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Institut National du Cancer


SCIENTIFIC REPORT 2023

# ACTIONS FOR CANCER RESEARCH

The French National Cancer Institute is the health and science agency in chage of cancer control.

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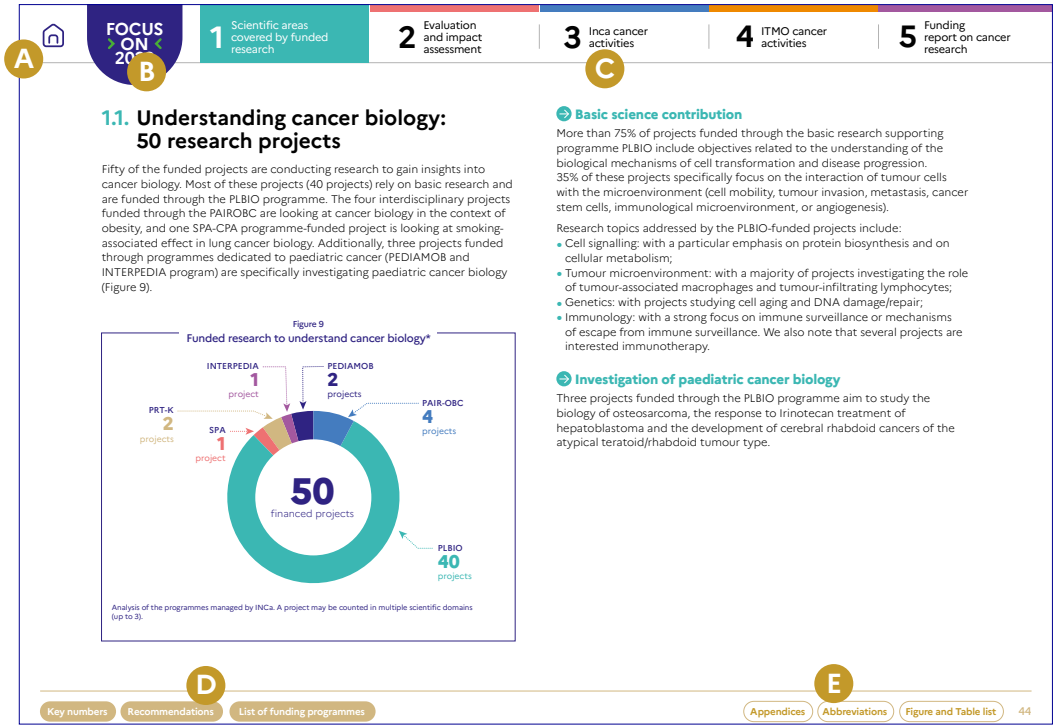
# NOTE TO READERS

This scientific report is an interactive document. It includes features that allow to navigate between different sections, quickly access key information, and consult additional resources.
Clickable elements are underlined.

**Please print this document only if necessary.**

This scientific report is enhanced with several interactive features:

- **a horizontal navigation bar at the top of the document** providing direct access to the table of contents (A), the "Focus on 2023" section (B), and the four main parts of the report (C);
- **buttons located at the bottom of each page** for easy access to key figures, recommendations, and the list of funding programmes (D), as well as to the appendices, abbreviations, and list of figures and tables (E).



# CONTENTS

## EDITO

# Research in the service of the fight against cancers

**Pr Norbert Ifrah,**
President of the National Cancer Institute

In 2023, the French National Cancer Institute continued to drive its actions and investments further to build the best creative and targeted cancer research in France and beyond. Research findings and the insights they offer are central to the development of an appropriate and effective strategy for the fight against cancer. The Institute's Missions together with the National Ten-Year Cancer Control Strategy set out the actions necessary to achieve game-changing results for patients and to shield the healthy population from cancer.

2023 also marked the Institute's association with Cancer Grand Challenges, an initiative led by Cancer Research UK and the US National Cancer Institute. We are pleased to contribute to this programme providing outstanding international research projects with the necessary levels of funding to help solve cancer's toughest challenges.

The celebration of the 20th anniversary of the *Cancéropoles*, the Institute's first structuring programme, illustrates our commitment to building a dynamic, synergistic and enduring research community. In 2023, we continued our endeavours in structuring the research landscape.

First of all, with the certification of 3 PEDIACRIEX, Paediatric Research Centres of Excellence, our aim was to strengthen the existing bonds between experts in paediatric oncology. These new Centres provide an opportunity for new collaborations, exploration of new hypotheses and innovations focused on paediatric patients.

Secondly, our objective is to support the federation of French academic research teams focusing on CAR-T cell expertise through the designation of the CAR-T cell network, UNITC. This network aims to translate research findings into therapeutic solutions by fostering strong collaboration among the group.

Finally, because patients are the ultimate beneficiaries of innovation generated through research, we need to make sure they all have equal access to it. With this in mind, a support programme has been initiated to extend clinical trials available in mainland France to overseas territories, ensuring all cancer patients, including those in overseas regions, can access the therapeutic clinical trials offered.

40% of cancers are preventable as they are attributable to behaviour and to risk factor exposure. As we are also committed to shielding the healthy population from cancer, the Institute believes strongly and invests substantially in research in the field of human and social sciences.

In 2023, the Institute published the Cancer Barometer, which informs us on public perception and behaviour regarding cancer risk factors. These findings provide a valuable tool to guide the Institute's strategy for public health intervention research and prevention. They also highlight the need for research focusing on risk factors.

In this vein, the Institute has invested in research projects aimed at understanding the link between obesity and cancer through a PAIR programme dedicated to "Obesities and cancer". The Institute has also created a Research Chair for "Tobacco and Cancer", aimed at deciphering the social inequalities associated with smoking behaviours. The findings obtained through this research should ultimately enable the implementation of appropriate interception actions.

As we progress through the first roadmap of the 2021-2030 Ten-Year Cancer Control Strategy, we are proud to see that most of the planned actions have been initiated, which demonstrates the Institute's dedication to its mission and the invaluable quality of its collaborators' work.

We are looking forward to the mid-term evaluation of the Strategy, which will start in 2024 and will give us an opportunity to assess the results of our actions. Most importantly, it will empower us to adapt and enhance these actions further to keep addressing patients' and the population's needs in the most meaningful way.

## EDITO

# We remain committed to a collaborative scientific policy

Cancer research represents the Institute's primary investment in the fight against neoplasia. According to our mission, we support the construction of competitive infrastructures, promote specific topics deemed relevant to the Ten-Year Cancer Control Strategy, and preserve free-minded, investigator-initiated research projects. The optimal balance between these different areas is a general matter of debate, but we are committed to promoting a bottom-up scientific policy approach.

Last year provided clear examples of this strategy. Oncopaediatric research centres (PEDIACRIEX) are one of the core structuring elements in France but have been selected according to specific scientific programmes developed by investigators. The Institute's participation in Cancer Grand Challenges, a prototype of the bottom-up approach, also illustrates our commitment to addressing the most challenging questions in the cancer field by bringing together the most talented individuals and teams for a common purpose. Our participation in the ASPIRE programme of the Japan Agency for Medical Research and Development (AMED) through a joint call is another example of our effort to leverage the best knowledge and expertise in the fight against cancer.

In 2025, the Institute will reach a major milestone: the completion and evaluation of the first roadmap of the Ten-Year Cancer Control Strategy. The design of the second roadmap for the 2026-2030 period will need to consider the scientific progress achieved worldwide and input from the scientific community to refine our goals. Issues with significant clinical impact, such as long-term recurrence, metastatic spread, better definition of poor prognosis cancers, and many others, will need to be included in the strategy.

None of these actions could have been implemented without the dedicated efforts of the Institute's staff and the invaluable expertise of the Institute's Scientific Advisory Board members. I want to take this opportunity to thank them for their unwavering commitment to our fight against cancer.

**Pr Bruno Quesnel,**
Director of the Research and Innovation division of the National Cancer Institute and Director of the Inserm Cancer Thematic Institute

# THE FRENCH NATIONAL CANCER INSTITUTE

The French National Cancer Institute was created by the French Public Health Act of 9 August. The Institute's missions are set in agreement with the French government in the name of both the Ministry of Health and the Ministry of Research. In addition to State representatives, the Institute's board of trustees includes charities, health insurance funds, hospital federations and research organisations.

As a state agency for scientific and health expertise in cancer, the Institute's mission is to develop, propose, and implement cancer control strategies and measures with health, social, economic, and science stakeholders. Our areas of intervention range from prevention, screening, and research to care. The Institute's actions, therefore, serve all fellow citizens: patients, patients' relatives, caregivers, users of the health system, the general population, health professionals, researchers and decision-makers.

The Institute is entrusted with the mission of ensuring the implementation of the 2021-2030 National Ten-Year Cancer Control Strategy.

**The Institute's Research and Innovation Division sets and executes the national cancer research strategy. It does so through research funding, structuring, coordination and federation.**

# ITMO CANCER

The Institute's actions for cancer research are complemented by the activity of ITMO Cancer, a cancer thematic institute that also works to improve the performance, competitiveness, and visibility of French research in the cancer field by defining research strategies. The successive French Cancer Plans have assigned ITMO Cancer the role of programming research funding based on identified strategic priorities.

# SCIENTIFIC ADVISORY BOARD: ADVICE AND RECOMMENDATIONS

The French National Institute's Scientific Advisory Board is composed of internationally renowned experts appointed by the supervising Ministers. The SAB issues advice and guidance for the Institute's strategy and action planning and to handle cancer research challenges over the years.

Its missions, as defined by law, include:
- ensuring coherence of the Institute's scientific and medical policies;
- reviewing the Institute's annual scientific report before it is presented to the Board of Directors;
- making recommendations and providing opinions on the Institute's scientific strategy and its implementation.

This 18th report to the SAB reviews actions carried out by both INCa and the Thematic Institute for Cancer (ITMO Cancer). This report is the key element allowing SAB members to review the actions undertaken by the Institute and subsequently.

**The SAB members met on 18 November for the SAB annual meeting to:**
- Review the activity reported in this 2023 scientific report;
- Issue recommendations on actions initiated in 2024 presented during the meeting;
- Review the Institute's mid-term evaluation of the National Ten-Year Cancer Control Strategy.

## Scientific Advisory Board members in 2024

**Prof. AGUIRRE-GHISO Julio A.**, PhD., Albert Einstein College of Medicine, Mount Sinai School of Medicine, New York, NY, USA
**Dr. ALMOUZNI Geneviève**, PhD, Institut Curie, Paris, France
**Mrs. ALTIER Pascale**, VBO Consulting, Saint-Rémy-Lès-Chevreuse, France
**Dr. BIZZARI Jean-Pierre**, MD, Celgene, Summit, USA
**Prof. BLANPAIN Cédric**, MD, PhD, Université Libre de Bruxelles, Brussels, Belgium
**Dr. BOURDEAUT Franck**, MD, PhD, Institut Curie, Paris, France
**Prof CAMPONE Mario**, MD, PhD Institut Cancérologie de l'Ouest, France
**Dr. DAUVERGNE Denis**, PhD, Institut national de physique nucléaire et de physique des particules (IN2P3), Grenoble, France
**Dr. DIEU-NOSJEAN Marie-Caroline**, PhD, Centre d'Immunologie et des Maladies Infectieuses (CIMI), Paris, France
**Dr. EISENHAUER Elizabeth A**, MD, Queen's University, Kingston, Canada
**Prof. GAUDUEL Yann**, PhD, École Polytechnique – ENS Techniques Avancées, Palaiseau, France
**Dr. GUT Ivo G.**, PhD, Centro nacional de analisis genomica (CNAG), Barcelona, Spain
**Dr. JACOB Guillemette**, Citoyen et Recherche- Association Seintinelle, Paris, France
**Dr. KALAGER Mette**, MD, PhD, Harvard T.H. Chan School of Public Health, Boston, USA
**Dr. LOWY R. Douglas**, MD, NCI Acting Director, Bethesda, USA
**Prof. Dame MARTEAU Theresa**, PhD, University of Cambridge, Cambridge, United Kingdom
**Dr. MEHLEN Patrick**, PhD, Centre de recherche en cancérologie de Lyon, Lyon, France
**Dr. OLIVE Daniel**, Institut Paoli-Calmettes Institute, Marseille, France
**Prof. POTVIN Louise**, PhD, Institut de recherche en santé publique de l'Université de Montréal, Université de Montréal, Montreal, Canada
**Prof. SOCIÉ Gérard**, MD, PhD, Hôpital Saint Louis, Paris, France
**Dr. TAYLOR Naomi**, MD, PhD, National Cancer Institute, NIH, Bethesda, USA
**Prof. WEINBERG Robert**, PhD, Massachusetts Institute of Technology (MIT), Cambridge, USA
**Prof. ZITVOGEL Laurence**, MD, PhD, Gustave Roussy, Villejuif, France

# 2024 recommendations issued on 2023 activity

## INCa SAB notes and recommendation on 18 November

Congratulations to INCa for continuing its hard work in the Ten-Year Cancer Control Strategy. The SAB would like to highlight/emphasize INCa's actions in:

- developing infrastructure within France to enhance collaborations;
- supporting cancer clinical trials investments and including enrolling patients from overseas French Departments;
- investing in the Cancer Grand Challenges.

**From the operational perspective, the SAB was grateful to receive the slides presented during the meeting in advance.**

The SAB received with interest the reports from the INCa team and provided a few comments and recommendations:

## 1 International ranking of cancer research

This interesting presentation underscored several findings:

- France has fallen from #4 to #9 in cancer publication numbers over the last two decades, partly due to the rise of some newer countries in the top 10, such as India. Over the same period, there appears to be an increase in the quality of publications (however measured by citations);
- in keeping with international trends in research distribution within countries, clinical research is rising in prominence in France, with a slight decrease in basic science. Translational research data are not available.

**A key issue raised was about metrics and the need for:**

a. showing the impact made specifically by INCa investment;
b. normalizing international comparisons by controlling for the research investment amounts and number of investigators would be helpful;
c. measuring the impact on biological concepts and patient and population outcomes remains essential, although bibliometric data is somewhat easier to collate. This issue was also raised in the feedback on the clinical trials report.

## 2 Report on 2023-2024 investments

Highlights include the "PEDIACRIEX" programme: three integrated paediatric research centres have been established, and a fourth is set to open in 2025.

**A note was made of the need to invest in cellular therapy research. A CAR-T (UNITC) consortium has been established, which will receive 300,000 euros:**

a. SAB notes this is a relatively small amount to invest in a highly competitive area, and there may need to be a discussion about how much of a player France will be in the academic trials of CAR-T. If so, a more substantial investment will be needed soon.

**SAB notes that providing funding to many different areas is always a struggle. However, the impact may be diminished by the amounts that are available for investment when funding is spread across many different projects and programmes:**

b. thus, selecting a more limited number of areas for more substantial investment will likely have more impact;
c. the Strategy is an important means of determining where priorities should lie;
d. it is noted that prevention research investment is low and shrinking despite being a priority in the Strategy.

## 3 Clinical cancer research PHRC-K programme

INCa manages this large competitive funding programme for phase II and III cancer trials. The absolute number of trials receiving funding has fallen by about 50% since 2011, while the cost per trial has doubled.

**SAB noted that there are several important questions to address in evaluating the impact of this programme:**

a. How often do these projects change practice?
b. How many patients are enrolled in these trials, and what proportion of cancer trial enrollments do they represent in France?

## 4 Cancer data platform

The presentation was impressive, and the team responsible deserves congratulations. Despite delays in assembling all components, there are already multiple active projects and 21 publications, which is an outstanding accomplishment.

Much thought has been put into governance oversight for science, ethics, operations, etc., which is important.

**The SAB had only a few comments to offer:**

**a.** Firstly, it is important to have access to patient relapse information in the data platform to maximize its impact, and;

**b.** Secondly, understanding the socioeconomic status of patients whose data are included via a surrogate, such as postal codes or similar, will be important.

## 5 Mid-Term evaluation

SAB recommendations on topics/progress in each strategic area are to be incorporated into the development of the new roadmap: four subgroups will be formed, each of which will evaluate the topics/actions and progress around one of the four main priority areas of the 10-year cancer control Strategy. Each subgroup will develop a ~4-page report with recommendations for the next 5-year roadmap. It may expand, eliminate and modify actions. Each group will receive a brief standardized report on each action within each topic to facilitate the evaluation.

**The recommendations from the International Scientific Council on the 2023 activity are available for download at cancer.fr.**

# 2023 RECOMMENDATIONS: WHERE ARE WE?

## 2023 recommendations and their progress status

At its 2023 annual meeting, the SAB issued recommendations that the Institute's Research and Innovation Division worked on addressing through 2024. While some of the questions raised are being addressed, some of them are still in planning as we are building the necessary capacity and tools. Finally, some of the recommendations are still being reflected on to identify the best way to address them.

**Progress status:**

BEING ADDRESSED

PLANNED

BEING REFLECTED ON

**1** **In order to maximise its potential for fulfilling its role[1] supporting INCa and the success of its strategy, the Scientific Advisory Board (SAB) would like to help develop the meeting agenda. The SAB suggests organising the annual meeting around the following items:**

a. Brief review/approval of the annual scientific report. To do so, an executive summary of the scientific report is advised;

b. Review of previous year's SAB recommendations and INCa's resulting responses;

c. Review of programme evaluations (see item n° 2) to determine whether these programmes should be renewed, reduced, cancelled or expanded.

d. Review of progress against INCa's strategy (10-Year Cancer Control Strategy and Performance contract) to determine:
- whether INCa is on track;
- if there are problems/roadblocks;
- if there is emerging data which suggests a *change* of strategy.

e. Identification, discussion, prioritisation of major emerging themes for cancer research investment (see items n° 4 and n° 5).

**2** **INCa should develop its evaluation capability. To do so:**

a. INCa should link the many active programmes to the four main priorities of the 10-year strategy (if feasible);

b. The SAB is concerned that 30 and more programmes may dilute INCa's limited resources and do not give the flexibility to focus investment into emerging areas or into those requiring enhanced investment. The n° 1.c. agenda item (see above) proposes to address this issue;

c. Programmes should have a formal external evaluation to assess their outputs against programme objectives, on a regular cycle;

d. Impact measurements should not only include citations, leveraged Euros but also societal and clinical impact;

e. Evaluation summaries can be presented to the SAB who in turn can advise INCa.

[1] INCa SAB mandate: a) ensure coherence of medical and scientific policies; b) validate the scientific report; c) formulate recommendations/advise on INCa's scientific direction and implementation…).

**3** **INCa should expand its research investment categorisation:**

a. If feasible, it is suggested it would be useful to categorize research investment not only by CSO[2]/disease terms but also perhaps according to cross-cutting themes in malignant process/intervention (e.g., cancer aetiology, invasion, metastasis, treatment, aging, prevention…);

b. INCa should formalize what is and what is not included under the umbrella of "INCa translational research", to have a better vision of how INCa money is distributed over the research fields.

**4** **Future prospects in Research and the "Current challenges in oncology research 2022"[3] document:**

a. For next year's meeting, there should be an opportunity to dig more deeply into a *subset of the topics* (felt to represent near-term opportunities) presented in the "Current challenges in oncology research 2022" document;

b. Pre-work should be conducted by selected SAB members on which aspects or actions could become INCa priorities in the next 10-20 years;

c. To identify potential priorities, INCa should consider research areas: 1) in which France has pre-existing strengths; 2) that are ready for investment now; 3) where (multiple) potential partners may be identified and 4) that fit with the 10-year strategy;

d. INCa should identify how best SAB might help prioritise.

**5** **Future prospects in Population Prevention, for the implementation side of INCa's remit in population prevention: Tobacco Endgame**

a. To define targets and strategies – and impact – of achieving a Tobacco Endgame for France, INCa should convene a meeting with scientists, policy makers and citizens (government, non-government and public);

b. INCa should consider that endgame includes targets, education, cessation programmes, prevention of smoking and that is aligned with the first and fourth priority[4] of the Strategy. *"Tobacco endgame reorients the discussion away from persistent tobacco "control" plans toward plans for ENDING the tobacco epidemic, envisioning a tobacco-free future"* (Ruth Malone).

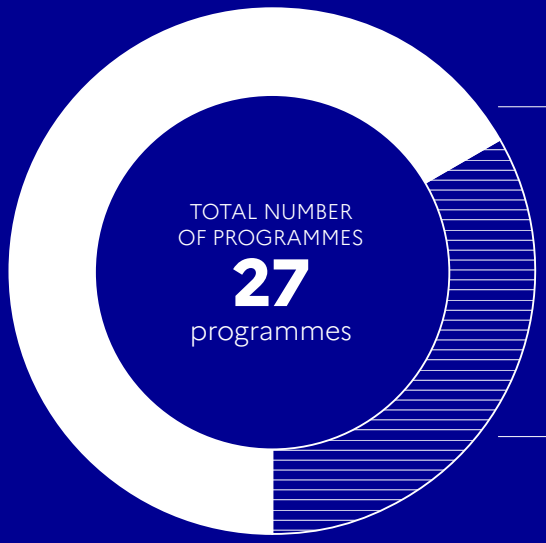
[2] CSO : Common Scientific Outline.
[3] "Current Challenges in Oncology Research, a Joint Reflection by Aviesan Multi-Organization Thematic Institute for Cancer and the French National Cancer Institute Research and Innovation Division".
[4] Ten-Year Cancer Control Strategy priorities:
1. Improving prevention
2. Limit sequels and improve quality of life
3. Fight against cancers with poor prognosis
4. Ensure that everyone benefits from the progress made.

# FOCUS ON 2023

# 2023 IN NUMBERS

INCa* **€121M**

ITMO Cancer **€23.7M**


INCa* **18** programmes

ITMO Cancer **9** programmes

*INCa, DGOS, Ligue contre le cancer, Fondation ARC pour la recherche sur le cancer, Fonds Addictions

enabled the funding of **260 projects**

**53%** of the allocated budget was dedicated to investigator-initiated **research programmes**

## 10-YEAR CANCER CONTROL STRATEGY 2021-2030

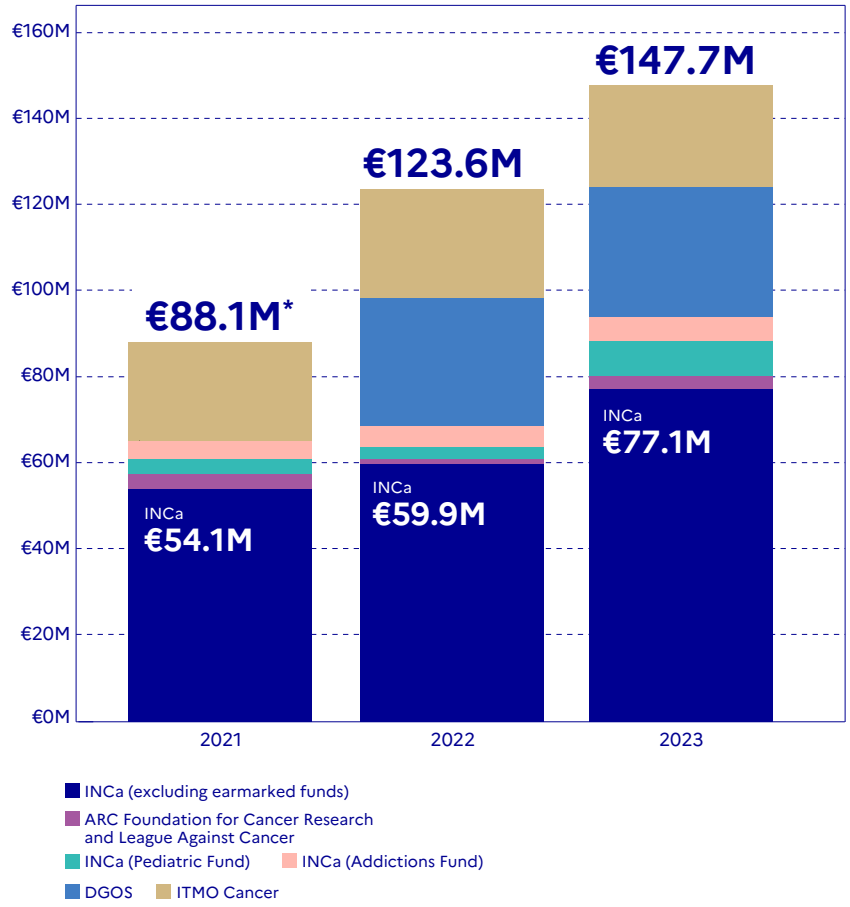
**€35.1M** invested for the Strategy's priorities

**6** programmes

enabled the funding of **24 projects** focusing on **3 priority areas** of the Ten-Year Strategy

Figure 1.a

## Distribution of funds effectively allocated to cancer research




* No calls were issued for the PHRC-K and PRT-K programmes in 2021.

Figure 1.b

## 2023 multi-year investment for cancer research

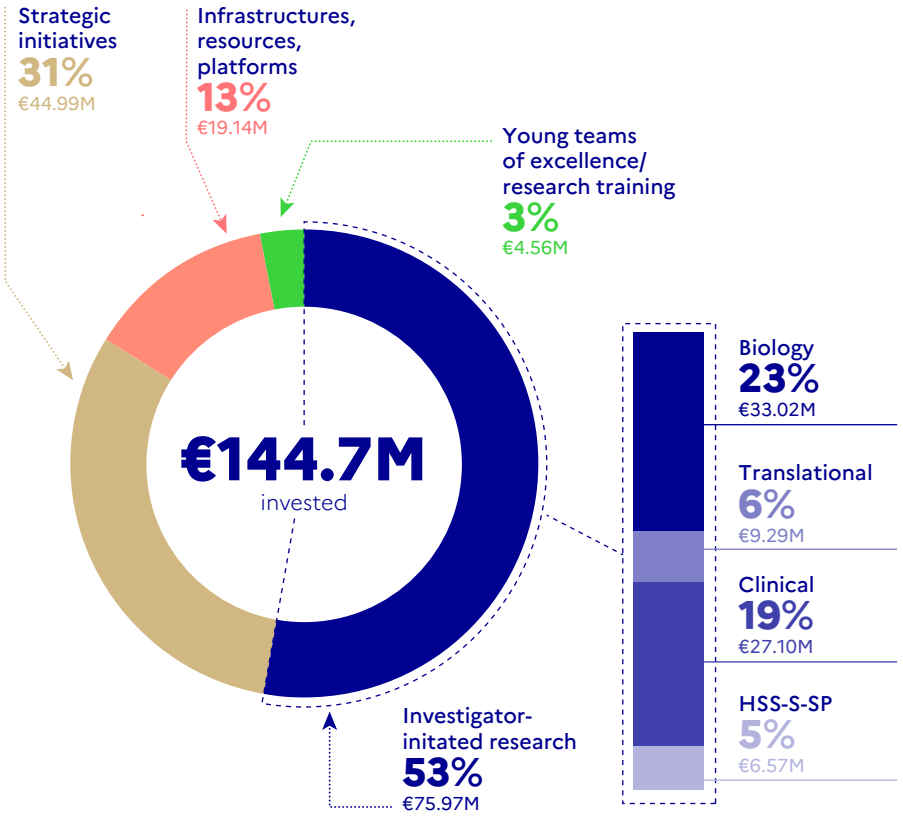


Figure 2

2023 Key number:
Number of Programmes and funded projects

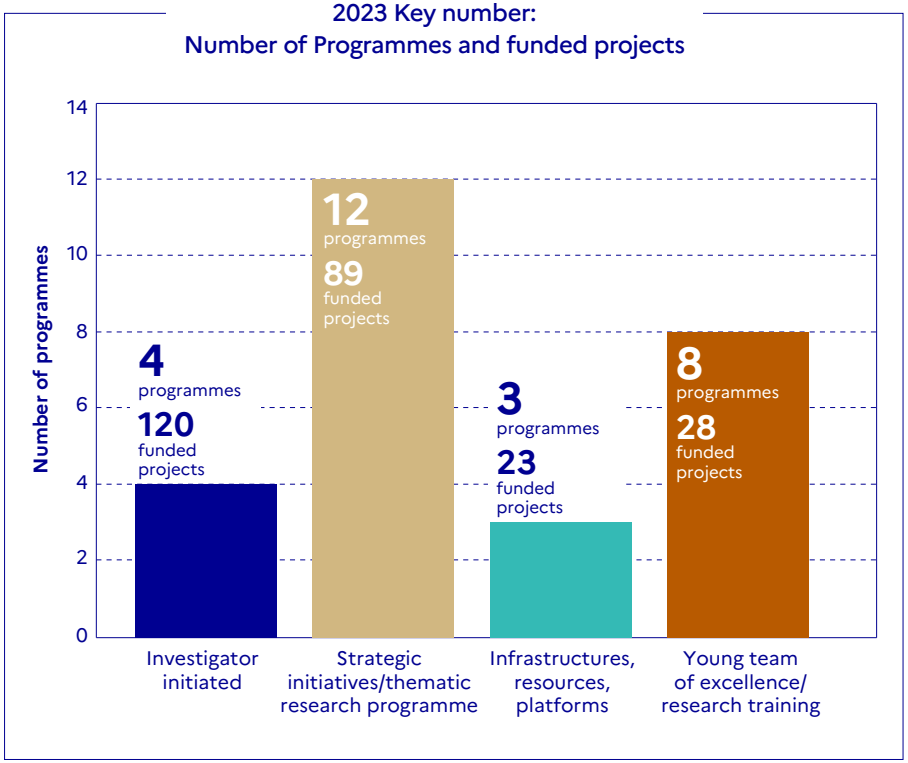
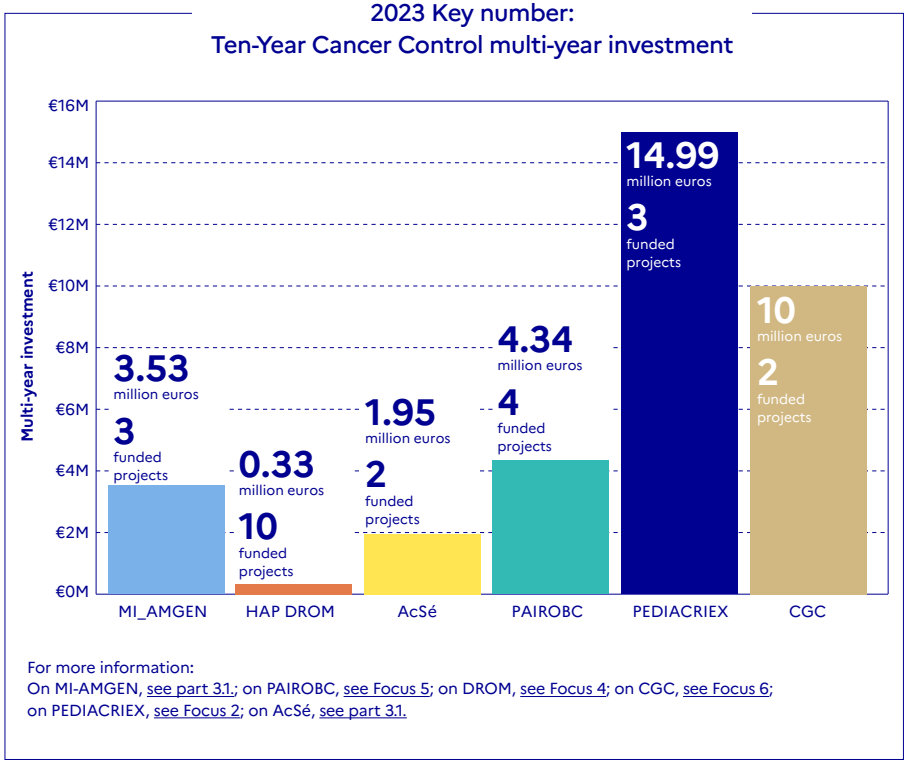



Figure 3

2023 Key number:
Ten-Year Cancer Control multi-year investment




For more information:
On MI-AMGEN, see part 3.1.; on PAIROBC, see Focus 5; on DROM, see Focus 4; on CGC, see Focus 6; on PEDIACRIEX, see Focus 2; on AcSé, see part 3.1.

