des Pandémies" (https://m2rfilms.com/la-fabrique-des-pandemies), which focuses on the balance between human health and the ecosystem, followed by a debate with experts. Finally, our Transition Committee also contributed to awareness-raising programs on the university campus during UBx's 2023 Ecology and Solidarity Week. Posters on the theme of responsible digital technology were displayed on campus.

In 2018, a **quality and integrity (Q&I) management process** was initiated in the Centre to increase awareness and promote scientific integrity in research. In 2023, the Quality and Integrity committee held six meetings. It is composed of team directors, researchers, engineers and staff with transversal activities.

The committee organised a theoretical training on Open Science and 31 participants from seven teams of the BPH participated. Around 80% of the participants were either satisfied or very satisfied with it.

A practice training aiming at learning how to publish on Open Access was proposed and five persons took part in the workshop. It consisted in a card game followed by a PowerPoint presentation. Other editions are planned in 2024.

The training on bibliography was reconducted with 13 participants and had a good satisfaction rate.

Posters created by the "Réseau Inserm Quality" (RIQ) illustrating various integrity situations were displayed. Catherine Fagard-Sultan, the coordinator of the BPH QI committee, is involved in several workgroups for the RIQ and the DIS (Délégation à l'Intégrité Scientifique de l'Inserm).

A research protocol draft for the Centre was edited and the Publication Guide was updated. The Centre is regularly informed about our activities and provided with any other relevant information on integrity.

QI committee members: AMIEVA Hélène, BEUSCART Aurélie, BONNAFOUS BESSE Lucie, COUGNARD-GREGOIRE Audrey, DELCOURT Cécile, FAGARD-SULTAN Catherine, FAVREAU Véronique, FLAMERIE Frédérique, LACHAIZE Morgane.

Finally, although it is a less prominent tradition in public health than in other disciplines, BPH researchers are increasingly involved in innovation and technological transfer activities. In the past five years, BPH researchers have produced over **15 patent invention disclosures**. They have obtained **15 Cifre fellowships** (joint academic-industry fellowships) and have concluded **25 industrial and R&D contracts**, both with SMEs and large multinational pharmaceutical companies, particularly in the context of vaccine trials.

Since 2016, **four start-ups** have emerged from BPH teams including Synapse, UT4H, Tricky and RetiNet in 2022, which offers a personalised medical service for the prevention of AMD via a digital platform. This new BPH spin-off has been selected by Microsoft to join the Microsoft for Startups Founders Hub, which aims to accelerate the development and growth of startups.

BORDEAUX POPULATION HEALTH | Research Center – U1219

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