# 11 HIGHLIGHTS OF THE INSTITUTE'S 2023 ACTIVITIES

## 1 Celebration of the 20th Anniversary of the *Cancéropôles*: the Institute's enduring first structuring programme

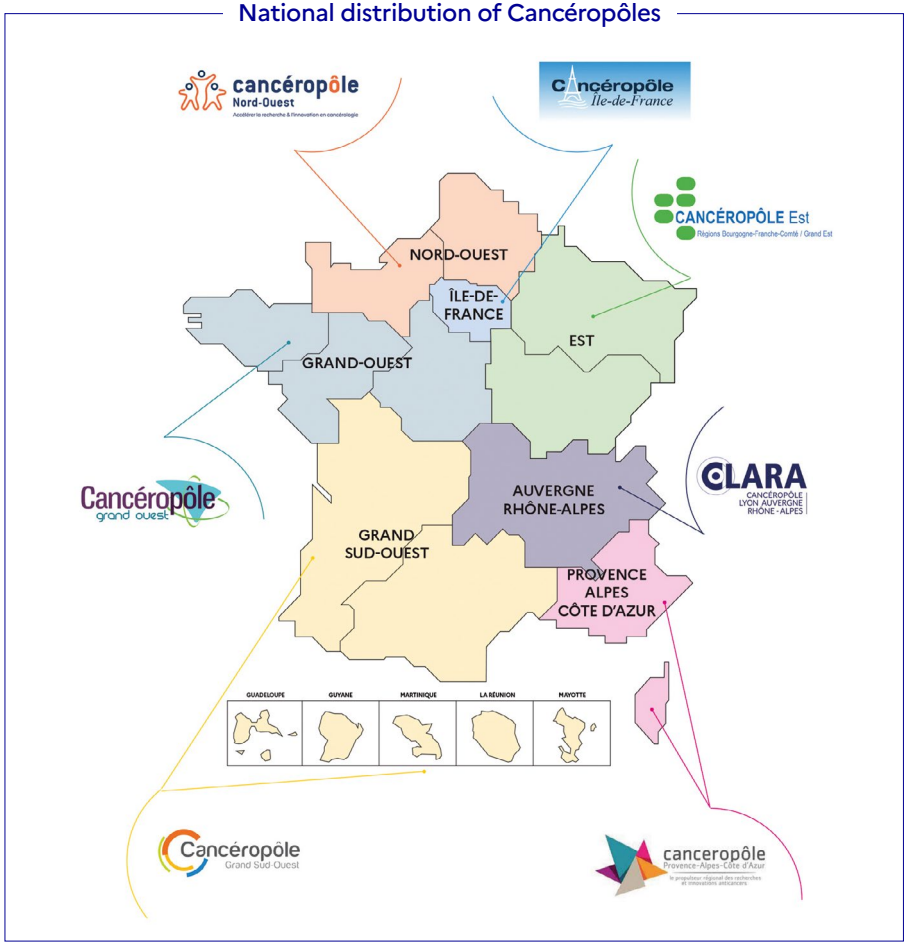
*Cancéropôles*, together with SIRICs and CLIP[2], represent a unique structuring system that supports cancer research in France. To mark the 20th anniversary of the *Cancéropôles*, the Institute brought together all their stakeholders to get an overview of their most significant achievements and allow them to collectively project themselves into the future.

### The *Canceropôles* designation programme

This initiative was launched in 2003 to structure cancer research at the regional and inter-regional territory level. Initiated by the French Research and Health Ministries as part of the 1st Cancer Plan, the French National Cancer Institute has supported the structure since 2005 and implemented a designation process. So far, 4 designation rounds have been held for the 7 *Cancéropôles*, 2011-2014 (4 years), 2015-2017 (3 years), 2018-2022 (5 years) with the most recent being from 2023 to 2027. They operate within the framework of the Institute's strategic orientations and the French Ten-Year Cancer Control Strategy with the objective of:

- Integrating cancer research into a regional or inter-regional dynamic relying on specific territory local ecosystems in research, health, industry and politics;
- Facilitating collaborations between the *Cancéropôles'* researchers within the same discipline or through a multidisciplinary approach;
- Supporting researchers by assisting emerging projects, by helping the development of national and international projects and supporting the mobility of young researchers, etc.;
- Fostering innovation detection and subsequent technology transfer.

Figure 4
National distribution of Cancéropôles



### Grand reunion around the *Canceropôles*

This event took place on 28 November, and was introduced by Misses Sylvie Retailleau, French Minister for Higher Education and Research, and Professor Norbert Ifrah, President of the Institute. Over 130 people attended the seminar. They included nationally elected officials, founding members of the *Cancéropôles* (Inserm, CNRS, CHU, CLCC, Universities, etc.). Key partners such as regional and local authorities and charities (Fondation ARC, Ligue contre cancer, etc.) were present. Structures involved in the economic development of research results, such as Technology Transfer Acceleration Societies (SATT), Inserm Transfert, CNRS valorisation, MATWIN, competitiveness clusters and private companies also took part in the event.

The seminar's highlights included 3 round-table discussions on the following topics:

- strategies to be developed to optimise the impact of *Cancéropôles'* structuring actions;
- the involvement of patients in the activities of *Cancéropôles*, and more generally in cancer research;
- the contribution of *Cancéropôles* to the creation of economic, social and human value in their regions.

**The Institute also released a brochure for this occasion, available for download on the cancer.fr website.**

### The *Canceropôles*: a central role in research at the regional level

A period of discussions with political leaders of local authorities highlighted local dynamics and the central role played by *Cancéropôles* in the research-structuring strategies they support. The different methods of interaction between stakeholders were presented, demonstrating the involvement of all those who have the ambitious objective of accelerating cancer research at a regional level.

Bruno Quesnel, Director of the Institute's Research and Innovation Division, and Thierry Breton, the Institute's Chief Executive Officer, concluded the seminar by emphasising the quality of the discussions, which had helped to identify new sources of leverage and actions to be implemented to improve the service provided to researchers, and to accelerate innovation for the benefit of patients.

## 2 Strengthening paediatric oncology structuring through Paediatric Research Centres of Excellence or PEDIACRIEX[5]

Paediatric cancers constitute a multitude of heterogeneous rare diseases. Their rarity considerably reduces the capacity of research endeavours to describe the mechanisms causing these cancers and to develop effective treatments. Efforts to structure and share expertise and data, as well as tumour samples, therefore represent key leverage for strengthening research potential at a national level. This is a focus of the Ten-Year Cancer Control Strategy aimed at taking action to reduce cancers in children, adolescents and young adults.

To help deploy and structure the scientific and medical community for the implementation of dedicated research programmes, the French National Cancer Institute has set up a competitive call for applications for the designation of integrated research centres of excellence in paediatric oncology. This call was made possible by the dedicated support of the Ministry of Higher Education and Research.

### PEDIACRIEX: Research Centres of Excellence in paediatric oncology

Three Research Centres of Excellence in paediatric oncology have been designated for a 5-year period for a total budget of 15 million (Figure 5):

- The **Paris Kids Cancer Centre**, which will bring together the major institutions in the Paris region: Assistance Publique-Hôpitaux de Paris, Gustave Roussy and Institut Curie, will implement an ambitious project aimed at understanding cancer cell resistance mechanisms and finding new therapeutic strategies. This centre is directed by Professor Olivier Delattre.
- The **EN-HOPE SMART4CBT Centre** will draw on existing strengths in Lille, Nancy and Strasbourg to conduct two research programmes focusing on radiotherapy resistance in paediatric brain tumours. This centre is led by Professor Natacha ENTZ-WERLE.

[5] A Ten-Year Cancer Control Strategy action.

- The **South-ROCK Centre**, created around a network in the cities of Lyon and Marseille, will study childhood and adolescent cancers from a developmental perspective, with two ambitions: to improve care at the time of treatment and during long-term follow-up, and to develop preventive approaches. Professor Patrick Mehlen is the director of this centre.

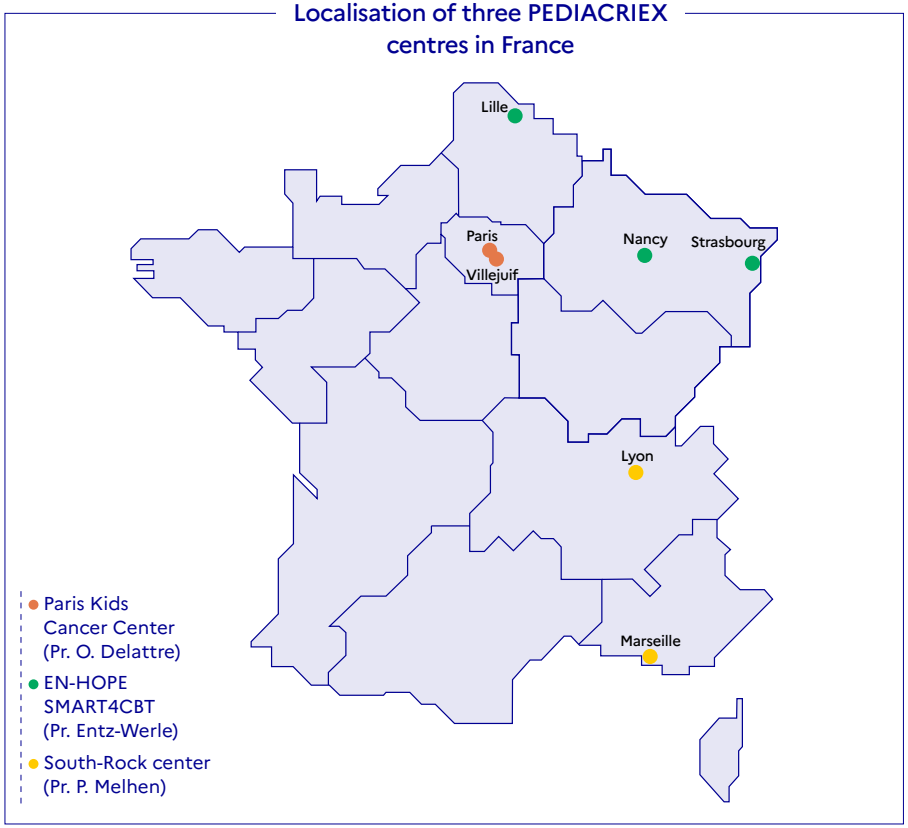
Misses Sylvie Retailleau and Mister Aurélien Rousseau, respectively Minister of Higher Education, Research and Innovation and Minister of Health and prevention personally announced the newly designated Pediacriex centres.

## Perspective for childhood cancer

This ambitious and far-reaching certification programme should enable the fight against childhood cancer to take a decisive step forward. In particular, it should create new operational conditions for translational research, to optimise and accelerate the production of new knowledge, and promote its dissemination and application in childhood cancer care.

The designated centres will have a three-fold mission of integration, structuring and development in order to achieve transferrable research excellence for the benefit of the 2,260 children and adolescents affected by cancer every year.

Figure 5
Localisation of three PEDIACRIEX centres in France



## 3 Structuring of research on CAR-T cells and other innovative gene therapies through the designation of a national cell therapy research network: UNITC

### CAR-T cells: an evolving immunotherapy strategy

In the field of cancer treatment, the search for ever more effective therapies is a relentless effort. CAR-T Cell (Chimeric Antigenic Receptor T Cell lymphocytes) therapy is an evolving immunotherapy strategy using the patient's own immune system to fight cancer, in which the patient's T lymphocytes are genetically modified to target and destroy cancer cells. France played an active role in the industry's clinical trials for CAR-T cells used in haematological cancer patients.

However, academic clinical development remains limited in France. In addition to having excellent structures and teams, the French CAR-T cell research field is striving to gain international recognition and to push academic CAR-T cell research through to clinical development. Organising a dynamic innovation programme is crucial for academic progress.

### UNITC: A national academic research network to support cell therapy innovation

The French National Cancer Institute has decided to support the structuring of research on CAR-T cells and other innovative gene therapies through the establishment of a national academic research network. A call for applications was launched for that purpose in 2023 with the ambition to propel scientific discoveries from the bench to the bedside.

The "national consortium on cell therapy research (UNITC)" was designated through this call for applications for a three-year period starting in 2024 and awarded funding of 300,000 Euro. This consortium includes the following five French structures of excellence: 1/ the French Society for Cancer Immunotherapy (FITC), 2/ the Carnot Institute Consortium for the acceleration of innovation and its transfer in the field of lymphoma (CALYM), 3/ the Carnot Institute Organisation for Partnerships in Leukaemia (OPALE), 4/ the DESCAR-T registry, a nationwide registry for patients treated with CAR-T Cells in France and 5/ the French Society of Immunology (SFI).

### Role of the UNITC network

The UNITC network will act as scientific facilitator without a requirement for research data production. Indeed, the designation and support provided by the programme is intended to:

- Promote multidisciplinary and transversal aspects of research into CAR-T cells and other innovative gene therapies in a complementary, coherent and integrated manner;
- Encourage grouping of and collaboration between existing groups at a national level;
- Boost academic capabilities in terms of innovation, design and management of projects in fundamental, translational and clinical research;
- Improve the international profile and attractiveness of French research into CAR-T cells;
- Develop European and international cooperation in the field.

Developing a strong network dedicated to advancing cancer cell therapy is not just a scientific or clinical mission. By fostering collaboration, accelerating innovation and expanding access to cutting-edge treatments, such a network holds the key to opening up new perspectives in the fight against cancer.

Through this structuring programme, the Institute is expanding its commitment to CAR-T and cutting-edge therapies. This initiative encourages the emergence of advances in this field, and will reinforce the position of academic research in this area, making potential discoveries more readily accessible to all.

## PERSPECTIVES ON CANCER RESEARCH ACTIONS

# Optimized treatments for cancer patients

**Caroline Dreuillet**
Head of the Clinical Research Department

2023's achievements in clinical research underscore our commitment to pioneering cancer research and treatment. By fostering innovative therapies, expanding clinical trial access, and updating research frameworks, the Clinical Research team continues to lead efforts in improving cancer care and patient outcomes.

In particular, the AcSé programme was revitalised in 2023 to provide secure access to innovative targeted therapies. The updated programme incorporates flexible trial designs and a revised charter to meet current regulatory standards. In 2023, two new trials were launched: Pan-MSI-AcSé, focusing on dostarlimab for MSI/dMMR cancers, and AcSé FGFR, testing pemigatinib for cancers with FGFR gene anomalies. These trials, backed by strategic committee guidance, should extend the benefits of cutting-edge therapies to a broader patient population.

The UNITC network was established to bolster research in CAR-T cell and innovative gene therapies. This national consortium unites five French structures of excellence. The programme aims to enhance the academic capabilities and global profile of French research in this cutting-edge field, setting the stage for future breakthroughs.

## 4 Supporting the opening of investigator centres in French overseas territories (DROMs) to promote access to clinical trials for French overseas cancer patients

The remoteness of French overseas territories (DROMs), the higher costs of implementation, the logistical issues sometimes encountered, and a lack of information regarding the capacity of care providers to support them, are major factors that do little to encourage clinical trial sponsors to include overseas-located investigator centres in their research projects.

Promoting access to clinical trials for French overseas patients has been made one of the French 2021-2030 Cancer Control Strategy objectives under the action: "Offering all patients the possibility to take part in clinical trials, opening up trials to more centres including those in overseas territories, while ensuring the quality of these centres for clinical research" (action n° III-5.2).

With this aim, INCa has provided additional funding to clinical research projects already selected and funded by PHRC-K, the Institute's clinical research funding programme, to open investigator centres in French overseas territories. Projects suitable for the opening of these additional investigation centres were identified by INCa and the Interregional Group for Clinical Research and Innovation for Southwest and Overseas Hospitals (GIRCI SOHO) in 2 pilot programme rounds, the first round in 2019 and the second in 2023.

### 2019: 7 projects funded for overseas patient enrolment in clinical trials

In 2019, 7 projects were proposed for total funding of around €300,000, with the aim of enabling the enrolment of 104 patients in clinical cancer trials in French overseas departments (University Hospital of Martinique, University Hospital of Guadeloupe, University Hospital of La Réunion and Sainte Clotilde Clinic in Reunion) (Table 10 in Appendix). Despite the low number of inclusions and the problems encountered such as delays obtaining regulatory authorisations, signing agreements, reported product supply issues during the COVID period and human resources issues, the overall assessment of the 7 projects funded in 2019 is positive. Indeed, French overseas patients have been able to access 5 trials in Martinique and La Réunion and to benefit from innovative treatments in their territories. In addition, links have been established and developed between medical investigators in French overseas territories and those in mainland France, making it possible to include French overseas investigator centres henceforth in clinical research projects applying for funding programmes such as PHRC-K. A real dynamic has been created thanks to this support from the Institute, with a view to encouraging future cooperation in the field of clinical cancer research in these regions.

### 2023: Lessons learned and funding of 10 additional projects

In 2023, learning from the issues encountered in 2019, a slightly different methodology was developed: indeed, the volunteering centres in French overseas departments were involved more directly and more actively by collecting information on their interest in specific clinical trial protocols open in mainland France, to work on proposals with a reasonable number of patients to be included, an inclusion period for the trial and an estimate of the additional costs in French overseas territories. For this 2023 round, 10 projects were proposed for total funding of around €330,000 for 1 to 5 years, to enable 190 patients to be enrolled in clinical cancer trials in French overseas departments. The targeted diseases were thyroid cancer, prostate cancer, oropharyngeal cancer, myeloproliferative neoplasia, vertebral metastases, cerebral lymphoma and acute promyelocytic leukaemia (Table 1).

As at December 2023, 6 patients had already been included at the University Hospital of Martinique and the University Hospital of La Réunion. Further inclusions are planned in 2024.

Table 1: Features of the 10 clinical research projects supported in 2023 in French overseas departments and enrolment status in December 2023

| Projects | Funding | Duration of the project | Investigation centres | Number of patients to be enrolled | Number of inclusions December 2023 |
|---|---|---|---|---|---|
| **PEACE 4**<br>A phase III trial of Aspirin and Metformin in patients with castrate-resistant prostate cancer | €49,772 | 60 months | CHU de Martinique | 50 | Currently recruiting |
| **PRESTO**<br>GETUG-AFU trial – Phase III randomized controlled trial of local ablative treatment of metastases in patients with oligometastatic hormone-naive prostate cancer | €27,545 | 60 months | CHU de Martinique | 30 | 3 |
| **ZOSTER**<br>Multicentre Medical-economic Study Evaluating the Efficacy of Adding ZOlédronique Acid to STERéotaxique Radiotherapy in the Treatment of Vertebral Metastases | €13,451 | 60 months | CHU de Martinique | 15 | Currently recruiting |
| **AVAJAK**<br>Apixaban/rivaroxaban versus Aspirin for primary prevention of thrombo-embolic complications in JAK2V617F-positive myeloproliferative neoplasms | €50,289 | 60 months | CHU de La Réunion | 54 | Currently recruiting |
| **CARLHA-2**<br>Combined Apalutamide, Radiotherapy, and LHRH Agonist in Prostate Cancer Patients After Prostatectomy | €17,172 | 60 months | CHU de Martinique | 12 | 1 |
| **GETUG-AFU-31**<br>Phase I/II multi-center study evaluating the efficacy of repeat stereotactic radiation in patients with intraprostatic tumour recurrence after external radiation therapy | €33,650 | 60 months | CHU de La Réunion | 5 | 1 |
| | | | CHU de Martinique | 2 | 1 |
| **INTERMEDIATE-01**<br>Multicentric phase III trial comparing two strategies in intermediate-risk differentiated thyroid cancer patients: Systematic radioiodine administration (3.7 GBq I131 after rhTSH) versus decision of radioiodine treatment guided by a post-operative work-up based on serum Tg values and diagnostic RAI scintigraphy | €17,472 | 60 months | CHU de la Guadeloupe | 15 | Currently recruiting |
| **TORPHYNX01**<br>Prospective observational cohort study of early-stage squamous cell carcinoma of oropharynx treated by primary intensity-modulated radiation therapy or transoral surgery | €4,348 | 12 months | CHU de la Guadeloupe | 10 | Currently recruiting |
| **LOC R01**<br>Randomized Phase IB/II study of escalating doses of Lenalidomide and Ibrutinib in association with R-MPV as a targeted induction treatment for patients aged 18 to 60 with a newly diagnosed primary central nervous system lymphoma. | €38,997 | 60 months | CHU de La Réunion | 2 | Currently recruiting |
| **ICC-APL-STUDY 02**<br>Treatment study for children and adolescents with Acute Promyelocytic Leukaemia: A multicentre study combining arsenic trioxide (ATO) and all-trans retinoic acid (ATRA) +/-Gemtuzumab Ozogamicin for patients with newly diagnosed acute promyelocytic leukaemia | €80,186 | 60 months | CHU de La Réunion | 4 | Currently recruiting |

## 5 "Obesities and cancer" PAIR Programme to inform a personalised prevention approach[6]

Understanding the complexity of cancer arising from the interplay of various factors, such as genetic, environmental and behaviour/lifestyle, necessitates an integrated and holistic research approach that combines expertise from various fields in order to improve prevention, diagnosis and treatment.

### PAIR programme for multidisciplinary research projects focusing on one type of cancer

To promote cooperation between all scientific disciplines including basic, translational, clinical research and epidemiology, public health and human & social sciences, around core cancer projects and accelerate knowledge transfer to clinical practice, in 2007, the French National Cancer Institute launched a recurring comprehensive Integrated Research Action Programme (PAIR) dedicated to a specific type of cancer for each new edition. The programme has been run by the Institute in partnership with the charities ARC Foundation for Cancer Research and *Ligue contre le cancer* (French charity dedicated cancer fighting) since 2009. A major objective of this programme is to promote, through the design and implementation of scientific projects, the federation of French research teams having an original perspective on research questions at the interface of several disciplines.

Twelve PAIR programme rounds have been run to date, leading to the funding of 92 cancer research projects for a total amount of 55.77 million euros.

### "Obesities and cancer" PAIR programme to address a priority of the Ten-Year Cancer Control Strategy: focusing research to develop a more personalised prevention approach

To address one of the priorities of the Ten-Year Cancer Control Strategy, the Institute and *Ligue contre le cancer* renewed their partnership to support, develop and co-fund the "Obesities and cancer" PAIR programme. The interaction between different disciplines allowed by the programme should improve knowledge, prevention and care for obese or overweight people with or without cancer. A dedicated Steering Committee was set up to define the scientific research priorities around the theme. Chaired by Doctor Mathilde TOUVIER, Director of the Nutritional Epidemiology Research Team in Paris and Doctor Marc BILLAUD, CNRS Research Director at the Cancer Research Centre of Lyon (CRCL), this committee is composed of renowned experts in fundamental and translational research, clinical research, nutrition, surgery and epidemiology. The Steering Committee has been split into 2 subgroups to work on 2 areas of the research priorities, to help the Institute draft the most relevant call for proposals:

- Area 1: Obesity, cancer and primary prevention: links, risk factors and mechanisms;
- Area 2: Obesity during and after cancer: impact on prognosis, treatment modulation and mechanisms.

A workshop was organised to present the work of the steering committee and announce the call for proposals to the entire scientific community before the launch of the call for proposals.

**Of the 17 projects submitted, 4 were selected for funding totalling 4.3 million euro. The 4 funded projects involve 21 research teams with the objective to:**

- Investigate the connection between obesity and luminal breast cancer (LBC) prognosis;
- Elucidate the genomic effects of obesity in breast cancer (closer look at low- and middle-income countries);
- Better understand the continuum between obesity, NAFLD (non-alcoholic fatty liver disease) and hepatocellular carcinoma development as well as the pathophysiological and molecular mechanisms linking these clinical conditions,
- Explore the role of obesity-related metabolic disturbances during colorectal cancer progression.

**For more information on the PAIR programme, please refer to the 2007–2023 report, section 2.2.**

[6] A Ten-Year Cancer Control Strategy action.

# 6 Supporting Cancer research on an unprecedented scale through partnership with the Cancer Grand Challenges initiative

## Uniting forces against Cancer's biggest challenges

To solve cancer's toughest challenges that are still standing in our way, forces need to be united across all borders: national borders, scientific discipline borders, cultural borders, to build the necessary funding power and unite the best diverse and creative minds to examine and address the cancer problem globally and relevantly.

## Cancer Grand Challenges a global scale initiative

With this ambition in mind, the French National Cancer Institute has partnered with Cancer Research UK through Cancer Grand Challenges, a unique international cancer research funding programme co-founded by Cancer Research UK (CRUK) and the US National Cancer Institute (NCI). It has the ambition of bringing together the world's brightest minds to tackle the major questions in cancer science by providing funding on an unprecedented scale. In addition to NCI and CRUK, partners from five different countries contribute to funding programme awardees.

To date, Cancer Grand Challenges has funded 16 interdisciplinary projects (including biology, physics, and epidemiology), led by 16 international consortia involving 1,200 investigators and collaborators from 16 different teams across 12 countries for a total funding of 400 million dollars (up to 25 million dollars per project). So far, 13 major challenges of cancer science are being addressed by these projects.

Cancer Grand Challenges is a cancer research call for proposals open to consortia of teams from any country or discipline. The call is implemented through the running of an international consultation of the public, people affected by cancer and scientists to help identify the problems hindering progress in the fight against cancer and to set the challenges. The consortia apply with projects addressing the chosen challenges. The selection of the winning consortia, 4 to 5 per edition, is overseen by the Cancer Grand Challenges Scientific Committee, which is composed of prominent scientists whose work has transformed our understanding of cancers and the healthcare provided to cancer patients. The awarded projects receive funding of up to 25 million dollars over five years.

## The Institute's partnership in the 2023 Cancer Grand Challenges edition

The 2023 challenges edition, which marks the Institute's first participation in Cancer Grand Challenges, has funded a total of five projects for a total budget of 125 million dollars. The Institute focuses its support on two of the teams:

- **The KOODAC project** aims to develop therapeutic solutions for paediatric solid tumours by targeting driver oncogenes, considered undruggable until now. They will harness PROTACs and Molecular Glue Degrader technology to propose orally bioavailable drug candidates. Olivier Delattre, French researcher and expert on Ewing Sarcoma is a co-investigator in the project.
- **The PROSPECT project's** goal is to address the global rise in the incidence of early-onset colorectal cancer (EOCRC). Through multidisciplinary approaches spanning from epidemiology to genomics and immunology, the aim is to understand the risk factors, the molecules and the biological pathways involved in EOCRC development in order to prevent EOCRC. Yasmine Belkaid, French researcher and world-renowned immunologist is a co-investigator of the project.

The three other teams funded by the 2023 edition are:

- **The MATCHMAKERS project's** ambition is to predict what immune T cells recognise in a patient's tumour, using a simple laboratory test and computational prediction. For this, they will develop novel methods and new algorithms, and create large, integrated datasets of TCRs and pMHCs.
- **The SAMBAI project's** aim is to determine the factors that cause and influence disparate cancer outcomes in diverse populations of African descent. To achieve this goal, the team will generate a comprehensive database with measurements of social, environmental, genetic and immunological factors. They will build a Biobank and Data Repository for Cancer Equity Research focused on three cancer types: breast, prostate and pancreatic.

- **The PROTECT** team will develop therapeutic drug candidates for paediatric solid tumours. They will use protein degradation, molecular glue and PROTAC strategies, as well as other all molecule-based approaches, to target undrugged selective targets.

This major partnership strengthens the Institute's international actions and addresses the French Ten-Year Cancer Control Plan priority to broaden our knowledge and promote innovation within all fields of research.

By joining the initiative, the Institute also aims to encourage the French research community to join forces.

## 7 Cancer Barometer: Monitoring and understanding public perceptions of cancer and its risk factors

Despite advances in prevention strategies, it is still estimated that about half of cancers are attributable to avoidable risk factors. The public perception of risk factors and of cancer directly impact behaviours. It is therefore paramount to assess these perceptions in order to support and evaluate cancer control policies to adapt our strategy for Prevention and the fight against inequalities that are central to France's Ten-Year Cancer Control Plan.

### The Cancer Barometer, an instrument to capture public perceptions of risk factors

The Cancer Barometers represent the sole instrument in France designed to capture the population's beliefs, perceptions, knowledge, opinions, and behaviours regarding cancer and its risk factors. It is a recurrent telephone survey conducted approximately every 5 years since 2005.

The 2021 edition of the Barometer was published in 2023 and was managed by the Institute in collaboration with *Santé publique France*. Employing a methodological approach using Computer-Assisted Telephone Interviewing (CATI), the Cancer Barometer surveys a random sample of the French population, totalling 4,938 individuals aged 15 to 85 years in 2021. The survey explores general awareness and information levels about cancer, perceptions of risk factors, attitudes towards prevention and screening, and behavioural data regarding smoking, alcohol consumption, diet, and UV exposure.
Each iteration of the survey follows a consistent methodology to ensure comparability over time, allowing for the effective monitoring of trends on over one hundred items.

The data collected is vital for tailoring interventions to specific community needs and to devise public health strategies. The Cancer Barometer also provides a valuable resource for researchers, offering opportunities for new research questions and deeper analyses in prevention.

## What the Cancer Barometer tells us about the public beliefs

The 2021 Barometer revealed encouraging shifts in the perception of cancer in France:

- Cancer is perceived as a serious illness, but nearly all French people (92.5%) believe that it is possible to recover from cancer, showing an increase compared to 2015. Moreover, almost three-quarters of the population (71.2%) believe that it is possible to take action against cancer, a slight increase compared to previous years. Additionally, the proportion of people afraid being affected by cancer has decreased slightly since 2015 (from 70.8% to 67.7%).
- The perception of the risks associated with tobacco, the leading risk factor for cancer, is good: in 2021, over 8 out of 10 people stated that smoking tobacco certainly causes cancer, an increase compared to 2015. However, although they are declining, socio-economic differences are still present: those with lower levels of education are less likely to perceive the risk of tobacco-related cancer.
- While alcohol consumption, the second preventable risk factor for cancer after tobacco, has stabilised in recent years, it remains high in France. Daily consumption, however, is decreasing: 8% of 15-85-year-olds in 2021, representing slightly less than half the level in 2005. French people increasingly consider alcohol consumption as a risk factor for cancer: 91.9% compared to 78.4% in 2015. Nevertheless, respondents still underestimate the link between alcohol and cancer, positioning alcohol as the third main cause of cancer, after tobacco and diet.
- Awareness of the relationship between diet and cancer is growing, with diet being the second factor spontaneously mentioned. Perception of risky foods (processed meats, red meat) or protective foods (fruits and vegetables) has also improved significantly since 2010.
- While there is improvement in public awareness of the main risk factors for cancer, the importance of certain scientifically proven risk factors is underestimated, notably lack of physical activity, sun exposure without protection, overweight, and even obesity, which are spontaneously mentioned as risk factors by less than 3% of participants.

## First results regarding e-cigarette beliefs among the public

For the first time in 2021, the Barometer included a section on e-cigarettes, and some notable results show that:

- France has one of the highest levels of use in Europe with 7.5% current e-cigarette users;
- 9 out of 10 regular users of e-cigarettes are motivated by tobacco cessation or reduction, 7 out of 10 people consider e-cigarettes as harmful products, and a majority of young people between 15-24 years have already tried e-cigarettes (53%);
- 8 out of 10 people believe e-cigarettes can cause cancer.

## Dissemination of Cancer Barometer results

Some of these results were presented at the ALBATROS Congress in Paris, along with a cross-country comparison between the U.S. and France related to tobacco, alcohol and e-cigarette use, and at EHPS in Bremen. In 2023, these results were disseminated in international scientific conferences including SRNT (San Antoni), ECToH (in Madrid), and SRNT-E (in London), by the Institute's Human & Social Sciences, Epidemiology and Public Health Department.

The next edition, in 2025, will mark the 20th anniversary of the Cancer Barometer, continuing a series of indicators that are particularly valuable for cancer control policies.

**The 2021 Cancer Barometer and its summary are available for download on the cancer.fr website.**

## PERSPECTIVES ON CANCER RESEARCH ACTIONS

# Search results: enhanced dissemination

**Jérôme Foucaud**
Head of the Human and Social Sciences- Epidemiology and Public Health Department

Research in human and social sciences, epidemiology, and public health (HSS-E-PH) is carried out across the four priority areas of the Ten-Year Cancer Control Strategy. It aims to improve knowledge through a cross-disciplinary approach supported by innovative, open, and thematic research initiatives. A major challenge for this research is effectively disseminating the evidence and knowledge generated.

In 2023, around ten scientific events – involving nearly 1,000 participants – were organised to disseminate findings from the 2021 "Cancer Barometer", addictions, population health intervention research (PHIR), health economics, and health promotion in schools. Additionally, a publication on implementation science was produced, with two more currently in progress for dissemination in 2024–2025 (PHIR, health promotion in schools).

Developed with a health democracy approach, these events and publications are systematically developed in collaboration with researchers and stakeholders. They aim to stimulate research, energise the scientific community, and promote knowledge.

In 2024, we will continue this commitment by organising the conference "End-of-life Care in the Field of Cancer: Contributions of Research in Human and Social Sciences, Public Health, and PHIR." Similarly, several days will be devoted to primary prevention research and drugs.

## 8 Structuring research into social inequalities associated with smoking and ways to prevent it through the Tobacco Chair

### Smoking and social inequalities

While the prevalence of smoking in the general population has fallen sharply in recent years, the prevalence of daily smoking among adults with lower incomes has risen from 30% in 2019 to 33.6% in 2022, a 12-point difference compared with the higher income group[7] (Figure 6). The same observation applies to the adolescent population: while the number of adolescents who start smoking has fallen sharply, there are still major differences depending on their educational status, with the prevalence of daily smoking among 17-year-olds rising from 10.1% among general and technological high school students to 38.4% among apprentices and 43.5% among school leavers[8].

As tobacco is the leading preventable cause of cancer, the Ten-Year National Control Cancer Strategy places great emphasis on tobacco control and combatting inequalities[9]. The Institute's long-standing involvement in this matter is illustrated by the deployment of smoking prevention programmes and support for the development of research on the subject.

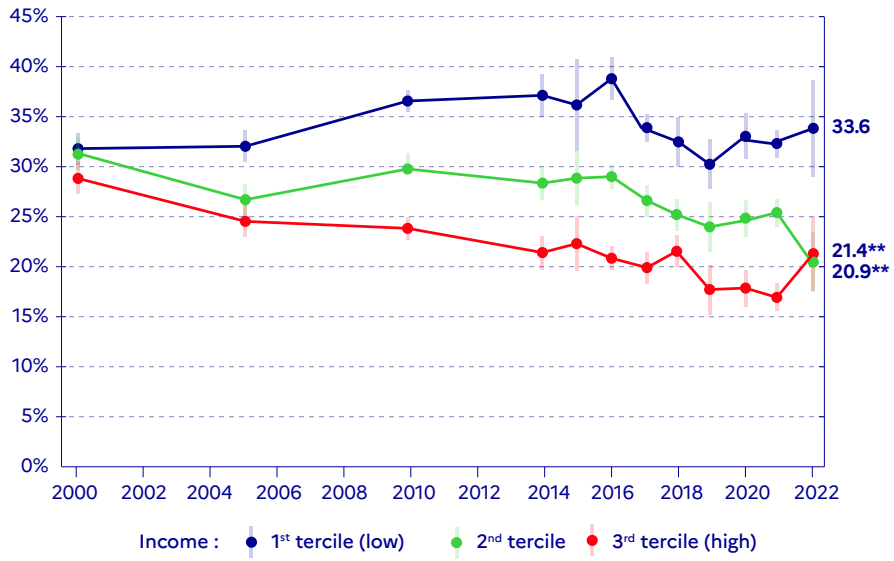
### Funding of a Chair "Tobacco and Cancer Prevention"

To support the development of research into questions that have not yet been fully answered, such as the reduction of inequalities associated with smoking and their determinants, hard-to-reach populations and the contribution of intervention research to the modelling of prevention programmes, a Research Chair dedicated to "Tobacco and Cancer Prevention" in Human Social & Sciences and Public Health was created in 2022. Maria Melchior, the chairholder will receive 750,000 euros over five years to fund her research. Her inaugural lecture was held on 21 December in the presence of Professor Norbert Ifrah, President of INCa.

Maria Melchior is Director of Research at the French National Institute for Health and Medical Research (INSERM) and holder of the "Tobacco and Cancer Prevention" Chair entitled "Social inequalities with regard to tobacco use: from observation to action". The programme of this Chair is made up of 3 main areas: scientific, educational and strategic. Through complementary research approaches, combining descriptive studies,

Figure 6

**Prevalence of daily smoking according to income age 18-75 years old (blue: low income, pink: high income)**




The asterisks (*) denote a significant change between 2021 and 2022: ** p<0.01.

Source: adapted from Pasquereau A. *et al*, Bull Épidémiol Hebd. 2023 ; (9-10) : 152-8

[7] Bulletin épidémiologique hebdomadaire, n° 9-10 Journée mondiale sans tabac. 31 May 2023. Santé Publique France.

[8] Tendance n° 155. Les drogues à 17 ans, analyse de l'enquête ESCAPAD 2022. March 2023. OFDT.

[9] Area 1 aims to improve prevention and calls for general mobilisation to put an end to tobacco use; Area 4 aims to ensure that everyone benefits from progress, by encouraging a pragmatic approach tailored to different populations.

## POINT INFO INCA AND NATIONAL TOBACCO CONTROL POLICIES

Created within the French National Health Insurance Fund, the Addiction Fund (FLCA) – formerly the Tobacco Fund – provides funding for initiatives that meet government priorities in the fight against addictions. The FLCA provides INCa with annual funding to support applied research and the evaluation of addiction prevention and care initiatives. Since 2014, INCa has also been involved in the National Tobacco Control Programme (PNLT) and its renewal as provided for in the Ten-Year National Cancer Control Strategy (Area 1-3.5).

cohort studies and intervention research, the research aims to meet the following objectives:

- monitoring socio-economic inequalities with regard to tobacco use;
- analysing mechanisms of socioeconomic inequalities;
- assessing the impact of policies/contexts on socio-economic inequalities with regard to tobacco use;
- and evaluating interventions designed to reduce socio-economic inequalities with regard to tobacco use.

At the same time, this Chair will contribute to the dissemination of conceptual frameworks and evidence-based research findings, as well as training in interdisciplinary and innovative quantitative and qualitative approaches. Finally, this Chair aims to encourage the next generation of tobacco researchers.

### Inaugural lecture by Maria Melchior, the chairholder

The inaugural lecture was an opportunity to give a more detailed presentation of current and future research projects. They include, among others, the TORECAMMI project, which aims to describe tobacco-related cancer mortality among immigrants; the ESPRIT project, which aims to study the impact of maternal smoking during pregnancy on children's reactivity to stress; and the TAPREOSI project, which aims to evaluate the implementation of a tool to help people living in shelters to stop smoking.

**The playback of the inaugural lecture can be found on the Inserm website (in French only):**
**pod.inserm.fr/chaire-tabac**

# 9 Transforming the use and sharing of oncology health data for research with OSIRIS, the data standardisation and interoperability project

## Data interoperability to enable the leveraging of health data

Artificial intelligence (AI) is at the forefront of current discussions in the healthcare field, yet many AI projects still fail primarily due to the quality and availability of medical data. Another layer of complexity is added by health data that cannot be used without transformation, originating from multiple sources and available in various formats with highly heterogeneous quality. One of the major solutions to address this issue is data interoperability, which can be broken down to four levels: fundamental interoperability that relates to technical and secure communication between different information systems, structural interoperability which deals with standardised health formats and terminologies, semantic interoperability associated with the use of common data models and standardised medical variables and organisational interoperability which addresses governance or rights for transparent communication.

## OSIRIS data model: a project dealing with oncology data interoperability

The Inter-SIRIC Group for the Sharing and Integration of Clinico-Biological Data in Oncology (OSIRIS) common data model project deals with semantic interoperability of oncology data. It was initiated by the French National Cancer Institute in 2017 with three specific objectives:

- Conceptualisation of cancer through a conceptual data scheme;
- Standardisation of data according to international standards and terminologies;
- Interoperability between hospital information systems.

The overall ambition is to move data from local use to multicentric projects, facilitating collaboration between various cancer centres (CLCCs), university hospital centres (CHUs), consortia, academic and industrial stakeholders, and also ensure matching with other databases such as the National Health Data System.

## OSIRIS data model adoption in the fields of oncology and health data

The OSIRIS project has enabled the selection of 130 clinical and genomic variables capable of representing the evolution of cancer over time. The MED-OSIRIS project that followed in 2021, supported by the Institute, aimed to include radiomic and radiotherapy data concepts through 120 new medical variables. This second phase of the project holds the objective of deploying the model and aligning it with the international FHIR standard to facilitate electronic health data exchange between multiple hospital facilities.

### 2023: THE INSTITUTE TAKES THE LEAD OF THE OSIRIS PROJECT

Since 2023, the Institute has been leading the OSIRIS project, with four strategic focuses:

- Maintaining the OSIRIS conceptual data model in alignment with international standards.
- Disseminating the model across France by engaging the OSIRIS community via web interfaces and IT tools.
- Expanding the data model to include, for example, real-life data from electronic medical records.
- Measuring the impact of using the OSIRIS model through scientific use cases and technical projects.

The OSIRIS data model is now being gradually adopted through medical proof-of-concept projects and national or European projects including the "HL7 Europe" project. Several software vendors also wish to integrate OSIRIS into their solutions. Additionally, the project is cited in various scientific publications and has been presented at European conferences, underscoring its importance in the fields of oncology and health data.

The OSIRIS project is striving to transform the use of health data in oncology to optimise its exploitation and facilitate multicentric collaborations to stimulate innovation as well as scientific and clinical research.

## 10 Supporting somatic genetic testing structuring to ensure the best personalised medical care for cancer patients

### Molecular diagnosis for cancer patients

To ensure equal access to molecular diagnosis for cancer patients, the French National Cancer Institute has supported the structuring of "Molecular genetics centres" which perform somatic genetic testing of cancers: 28 centres all over France have been supported since 2006. To help the centres cope with the growing number of analyses required, the Institute has supported, since 2013, the development of targeted high-throughput sequencing (NGS) for diagnosis, prognosis, therapeutic decisions and follow-up purposes. As a result, NGS, on both DNA and RNA, is now rolled out in all the centres.

Despite these developments, the centres and healthcare professionals are facing an increasing number of challenges that the Institute is striving to help overcome:

- The number of patients treated for cancer each year is increasing (if only due to the growth in the elderly population),
- The chronicity of the disease, increasing the number of lines of treatment,
- The increase in biomarker-guided therapies,
- The identification of new biomarkers.

### Rapid evolution of the cancer somatic testing landscape

Because the landscape of molecular somatic testing in cancer is becoming increasingly complex, healthcare professionals require guidance in their practice to ensure the best possible care for patients in France. To that end, the Institute has set up working groups with pathologists, molecular geneticists and clinicians to produce recommendations for the prescription of somatic tests for cancer. The aim is to list all the different stages of the disease and to recommend which test should be carried out at which stage

to ensure the best diagnosis or treatment for each patient. Recommendations for lung cancer and melanoma testing were published in 2023 while colon cancer recommendations were published in 2022.

All this effort should translate in continuously improving personalised medicine, providing tools for best diagnosis and biomarker-guided treatment of malignancies.

## 11 Bringing together oncogenetics[10] stakeholders around the national scheme for the diagnostic and follow-up of people with a very high cancer risk

In France, the diagnosis of hereditary predispositions to cancer is carried out within the framework of the "National oncogenetics scheme". This scheme aims to identify all people with a hereditary cancer risk, in order to guarantee personalised and multidisciplinary follow-up for them.

The scheme is organised around 146 consultation location sites in 101 cities throughout France (mainland and overseas territories). These sites work in close collaboration with 26 academic laboratories, historically supported by the Institute, in charge of carrying out genetic tests prescribed during consultations. To complete this scheme, 17 regional and interregional programmes have been set up to coordinate and facilitate the follow-up of people with a very high cancer risk, once families have been identified.

### Meeting of national stakeholders around the management of people with a cancer risk

The French National Cancer Institute organised a national seminar on the "National oncogenetics programme" on 19 June 2023, accessible in-person or remotely. It included nearly 130 participants. This seminar provided an opportunity to present and discuss with stakeholders the inventory and the evaluation of oncogenetic consultations and the follow-up programmes for people with a high cancer risk (conclusions presented in the 2022 scientific report). Professionals from oncogenetic consultations, patient follow-up programmes and laboratories, as well as some external institutional representatives from *DGOS* (French Directorate-General of Care Provision), *Agence régionale de santé* (Regional Health Agency) and *Agence de Biomedicine* (Biomedicine Agency) were present.

[10] Medical speciality that studies constitutional mutations for the diagnosis of hereditary predispositions to cancer.

The seminar also included sessions on new strategies for supporting high-risk patients, on the evolving missions of genetic counsellors and on the impact of the 2021 bioethics law revision on care pathways in medical genetics.

Lastly, a final session was devoted to the various oncogenetic management pathways in the context of PARP-inhibitor treatments and indirect access to oncogenetics, for instance when constitutional mutation (suspected hereditary predisposition) is first identified through somatic tumour testing.

## Perspective: production of organisational guidelines for the oncogenetic healthcare system

The feedback from professionals at the seminar, as well as the discussions that followed, will serve as a basis for the production of organisational guidelines for oncogenetic healthcare: a health expertise is planned for 2024 within the "Organisation and Healthcare Pathways" of the Institute's Care division, one of the several projects designed to meet the objectives of Action II-3.3 of the 2021-2030 Ten-Year Cancer Control Strategy (*Making precision medicine accessible to all and promoting informed consent*) and address identified needs.

After being managed in the Institute's Research and Innovation Division within the Precision medicine initiatives the "National oncogenetics programme" has made it possible to provide a solution for the care of patients routinely used in clinical practice. Within the Institute, the vast majority of projects dedicated to oncogenetics are no longer part of the Research strategy, but are now part of the Institute's healthcare strategy elaboration.

## PERSPECTIVES ON CANCER RESEARCH ACTIONS

# Is it still possible to transfer research findings to patient care?

**Sophie Le Ricousse,**
Head of the Basic and Translational Sciences Department

Even though basic research questions still mostly target the biological mechanisms of cell transformation and disease progression, 34% of the projects funded under the PLBIO call for proposals aim to study the molecular mechanisms of response or resistance to treatments or to identify new therapeutic targets (see PLBIO 2023 data, part 1.1. and part 1.5. ). They also aim to identify new therapeutic targets. The potential for clinical application is now increasingly considered or questioned while evaluating these projects, leading us to consult committee members about basic and translational research definitions. Concepts such as priority objectives, the timeline for clinical application, or the models used have sometimes been mentioned and considered differently by various stakeholders, challenging the "boundaries" between these two fields, which can be defined by the TRL (Technology Readiness Level) scale.

Under the 2023 PRT-K call for proposals, 16 projects were selected despite a reduced budget compared with 2022. More than 85% of projects have the primary or secondary objective of discovering or developing new biomarkers, and 50% of projects also aim to discover or develop new treatments.

In France, 28 molecular genetics platforms are responsible for performing pathology tests, cytogenetic analyses, and molecular genetic tests for all cancer patients in the country, regardless of where they are treated. These tests should help stratify cancers, provide a diagnosis or prognosis, assist in the treatment choice, or monitor the disease. Currently, 73 innovative tests are under development (survey conducted among platform managers; data from 2022). The question of their validation and use in routine clinical practice ensues, considering the financial, technical, and training challenges faced by staff.

The ability to now analyse gene expression and the transcriptome at the single-cell level over

time and space, for example, in comparison to a healthy state or before and after treatment, and to associate/integrate all the generated data for developing predictive algorithms offers new approaches to personalised care. Again, the necessary validation of the results (robustness of the results, compliance with regulatory requirements, etc.) requires ever-increasing financial resources, which are currently insufficient.

Some of the questions raised will thus provide answers to clinical observations or for developing and validating new biological tests, therapeutic decision-making tools, monitoring response tools, treatment optimisation, etc. The sensitivity and specificity of techniques and the computing power now available allow for specific and rapid responses.

Integrating these innovations into routine clinical practice remains a major challenge to help ensure equitable access to innovative care and should remain a priority objective.

# LIST OF 2023 FUNDING PROGRAMMES

Table 2: List of INCa's 2023 funding programmes (INCa, DGOS, *Ligue contre le cancer, Fondation ARC pour la recherche sur le cancer, Fonds Addictions*)

| INCa programmes 2023 | Objectives/Goals | Ten-Year Cancer Control Strategy (Action Numbering) | Funding | |
|---|---|---|---|---|
| | | | Amount | Number of Projects |
| AcSé | Clinical evaluation of targeted therapies in patients with therapeutic failure whose tumours present molecular alterations targeted by drugs not yet approved for market authorisation for the indication. | Yes (III-5.1) | €1,953,650 | 2 |
| Cancer Grand Challenges | International funding programme co-founded by CRUK and the NCI to support international and interdisciplinary teams addressing the most challenging cancer-related issues. | Yes (IV-1.1) | €10,000,000 | 2 |
| DOCSHS | Promotes research by young talents in human and social sciences, public health, and epidemiology applied to cancer control. | No | €846,033 | 6 |
| DROM | Facilitates access to clinical trials for French overseas patients with cancer by supporting the opening of investigator centres in French overseas territories (DROM). | Yes (III-5.2) | €332,882 | 10 |
| HAP PHRC | Enables the completion of the BIG-1 clinical trial. | No | €300,000 | 1 |
| Interpedia | Supports the emergence of ambitious interdisciplinary research projects in paediatric oncology. | No | €1,051,812 | 2 |
| Mi-Amgen | Supports early-phase clinical trials evaluating innovative molecules from pharmaceutical laboratories for indications not yet developed by them. | Yes (III-5.1) | €3,531,509 | 3 |
| PAIROBC | Promotes cooperation among all scientific disciplines to improve knowledge, prevention, and care for obese or overweight individuals, whether or not they have cancer, and to accelerate knowledge transfer to clinical practice. | Yes (I-1.4) | €4,339,775 | 4 |
| PEDIACRIEX | Strengthens paediatric oncology structuring through labelling integrated research centres of excellence in paediatric oncology. | Yes (V-2.12) | €14,988,600 | 3 |
| PEDIAMOB | Strengthens research attractiveness on paediatric cancers for young scientists by funding doctoral and postdoctoral theses and enabling international mobility for master's students, doctoral candidates, postdocs, and permanent staff. | No | €252,590 | 2 |
| PHRC-K | Supports national academic clinical research on cancers. | No | €27,102,191 | 33 |

| INCa programmes 2023 | Objectives/Goals | Ten-Year Cancer Control Strategy (Action Numbering) | Funding | |
|---|---|---|---|---|
| | | | Amount | Number of Projects |
| PLBIO | Support fundamental science research projects to improve our understanding of cancer biology. | No | €33,017,148 | 52 |
| PRT-K | Encourage the development of interdisciplinary projects involving researchers and clinicians to support translational research and accelerate the transfer of scientific and medical knowledge to clinical practice. | No | €9,286,843 | 16 |
| CAR-T Network | Unite French academic research to promote clinical research, CAR-T cells, and cellular therapy development. | No | €300,000 | 1 |
| SHS-RISP | Promote the development of multidisciplinary cancer research in the fields of human and social sciences, public health, and population health intervention research. | No | €6,565,565 | 19 |
| SPA-CPA | Support research and knowledge production on psychoactive substances and addictive behaviours. | No | €4,605,813 | 14 |
| SPA-CPA-DOC | Support the community of researchers interested in psychoactive substances and addiction by funding doctoral theses. | No | €446,865 | 3 |
| TABACJC | Support young researchers presenting innovative research projects in the fields of human and social sciences, public health, and interventional research to promote the development of research on tobacco and/or alcohol. | No | €998,401 | 7 |
| TRANSCAN JTC-2022 | Transnational cooperation of 31 funding organisations from 20 countries to support translational research with a high impact on cancer. | No | €1,167,810 | 4 |
| | | | **€121,087,487** | **184 projects** |

For details/more information on the programmes funded or managed by the Institute, refer to Part 3 and Table 8.

Table 3: List of ITMO's 2023 programmes

| ITMO Cancer Programmes 2023 | Objectives/Goals | Funding | |
|---|---|---|---|
| | | Amount | Number of Projects |
| ANR JCJC | Support young researchers already in position by providing additional funding for their cancer research projects. | €936,639 | 3 |
| Anses PNR EST | Support the production of scientific knowledge on public health issues related to the environment and the workplace. | €411,143 | 2 |
| Atip-Avenir | Promote the establishment of young researchers in the field of cancer research. | €300,000 | 1 |
| Equipment | Support the acquisition of shared equipment to promote ambitious cancer research projects and strengthen interaction between research teams. | €3,849,017 | 19 |
| FIRE | Encourage the use of a wide range of academic disciplines in conducting ambitious cancer research projects. | €230,140 | 2 |
| FRT-DOC | Encourage the training of medical, pharmacy, and veterinary students or recent graduates in fundamental or translational research through doctoral theses focused on cancer. | €553,088 | 4 |
| MIC | Encourage the contribution of mathematics and computer science to cancer research. | €2,317,835 | 6 |
| PCSI | Support using concepts and tools from physics, chemistry, or engineering sciences to improve understanding of cancer pathologies and patient prognosis. | €10,597,274 | 32 |
| PNP | Contribute to better understanding and modelling of preneoplastic lesions to allow stratification of progression risk and identification of therapeutic targets. | €4,376,495 | 7 |
| | | **€23,571,631** | **76 projects** |

For details/more information on the programmes funded or managed by ITMO Cancer, refer to Part 4.

# OBJECTIVES AND STRATEGY FOR CANCER RESEARCH

## National Ten-Year Cancer Control Strategy actions

To bridge the gaps left by existing cancer control initiatives, schemes and structural tools, France has adopted a National Ten-Year Cancer Control Strategy, running from 2021 to 2030. Its steering and monitoring are operated by the Institute. It focuses on 4 main areas:

- Improving prevention
- Reducing side-effects and late effects and improving quality of life
- Combatting cancers with poor prognosis
- Ensuring that everyone benefits from progress

It targets **41 main topics** through a total of **237 specific actions**.

## Objective and Performance Contract (COP)

The Objective and Performance Contract (COP) records the implementation of the French National Cancer Institute's missions as it defines the its strategic and operational objectives. It takes into account the national strategy in research and health and is complementary to the Ten-Year Cancer Control Strategy.

This COP stands as an agreement between the Institute and the State. It is drafted collaboratively between the Institute and the State.

Five main strategic priorities have been identified and translated into 24 operational objectives, which are:

- Continuing the structuring and coordination effort in cancer control activities
- Improving our anticipation and innovation abilities and promoting access to innovation
- Ensuring high-quality service for each mission led by the Institute
- Reinforcing the Institute's contribution to European and International initiatives
- Strengthening the Institute's performance and efficiency

# SCIENTIFIC AREAS COVERED BY FUNDED RESEARCH

- 1.1. Understanding cancer biology: 50 research projects
- 1.2. Understanding cancer aetiology: 12 research projects
- 1.3. For prevention strategy development: 17 projects
- 1.4. For early detection, diagnosis and prognosis: 34 projects
- 1.5. For treatment strategy discovery and development: 80 projects
- 1.6. For Cancer Control, Survivorship, and Outcomes Research: 33 projects

In 2023, through its Research and Innovation division, the Institute managed **16 research project funding programmes**, supporting **180 research projects** et **2 structuring programmes**, leading to the certification of **3 Pediacriex centres** for paediatric oncology and the designation of the **UNITC network** for CAR-T cell development (see Focus 2 and Focus 3).

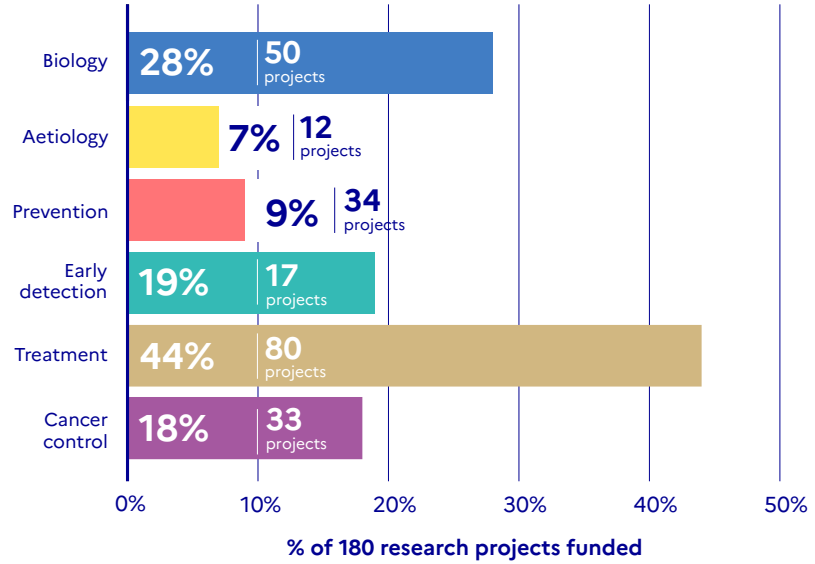
The research projects span all scientific fields. Considering that a single project may address multiple objectives and scientific domains, it was observed that (Figure 7):

- 28% covered objectives aimed at understanding cancer biology
- 7% included research on the cause and origins of cancer
- 19% covered objectives related to early detection, diagnosis and prognosis
- 9% explored strategies for cancer prevention
- 44% had objectives related to the identification, development, testing/ validation of treatments
- 18% covered topics related to patient outcomes and population health

More than 50% of the budget (€62 million) went to funding scientific objectives linked to understanding of cancer biology and to discovery and development of cancer treatment (Figure 8). This research categorisation was based on the Common Scientific Outline; a classification system developed by the ICRP (10.6).

Figure 7

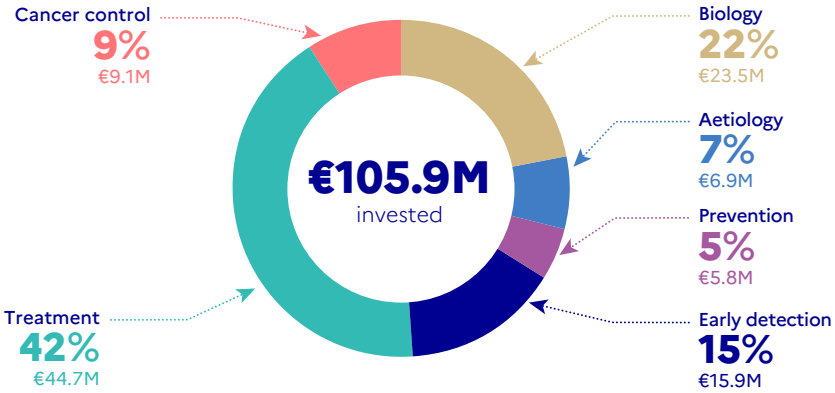
**Funded Projects breakdown according to covered scientific area (out of 180 projects)***




* Number of projects in full counting: one project can be counted as a full projects in several scientific area (up to 3). Note that projects funded within the structuring programmes PEDIACRIEX and the UNITC network are not included in this breakdown.

Figure 8

**Scientific objectives coverage and associated budget***



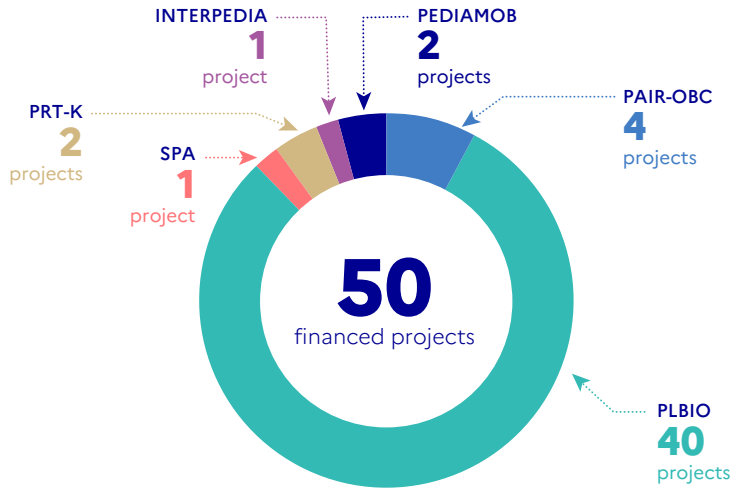

* Budget allocated to funded projects. When a single project addresses multiple research domains, its budget is equally divided among the relevant domains.

# 1.1. Understanding cancer biology: 50 research projects

Fifty of the funded projects are conducting research to gain insights into cancer biology. Most of these projects (40 projects) rely on basic research and are funded through the PLBIO programme. The four interdisciplinary projects funded through the PAIROBC are looking at cancer biology in the context of obesity, and one SPA-CPA programme-funded project is looking at smoking-associated effect in lung cancer biology. Additionally, three projects funded through programmes dedicated to paediatric cancer (PEDIAMOB and INTERPEDIA programme) are specifically investigating paediatric cancer biology (Figure 9).

Figure 9

Funded research to understand cancer biology*




* Analysis of the programmes managed by INCa. A project may be counted in multiple scientific domains (up to 3).

## Basic science contribution

More than 75% of projects funded through the basic research supporting programme PLBIO include objectives related to the understanding of the biological mechanisms of cell transformation and disease progression. 35% of these projects specifically focus on the interaction of tumour cells with the microenvironment (cell mobility, tumour invasion, metastasis, cancer stem cells, immunological microenvironment, or angiogenesis).

Research topics addressed by the PLBIO-funded projects include:

- Cell signalling: with a particular emphasis on protein biosynthesis and on cellular metabolism;
- Tumour microenvironment: with a majority of projects investigating the role of tumour-associated macrophages and tumour-infiltrating lymphocytes;
- Genetics: with projects studying cell aging and DNA damage/repair;
- Immunology: with a strong focus on immune surveillance or mechanisms of escape from immune surveillance. We also note that several projects are interested immunotherapy.

## Investigation of paediatric cancer biology

Three projects funded through the PLBIO programme aim to study the biology of osteosarcoma, the response to Irinotecan treatment of hepatoblastoma and the development of cerebral rhabdoid cancers of the atypical teratoid/rhabdoid tumour type.

Three projects were funded through the programmes dedicated to paediatric cancers:

- One interdisciplinary project funded through the INTERPEDIA programme will apply a comparative approach to the mechanisms involved in myogenesis, and use the combination of co-culture models and the integration of transcriptomic data, to define the role of two extracellular matrix proteins, in rhabdomyosarcomas
- Two PEDIAMOB Programme funded doctoral projects aim to identify regulatory networks and potential therapeutic targets in subtype 1 retinoblastoma for the first one and to develop a unique system that will mimic cancer-associated chromosomal aberrations in paediatric cancer and that will detect and isolate cells carrying chromosomal aberrations, to provide new early biomarkers and a new basis for early detection and management of paediatric cancers

## 1.2. Understanding cancer aetiology: 12 research projects

Twelve of the funded projects plan to extend our understanding of the causes or origins of cancer. For that they will investigate several factors including genetic, environmental, and lifestyle.

This research is funded within seven different programmes (Figure 10) including the Cancer Grand Challenges which selected an ambitious projects aiming to identify the cause of early-onset colorectal cancers' incidence rise in adults (see Focus 6). Within the psychoactive substances dedicated programmes SPA-CPA and SPA-CPA-DOC, the funded project's main focus remain tobacco and the addictive behaviour induced by nicotine. They also address smoking-associated lung cancer aetiology. One project funded through the dedicated call PAIROBC, is interested in the link between obesity and cancer. Additional factors investigated within the funded projects include exposure to pesticide, UV light, alcohol and the Lynch syndrome.

Figure 10

Funded research to understand cancer Aetiology


## 1.3. For prevention strategy development: 17 projects

Seventeen research projects looked at identifying individual and population-based primary prevention interventions to reduce exposure to cancer risks and increasing protective factors. The ultimate aim being to reduce cancer risk. Most of these research projects (13 projects out of 16) are funded within the programmes dedicated to the support of studies focusing on psychoactive substances and tobacco/alcohol, SPA-CPA, SPA-CPA-DOC and TABACJC (Figure 11).

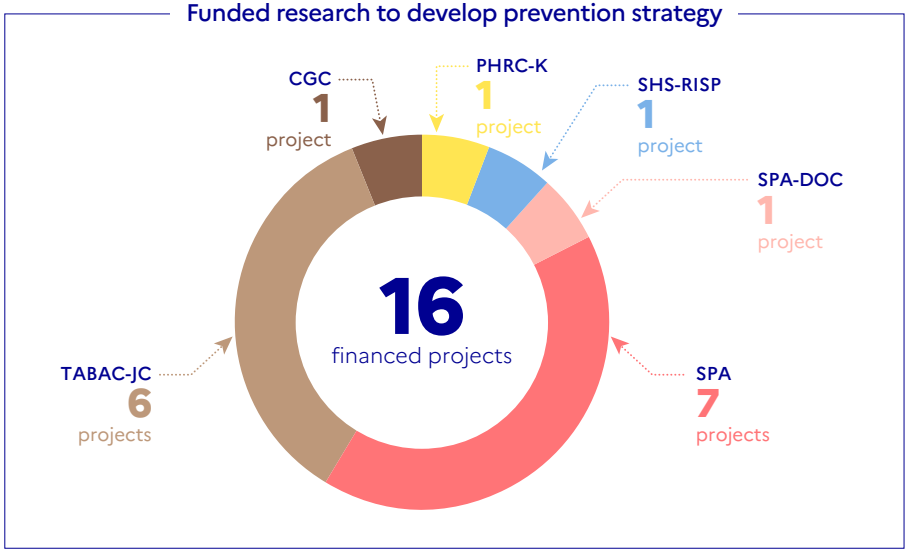
The Prospect project funded within Cancer Grand Challenges (CGC) programme has the ambition to develop precision intervention strategies to prevent the development of early onset colorectal cancer in adults (see Focus 6).

86% of the projects funded within the Tabac/Alcohol research projects dedicated programme TABACJC cover several themes, including social representations, commercial and cultural determinants of alcohol consumption, vulnerability factors to tobacco and/or alcohol consumption, and health impacts of using or reducing the use of these substances. They are studying:

- Lobbying strategies of the French alcohol industry
- Representations and practices of health professionals in reducing alcohol-related risks among vulnerable groups (OSIRIS)
- Modelling interventions to prevent hepatocellular carcinoma linked to harmful alcohol use (MOENA)
- Representations of alcohol consumption in French cinema since the 1960s (RACin)
- Remote work and alcohol, tobacco and vape consumption: longitudinal studies
- Cognitive function and alcohol consumption in students: the role of changes in the sleep/wake cycle

Figure 11

Funded research to develop prevention strategy

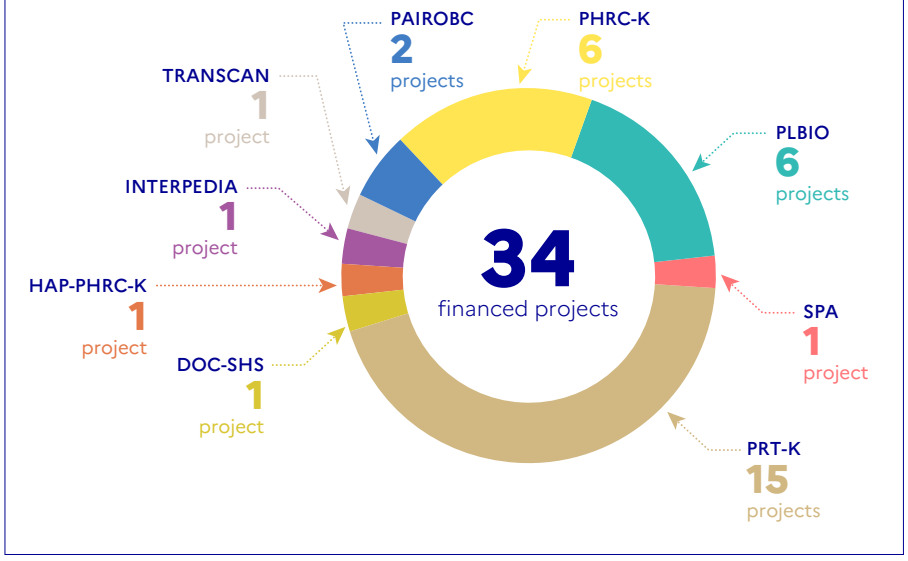



## 1.4. For early detection, diagnosis and prognosis: 34 projects

34 funded projects included focus on identifying and testing cancer biomarkers, imaging and other methods. These tools are crucial for cancer detection and diagnostic, for outcome prediction and chance of recurrence as well as to support treatment decision-making in stratified/personalised medicine. Most of these projects are supported by the Institute's recurrent programmes, PLBIO, PRT-K and PHRC with the majority being funded by the translational research funding programme PRT-K (15 projects). 94% of the projects funded by the PRT-K programme cover objectives related to cancer early detection, diagnosis and prognosis. More than 85% of the projects have the primary or secondary objective of discovering or developing new biomarkers. This emphasises the importance of translational research for these objectives' achievement (Figure 12).

Figure 12

Funded research for early detection, diagnosis and prognosis strategies

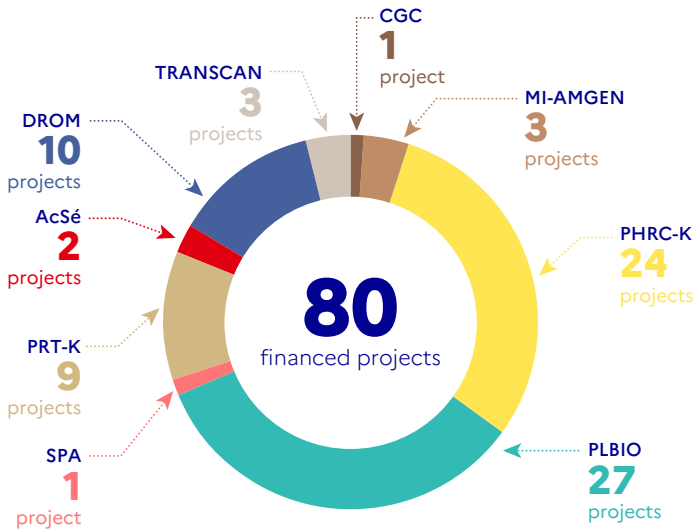


## 1.5. For treatment strategy discovery and development: 80 projects

80 funded projects' objectives included identifying and testing treatments administered locally (such as radiotherapy and surgery) and systemically. These projects also include research into the prevention of recurrence and treatment of metastases. Most of these projects develop basic research or clinical research projects and are funded through the PLBIO and PHRC-K programme dedicated to clinical research (Figure 13).

With 27 funded projects by PLBIO, the basic research dedicated programme provides a great support to treatment strategy discovery and development and to investigation of the biological basis of treatment strategy

Figure 13
Funded research for therapeutic strategies




The PHRC-K clinical research dedicated programme funded 24 investigator-initiated clinical research projects. 75% of these projects aimed at clinically testing applications of systemic therapies (66%) and localised therapies (19.1%) (Figure 13).

### Targeting High Grade Glioma

It is worth noting that one of the selected trials, as part of Amgen's Innovative Drugs Call for Proposals, addresses the ambitions of the Ten-Year Cancer Control Strategy. Indeed, the TarlaTEM trial focuses on central nervous system tumours with a specific emphasis on high-grade gliomas -one of the categories of cancer with a poor prognosis- and targeting a specific population of the strategy, namely patients aged 12 years or older.

The proposed project aims to combine the drug provided by Amgen, which falls under an innovative therapeutic approach, BiTE® (Bispecific T-cell Engager), with metronomic chemotherapy based on Temozolomide. BiTE molecules are designed to connect T lymphocytes to tumour cells, but their effectiveness is limited by the blood-brain barrier, which often prevents large molecules, such as antibodies, from reaching the brain. However, this barrier is often altered in central nervous system tumours, which may allow the entry of smaller therapies such as BiTEs.

One of the hypotheses supporting the combination is that Temozolomide could modulate the immune microenvironment of central nervous system tumours, thereby allowing for better antitumor activity of T lymphocytes activated by Tarlatamab. This approach could potentially improve immune responses and reduce tumour growth.

In addition, Temozolomide is a validated chemotherapy for central nervous system tumours, and its metronomic administration has shown promising results, reducing tumour growth and angiogenesis, while promoting apoptosis. Metronomic administration also helps modulate the immune microenvironment by reducing the proportion of regulatory T lymphocytes, which are often a barrier to the effectiveness of immunotherapies in highly immunosuppressive contexts such as glioblastomas.

### Targeted therapies offered by the New AcSé Programme

Two clinical trials have been funded within the New AcSé programme:

- **The Pan-MSI-AcSé trial focuses on evaluating the efficacy of dostarlimab,** a PD-1 checkpoint inhibitor, as a first-line treatment for various cancers characterised by microsatellite instability (MSI) or mismatch repair deficiency (dMMR). These types of cancers, which include non-colorectal and non-endometrial forms, are particularly resistant to conventional treatments.
  Scope and Methodology: The trial will involve 120 patients across 25 centres in France. The main objective is to measure the progression-free survival of dostarlimab compared to standard chemotherapy. This study will not only assess the efficacy of the therapy but also better understand the molecular mechanisms of cancers with MSI/dMMR anomalies.

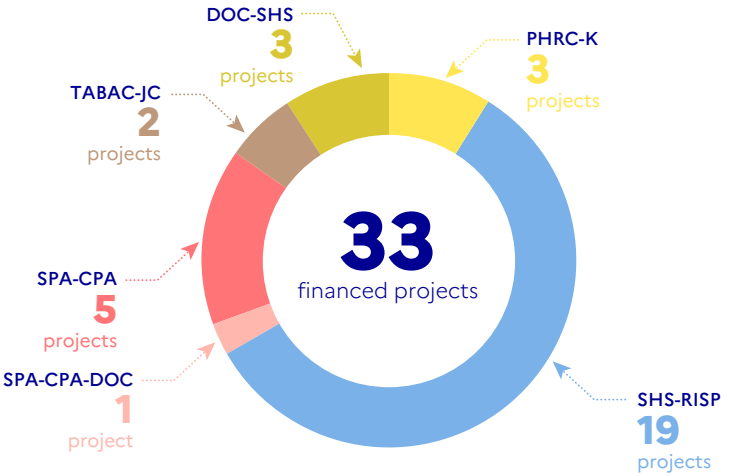
- **The AcSé FGFR trial explores the effectiveness of pemigatinib,** a tyrosine kinase inhibitor, specifically targeting cancers with fusions or rearrangements of the FGFR genes. This molecule, already used for urothelial cancers and cholangiocarcinomas, is tested here in a broader context to treat other types of cancers presenting these genetic anomalies.
  Approach and Implications: The methodology of the trial is centred on tumour growth kinetics and tumour response, providing a valuable perspective on the effectiveness of the treatment in a recurrent and metastatic context. The agreement with Incyte to provide pemigatinib significantly expands the possibilities for patients with few available therapeutic options.

## 1.6. For Cancer Control, Survivorship, and Outcomes Research: 33 projects

33 projects included scientific areas spanning from patient care and pain management, tracking cancer cases in the population; beliefs and attitudes that affect behaviour regarding cancer control, ethics, education and communication approaches for patients, family/caregivers, and healthcare professionals, supportive and end-of-life care; and healthcare delivery in terms of quality and cost-effectiveness.

Most of the projects were funded through the human and social sciences-dedicated programme HSS-PHIR and the psychoactive dedicated programmes SPA-CPA, SPA-CPA-DOC and TABACJC (Figure 14).

Figure 14
Funded research for Cancer Control, Survivorship, and Outcomes Research (number of funded project per programme)



## Contribution of Social Sciences and PHIR

All projects funded by the HSS-PHIR programme address cancer control, survivorship issues and outcome research. Fourteen projects were investigator-initiated and focused on personalised care pathways and accessibility, screening, supportive care and the impact of adapted physical activity, impact on the spouse/partner, co-morbidities, and social inequalities in health. Five projects funded by the same programme addressed a set theme: 2 focused on the fight against inequalities, and 3 on cancers in children, adolescents and young adults.

# EVALUATION AND IMPACT ASSESSMENT

# 2.1. Building tools to inform research funding strategy

## Analysis of 2011-2020 publications and patents related to cancer worldwide[11]

### • Context, objective and scope

In 2017, INCa published specific data on French cancer research (publications and patents) for the 2003-2015 period. This study showed that despite increased competition in recent years, France was still one of the most competitive countries in the field of cancer research. The implementation of Cancer Plans has undoubtedly contributed to this dynamic. Indeed, the international visibility of French cancer research seemed to have increased since the launch of the first French Cancer Control Plan.

A study has been launched with the objectives to:
- update data (publications and patents) for the 2011- 2020 period;
- establish the French positioning on some specific research fields;
- obtain a first analysis of French publications focused on cancers with poor prognosis (strategic area of the Ten-Year strategy)

### • Methodology

The Institute collaborated with OST (Observatoire des Sciences et Techniques-HCERES) and a group of experts (Prof Isabelle BOUTRON, Sophie GOURGOU, Prof Marie PREAU, Claude SARDET, Prof Virginie WESTEEL) to produce a fairly comprehensive corpus of relevant publications in oncology. They also validated the disciplines sub-corpus.

The selected publications are original articles (from journals or proceedings) and summary articles (reviews). The analysis of patents is based on the notion of "patent family". An invention can give rise to several filings in one or more patent offices and the patents relating to the same invention are grouped within a family. In order to concentrate on the most significant patents, only families with filings and extensions in at least two offices were kept, as well as all applications filed at the European Patent Office or at the World Intellectual Property Organization (WIPO).

Table 4: Scientific publications from the leading countries publishing in the field of cancer (2011-2020) (in %)*

| | Share of the worldwide cancer corpus, % | | Trends number of publications, % | Share of publications in cancer corpus in fundamental research (%) | | Share of publications in cancer corpus in clinical research (%) | |
|---|---|---|---|---|---|---|---|
| | 2011-2015 | 2016-2020 | | 2011-2015 | 2016-2020 | 2011-2015 | 2016-2020 |
| China | 14.5 | 24.3 | 117.8 | 22.1 | 24.7 | 19.7 | 24.8 |
| United-States | 25.9 | 21.3 | 6.6 | 22 | 20.4 | 16.6 | 18.6 |
| Japan | 6.4 | 5.4 | 8.8 | 15.4 | 15.1 | 20.9 | 24.8 |
| Italy | 4.5 | 4.2 | 20.4 | 19.4 | 21 | 21.2 | 23.9 |
| Germany | 5 | 4.1 | 4.8 | 19.9 | 20.8 | 19.4 | 20.4 |
| South Korea | 4 | 3.6 | 19.7 | 19.3 | 21.3 | 15.7 | 19 |
| United Kingdom | 4.2 | 3.3 | 1.9 | 20.9 | 19.9 | 20.3 | 22.8 |
| France | 3.5 | 2.8 | 5.2 | 19 | 18.8 | 21 | 23.4 |
| India | 2.5 | 2.8 | 40.8 | 20.4 | 23.3 | 10.9 | 10.4 |
| Canada | 2.7 | 2.3 | 10.9 | 22.2 | 20.3 | 18.3 | 20.2 |
| Spain | 2.2 | 1.9 | 15.1 | 22.5 | 21.4 | 18.7 | 22 |
| Australia | 2.1 | 1.9 | 19.6 | 22.2 | 21.1 | 17.5 | 20.9 |
| Taïwan | 2 | 1.6 | 2.9 | 21.1 | 24.1 | 15.4 | 19.5 |
| Brazil | 1.6 | 1.6 | 27.8 | 20.9 | 21.9 | 16.6 | 19.1 |
| Netherlands | 1.8 | 1.6 | 11.8 | 17.6 | 15.8 | 21.1 | 25 |
| EU27 | 24.5 | 21.3 | 13 | 20.2 | 20.7 | 19.8 | 21.8 |
| World | 100 | 100 | 30.1 | 20.5 | 21.5 | 18 | 20.8 |

* Number of publications in fractional counting, with each affiliation receiving a fraction of the publication proportional to the number of signatures (see methodology).

11 This analysis is drawn from the executive summary of the Ministry of Research and Higher Education report, which assesses (or "to assess") France's research efforts in oncology. The report is available on the **cancer.fr** website.

### • Ranking of publishing countries in the cancer field

Scientific publications relating to cancer worldwide increased by 30% between 2011-15 and 2016-20. They represent 8% of global publications in 2011-15 and almost 9% in 2016-20. Between these two periods, the number of publications in the field increased by 30% (Table 4). Among the first 15 publishing countries, eight, including France, are specialised in the field of cancer. China and the United States are the first two countries, France is in 8th place in 2016-2020.

China accounts for 24% of global contributions on cancer and the United States 21%. Japan has 5.4%, Italy and Germany more than 4%, South Korea and the United Kingdom more than 3%. In 2016-20, India and France account for 2.8% of contributions.

Among the main publishing countries, Japan and Italy are the most specialized in the field of cancer: the share of publications from these two countries in the field is 40% higher than the share of the cancer corpus in total world publications, i.e. a specialization index of 1.4 (Figure 15).

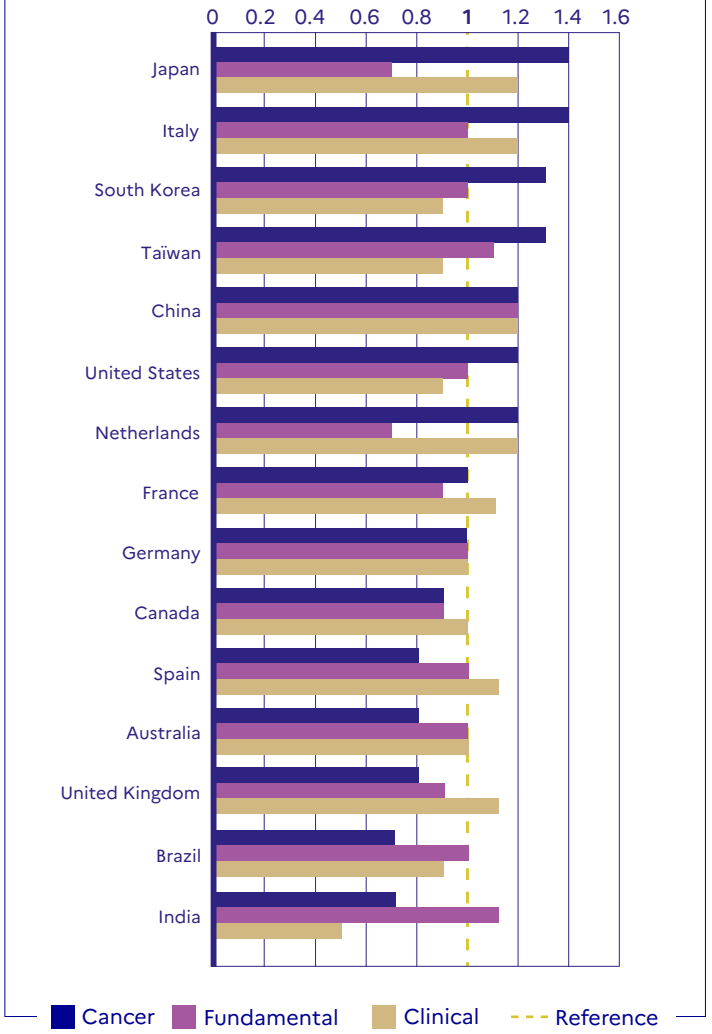
France and Germany have a share of publications in the field of cancer at the world average.

### • Cancer corpus' research fields

Publications relating to clinical research are more dynamic than those relating to fundamental research (Figure 15). Between 2011-2015 and 2016-20, the share of the former in the cancer corpus increased from 18% to 21%, while the share of the latter increased from 20.5% to 21.5% (Table 4). The remaining publications correspond in particular to translational research work or to epidemiology or public health. Note that many publications may be on the border between these different fields and therefore more difficult to characterize precisely.

Publications from the Netherlands, Italy, France and Japan are more clinically oriented, while those from Spain, Canada, Australia, China and the United States are relatively more on fundamental research fields (Figure 15). Within the field, the major publishing countries have relative engagement in both types of detailed research close to the global average. However, Japan, China and the Netherlands are the countries with a higher relative commitment to clinical research (index of specialization in clinical research within the cancer corpus of 1.2). Conversely, India is very little involved in clinical research (index 0.5).

Figure 15
Index of specialization in the field of cancer and by type of research within the field, top publishing countries, 2016-2020



### • Impact indicators of publication citations

Average impact is measured by a standardized indicator of publication citations[12]. The United States, the United Kingdom and the Netherlands have impact indicators 30% higher than the global average in the field of cancer (Figure 16). These three countries, as well as Australia, have impact indices between 1.3 and 1.4 for clinical research. France and Canada are also countries which have an impact index in clinical research (1.2) higher than their index in the total cancer corpus (1.1). China and India present an opposite profile: their clinical research publications have low impact indices (0.8 and 0.7, respectively). Japan, the third country publishing the most on cancer and very specialized, presents low impact indices.

### • Innovation in the field of cancer research

Innovation in the field of cancer measured through patent filings is dominated by the United States, followed by China and Japan. France is 7th in terms of inventions relating to cancer (Table 13). With 1,104 families, France contributes 3% of deposits, ranking 7th among countries producing inventions relating to cancer, ahead of Canada and Switzerland.

In 2016-20, the most specialized countries in terms of patents in the field of cancer are the United States, Israel, Spain and the United Kingdom, with indices between 1.7 and 1.5 (Figure 17). Between 2011-15 and 2016-20 France's technological specialisation index in the field of cancer fell from 1.2 to 0.9. The Netherlands and Italy are also in this case. India's specialization index falls significantly, but its index remains higher than the world average.

This analysis is extracted from the future fact sheet included in the Ministry of Research and Higher Education report to measure France 's research effort in oncology

Figure 16

**Impact index of publications in the field of cancer 2016-2020**

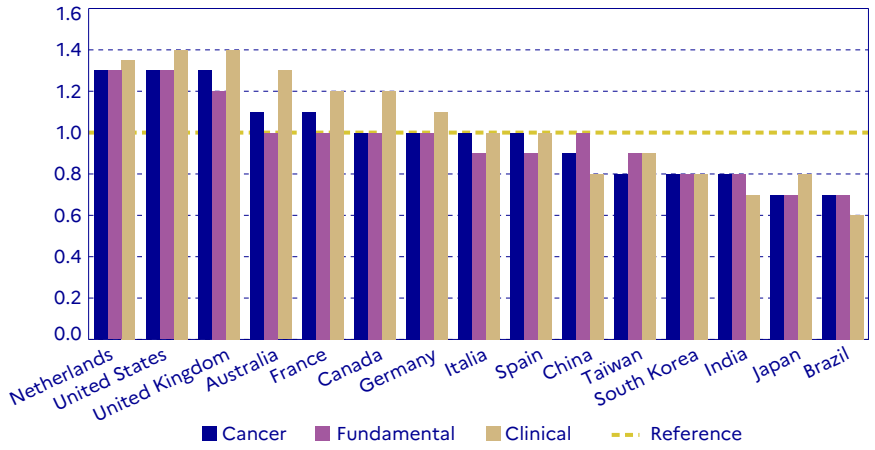
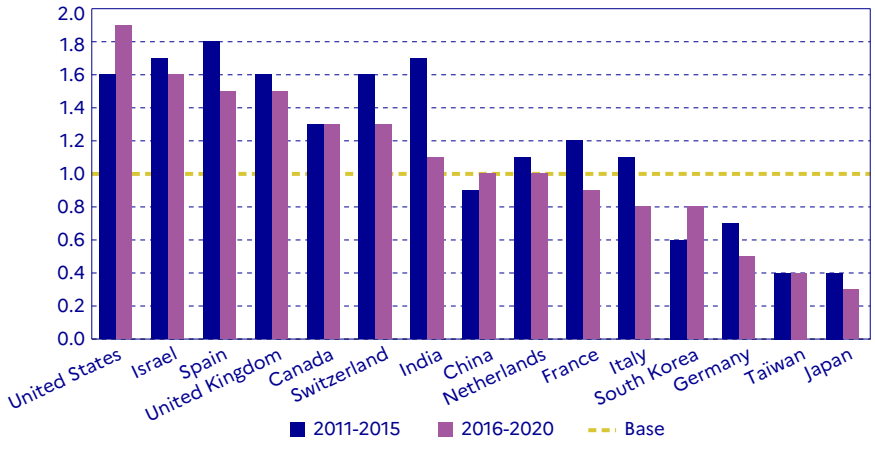



Figure 17

**Index of technological specialisation in the field of cancer in the top 15 inventor countries**




[12] Mean normalized citation score.

### Ongoing programme to enable ex-ante and ex-post scientific evaluation of research funding programmes:

An action programme dedicated to funding data research has been launched. Indeed, as we mentioned in last year's report, we need to improve our monitoring over time and along the "impact pathway" to produce *ex-ante* and *ex-post* evaluations. The many actions to be completed over the next few years should enable us to achieve the objectives set out in the Ten-Year Strategy and the objectives and performance contract (COP), and address the lack of an evaluation strategy highlighted by SAB members for many years.

An initial evaluation of the calls of proposals for the 2008-2020 period will be submitted to the SAB in autumn 2025, as requested by the DGRI. This initial study will be based on available data. A considerable effort is underway to retrieve retrospective data.

### Foresight study for oncology research

Faced with a context of major geopolitical, economic, environmental and societal instability, scientific advances in oncology research represent a major public health challenge for France and Europe. To respond to this challenge, the Institute is conducting a prospective study on oncology research in France by 2035 in order to anticipate future research efforts as much as possible.

This strategic foresight study aims to identify and anticipate future challenges in oncology research, contributing to the definition of the future cancer-fighting strategy and providing insights for upcoming decisions.

## 2.2. Evaluation of funding programmes

### PLBIO funding programme from 2007 to 2023: Supporting Basic cancer research for almost 20 years

Basic research is essential to keep expanding our understanding of cancer biology which is central to the development of relevant strategies for cancer prevention, early detection, diagnostic and treatment. One of the French National Cancer Institute's priorities is therefore to support and promote basic research in the cancer field.

#### • PLBIO, the emblematic basic cancer research funding programme

The PLBIO programme was initiated in 2005 and has become over the years a major annual event and an unequalled opportunity for funding offered to the French scientific community working on basic research projects in the field of cancer. This programme identifies the Institute as a major funding agency for basic sciences in relation to cancer, alongside the French National Research Agency (ANR), which funds basic research outside the field of cancer. As of late, around 225 applications are submitted each year, with around 50 funded for a total budget of 30 million euros (Figure 18 and Figure 19). This investigator-driven call funds original and promising projects in different areas and disciplines of basic cancer research. It promotes multidisciplinary collaboration and supports research in emerging areas.

Figure 18

Trends in selection and funding of the research programme in biology and basic sciences for cancer research over the 2007-2023 period

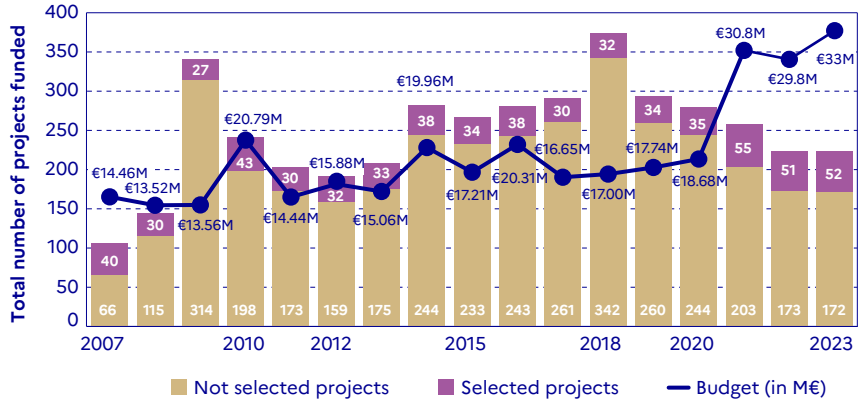
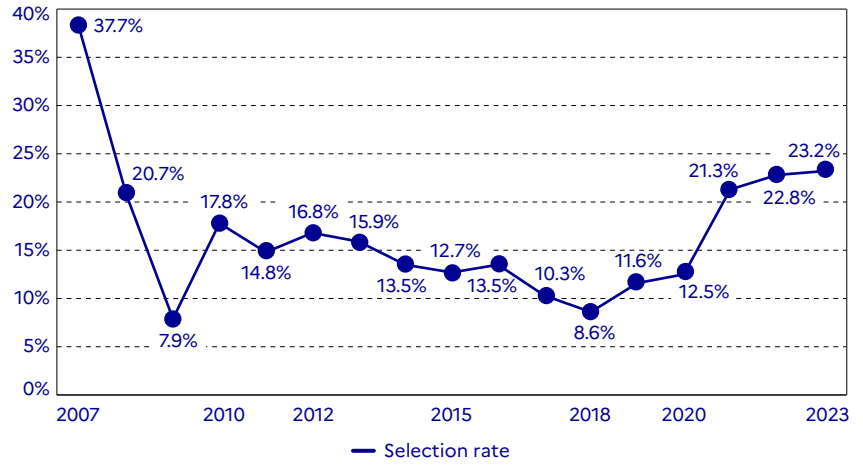



Figure 19

Trends in selection rate of the research programme in biology and basic sciences for cancer research over the 2007-2023 period




## • PLBIO-funded projects and teams

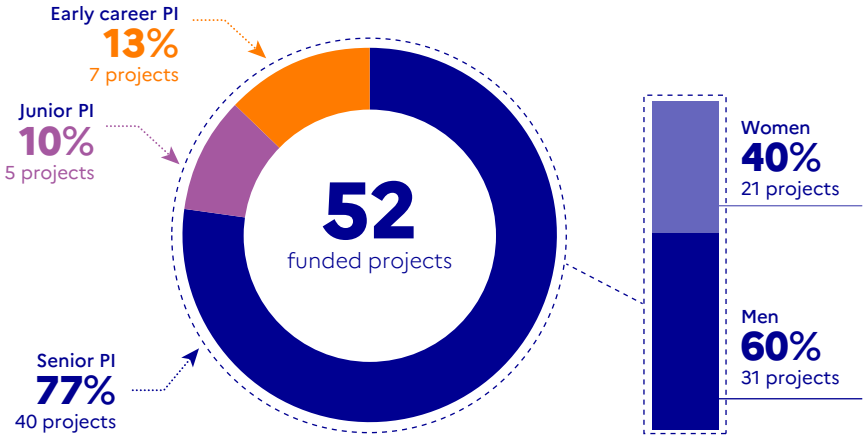
From 2007-2023, 634 projects out of 4209 submitted proposals were selected for funding for a total budget of 328.87 million euros.

The majority of funded projects study cancer cell transformation and disease progression, including themes around the tumour microenvironment, cancer cell – immune cell interaction, cell signalling and cell genetics. A large number of projects investigate new therapeutic targets and molecules, new active drug delivery systems, treatment response and resistance mechanisms.

These projects are carried out collaboratively as teams come together to form consortia usually of around 3 teams. In 2023, 40% of funded projects were led by women and 23% of project led by junior and early career scientist, who had defended their thesis within the previous 10 years and 15 years, respectively, at the time of application (Figure 20).

Figure 20

Principal Investigator (PI) seniority profile




Gender (distribution) of the principal investigator for submitted projects: 41% women and 59% men.

### • Looking back at completed projects funded from 2012 to 2016

To get a sense of the impact of the PLBIO programme, we performed an analysis of completed projects funded from 2012-2016. 175 projects were funded over that period for a total budget of 88,4 million euros. In 2018, based on information reported by the coordinators of the funded projects, we monitored the teams' research activity and scientific contribution, showing a very positive outcome overall:

- 501 scientific articles were published in peer-reviewed journals: 3 articles per project on average;
- 38 articles were published in journals with an impact factor of 20 or higher (Figure 21);
- 35.4% of projects made important scientific contributions, corresponding to a total of 62 projects: 57% provided new insight on tumour pathology, 11% on development of new tools, and 26% opened up new therapeutic prospects (Figure 22);
- Around half of the projects reached 70% or more of their initial objectives, while 12% reached less than 50% of their initial objectives (Figure 23);

In conclusion, we see the importance of the PLBIO programme in the support for French basic cancer research and how funded projects provide critical insight into the mechanisms governing cancer onset, progression and treatment.

Figure 21

Publications' impact factor (IF)

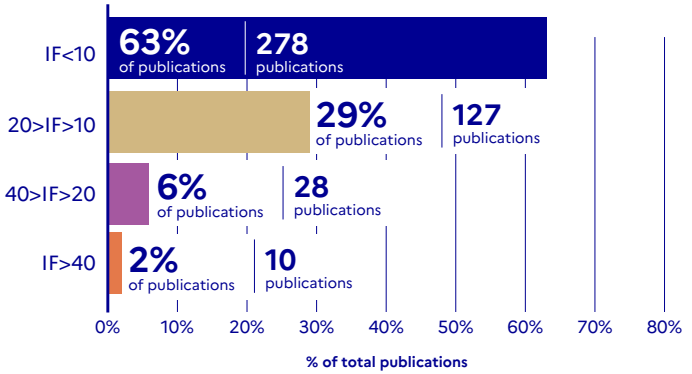


Figure 22

Scientific contribution of 2012-2016 PLBIO-funded projects

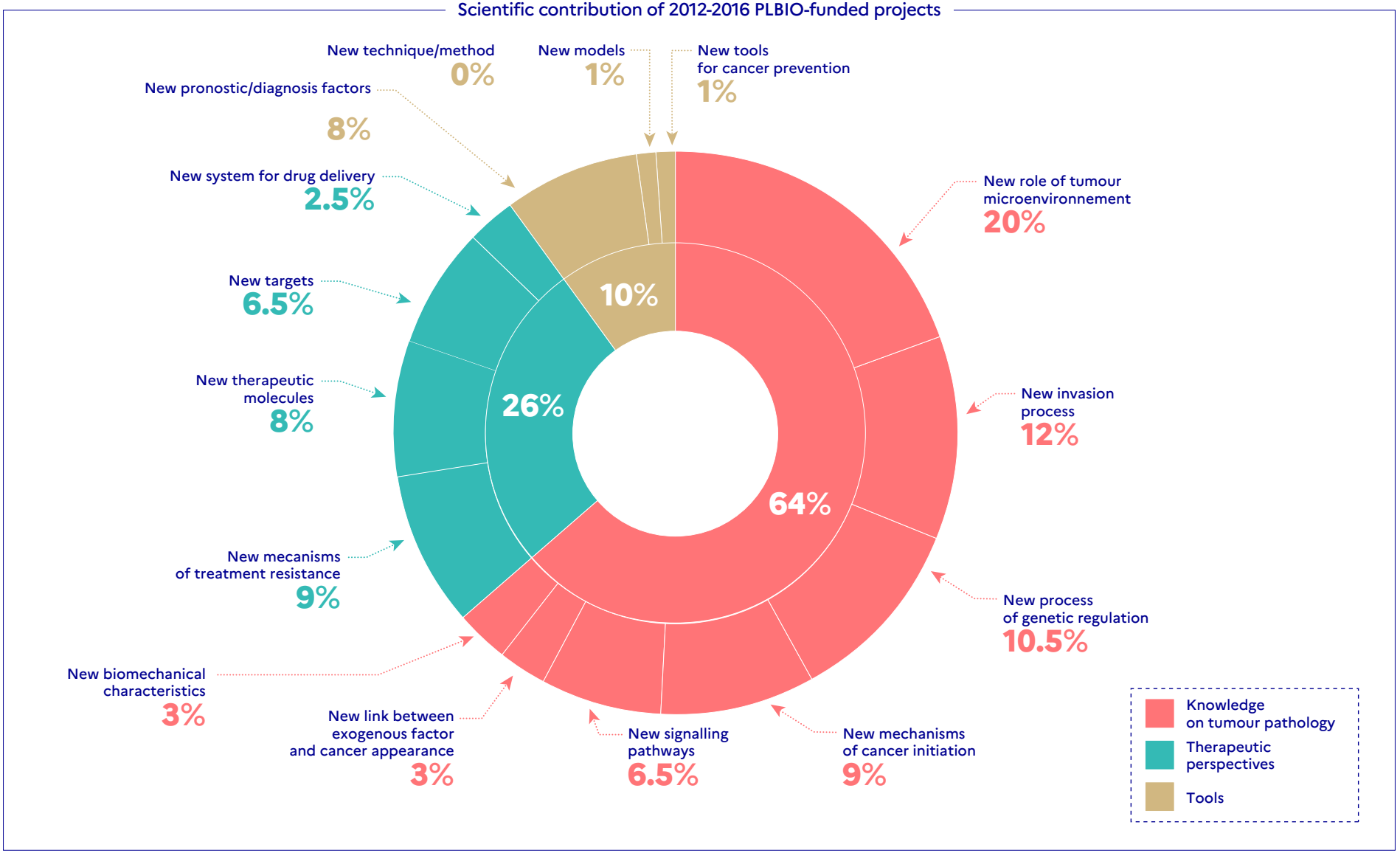
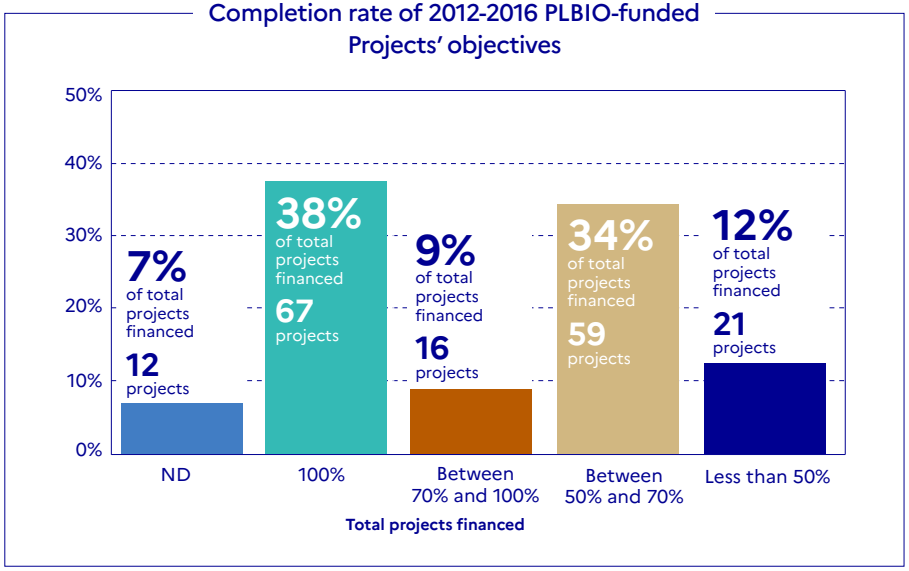


Figure 23
Completion rate of 2012-2016 PLBIO-funded Projects' objectives




## PAIR research funding programme from 2007 to 2023: 15 years of promoting collaborative and integrated multidisciplinary research

### • PAIR programme for multidisciplinary research projects focusing on one type of cancer

To promote cooperation between all scientific disciplines including basic, translational, clinical research and epidemiology, public health and human and social sciences, around core cancer projects and accelerate knowledge transfer to clinical practice, in 2007, the French National Cancer Institute launched a recurring comprehensive Integrated Research Action Programme (PAIR) dedicated to a specific type of cancer for each new edition. The programme has been run by the Institute in partnership with the charities ARC Foundation for Cancer Research and *Ligue contre le cancer* (French Cancer League) since 2009. A major objective of this programme is to promote, through the design and implementation of scientific projects, the federation of French research teams having an original perspective on research questions at the interface of several disciplines.

**Twelve PAIR programme rounds have been run to date, leading to the funding of 92 cancer research projects for a total amount of 55.77 million euros:**

- Ten different cancer types have been covered by the programme: Early colorectal cancers (14 funded projects), – Lymphoma (7 projects) – Hepatocellular carcinomas (12 projects) – Prostate (8 projects) – Upper aerodigestive tract cancers (7 projects) – Gynaecological cancers (6 projects) – Melanomas (9 projects) – Early breast cancers (8 projects) – Pancreatic adenocarcinomas cancers (7 cancers) – Brain tumours (7 projects) – Obesities and cancers (4 projects) (see table appended).
- The 2017 edition covered paediatric cancers and funded 3 projects.
- The 2023 edition funded 4 teams studying the link between Obesities and cancer.

### • Looking back on the 9 first PAIR programme rounds

A survey of the first 9 PAIR programme (2007-2017) was conducted in 2018 by the Institute, ARC Foundation and the French Cancer League. Over that period, the programme funded 80 projects for a total budget of 45.5 million euros.

The survey results demonstrate that funded teams have generated a real impact on improving knowledge and on clinical practices. The survey revealed the integrative ability of the PAIR programme to unify French research teams around a targeted theme:

- Each project was run by a consortium of 5 research teams on average;
- 2/3 of the consortia initiated new collaboration within the project;
- 4/5 of the collaborations were maintained beyond the end of the project.

The research consortia were productive with:

- 303 publications claimed in peer-reviewed international (5 publications per project on average), reaching an average impact factor of 8.13,
- 16% of the projects filed a patent.

The PAIRs have created a substantial leverage effect for obtaining other funding: new projects arising from PAIR programme-funded projects raised **35 million euros**.

## PHRC cancer programme (PHRC-K) 2011-2023: Supportfor clinical research

### • Progress monitoring of projects selected for funding

Since 2013, funded projects have been eligible to receive the funding instalments upon justification of their progress status. This instalment process makes it possible to monitor the progress of projects and provide a general overview of the clinical study flow of PHRC-K programme-funded projects.

Funding is divided into 5 instalments, each corresponding to one of the 5 key stages of the clinical trial implementation process:

- Instalment 1 is delivered once the project is selected for funding.
- Instalment 2 is requested by the investigators when all necessary authorisations have been obtained and the study is registered in an international clinical trial registry (Clinicaltrials.gov or equivalent).
- Instalment 3 is requested when 50% of the planned inclusions or data collections have been reached (if applicable).
- Instalment 4 may be requested when 100% of patients have been included and all patients have been monitored.
- Instalment 5 may be requested when a scientific article has been submitted to a peer-reviewed journal.

### • Progress status of projects funded over the 2011-2023 period

As at 2023, for all 500 projects funded during the 2011-2023 period (Figure 24 and Figure 25):

- 20% of funded projects had not started the clinical study either due to non-approval or another reason (lack of human resources, no longer supported by the pharmaceutical industry, etc.).
- 28% of projects requested instalment 2, corresponding to the approval stage.
- 24% of projects reached instalment 3, meaning that they had reached the "50% inclusion" stage.
- 12% of projects submitted an article or had published an article based on their primary findings.
- 5% of the projects had been abandoned.

Figure 24

Distribution of PHRC-K funded projects according to their progress according to the instalment status

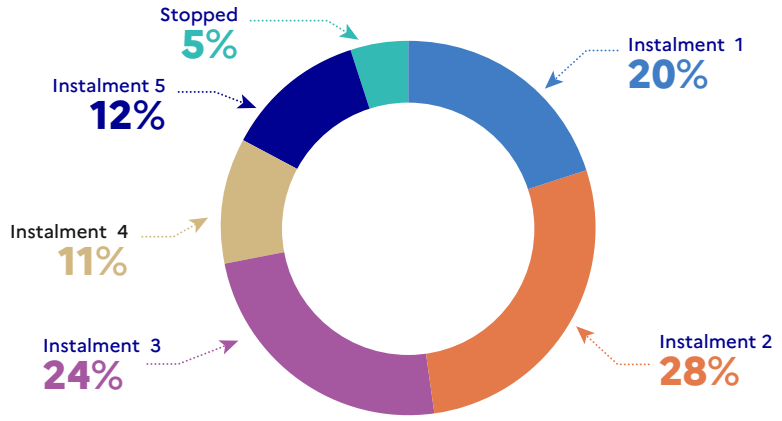
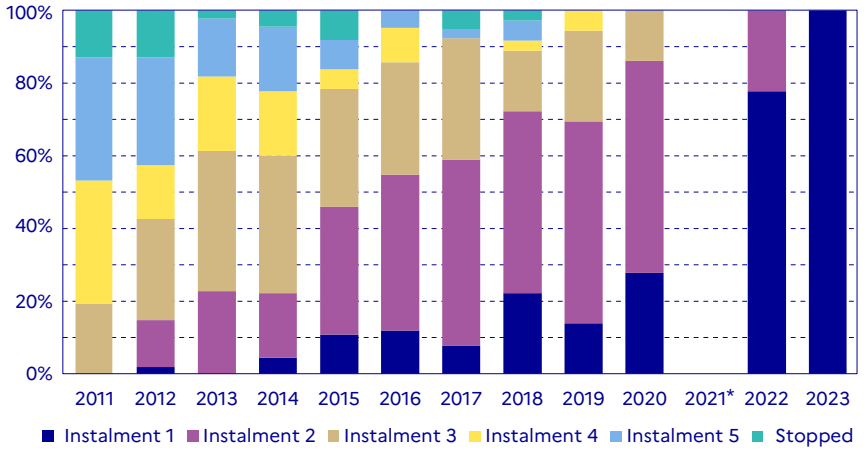



Figure 25

From 2011 to 2023, 500 projects were PHRC-K-funded and are monitored according to funding instalments




*In 2021, submission to the PHRC-K programme was postponed to the following year.

This analysis highlights several issues that need to be addressed in order to facilitate clinical trial implementation and promote access to innovation. The primary challenges could include:

- Developing multicentre studies to shorten the patient inclusion period;
- Contacting investigators to address various difficulties encountered and thus achieve better feasibility assessment in the future.

### • Issues impacting project progress

A survey conducted in 2023 aimed to identify reasons why projects remained stalled at the instalment 1 stage for more than 2 years after selection for funding. Over the period from 2011 to 2018, 50 projects were examined, revealing various reasons (Figure 26):

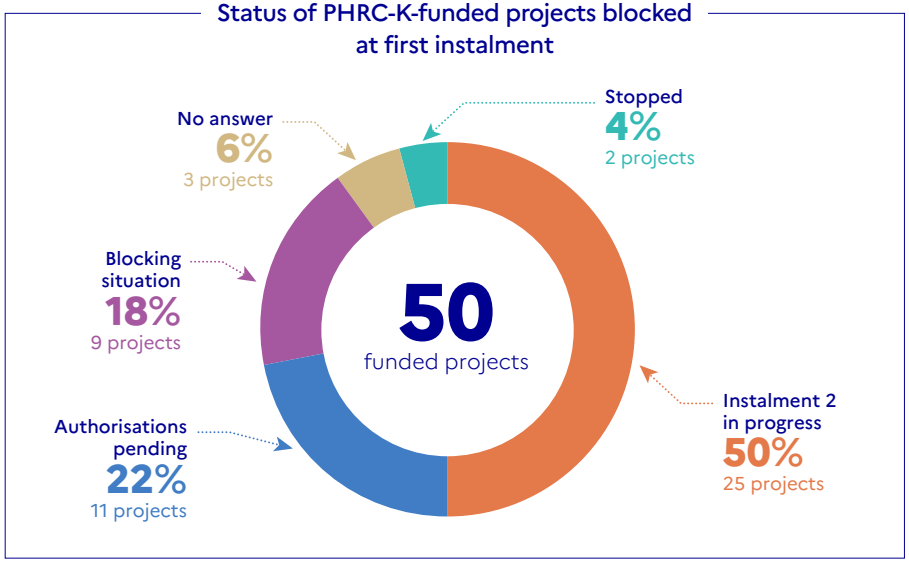
- 50% of projects simply had not progressed to apply for instalment 2;
- 22% of projects were awaiting necessary authorisations (ANSM, CPP);
- 18% of projects had encountered difficulties blocking the launch of their studies;
- 4% of projects had been discontinued.

Most projects have successfully overcome the difficulties encountered, but some projects are still awaiting resolution.

This is particularly true for projects no longer receiving support from the pharmaceutical firm supplying the drug of interest or which are forced to make a significant change to their study design, resulting in substantial delays for the validation of the amended protocol.

Figure 26

**Status of PHRC-K-funded projects blocked at first instalment**




### • 2023 results highlights

**• Results of Cutallo trial published in *the Lancet* April 2023**

This project was awarded funding by the PHRC-K programme in 2014.

CUTALLO is a multicentric, prospective trial intended to evaluate the effect of an allogeneic haematopoietic stem cell transplant in the treatment of these patients. A total of 99 patients were enrolled between 2016 and 2022 in 17 centres in France.

The CUTALLO results demonstrated a significant improvement in progression-free survival in patients treated with allografts compared with the control group, as well as an improvement in their quality of life.

The results of CUTALLO were presented at the SFH and EBMT congress in 2023 and published[13] in *The Lancet* in April 2023.

[13] Adèle De Masson *et al.* Allogeneic transplantation in advanced cutaneous T-cell lymphomas (CUTALLO): a propensity score matched controlled prospective study. The Lancet. June 2023.

In June 2023, the Institute interviewed the principal investigator of the trial, **Prof Adèle De Masson** (AP-HP): cancer.fr

**• Results of the SARI trial published in Radiotherapy and Oncology in April 2022**

This project was awarded funding by the PHRC-K programme in 2011.

SARI is a prospective, retrospective trial designed to determine the clinical and biological risk factors predictive of the occurrence of a sarcoma in an irradiated area. A total of 125 patients with angiosarcoma of the breast in irradiated areas were enrolled and were compared with those of 240 controls.

The SARI study concluded that, to date, there are no convincing risk factors to determine which patients are more likely than others to develop this radiation induced sarcoma. The last results of SARI[14] were published in *Radiotherapy and Oncology* in April 2022.

In February 2023, INCa interviewed the PI of this trial, **Prof Philippe Maingon** (AP-HP, Sorbonne University): cancer.fr

## 2.3. Contribution to best practices and policies in science

### Coara – Working Group "to improve practices in the assessment of research proposals"

The Coalition for Advancing Research Assessment was initiated in January 2022 with the aim of drafting an Agreement on reforming research assessment. More than 350 organisations from over 40 countries were involved, and members of the coalition continues to grow. They include public and private research funders, universities, research centres, institutes and infrastructures, associations and alliances thereof, national and regional authorities, accreditation and evaluation agencies, learned societies and associations of researchers, and other relevant organisations, representing a broad diversity of views and perspectives.

**• INCa participation to the Working Group "to improve practices in the assessment of research proposals"**

The overall objective of the Working Group is to improve practices in the assessment of research proposals, ultimately supporting higher-quality and more impactful projects, in line with the principles and commitments of the Agreement on Reforming Research Assessment. The work that should be completed in two years' time.

The Working Group will exchange information and learn together about how quality is understood and operationalised by research funding and other organisations through their assessment criteria. It will share experiences and lessons learnt and will identify general trends and developments. It will also aim to discuss innovative approaches for the selection of proposals, including approaches beyond peer review, and the challenge of focusing on quality and impact, at scale.

[14] Philippet Maingon *et al.* Treatment related factors associated with the risk of breast radioinduced-sarcoma. Radiology and Oncology. April 2022.

## Selection of and guidance to reviewers on responsible research assessment practices

The Working Group will support exchanges of experiences and good practices as regards the selection of and guidance to experts and associated materials and their effectiveness. It will address how appropriate reviewers can be selected and provided with adequate, high-quality training on selection criteria and processes, how to use indicators appropriately, and how to apply high standards of ethics and integrity in their decision-making. It will also address how to appropriately recognise and support the work of peer-reviewers.

### • Information requested from applicants

The Working Group will exchange practices relating to information requested from applicants, how to balance quantitative and qualitative information, as well as how to recognise a diversity of outputs, tasks, practices, skills and competences. It will also explore aspects such as when information should be requested.

## National research funding agencies of France – towards the implementation of an open science policy – 2023 highlights

On 29 June, five national research agencies including the French National Cancer Institute signed a Joint Declaration to support open science. These agencies were:

- French Agency for Ecological Transition-ADEME;
- French National Research Agency-ANR;
- French National Food, Environment and Occupational Health Safety Agency- ANSES;
- French National AIDS and Viral Hepatitis Research Agency-ANRS MIE
- And the Institute.

Thus far, we are continuing our common policy and, in 2023, committed to working collaboratively on the following areas:

- **Promotion of immediate Open access:** we will continue our commitment to open access by recommending immediate open access with CC-BY license for publications resulting from projects we fund. Furthermore, in accordance with the second edition of the National Plan for Open Science, we undertake to collaborate in the implementation of the rights retention strategy for scientific publications.
- **Support for the diversity of Open access publication models:** Committed to bibliodiversity, we will join the community created around the Diamond Action Plan published in March 2022 and will work to identify funding levers to support equitable, transparent and community-driven scientific publishing models.
- **Deployment of a common structured data management plan template:** In order to prepare data for sharing and possible dissemination, the agencies wish to collaborate on the progressive implementation of a machine-readable data management plan. A first step will consist of deploying our common structured data management plan template, based on the DMP OPIDoR tool. Depending on the areas of intervention, the agencies will also be interested in raising awareness among private actors in terms of sharing and opening up data.
- **Contribution to discussions on revising research evaluation.** We will continue our discussions to improve our practices for evaluating the scientific quality of projects, taking into account the DORA principles and the new European coalition CoARA. In this context, we will ensure that all research products are taken into account, including datasets, source codes and software, as well as the progressive use of the narrative CV.
- **Continue to promote adoption of the ORCID identifier** and more generally implement a policy of unique identifiers particularly as part of the deployment of the appelprojetsrecherche.fr portal.

### • Highlights of the Network's achievements in 2022

The Network of funding agencies developed a joint series of five open science webinars aimed at its partners/stakeholders. Each session was hosted by a renowned expert in open science and gathered around 100 participants. The agencies will continue this awareness-raising initiative with one- or two-yearly webinars focusing on specific open science topics.

# THE FRENCH NATIONAL CANCER INSTITUTE ACTIVITIES

# 3.1. The Institute's 2023 funding programmes

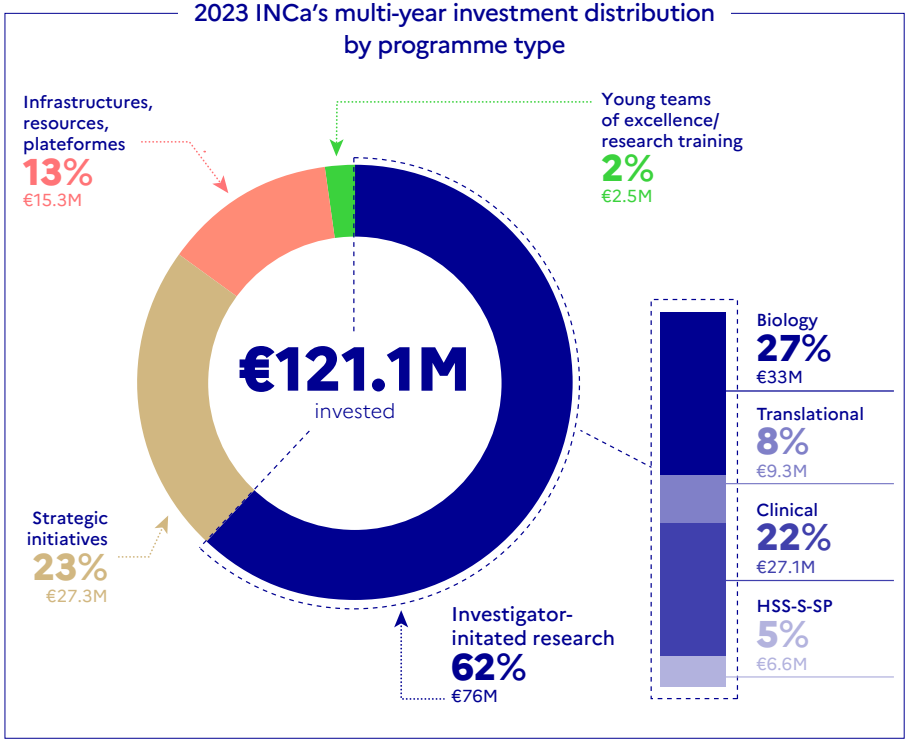
**In 2023, the Institute's Research and Innovation division managed 18 Programmes for a total of 121,1 million euros multi-year investment to support cancer research activity[15] (Figure 27)**

Among the 18 programmes (Figure 28):

- 4 were funding programmes for investigator-initiated research projects and represented more than half of the invested budget. They are recurrent programmes of the Institute.
- 2 programmes were dedicated to the structuring of the research landscape for paediatric cancer (PEDIACRIEX see Focus 2) and CAR-T cell therapeutics (UNITC see Focus 3)
- 8 programmes were strategic initiatives:
  - targeting the investigation of psychoactive substances and overweight links to cancer (PAIROBC see Focus 5; SPA-CPA);
  - to enable public-private partnership to bring innovative therapies to patients (MI-AMEN and New AcSé see 3.1);
  - to give access to clinical trials to all patients, including the ones in remote territories through the DROM programme (DROM see Focus 4);
  - to mutualise our resources to amplify our impact in cancer challenges addressing through international collaboration through Cancer Grand Challenges (see Focus 6) and Transcan (see 3.1) programmes;
  - to promote interdisciplinary research investigating paediatric cancers (INTERPEDIA see 3.1)
- 4 programmes' objective are to support training in research and young research teams (see part 3.1.).

Figure 27

2023 INCa's multi-year investment distribution by programme type




15 The specifications for the CSO and the types of cancers studied in the funded projects can be found in Appendices 6 and 7.

Figure 28

2023 number of programmes and funded projects

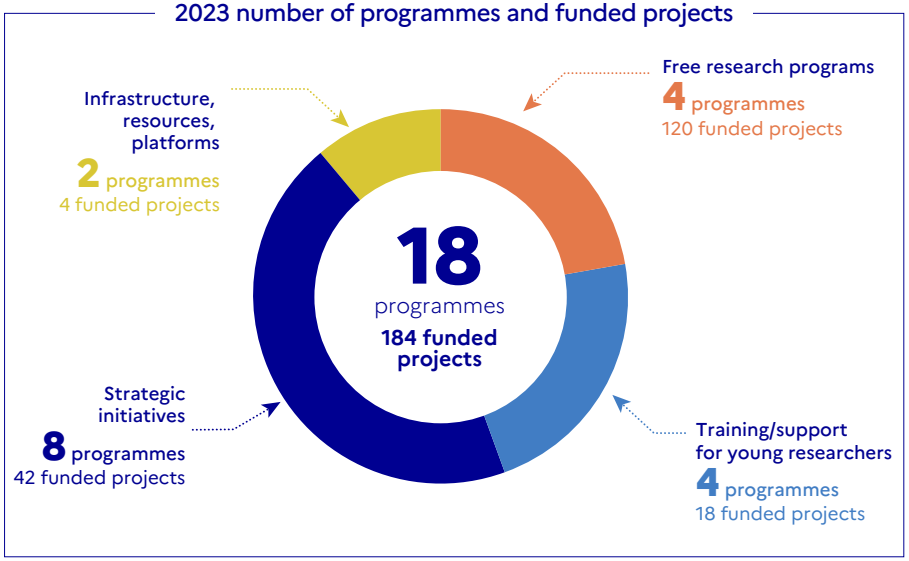
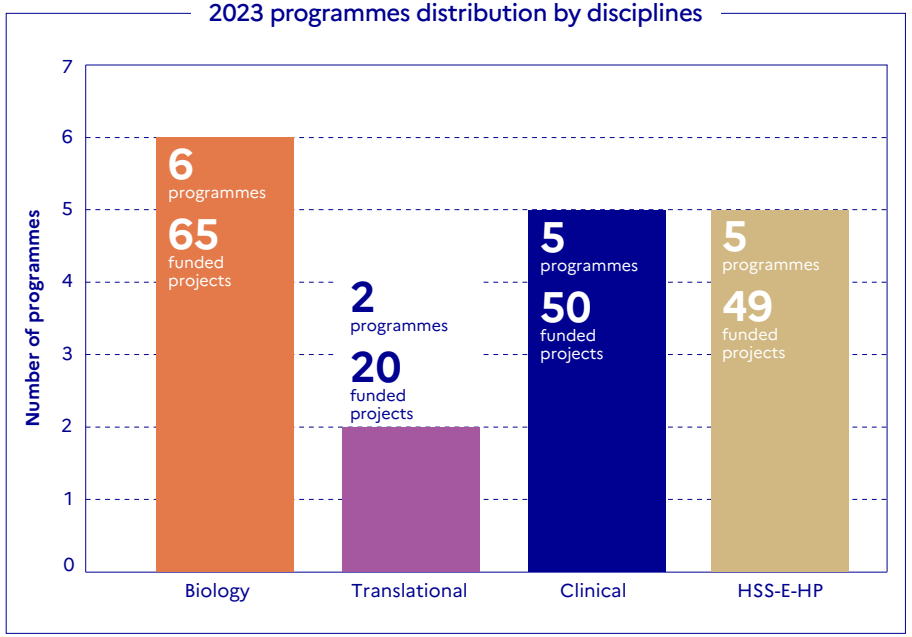



Figure 29

2023 programmes distribution by disciplines




To insure a robust and effective strategy for cancer research, the Institute invests in several scientific discipline, in 2023 (Figure 29):

- 65 projects involving biology and basic research were funded for a total of 63.6 million euros
- 20 projects involving translational research were funded for a total of 10.4 million euros
- 50 projects involving clinical research were funded for a total of 33.5 million euros
- 49 projects involving human and social sciences were funded for a total of 13.4 million euros

## Investigator-initiated research projects

To promote investigator-initiated cancer research, the Institute provides annual funding through four recurring calls for proposals covering biology, translational, clinical, human and social sciences research, and interventional and public health research (see Figure 30).

### • PLBIO programme to fund biology and basic sciences for cancer research

To expand our understanding of cancer biology and develop new tools to create novel therapeutic approaches the Institute issues, since 2005, an investigator-initiated call for proposals for the funding of original and promising research projects. The call is open to the French scientific community in all areas of basic research and scientific disciplines involved in tumour biology research. The objectives of this programme are to:

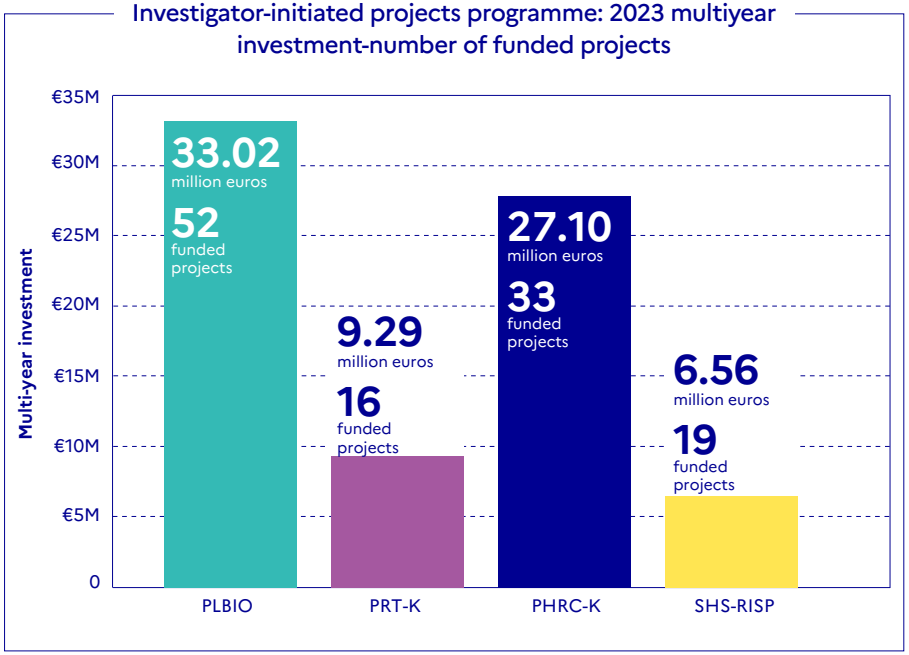
- Enable the achievement of original projects;
- Strengthen multidisciplinary collaborations;
- Develop research in emerging areas.

**In 2023, 52 projects were selected out of the 224 proposals submitted for a total amount of 33 million euros. 23.2% of the submitted applications were selected for funding.**

**For more information on the PLBIO programme please refer to the 2007-2023 overview of the programme, available section 2.2**

Figure 30

Investigator-initiated projects programme: 2023 multiyear investment-number of funded projects




### • PRT-K programme to enable translational research

To accelerate the transfer of knowledge with a view to its prompt application in clinical practice for the benefit of patients, the Institute, in partnership with DGOS, a directorate of the French Ministry of Health, launched the National translational cancer research programme, PRT-K, in 2007. It has been run every year since 2009.

This Call for proposals aims to give an incentive to researchers to develop interdisciplinary projects in close collaboration with clinicians. Sharing specific expertise, skills and knowledge should promote the translation of scientific and medical discoveries into clinical progress for cancer patients. It should also improve prevention, early detection, and diagnosis for the public.

**In 2023, 16 projects were funded out of 84 proposals for a total budget of 9.3 million euros. The selection rate reaches 18.4% of submitted application.**

**POINT INFO: PHRC-K**

Nationwide support of academic clinical cancer research is organised through the "National programme for hospital clinical research on cancer", PHRC-cancer (PHRC-K).

It is a specific call for proposals operated by the French National Cancer Institute, and funded by *DGOS*, a directorate of the French Ministry of Health.

### • PHRC-K programme for clinical cancer research

The PHRC-K programme funds clinical cancer research projects that assess the efficacy of health technologies. Funding is prioritised for research that uses controlled comparative methods, using randomisation whenever feasible, and that aims to help achieve recommendations with strong scientific evidence. The PHRC-K also looks at funding projects aimed at evaluating the safety, tolerance or feasibility of the use of health technologies in humans.

Therapeutic de-escalation trials are particularly welcome and, in the context of the Ten-Year Cancer Control Strategy, are treated as a priority. Reducing the toxicity of treatments in the medium and long term is part of an approach to reduce sequelae and improve patients' quality of life, a key priority of the national Ten-Year Cancer Control Strategy.

**In 2023, 33 projects were selected for funding for a total amount of €27.1M out of 146 submitted proposals. 22.6% of the submitted proposals were funded.**

**For more information on the PHRC-K programme, refer to Section 2.2.**

### • SHS-RISP programme for social sciences and intervention research for cancer

The contributions of public health (PH), human and social sciences (HSS) and population health intervention research (PHIR) in the fight against cancer are significant. These disciplines cover a multitude of fields of research in which the non-medical perspective is proving to be increasingly relevant. Questions remain about social perceptions of cancer, barriers to screening, environmental factors and health risk behaviours.

Through the HSS-PHIR programme, the Institute aims to promote the development of high-quality, innovative and multidisciplinary research in the HSS, PH and PHIR fields. The targeted research addresses all the stages of the individual experience, from primary prevention to all stages of cancer, and also includes medical care of patients and care for caregivers.

The call for proposals is organised to specifically target:

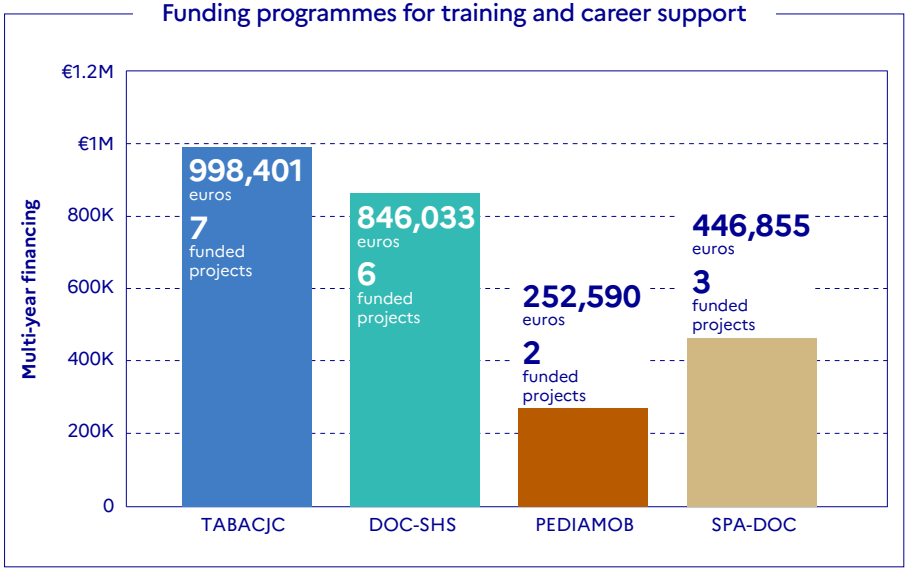
- Investigator-initiated research projects in the HSS field and in the PHIR field
- Thematic research projects in the HSS field and PHIR addressing the following specific objectives of the Ten-Year Cancer Control Strategy:
  - Combating inequalities through a pragmatic approach tailored to different populations;
  - Taking action to reduce cancer in children, adolescents and young adults;
  - Developing research into cancers with a poor prognosis.

**In 2023, 19 projects were selected from the 36 submitted, for total funding of 6.56 million euros.** 14 projects were investigator-initiated, 5 projects addressed the set theme, including 2 on the fight against inequalities, and 3 on cancers in children, adolescents and young adults.

## Training and career support funding

To support the new generation of cancer researchers and enhance the appeal of certain/specific fields of investigation, the Institute funded four calls for proposals in 2023 aimed at early-career researchers and their training (see Figure 31).

Figure 31
Funding programmes for training and career support




### • PEDIAMOB programme to promote paediatric cancer research for young talent

To reinforce the attractiveness of paediatric cancer research for young talent and facilitate career progression in paediatric cancer research, the Institute has launched, for the 3rd time, a call for applications aiming to:

- Fund doctoral theses and post-doctoral fellowships in France or abroad in paediatric oncology;
- Enable 2nd year Masters and PhD students, postdoctoral fellows and statutory staff (researchers, doctors, engineers, etc.) carrying out research work in France to complete internships abroad, to acquire new skills for the development of research projects in paediatric oncology.

In 2023, after the 2019 and 2020 edition of the call, it was decided, in conjunction with the Paediatric Task Force, that this third edition would also fund research theses.

**In 2023, 2 projects out of a total of 12 were selected for funding, with an overall budget of 252,590 euros.**

### • DOC-SHS programme to support the research community for HSS-E-PH applied to Cancer

To promote research in HSS-E-PH applied to cancer control, the French National Cancer Institute launched in 2023, for the 13th consecutive year, a call for applications to fund four doctoral grants.

**A total of 19 applications were submitted to INCa. Following the review process, including interviews of applicants, 6 PhD theses were selected for funding for a total budget of 846,000 euros** (3 in epidemiology/biostatistics, 1 in sociology, 1 in economy, 1 in psychology).

### • SPA-CPA-DOC programme to develop the scientific community studying psychoactive substances

To support the research community addressing psychoactive substance use and addiction, the Institute has a dedicated call for applications to fund doctoral theses addressing this area of research.

It targets all students with a Master's degree in human and social sciences, public health, epidemiology, or biology, enrolled in first or second year in a doctoral school. The programme covers all aspects of research, as well as a broad array of disciplines, ranging from clinical research to public health, and including information and communication technologies, economic and political science, hum and social sciences, law, biology, and epidemiology.

This call is managed jointly with the Institute for Public Health Research (IReSP). This is the fourth year that the call has been open to all psychoactive substances, and a wide variety of substances are being studied, including cocaine, alcohol, tobacco, psychedelics, along with addiction mechanisms. Since 2023, the scope of the call has been extended to all kind of addiction, including non-substance addiction, and it now targets four themes:

- Psychoactive substances and general population (co-managed by the Institute and IReSP);
- Psychoactive substances and cancer (managed by the Institute);
- Psychoactive substances and diseases other than cancer (managed by IReSP);
- Non-substance addiction and behavioural disorders with addictive potential (managed by IReSP).

**In 2023, 24 applications were submitted and 6 PhD students were selected for funding. The Institute is funding 3 of them for a total amount of 447,000 euros and IReSP is funding the other 3.**

### • TABAC-JC programme to attract junior researchers in the fields of tobacco and alcohol

To attract young PhDs to the development of tobacco and/or alcohol research, in 2020, the Institute launched an innovative programme targeting junior researchers who have obtained a PhD thesis in the ten years preceding their application. The goal is to support young talent who would like to propose innovative ideas in the field of research in human & social sciences, public health and intervention research in the field of Tobacco and/or alcohol to reduce the risks of cancers associated with these psychoactive substances. They are expected to propose new models, approaches, methodologies and scientific protocols.

Through a collaborative system of initiatives led by junior researchers, this programme aims to develop a scientific community around these themes.

This call is implemented around three steps:

- pre-selection of candidates based on letters of intent;
- development of projects including participation in a collaborative seminar;
- selection of candidates based on projects and interviews.

**In 2023, 15 applications were submitted, among which 11 were eligible. Seven were selected for funding for a total budget of 998,000 euros.**

#### POINT INFO: COLLABORATIVE SEMINAR OF THE TABAC-JC PROGRAMME'S SELECTION PROCESS

The "Junior researchers in tobacco and/or alcohol" call is organised in two selection phases. After the first stage of pre-selection based on letter of intent, a collaborative seminar is organised with and for the pre-selected applicants to prepare their full proposal and interviews. They have the opportunity to challenge themselves and to benefit from the feedback and advice of scientific experts. In addition, this meeting contributes to the development of a multidisciplinary community of researchers in the field of tobacco and alcohol.

The seminar was held on 25 April 2023 at the Institute's premises, and nine pre-selected junior researchers presented and discussed their proposals at the event. An experienced researcher and a laureate of the 2022 edition of this call also participated in the event to share their experience in designing, coordinating and managing research proposals with the applicants.

## Thematic cancer research projects funding: a strategic initiative

In order to fund research projects that address specific scientific priorities due to a restricted active community or public health emergency, the Institute issues targeted thematic calls for proposals (Figure 32).

### • "Obesities and cancer" PAIR programme

This year, the "Obesities and cancer" PAIR programme was aimed at improving knowledge, prevention and care for obese or overweight people with or without cancer. **Of the 17 projects submitted, 4 were selected for funding totalling 4.3 million euros.**

**For more information on the 2023 edition of the PAIR programme, see Focus 5.**

### • SHS-PHIR programme

**A section of the SHS-PHIR Programme is dedicated to thematic areas aligning with the Ten-Year Cancer Control Strategy, and includes:**

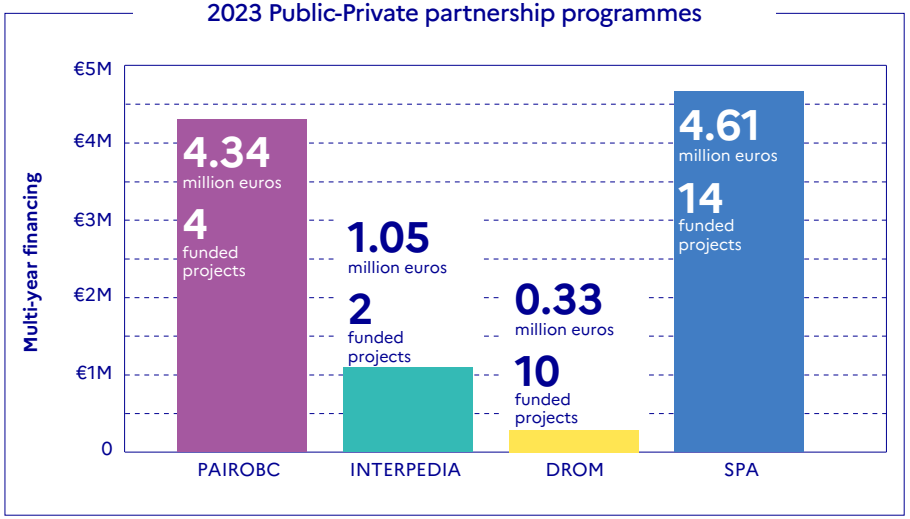
- Combating inequalities through a pragmatic approach tailored to different populations;
- Taking action to reduce cancer in children, adolescents and young adults;
- Developing research into cancers with a poor prognosis.

**The SHS-RISP programme is detailed on page 67.**

### • INTERPEDIA programme for interdisciplinary approaches in paediatric oncology research

To foster the emergence of ambitious interdisciplinary research projects in paediatric oncology research, the Institute has launched a specific funding programme. It allows the development of original approaches by associating only two teams with different scientific expertise, with at least one of the two teams not coming from the cancer research field.

Figure 32
2023 Public-Private partnership programmes




The proposed project should be built on the contributions of the planned interdisciplinary approach(es) and must address one or more research questions in paediatric oncology.

**In 2023, 2 applications out of a total of 5 submitted were selected for funding, for an overall budget of 1.05 million euros.**

## THE ADDICTION FUND FROM THE NATIONAL HEALTH INSURANCE FUND (CNAM) TO SUPPORT RESEARCH ON PSYCHOACTIVE SUBSTANCE ABUSE AND ADDICTION

In France, tobacco consumption is responsible for 75,000 deaths per year, including 45,000 deaths from cancer; alcohol is responsible for 41,000 deaths, including 16,000 deaths from cancer[16]. Among illegal substances, cannabis is the most used in France (11% of adults), followed by cocaine (1.6% of adults) and, to a lesser extent, ecstasy, opioids, and new substances. These different addictive behaviours cause substantial social harm and exacerbate social inequalities, as vulnerable groups are particularly affected.

A specific fund was set up in December 2016 within the National Health Insurance Fund (CNAM), notably funded by a tax on tobacco products, to fund tobacco control actions. The scope of intervention of this fund was extended in 2019 to all psychoactive substances, becoming the Addiction Fund, and in 2021 to non-substance addictive behaviours.

This fund aims to perpetuate existing addiction control and prevention initiatives and is also an opportunity to propose funding of new initiatives, particularly for supporting research actions.

**In 2023, the Addiction Fund allocated €18.5M to INCa and the Institute for Public Health Research (IReSP) to deploy research and intervention measures against addiction.**

[16] ~~The French~~ Monitoring Centre for Drugs and Drug Addiction https://www.ofdt.fr/publication/2022/drogues-et-addictions-chiffres-cles-2022-569

### • SPA-CPA programme to fund research on psychoactive substance abuse and addiction

This call for proposals aims to support research and produce knowledge in the field of psychoactive substance use and behaviours with addictive potential, prioritising tobacco, alcohol and cannabis, identified as known cancer risk factors, but also focusing on other psychoactive substances, polysubstance use and non-substance addictions.

It covers the research continuum, from fundamental science to intervention research, via human and social sciences, psychology, psychiatry, epidemiology, public health disciplines and clinical research. The call is open to researchers as well as to health or other professionals who wish to engage in a research process.

In the context of the Addiction Fund, the Institute and IReSP are jointly in charge of the call for proposals. This programme follows on from the "Tobacco INCa-IReSP" programme (2018, 2019) and the "Psychoactive substances INCa-IReSP" programme (2021, 2022) whose scope has been extended to all kind of addiction, including non-substance addiction.

The programme targets projects addressing the following themes:

- Psychoactive substances and general population (co-managed by the Institute and IReSP);
- Psychoactive substances and cancer (managed by the Institute);
- Psychoactive substances and effects other than cancer (managed by IReSP);
- Since 2023: Non-substance addiction and behavioural disorders with addictive potential (managed by IReSP).

Candidates can submit three types of proposals: "Full research proposals", "Pilot proposals" and "Emerging proposals".

**In 2023, 24 projects out 43 proposals were funded. The Institute funded 14 projects for a total budget of 4.6 million euros and IReSP funded 10 projects.** Half of the projects funded (12) are full research projects; the other half are made up of emerging projects (2) and pilot projects (10).

Twenty projects addressed the theme "Psychoactive substances and general population", while 4 addressed psychoactive substances and cancer.

Table 5: Ongoing research structuring programmes

| Structuring Programmes | Objectives/Goals | Labeling/selection | | | |
|---|---|---|---|---|---|
| | | Label Duration | Year of Label | Number of Structures | Total Budget (Euros) |
| Cancéropôles | Promote better coordination of cancer research at the regional or interregional level. | 4 years | 2023 | 7 | €27.5 million |
| SIRIC | Offer translational cancer research new operational conditions to optimise and accelerate the production of new knowledge while promoting its dissemination and application in cancer treatment. | 5 years | 2023 | 8 | €49.6 million |
| CLIP[2] | Support specialised investigator centres within healthcare institutions (university hospitals, cancer centres), dedicated to early-phase trials of new drugs from pharmaceutical labs, biotech, and academic labs. | 5 years | 2019 | 16 | €6.5 million |
| Clinico-biological databases for poor prognosis cancers | Encourage cooperation between research teams and clinicians to create clinical and biological databases associated with biological samples on poor prognosis cancers. | 5 years | 2023 | 6 | €2.5 million |
| Cooperative intergroups | Promote collaboration and the formation of cooperative groups at the national level, addressing various cancer pathologies. | 5 years | 2022 | 14 | €3.5 million |
| Radiotransnet | National preclinical research network in radiotherapy to unite researchers in this field. | 4 years | 2022 | 1 | €0.4 million |
| Research Chairs | Promote research in human and social sciences and interventional research applied to cancer: | 4-5 years | 2020 | 1 | €0.6-0.75 million per Chair |
| | • Social issues in personalised medicine and innovation in oncology | | 2021 | 1 | |
| | • Health democracy/empowerment: involvement of citizens and people affected by cancer | | 2021 | 1 | |
| | • Innovations in psycho-oncology and interventional research | | | | |
| | • Tobacco and cancer prevention | | 2022 | 1 | |
| SoRISP Network | For the development of interventional research in population health. | 4 years | 2022 | 1 | €1.6 million |
| CANCEPT Network | Transdisciplinary research network on nutrition and environment in primary cancer prevention. | 4 years | 2022 | 1 | €1.6 million |

## Structuring of the research landscape

In 2023, the Institute invested in structuring activities through 2 actions:

- **PEDIACRIEX** to support the paediatric oncology research community with the designation of 3 centres of excellence for a total budget of 15 million euros (see Focus 2)
- **UNITC** to promote the clinical research and development of CAR-T cells and innovative cell therapy, with the designation of the UNITC network for a total budget of 300 000 euros (see Focus 3);

These 2 programmes supplement the Institute's portfolio of pre-existing and ongoing structuring programmes (Table 5, on previous page).

## Public-Private partnership strategic initiatives

2 strategic initiatives involve Public-Private partnership (Figure 33):

- the **MI-AMGEN programme** (3.53 million euros multi-year investment in 2023)
- the **New AcSé programme** (1.9 million euros multiyear investment)

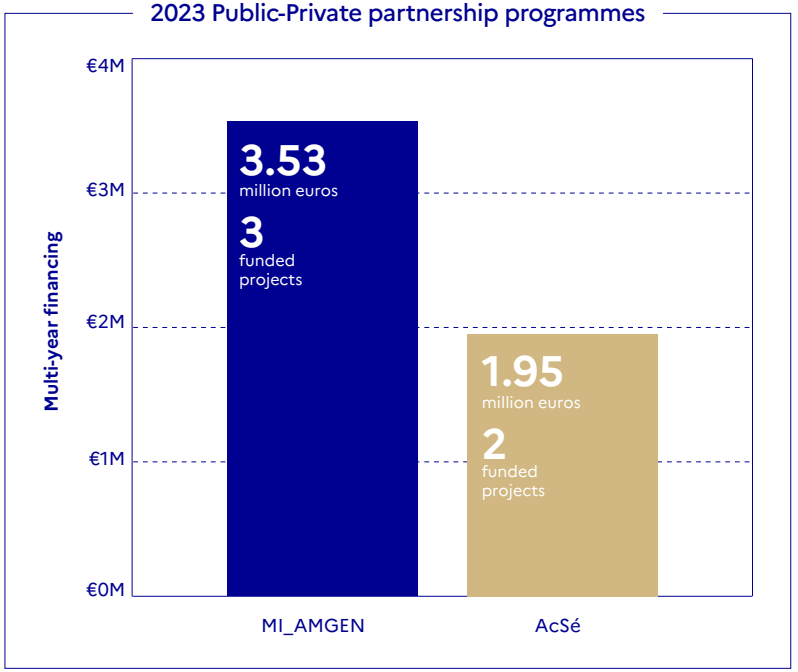
### • MI-AMGEN programme: AMGEN's Innovative molecules for clinical trials in CLIP²

To allow patients to access innovative treatments within clinical trial settings, the French National Cancer Institute has established a Public-Private Programme through which private pharmaceutical companies provide the Institute with drug-candidates that are still in early clinical development and not yet available on the market.

In turn, the Institute organises a call for proposals and the funding of academic projects that aim to evaluate these molecules for indications not targeted by the owning company. This call for proposals is open only to the Early Phase Clinical Research centres (CLIP²) designated by the Institute.

The programme offers investigators the opportunity to design and propose innovative academic clinical trials using otherwise non-accessible molecules. Most importantly, it provides clinicians participating in the funded trials with the valuable opportunity of using these new molecules from the early stages of their development. This not only advances research before these drug

Figure 33
2023 Public-Private partnership programmes




candidates even reach the market, but also allows them to be offered directly to their patients, thus maximising the potential therapeutic benefits.

To address the Ten-Year Cancer Control Strategy Focus on "ensuring access for patients to innovative therapies within the scope of clinical trials", in October 2022, the Institute signed an agreement with the private company Amgen to provide the 16 CLIP² centres with three innovative drugs:

- Sotorasib: KRASG12C inhibitor
- Tarlatamab (AMG 757): CD3/DLL3 bispecific antibody
- Bemarituzumab (AMG 552): Anti-FGFR2b antibody

**This agreement enabled the launch of a call for proposals in November 2022. Among the 16 projects submitted in total by 16 CLIP² centres, 3 will be funded for a total amount of €3.53M. The table 6 summarises the information on the funded projects.**

### • New AcSé Programme

To enable access to targeted anti-tumoral therapies for patients in treatment failure for cancer types not yet approved by existing marketing authorisations, the AcSé programme (*Accès Sécurisé*: Secure Access) was launched in 2013 by the French National Cancer Institute (INCa). This programme offers additional therapeutic options to be tested in medically supervised and safe Phase 2 clinical trial settings:

- It provides patients with controlled targeted treatments based on their genetic tumour profile and the presence of potential therapeutic targets;
- it assesses the potential efficacy and tolerance of these new therapies;
- it ensures equity of access to innovative treatments;

The review of the AcSé programme from 2013-2022 shows remarkable success with nearly 17,000 patients engaged in various trials and about 1,300 directly benefiting from the proposed therapeutic innovations. The experience gained during this period allowed refining of inclusion and treatment strategies and highlighted the flexibility needed to adapt clinical trials to interim results and advancements in scientific knowledge.

### • Objectives of the renewal of the AcSé programme

As part of the Ten-Year Cancer Control Strategy, it was decided to significantly renew the programme to incorporate more flexible and inclusive treatment approaches, such as multi-arm, multi-target, and multi-drug trials. The aim is to extend access to new targeted molecules to a greater number of patients from the first lines of treatment. This should increase the chances of therapeutic success for advanced and treatment-resistant cancers. Ultimately, the programme aims to generate actionable data that can transform medical practice and substantially improve clinical outcomes for patients.

### • Structuring of the New AcSé Programme

While 2022 was dedicated to defining the scientific profile of the new AcSé programme, identifying possible initial trials, and approaching pharmaceutical firms likely to provide the necessary molecules for these trials, 2023 was devoted to restructuring the programme at Institute level and preparing the first two trials.

Table 6: MI-AMGEN funded clinical research projects

| Agents tested | Project | CLIP² centre and Principal Investigator |
|---|---|---|
| **Bemarituzumab (AMG 552): Anti-FGFR2b antibody – Amgen**<br><br>**5-fluorouracil, leucovorin, oxaliplatin and docetaxel (FLOT regimen)** | BEMAFLOT: Open-label non-randomised multicentric phase 2 study evaluating the association of bemarituzumab + FLOT chemotherapy in perioperative setting for resectable stage c T2-T4Nx gastric and GEJ adenocarcinoma overexpressing FGFR2b | CLIP²: Unité de Développement Thérapeutique Précoce<br><br>Institut de Cancérologie de l'Ouest – SAINT-HERBLAIN<br><br>Dr. Judith RAIMBOURG |
| **Bemarituzumab (AMG 552): Anti-FGFR2b antibody – Amgen**<br><br>**Bevacizumab-awbb: anti-VEGF antibody – Amgen** | ANGELICA – AssociatiNG avastin bEmarituzumab GynecoLogIcal CAncer – A multicentre, open-label Phase I/II trial aiming to assess the safety and clinical activity of Bemarituzumab + bevacizumab-awbb in advanced/metastatic gynaecological cancer overexpressing FGFR2. | CLIP²: Centre Léon Bérard<br><br>Centre Léon Bérard – LYON<br><br>Prof. Isabelle RAY-COQUARD |
| **Tarlatamab (AMG 757): CD3/DLL3 bispecific antibody – Amgen**<br><br>**metronomic Temozolomide** | TarlaTEM: A multicentre, open-label Phase I/II trial aiming to assess the safety and clinical activity of Tarlatamab and metronomic Temozolomide in patients with central nervous system tumours | CLIP²: Centre Léon Bérard<br><br>Centre Léon Bérard – LYON<br><br>Dr Pierre LEBLOND |

Developments of the programme and of the regulatory environment, and the strengthening of transparency requirements independent of the health industry required an update of the AcSé charter last reviewed in 2016, to take account of:

- The implementation of the "*Jardé law*" and changes to the French early access framework;
- Developments in clinical research since 2016, enhancing the missions of AcSé's strategic committee;
- The evolving role of pharmaceutical firms in the programme;
- The evolving missions of AcSé's Strategic Committee.

This evolution of the AcSé Charter was submitted to the Institute's Ethics and Deontology Committee, which issued a favourable opinion, and presented to the Institute's board of directors.

AcSé's strategic committee is composed of: 4 physicians; 2 experts from molecular genetics platforms; 2 statisticians; 1 patient representative; 1 representative of the France Genomic Medicine 2025 Plan.

Members of the New AcSé Programme's strategic committee were appointed by the Institute's president based on their skills and experience. The committee will meet twice a year to attend to their missions.

The main missions of this committee are to:

- Reflect on current biological questions that could be the subject of a clinical trial under the AcSé Programme;
- Provide the Institute with a prioritisation of therapeutic research topics that may focus on a disease or biological anomalies that are candidates for a clinical trial within the AcSé Programme;
- Propose, where appropriate, the Institute with a list of molecules capable of targeting these anomalies when multiple molecules are available.

**Two trials are already planned in the framework of the new AcSé programme and are both sponsored by Unicancer and funded by the Institute for a total budget of 1.9 million.** The Pan-MSI-AcSé and the AcSéFGFR trials are described in the section 1.5. above.

## EU and international partnership strategic initiatives

In 2023, the Institute has contributed and co-funded to 2 international research funding programmes to promote transnational research collaboration (Figure 34).

### • Cancer Grand Challenges

In 2023, the Institute has entered a partnership with Cancer Research UK to contribute to the Cancer Grand Challenges initiative. For the 2023 edition, Cancer Grand Challenges has awarded 5 international research consortia with 25 million euros each to tackle cancer toughest challenges, for an overall budget of 125 million euros. **The Institute has co-funded the Koodac and Prospect international consortia for a total budget of 10 million euros.**

**For further details/information on these two international consortia, see Focus 6.**

### • TRANSCAN

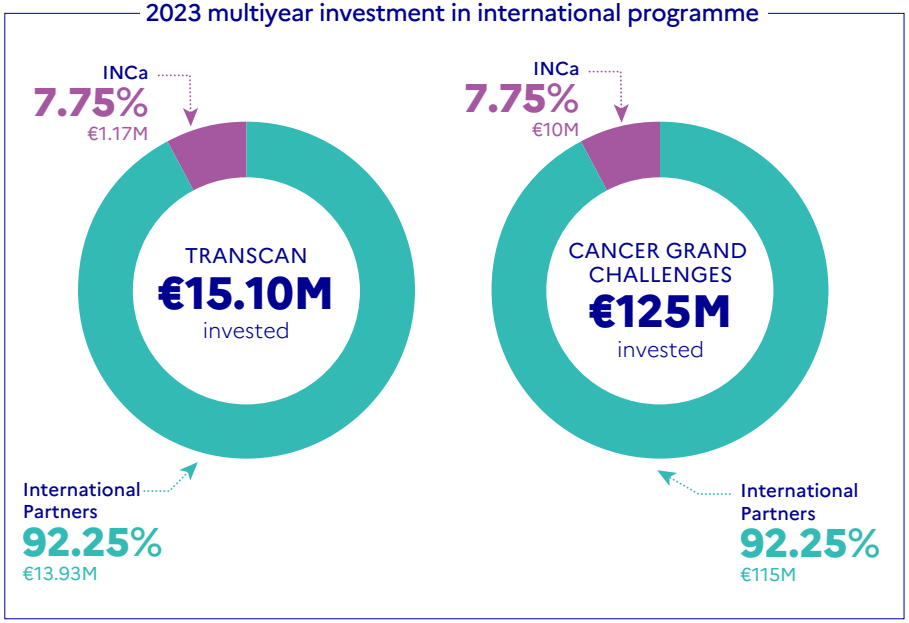
The TRANSCAN-3 network, which comes after TRANSCAN1 and TRANSCAN-2, is a cross-national cooperation, bringing together 31 funding organisations from 20 countries.

The network shares the common goal of enabling high-impact translational cancer research through joint transnational calls for proposals, and by an efficient investment of dedicated national/regional public funding, leveraged with foundation/charity-based resources and EU financial support.

In 2023, funded teams for the JTC22 (launched in 2022) were announced. This second call of the TRANSCAN-3 aimed for proposals on "Novel translational approaches to tackle the challenges of hard-to-treat cancers from early diagnosis to therapy".

**Fourteen projects were funded, 7 with French partners, out of the 70 submitted proposals. The total amount of French funding is 1.8 million euros, including 1.2 million euros from INCa and 0.6 million euros from ARC Foundation for Cancer Research.**

Figure 34
2023 multiyear investment in international programme




## 3.2. The Institute's 2023 coordination and facilitation activities

In addition to financial support, the Institute holds a facilitator and coordinator role required to federate the research community which involves research monitoring activities, workshops, conference and seminars organisation.

### Monitoring of research activity

**• Data collection, management and visualisation: professional activities**

To monitor the clinical cancer research activity and assess its research investment, the French National Cancer Institute conducts surveys with questionnaires directed at clinical professionals. These surveys accrue with those conducted by other national structures such as inter-regional cooperative groups, and ministries in which the requested indicators or metrics are redundant. This is an issue brought up every year by clinical research stakeholders to whom these surveys are directed. To address this issue, the Institute has been working, since 2018, on optimising these surveys as well as on how to use and add value to collected data through professional data management activities.

**• Optimising the CLIP² activity monitoring survey**

The first action targeted the survey monitoring the activity of the *Centres labellisés INCa de phase précoce* CLIP² (INCa-designated Early clinical phase Centres). We worked with the coordinators of these centres to minimise the workload created by the surveys and increase the relevance, quantity and robustness of information generated from these forms. New and more informative indicators, including qualitative ones, were included in the survey, while the total number of indicators to be completed by surveyed centres dropped from 22 to 8. This was partly made possible by collecting publicly available standardised clinical research data from www.clinicaltrials.gov, which totalled 50 indicators collected from this source. Thanks to the work conducted on updating the CLIP² activity monitoring survey, the activity of CLIP² centres can be evaluated through greater and more robust qualitative measurements i.e. ability of CLIP² centres to set up a trial, and quantitative measurements i.e. number of open trials and inclusions, with a decreased amount of work required from clinical stakeholders.

**• Facilitating data use and visualisation with Dataviz_CLIP and DATAVIZ-SCREEN**

The second action was aimed at facilitating the analysis, use, sharing and promotion of all of the CLIP² activity data collected. For this purpose, a complementary data visualisation project, DATAVIZ_CLIP, was developed. The comprehensiveness and detailed information provided by this data visualisation interface allows CLIP² centres to self-evaluate, to compare themselves to each other, and to have access to and present an overview of their activity (Figure 35 et Figure 36) from various angles.

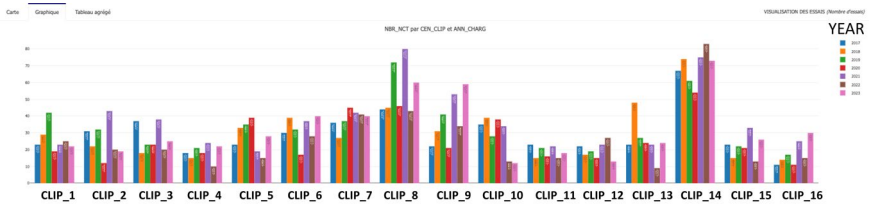
Based on the experience gained with the CLIP² activity monitoring survey optimisation, another survey conducted among CLIP² centres, the "molecular screening" survey, was updated, optimised and simplified by making use of publicly available data. A data visualisation interface was also created, for identifying clinical trials driven by genomics ("molecular screening survey/ DATAVIZ_SCREEN") (Figure 37).

- **DATAVIZ_ERCC for the National clinical cancer research activity survey**

Finally, DATAVIZ_ERCC, dedicated to data visualisation from the Clinical Cancer Research Activity Survey, should be developed in 2024-2025, and will make it accessible and easy to obtain an annual overview of national clinical research activity in oncology (different metrics collected i.e. number of trials, number of inclusions, etc., different types of aggregation chosen by the user[16]). This work would help improve not only the management and analysis associated with this survey in terms of efficiency and robustness, but also the typological monitoring of projects and/or trials funded by the Institute within the framework of various programmes (CLIP², AcSé, etc.) or calls for proposals (PHRC-K, etc.).

Figure 35

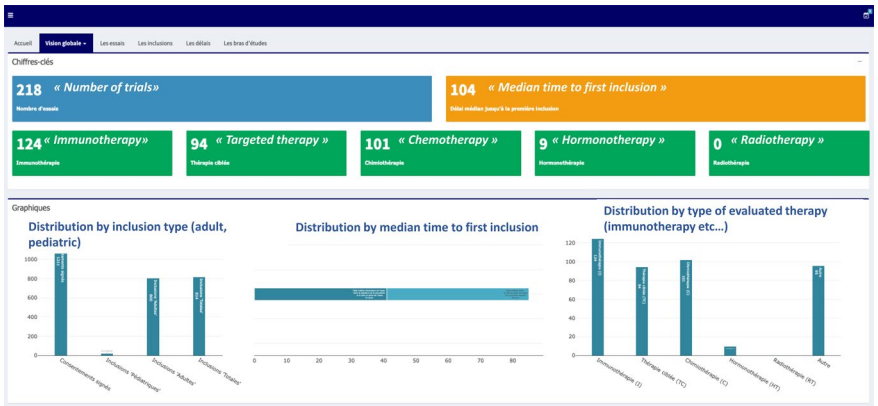
DATAVIZ-CLIP Example of data visualisation: number of trial by CLIP² centre over the 2017-2023 period




Source: DATAVIZ-CLIP

Figure 36

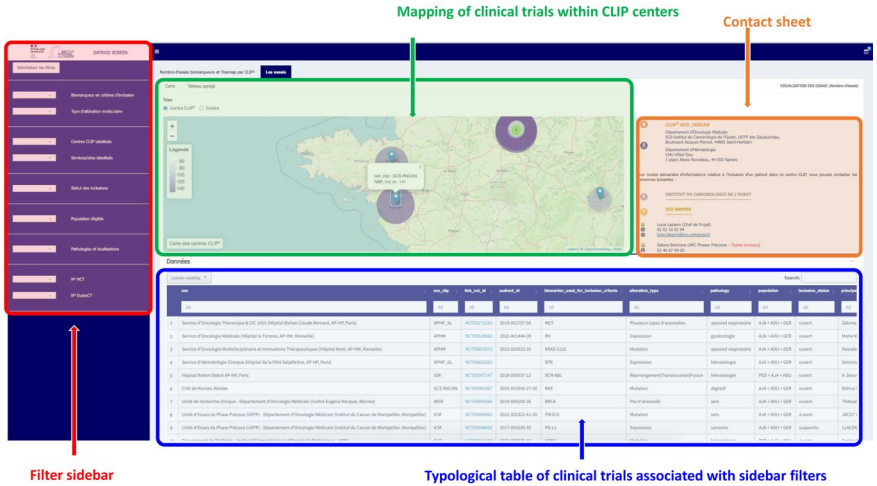
DATAVIZ-CLIP example of data visualisation: key characteristics of 2023 trials in CLIP² centres




Source: DATAVIZ-CLIP

Figure 37

DATAVIZ_SCREEN interface




Source: DATAVIZ-SCREEN

[16] For example, the number of trials or the number of inclusions by health establishment, by inter-region, by intercooperative group, by year, by phase, by disease, by sponsor, or by eligible population (children, adolescents and young people adults, adults, or the elderly)

Given the national dimension and the wealth of information generated by this survey, this project would allow the Institute to continue its strategy aimed at leveraging and adding value to collected data within the Institute (ability to monitor and categorise its research investments, by broadening the typologisation of funded research projects and associated clinical trials, inputs for annual scientific reports, additional information for the Scientific Advisory Board, publications on the Institute's website e-cancer.fr, etc.). It will also be a source of information to provide elements of context or response to external requests and/or to ministerial referrals.

### • National clinical cancer research activity monitoring: the annual declarative survey

Within the framework of the Ten-Year Cancer Control Strategy, in which one focus is that of ensuring access for patients to innovative therapies within the scope of clinical trials, the Institute's annual declarative survey assesses clinical cancer research activities in France. Using the data reported by University Hospitals, Cancer Care Centres, and Public and Private Health Care Centres, this survey provides an estimation of the enrolment rate in cancer clinical trials every year in France. These data are presented annually to the French President (Figure 38, Figure 61 et annexe 5).

**• Patient enrolment in cancer clinical trials**

The 2023 declarative survey was based on data from year n-1, i.e. 2022. In 2022, 54,557 patients were included in a clinical trial:

- 28,904 patients in a therapeutic clinical trial;
- 83% were enrolled in academic trials;
- 44,253 patients in clinical trials addressing solid tumours and 11,065 in haematology.

The results of the 2022 annual survey show a steady increase in the number of patients enrolled in clinical trials over the last 14 years: over the 2009-2022 period, the number of patients enrolled in cancer clinical trials has almost doubled, probably due to the actions of the different Cancer Control Plans (Figure 38);

**For more details, refer to the main results of the national survey in Appendix 5.**

### ENROLMENT OF PATIENTS IN CLINICAL CANCER TRIALS IN FRENCH OVERSEAS TERRITORIES

One of the objectives of the 2021-2030 Cancer Control Strategy is to open investigating centres in French overseas territories to increase trial inclusions. In 2022, the University hospitals CHU Martinique, CHU Guadeloupe and CHU La Réunion included 928 patients in academic cancer clinical trials.

**Because childhood and adolescent cancers are a constant concern of the 2021-2030 Cancer Control Plan, the survey closely monitors their inclusion in clinical trials.** In 2022, 2,370 children were enrolled in a trial, 88% of academic trials and 1,961 inclusions of adolescents and young adults in trials were recorded, with 82% being academic trials.

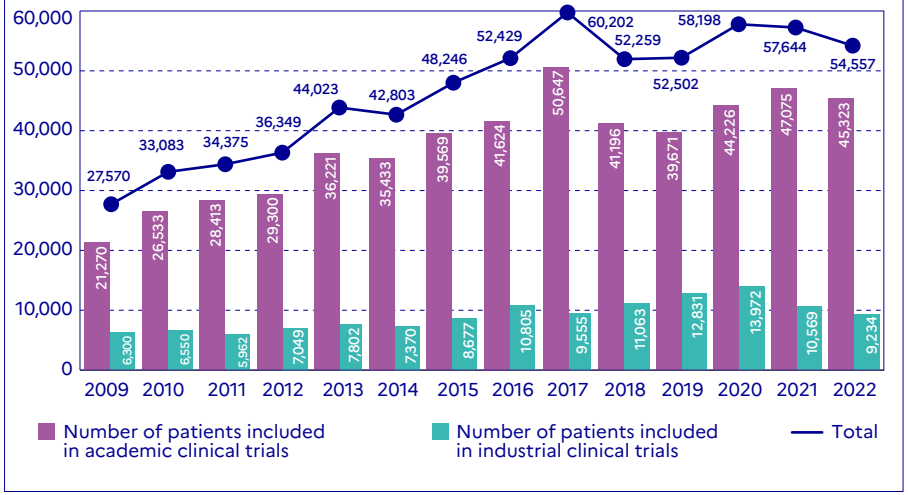
**Another indicator closely monitored by the Cancer Control Plan is the inclusion of elderly patients.** In 2022, 2,954 inclusions of patients over 75 years of age in total were recorded, 81% of these being included in academic trials.

**• Healthcare professionals in clinical cancer research**

Furthermore, this survey analysed the staff involved in clinical cancer research activities. The results show that 1,722 members of clinical research staff (full-time equivalent) were assigned to clinical cancer research in 2022 with 46% concentrated in Cancer Care Centres and 34% in University Hospitals. Over the 2009-2022 period, there was a significant increase in the number of clinical cancer research staff (+243% between 2009 and 2022).

Figure 38

Trends in patients enrolment to cancer clinical trials over the 2009-2022 period




**• The cooperative intergroup research activity monitoring**

Since 2020, a declarative survey on clinical cancer research activity has been specifically designed at the request of cooperative intergroups and based on the national survey (Figure 38 and Figure 39). This survey aims to quantitatively assess clinical cancer research activities within these cooperative intergroups in France every year.

French cancer cooperative intergroups are independent and not-for-profit academic groups, including doctors and medical research professionals who collaborate to develop and conduct clinical trials (see List of cooperative groups designated in 2022 in Appendix, Table 11).They may be sponsors, and may be involved in academic trials, and/or industrial trials[17].

The 2023 published results are based on 2022 activity (Table 7, on next page):

- 103 clinical cancer trials were sponsored by 11 cooperative intergroups (or a group of the intergroup):
  - 31,409 inclusions (+21% increase compared to 2021) (Table 11) were reported in 1,454 French centres all types combined (University Hospitals, Cancer Care Centres, Public and Private Health Care Centres);
  - These 11 cooperative intergroups, as sponsors, were active at an international level with 158 participating centres abroad.
- All the cooperative intergroups were involved in academic trials with 191 clinical cancer trials reported and 8,561 inclusions.
- Six cooperative intergroups were involved in industrial trials with 74 clinical cancer trials and approximately 679 inclusions reported. In total, cooperative intergroups were involved in 40,649 inclusions; they represented 74% of national inclusions.
- The total number of inclusions where cooperative intergroup are sponsors increased sharply in 2022 compared to 2019 (31,409 inclusions in 2022 versus 7,443 in 2019).

[17] Members of cooperative intergroups participate in the design of the study methodology and/or the inclusion and follow-up of patients in the study.

**Table 7: Main results of 2022 clinical cancer research activity among cooperative intergroups**

| | Year | Status of cooperative intergroup | | | Total on 2022 |
|---|---|---|---|---|---|
| | | Sponsors | Involvement in academic trials | Involvement in industrial trials | |
| Number of cooperative intergroups | 2019 | 9 | 13 | 7 | |
| | 2020 | 11 | 13 | 6 | |
| | 2021 | 11 | 13 | 5 | |
| | 2022 | 11 | 13 | 6 | 30 |
| Number of trials | 2019 | 86 | 162 | 39 | |
| | 2020 | 100 | 198 | 36 | |
| | 2021 | 152 | 198 | 33 | |
| | 2022 | 103 | 191 | 74 | 368 |
| Number of inclusions | 2019 | 7,192 | 12,469 | 714 | |
| | 2020 | 10,272 | 9,652 | 422 | |
| | 2021 | 25,910 | 11,803 | 311 | |
| | 2022 | 31,409 (+21% compared to 2021) | 8,561 | 679 | 40,649 |

In 2022, strong clinical research activity in early phases (phase 1 and 1/2) and phase 3 was still observed: 94% of inclusions were observed in phase 3 when the cooperative intergroups were sponsors, 28% of inclusions were observed in early phases when they were involved in industrial trials.

Moreover, this survey analysed the staff involved in clinical cancer research activities: 131 members of clinical research staff (full-time equivalent) were assigned to clinical cancer research in cooperative intergroups in 2022.

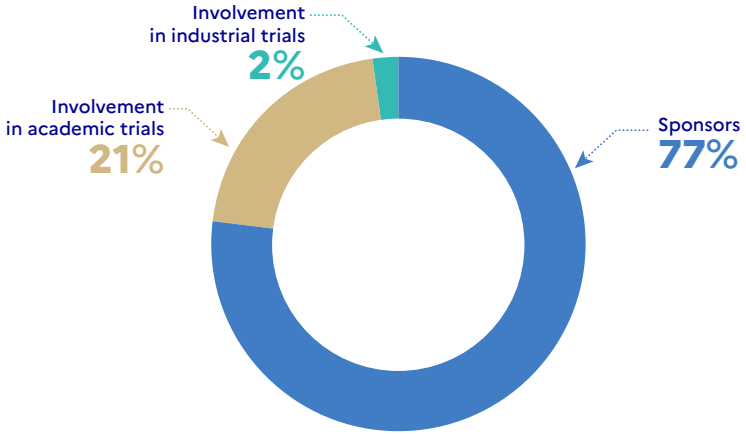
These results highlight the key role of intergroups in the clinical cancer research landscape in France, particularly in academic trials, both in terms of the design and conduct of clinical trials.

### • The Institute's Cancer Registry

Since 2007, INCa's cancer clinical trials registry has allowed easy access to cancer clinical trials conducted in France. It is freely accessible on INCa's website, and enables provision of quality and regularly updated information to patients, health professionals and the general public.

Figure 39

**Appendix Cooperative intergroup: Inclusions according cooperative intergroup status in 2022**



**FOCUS**

Since the European regulation came into force in January 2022, clinical trial sponsors have been submitting clinical trial authorisation requests directly on the Clinical Trials Information System (CTIS) platform.

Clinical trial data would then be publicly displayed on the CTIS website. However, following a malfunction on the site, these data will not be displayed until June 2024.

The French National Cancer Institute will therefore have access to data from cancer trials authorised in France, which will be made available on the Institute's Cancer Clinical Trials Registry.

The INCa cancer clinical trials registry provides information accessible to the general public, and facilitates the search and selection of clinical trials. Visitors to the clinical trials registry can, with the help of a multicriteria search engine, accurately target their search using different selection criteria, such as the sponsor or target organ, and can also apply the geographic criterion using the geolocation module included in the registry.

In December 2023 4,336 clinical trials were advertised on INCa's website, sponsored by more than 513 industrial and academic bodies. 529 were ongoing recruiting trials. With 50% sponsored by academic bodies and 78% of treatment trials.

**Since January 2023, INCa has provided clinical trial sponsors with a database for the registration and administration of their clinical trials.** This database is accessible on the Internet for both academic and industrial sponsors. Some clinical research operators working with sponsors have already created user profiles and are registering and updating their trials directly in the database.

## EU and international working groups

### • White paper: Back to Activity – A call to action to support cancer survivors in work and employment

Over two million working-aged people are diagnosed with cancer each year in Europe. Although better treatments have increased survival rates in the past decades, cancer survivors face considerable financial, psychological, and social hardships. Returning to work, when possible and desired, during or after cancer treatment is one appropriate response to these challenges.

However, cancer survivors face several barriers when willing to go back to work. In France, 20% of those between 18-54 years and in employment at the time of diagnosis are no longer working 5 years later.

Support for cancer survivors is lacking at diverse levels, and these challenges are "malicious problems" that could be solved with new holistic methodologies, cross-disciplinary knowledge and participatory science projects.

**• European research consortium with 7 represented countries including France**

Improving support for cancer survivors in returning to work is an objective of the Ten-Year Cancer Control Strategy. For this purpose, the Institute has been boosting the European research agenda. Following an international scientific conference devoted to this aspect in Paris in 2022, the French National Cancer Institute coordinated, in collaboration with the Swedish Karolinska Institute, a European research consortium. Composed of 16 top experts from 7 European countries, this Consortium produced a **White Paper proposing perspectives and ways of supporting research at a European level**. It is targeted at research stakeholders and was presented at a scientific event in Stockholm on 9 May.

This White Paper reflects on the need for European cross-country comparisons to better identify specific barriers and return-to-work trajectories according to age, sex, employment status or cancer sites. The Consortium calls for the launch of research programmes on 4 key return-to-work aspects:

- Individual perspectives;
- Social security system;
- Health professionals; and
- Employers.

The Consortium's work programme for 2024 will be to put these recommendations into operation.

### • T2EVOLVE: An EU Initiative bringing together academic and industry leaders in cancer immunotherapy

The French National Cancer Institute is an active partner within the T2EVOLVE consortium, a breakthrough alliance of academic and industry leaders in cancer immunotherapy under the European Union's Innovative Health Initiative (IHI).

The key objective of T2EVOLVE is to foster the overall development of engineered T cells, with a particular focus in Europe and patient access. Moreover, patient involvement will ensure that the perspectives of cancer patients are at the centre, in the research setting as well as along the cancer care continuum.

T2EVOLVE was operationally launched in January 2021 and will last until December 2025. The project is now in the second phase of its five-year period. During the first phase, the T2EVOLVE-project achieved most of its objectives and milestones.

**• T2EVOLVE: Specific objectives**

To achieve its ambitious goal, the T2EVOLVE consortium will work on and improve the state-of-the-art of different key aspects:

- selection of optimal lymphodepletion regimens;
- optimisation of pre-clinical models for safety and efficacy prediction;
- definition of gold-standard analytical methods for pre- and post-engineered T-cell infusion to ensure optimal patient monitoring;
- production of good manufacturing practice (GMP) guidance and establishment of standard product profiles to minimise unpredictable variables;
- integration of patient stakeholders into the R&D lifecycle of engineered T cell therapy;
- improvement of patient experience and making excellent cancer therapies accessible to all European patients.

These key aspects are divided across eight Work Packages (WP). The Institute is actively involved in two of these WPs:

- WP2, which specifically addresses the need for patient information, engagement and involvement in healthcare decisions in the field of engineered T-cells;
- WP5, which addresses needs for standardisation of analytical practices to improve prediction and comparison of safety and efficacy of the products.

**• The Institute's contribution to WP2 for Patient engagement**

To allow the T2EVOLVE consortium to align its work with the patient perspective, the working group of patients and caregivers (WGPC) was created. Meetings with the WGPC take place on a regular basis.

With the input of the WGPC, **the European Survey on the patient experience with CAR T-cell treatment was launched**. Feedback from more than 300 adult patients was obtained. The first results of the European Survey were presented at the annual meeting of the European Haematology Association 2024.

Results of this survey are a cornerstone of the important institute-led project to draft recommendations to make CAR T-cell clinical research informed consent forms more user-friendly for patients.

**Five topics for Explainer Videos to inform patients on different aspects of CAR T-cell treatment were identified** in collaboration with the WGPC. These explainer videos aim to help patients better manage their anxiety and play an active role throughout their illness. The first explainer video on how to identify reliable information is available on the T2EVOLVE Patient Hub.

Two videos based on interviews with patients, caregivers and health care professionals are currently being developed. These explainer videos will cover eligibility for CAR T-cell treatment and treatment failure.

Over the course of 2023, the Institute conducted one-to-one interviews with public and private stakeholders involved in the field of modified T cells to **identify the current obstacles hindering access to CAR T cells**. Results of these interviews will be part of the "access roadmap" to further improve patient access to modified T cell therapy across Europe.

**• The Institute's collaboration on WP5 for the standardisation of analytical practices pre- and post-infusion of engineered T cells**

Under the Institute's leadership, the Committee of European National Experts on engineered T-cells (CENET) has been created, including 15 experts from 14 different countries.

In collaboration with CENET, **the European survey of current analytical methods in the field of modified T lymphocytes was launched**. The findings of this survey will be presented in the manuscript to be submitted to a peer-reviewed scientific journal in 2024.

Relevant work was carried out during the first phase of the project on this WP with **mapping of practices for quality control and release criteria of CAR-T products**. The same applies for the highly relevant potency assays. A white paper to describe and to analyse the different cell culture-based biological assays currently used for CAR T-cell product characterisation and release, considering the best scenario for developing a standardised potency assay across drug products and indications, will be submitted for publication during 2024.

The Institute is also helping **define the standardisation approach that WP5 members would like to apply to several analytical assays** used to control engineered T-cell products. Guidelines on standardisation are expected to be shared and distributed through Europe by the end of the project in 2025.

## Workshop, seminars and conferences organisation

### • Report workshop on "Paediatric cancers" PAIR programme-funded projects

In March 2024, INCa and its partners, *ARC Foundation* and *Ligue contre le cancer*, organised a workshop in Paris dedicated to the 3 projects funded within the scope of the 2017 PAIR programme devoted to Paediatric cancers. Approximately 90 health professionals, researchers and patient associations attended the workshop.

This workshop provided an opportunity to share the knowledge gained from the projects funded, their results and achievements, as well as their potential impact on clinical practice, and to explore how these initiatives can benefit young patients.

The background to the Paediatric PAIR programme was presented by Profs. Olivier Delattre and André Baruchel, co-chairs of the PAIR steering committee. Presentations on the progress of the 3 funded projects followed, demonstrating the overall success of this PAIR programme.

A round-table discussion concluded that this PAIR programme has been a success, these 3 projects had been unifying, dynamic, multidisciplinary and multi-team, and included patient associations as partners. These projects will continue after the PAIR programme.

### • Report workshops on PHRC-K programme funded projects

**• "Clinical research in oncology" workshop – June 2023**

This workshop was organised during the IFODS congress and provided an opportunity to present 7 projects:

- **Lung Art** – Phase III study comparing post-operative conformal radiotherapy to no post-operative radiotherapy in patients with completely resected non-small cell lung cancer (NSCLC) and mediastinal N2 involvement, by Cécile Le Péchoux (Gustave Roussy, Villejuif – PHRC-K 2012). The findings of this study were published in the Lancet Oncol in January 2022.
- **ESTIMABL2** – Low-risk differentiated thyroid cancer: is ablative treatment with iodine 131 useful? by Isabelle Borget (Gustave Roussy, Villejuif – PHRC-K 2012). The findings of the clinical trial were published in the New England Journal of Medicine in 2022.
- **PAZOTHYR** – Randomised phase II study aimed at evaluating the effectiveness of treatment with pazopanib/paclitaxel versus paclitaxel alone for the treatment of anaplastic thyroid cancers that are metastatic and/or relapsed after initial treatment, by Christelle De La Fouchardière, (Institut Paoli-Calmette, Marseille – PHRC-K 2011). The results of this study were published in the Journal of Clinical Oncology in 2021.
- **IMHOTEP 01** – Neoadjuvant immunotherapy in MSI/dMMR tumours, by Christelle De La Fouchardière, (Institut Paoli-Calmette, Marseille – PHRC-K 2019). This study is in the process of including patients.
- **MIRs 03** – Phase IV, multicentre, double-blind, randomised clinical trial evaluating the effect of paravertebral block with ropivacaine on chronic pain after breast cancer surgery, by Aline Albi-Feldzer (Institut Curie, Paris – PHRC-K 2013). The findings of this clinical trial were published in Anesthesiology in 2021.

- **MIRs 04** – Randomised, multicentre, double-blind clinical trial evaluating the effect of interpectoral nerve block (Pecs 1 and 2) with ropivacaine versus placebo on acute pain after breast cancer surgery, by Aline Albi-Feldzer (Institut Curie, Paris – PHRC-K 2018). This study is currently being monitored.
- **EPIC-2015** – Impact on survival of early palliative care in metastatic cancers of the upper digestive system (pancreas, bile ducts and gastric) treated with chemotherapy – Randomised phase III study, by Marie-Cécile Le Deley **(Institut Oscar Lambret, Lille – PHRC-K 2016)**. Initial results have shown that, in patients treated for metastatic cancer of the upper digestive tract, the introduction of early palliative care consultations is not associated with an improvement in overall survival compared to standard care.

**• "PHRC PROJECTS in supportive cancer care" workshop – October 2023**

In order to illustrate the PHRC-K programme's support for supportive care, a PHRC-K project was presented in October 2023 at this seminar organised within the congress of Association francophone des soins oncologiques de support (AFSOS), in Lille. This study was presented: **eMouvoir_01** – Randomised trial evaluating the impact of personalised remote support on physical and sports activity for patients after breast cancer, by Laurence VANLEMMENS, (Lille, PHRC-K 2018). The results of this study have not been published to date.

### • Conference: the contributions of PHIR in the field of cancer

INCa has been strongly committed to supporting Population Health Intervention Research (PHIR) since 2010, with a dedicated call for projects and an international French-language scientific conference organised every two years. The 6th PHIR conference was held on 12 and 13 December in Paris, on the topic of **"Intervening, acting with and for citizens, patients and workers: the contributions of PHIR in the field of cancer"**.

The aim of the conference was to identify – through completed and ongoing research – the similarities and specificities of intervention in these different contexts and target populations. The conference included nearly 200 participants: researchers, experts, decision-makers, practitioners and patients. A special issue of the Canadian Journal of Public Health is currently being prepared (2024) to continue the exchanges and discussions initiated at the conference. It will be published and promoted at the 7th PHIR conference in autumn 2025.

### • Junior Researcher Seminar on Tobacco and alcohol

Tobacco and alcohol remain the leading causes of avoidable death in France, responsible for cancers, diseases of the cardiovascular, digestive and nervous systems, and social harm. Following the observation that the French scientific community around this topic still needs development, INCa launched the Junior researchers in tobacco and/or alcohol programme (see Programme for Junior researchers in tobacco and/or alcohol).

In this context, a scientific seminar based on the research projects funded under the Junior researchers call was held in October 2023 in Paris. Its aim was to provide an opportunity to strengthen the development of a scientific network of junior researchers in public health, human and social sciences on the subjects of tobacco and alcohol, and to promote the dissemination of scientific knowledge produced by these projects to a wide audience (scientists, policy makers, professionals) on the main themes of the programme: social inequalities in health, specific populations, and preventive measures or support for cessation or harm reduction.

The seminar included 80 participants and 20 Junior researchers funded by INCa. This event was financed by the Addiction Fund, managed by the *Caisse nationale de l'Assurance maladie* (CNAM).

### • INCa-IReSP Conference on Young people and psychoactive substances

In France, the consumption of tobacco, alcohol and illicit drugs, particularly cannabis, among young people remains high, despite an improvement in recent years among secondary school adolescents. Adolescence is a vulnerable period for addictive behaviour, and early onset of psychoactive substance use increases the risk of short- and long-term health and social harm.

In this context, and in accordance with the Ten-Year Cancer Control Strategy, the National Tobacco Control Programme and the National Plan to Combat

## PHIR SYMPOSIA IN SCIENTIFIC CONFERENCES

Despite considerable support from the Institute, there continues to be a lack of awareness and understanding of Population Health Intervention Research (PHIR) among researchers. Presented as a solutions-based science, it proposes a new scientific paradigm centred on intervention rather than the description of the problem and its causes. Since 2022, INCa has been organising symposia on PHIR at national and international scientific conferences in the fields of human and social sciences, and public health. They aim to raise awareness among the French and international scientific community by presenting the role of INCa as a player and funder of PHIR, the challenges and methodological issues of PHIR, followed by an illustration of a project funded by INCa presented by a researcher.

In 2023, two symposia were organised, each including between 30 and 50 people:
- "Nutrition: a challenge for the intervention research and health promotion", at the EUPHA Conference (8-11 November 2023 in Dublin);
- "The challenges of Population Health Intervention Research (PHIR) in health promotion in the field of cancer", at the AFPSA Congress (3-5 July 2023, Montpellier).

Addiction, a scientific conference on the research prospects in the prevention of addictive behaviour and psychoactive substance use among young people was held in March 2023 in Paris.

Its aim was to provide an opportunity to discuss knowledge produced to date on this topic and the challenges of research in public health, and human & social sciences, to promote the projects funded by INCa and IReSP under the Addiction Fund, and to help create a forum for discussion between researchers, policy-makers and professionals interested in this issue.

The conference included 300 participants (in person and by videoconference) and 17 speakers. A playback of the event is available on the INCa YouTube channel. This event was funded by the Addiction Fund, managed by the *Caisse nationale de l'Assurance maladie* (CNAM).

### • Conference on Health promotion in school settings

The school environment is an ideal place to assemble all those involved in the health of children and adolescents, such as educational staff, health professionals, parents, peers, associations, elected representatives, and decision-makers.

Health promotion in schools is a priority of the French Ten-Year Cancer Control Strategy. In this context, on 30 November 30 and 1 December, the French National Cancer Institute co-organised an international French-speaking scientific conference in Paris with several collaborators[19].

Since the Ottawa Charter (1986), the international agreement for action to achieve "Health for all", a great deal of work has been carried out to understand, model and intervene on the determinants of health in school settings. This research has highlighted the importance of comprehensive and complex approaches (e.g. "health-promoting schools") promoting, among other things, the development of psycho-social skills, and health literacy, as well as the relevance of intervention models involving children and adolescents themselves such as use of co-creation, peer interventions. Identifying, understanding and transferring promising initiatives are further

[19] Directorate-General for School Education, Directorate-General for Higher Education and Research, Interministerial Mission for the Fight against Drugs and Addictive Behaviours, National Federation for Health Education and Promotion, International Francophone Network for Health Promotion, Network of National Higher Institutes for Teaching and Education, Network of Universities for Health Education, Santé publique France (French Public Health Agency).

steps needed to develop interventions that contribute to the promotion of health-promoting practices and environments.

With more than 280 participants and 120 scientific communications from 8 countries, this conference focused on the issues of research and innovation in the field of health promotion in school settings. Discussions were held on:

- theoretical, ethical and conceptual issues involved in school health promotion research;
- modelling, implementation and dissemination of innovative interventions;
- determinants and reduction of social and territorial inequalities in the school environment.

This event featured contributions from 3 renowned experts offering insights into:

- A socio-anthropological approach to the notion of health literacy by Maryvette Balcou-Debussche (Emeritus University Professor, Université de la Réunion);
- The importance of socio-emotional skills for health, by Noémie Le Donné (Head of the Socio-Emotional Skills Unit, OECD);
- Innovation in health promotion: questioning our approaches and our vision of what constitutes health, by Linda Cambon (ISPED Prevention Chair).

In the wake of this conference, the Institute will be publishing, in collaboration with the scientific journal *Global Health Promotion*, a special issue on the range of approaches and practices that contribute to improving health promotion in schools. This special issue is scheduled for publication in February 2025.

### • The INCa-Paris Dauphine chair on Improving cancer care: economic analyses

A scientific day was held on 22 March at PariSanté Campus to promote the initial work undertaken as part of the INCa-Paris Dauphine research chair **"Improving cancer care: economic analyses"**. The event was also available in webinar format. More than 80 participants attended.

Brigitte Dormont, who holds the Chair, and her team presented a progress report on the work being carried out in the Chair's 3 areas: 1/ Understanding drug shortages to secure supplies; 2/ Innovative methods for medico-economic evaluation and applications to cancer care; 3/ Legitimacy and effectiveness of financial incentives for preventive behaviour.

### • Doctoral students' meeting

Since 2020, the Institute has set up a specific support and facilitation system for doctoral students funded by the Institute via the DOC-SHS and SPA-CPA-DOC calls for applications. These include annual meetings, aimed at creating a space for exchanges between doctoral students by allowing them to present their work; meet other doctoral students, researchers and other stakeholders in the fight against cancer; and encouraging a multidisciplinary research approach. In addition, this organisation contributes to the Institute's influence and helps build a multidisciplinary community of researchers in the field of cancer control. This mechanism therefore meets the objective of breaking down disciplinary barriers as set out in the Ten-Year Cancer Control Strategy and in the Institute's action plan.

In 2023, for the fourth edition, 38 PhD students met for two days on 25 and 26 September on the Berges de Seine campus in the Seine-et-Marne region.

The programme of ths meeting was co-constructed with the doctoral students, in order to best meet their expectations and needs. The themes of this meeting were challenges of open science and social & health inequalities. The second topic was presented by Cyrille Delpierre.

The first morning was spent at INCa, with an institutional introduction and a workshop on open science (with Carla Estaquio and Laurence El Khouri). The rest of the seminar was held at the Berges de Seine campus. Different sessions were organised by themes (aetiology, prevention, screening, etc.) around presentations by the PhD students; of their thesis work, followed by a time for discussion.

# ITMO CANCER ACTIVITIES

ÉDITO

# The Medical Research Landscape Is Evolving

ITMO Cancer has supported cancer research for more than a decade through the involvement of the main French research agencies via the AVIESAN alliance, with the direct support of INSERM. The ITMO Cancer strategy has been funded through successive cancer plans and now through the Ten-Year Strategy. The close coordination between INCa, ITMO, INSERM, and CNRS has been the key to our success.

The essence of ITMO Cancer was to break down barriers between scientific disciplines, bringing together the best of all sciences in the fight against cancer. Mathematics, statistics, computer science, physics, chemistry, toxicology, and innovative methodologies have been deployed through dedicated calls for proposals to make significant progress in understanding neoplasia. Specific support for innovative equipment and doctoral scholarships has also been granted through competitive evaluation processes to support this interdisciplinary strategy. All these actions have been designed and implemented with the invaluable help of experts from ITMO Cancer, and we thank them deeply for their commitment.

The landscape of medical research is now evolving to tackle the difficult challenges ahead. Research has become increasingly incremental, and disruptive results are less frequent. Factors such as the time required to reach the frontier of knowledge, the "low-hanging fruit" theory, increased costs, and regulations are likely contributing to this slowdown, which contrasts with the urgent needs of patients. In 2024, France initiated a new medical research agency, "l'agence de programmes de recherche en santé" within INSERM, to better identify and define research priorities. Actions from the former ITMO Cancer will be continued through this new agency in coordination with INCa and CNRS, and other agencies, ensuring that our efforts to support the scientific community involved in cancer research will persist.

**Pr Bruno Quesnel,**
Director of the Research and Innovation division of the National Cancer Institute and Director of the Inserm Cancer Thematic Institute

I want to thank all my colleagues and associates from INSERM, CNRS, and INCa who worked with me to ensure the success of ITMO Cancer.

In 2023, ITMO Cancer launched 5 calls for proposals and funded 68 projects of the 194 evaluated (35% rate), for a total amount of €21.7M. In addition, it has participated to programmes in partnership and funded 8 projects for a total budget of 1.9 million euros.

**2023 investment for cancer research therefore amount to 23,5 million euros for a total of 76 funded projects** (Figure 40, Figure 41 and Figure 42).

Figure 40

2023 ITMO Multi-year investment distributed per Programme type

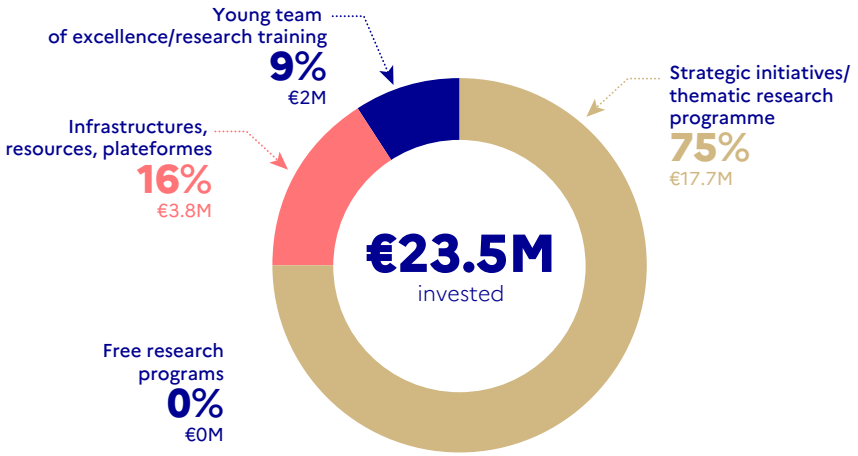



Figure 41

Distribution of research programmes and projects in 2023 by programme type

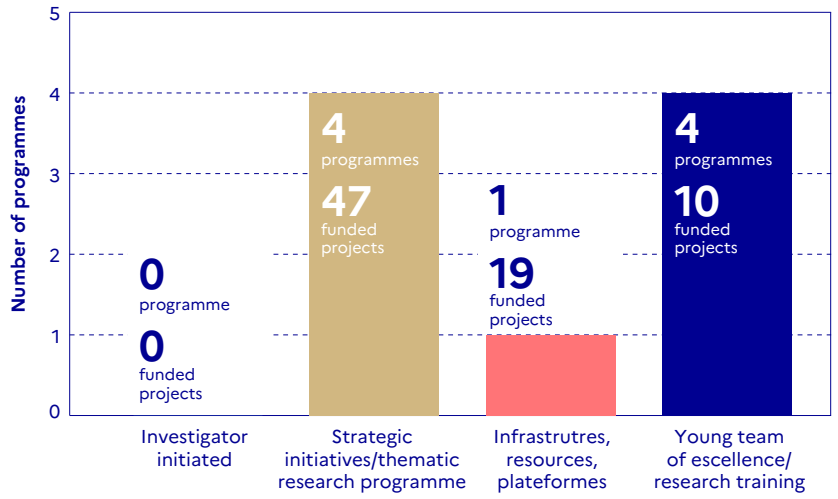
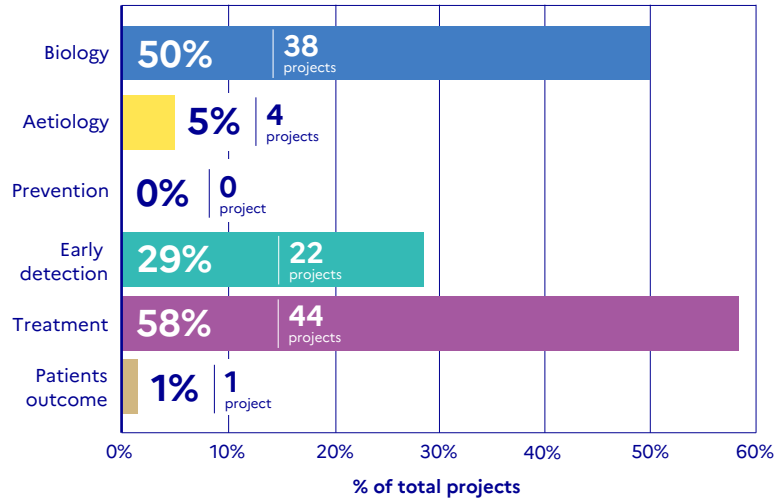



Figure 42

Scientific domains covered by research projects funded by ITMO Cancer (% of total projects)



# 4.1. Thematic research funding

## Characterisation of preneoplastic lesions and risk stratification (PNP)

After a first edition in 2021, a "PNP" call for proposals was launched in 2023, with the aims of contributing to a better understanding and modelling of the progression of pre-neoplastic lesions (premalignant to malignant transition, stabilisation, regression) by characterising the underlying mechanisms, the sequence of formation and the factors involved in the emergence and progression of the risk. Objectives are to stratify pre-neoplastic lesions according to their risk of progression and to identify targets for intervention.

**In 2023, 39% of the projects assessed were funded, i.e. 7 projects for a total amount of €4,376,495.**

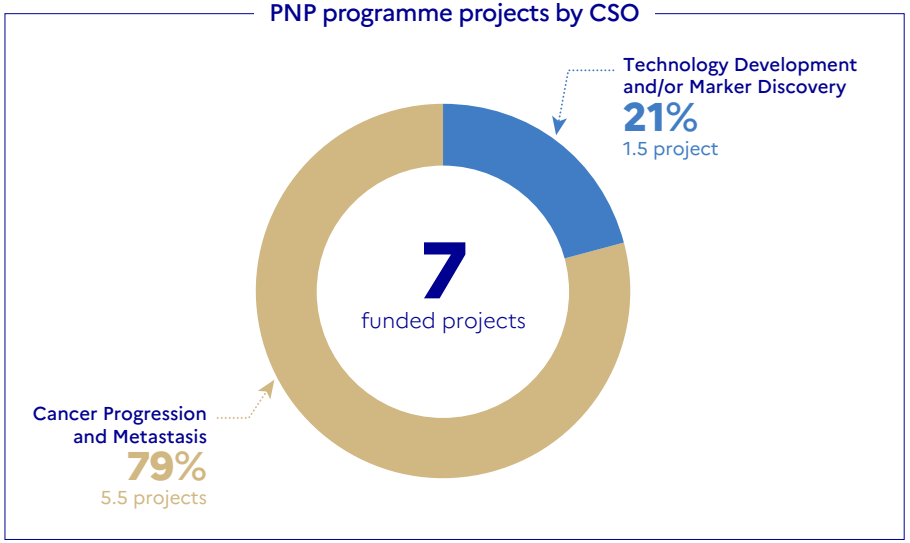
Almost 80% of the projects (i.e. €3.4M) were dedicated to the biology of cancer progression and metastasis, and 21% (i.e. €0.9M) to technology development or marker discoveries for early detection, diagnosis or prognosis of cancer (Figure 43).

Projects aimed at:

- Deciphering the mechanisms whereby colonic fibroblasts expressing protein kinase receptor 7 regulate progression to colorectal cancer,
- Studying crosstalk between bone marrow mesenchymal stromal cells and hematopoietic stem cells, and its impact on anti-tumour cytotoxic NK cells differentiation and function during progression to myelodysplastic syndromes and secondary acute myeloid leukaemia,
- Studying the role of field cancerisation as a risk factor for the growth of single or multiple basal cell carcinoma, and providing perspectives on the divergent progression of basal cell carcinomas and cutaneous squamous cell carcinomas from common precancerous skin lesions,
- Developing a reliable method to explore mechanisms involved in the progression of precancerous actinic keratoses to malignant cutaneous squamous cell carcinomas and stratify lesions,
- Characterising cell populations (with a particular focus on the stromal compartment), their spatial organisation and interactions in breast pre-neoplastic lesions to improve their stratification,
- Describing the mechanisms leading to hepatocellular adenoma occurrence, identifying biomarkers of malignant transformation in hepatocellular carcinoma to stratify at-risk patients, and finding new therapeutic targets,
- Identifying predictive biomarkers of high-risk smouldering multiple myeloma, and finding new therapeutic targets to prevent progression to multiple myeloma.

Figure 43

PNP programme projects by CSO



## Interdisciplinary approaches in oncogenic processes and therapeutic perspectives: Contributions of mathematics and computer science to oncology (MIC)

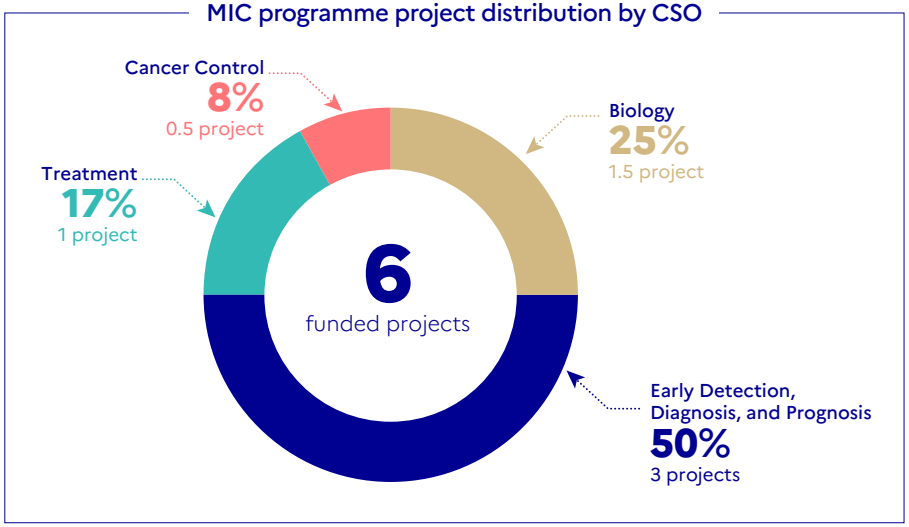
Initiated in 2019, the "MIC" programme supports projects aimed at unlocking conceptual and methodological barriers at the frontier of mathematics, computer science and oncology, to improve understanding of tumour diseases and improve patients' prognoses.

**In 2023, 26% of the projects assessed were funded, i.e. 6 projects for a total amount of €2.3M.**

Half of the projects (i.e. €1.3M) were devoted to early detection, diagnosis, and prognosis, whereas one quarter of them (€0.7M) were dedicated to cancer biology. Slightly less than 20% addressed cancer control, survivorship, and outcomes research, and 8% cancer treatment (Figure 44) .

Figure 44

MIC programme project distribution by CSO




Projects were aimed at developing:

- Deep learning-based tools using multiscale imagomics to build a classification of combined hepatocellular-cholangiocarcinomas, and identify prognostic subgroups making it possible to propose a tailored management of patients,
- A mathematical model to reconstruct and predict the evolution of clonal heterogeneity in leukaemias, and establishing the proof of concept that the proliferative characteristics of clones measured from 3D culture models make it possible to design predictive models for the evolution of clonal heterogeneity depending on the therapy,
- A deep generative model to better understand the dynamic activity of the tumour ecosystem in 3D models of lung and breast cancers, and its relationship with response and resistance to immuno-oncology drugs,
- A deep learning-based ultrasound tool for tumour vessel imaging to improve early diagnosis of lesion progression during glioma treatment follow-up,
- Machine learning strategies, combined with model-based approaches, to predict, from patient-specific data, the individual recurrence of prostate cancer after radiotherapy, and to optimise radiotherapy by simulating different treatments,
- A model to determine a new endpoint for cancer clinical trials, combining survival and longitudinal health-related quality-of-life data, and thus taking both clinical and patient-centred points of view into account.

## Interdisciplinary approaches to oncogenic processes and therapeutic perspectives: Contributions of physics, chemistry, and engineering sciences to oncology (PCSI)

Initiated in 2019, the "PCSI" programme supports projects aiming to improve understanding of tumour diseases and improve cancer prognosis by funding projects based on concepts or tools from physics, chemistry or engineering sciences.

**In 2023, 39% of the projects assessed were funded, i.e. 32 projects for a total amount of €10.6M.**

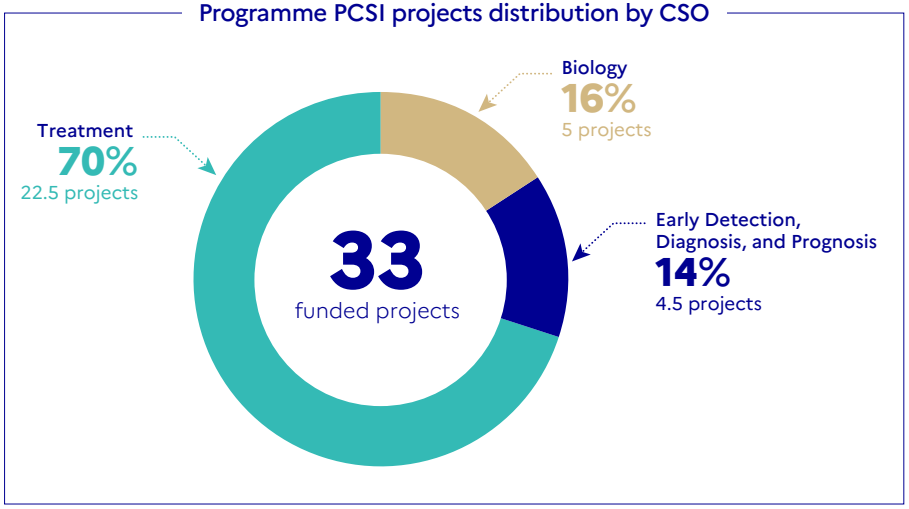
A large majority of the projects (70%, i.e. €7.9M) were dedicated to cancer treatment, the remaining being divided equally between cancer biology (16%, €1.6M) and early detection, diagnosis, and prognosis (14%, €1.1M) (Figure 45).

Projects devoted to cancer biology were aimed at:
- Exploring, theoretically and experimentally, the role of a chromatin remodeller in repair initiation of a major mutagenic DNA lesion,
- Setting up a fluorescence imaging approach to monitor, in living cells and at the single molecule level, the dynamics of PARP1 while searching for DNA lesions,
- Explaining the physics of EF1 (hallmark of Ewing's sarcomas) dynamics in binding to DNA microsatellites and initiating aberrant transcription,
- Developing chemical proteomics methods in crosslinking mass spectrometry to probe molecular interactions at the amino-acid level in cancer systems,
- Deciphering, using structural, chemical, and biological methods, the molecular basis of the MyD88-ERK kinase interaction in oncogenic transformation,
- Developing aptamer-based multiplex imaging by mass spectrometry for breast tumour microenvironment characterisation,
- Exploring mechanical signals triggering the emerging of stemness in non-stem intestinal tumour cells.

Projects devoted to cancer early detection, diagnosis and prognosis were aimed at:
- Improving a supine non-contrast MRI technology and evaluating its ability to detect breast cancer lesions,
- Assessing the use of the snake toxin MQ1 as a diagnostic tool for identifying membrane protein V2R-expressing tumours (renal, prostate, lung and breast cancers) in vivo by PET imaging,
- Developing proton magnetic resonance spectroscopy to detect in vivo specific metabolic profiles associated with mutated genes in paragangliomas,
- Developing elastography-based methods for imaging tissue viscosity to monitor hyperthermia treatment and diagnose cancer,
- Developing a theranostic-based approach using a versatile molecular system targeting β-glucuronidase, specifically present in the glioblastoma microenvironment.

Projects devoted to cancer treatment were aimed at:
- Developing inactive precursor/active final compound couples allowing in-tumour photo-induced synthesis of DNA intercalating agents,
- Characterising compounds affecting the hypusination pathway regulating prostate cancer cell proliferation and aggressiveness,
- Exploring the usefulness of autonomous nervous system targeting to mitigate resistances to tyrosine-kinase inhibitors in hepatocellular carcinoma,
- Developing PROTAC-based degraders of IRE1 alpha, a protein involved in the endoplasmic reticulum stress with protumoural roles in several cancers,

Figure 45
Programme PCSI projects distribution by CSO



- Developing versatile and pH-activable photosensitisers targeting head and neck tumour cells,
- Designing photosensitising COX-2 inhibitors containing coumarin scaffold for colorectal cancer treatment,
- Optimising and exploring the effects of novel radiosensitising bimetallic platinum complexes for cancer therapy,
- Designing stable and specific folic acid analogues to improve folate receptor alpha targeting photodynamic therapies in ovarian cancer and pancreatic ductal adenocarcinoma,
- Designing new biogenic magnetic nanoparticles produced by magnetotactic bacteria for multimodal nanomedicine in cancer therapy,
- Developing biodegradable biomimetic and drug armed 3D implants to improve bone regeneration and limit cancer cell proliferation in osteoclastoma,
- Designing aptamer nanoassemblies with the dual functions of targeting cancer stem cells and delivering a programmed combination of drugs in gastric tumours,
- Adapting nanocarriers for targeting and release of therapeutic bacteria to tumours,
- Developing nanoparticles for two-photon-triggered co-delivery of therapeutic siRNA and photodynamic therapy in prostate cancer,
- Deciphering mechanisms of action of copper complexes for redox-mediated glioblastoma therapy,
- Deciphering the biotransformation mechanisms of cytotoxic gold compounds in the cellular environment using advanced synchrotron-based techniques,
- Exploring the effects of nanoparticle-induced hyperthermia combined with immunotherapy on the tumour microenvironment in lung cancer,
- Developing an endoscopic ultrasonography-based antitumour agent delivery combined with pulsed electric field application to modify the tumour microenvironment and improve tumour chemosensitivity in pancreatic cancer,
- Developing a cold plasma-triggered immunotherapy endoscopically applied to solid tumours of the digestive (cholangiocarcinoma) and respiratory (non-small cell lung carcinoma) tracts,
- Developing innovative dosimetry approaches for microbeam radiosurgery and flash photon radiotherapy,
- Characterising the production of the biological FLASH effect by a high-energy X-ray device and its side-effects on normal tissues.

### Support for the National Environmental and Occupational Health Research Programme (PNR-EST)

This multi-agency programme of the French National Agency for Food, Environmental and Occupational Health and Safety (Anses) addresses various public health issues related to the environment and workplace. ITMO Cancer has been funding cancer-related projects within this programme since 2011.

In 2023, 2 projects were funded for a total amount of €411,143. They were aimed at:

- Characterising the impact of socioeconomic disparities on exposures to pollutants (including pesticides) and their biological effects in children,
- Developing an organoid model predictive of the effect of carcinogens in humans in a context of hepatic metabolic disruption.

## 4.2. Support for cancer research equipment

Since 2016, the "Equipment" programme aims to support equipment acquisition to foster the development of ambitious research in the field of oncology, to encourage interactions between research teams, and to increase the attractiveness and the position of French teams on the international arena.

**In 2023, 40% of the projects assessed were funded, i.e. 19 projects for a total amount of €3.84M.** Devices selected mainly belonged to the categories of Imaging, Biochemistry and proteomics, and Cellular characterisation and histology, as every year. However, for the first time since the programme was launched, considerably more were dedicated to Biochemistry and proteomics (32%) than to Cellular characterisation and histology (16%) (Figure 46).

Devices funded were primarily intended to (Figure 47):

- Explore cancer biology (58% of projects, i.e. €2.2M), mainly in relation to cancer progression and metastasis. Projects aimed to analyse particular features associated with cancer at different levels: atomic and molecular (DNA damage, repair and recombination), single cell (nuclear organisation, proteomics, transcriptomics, metabolic reprogramming, cytoskeleton dynamics, etc.), tumour and tumour microenvironment (spatial organisation, heterogeneity, extracellular matrix remodelling, immune cell recruitment, etc.), and tissues or organs (cancer biomarkers in living animal tissues, organ reshaping during cancer development).
- Identify therapeutic targets and design new treatments (34% of projects, i.e. €1.4M): epidrugs, peptides, molecules derived from agri-resources, radiosensitising nanoparticles, targets, vectors and radionuclides for radioimmunotherapy, etc.

Figure 46
Category of equipment funded by the "Equipment" programme

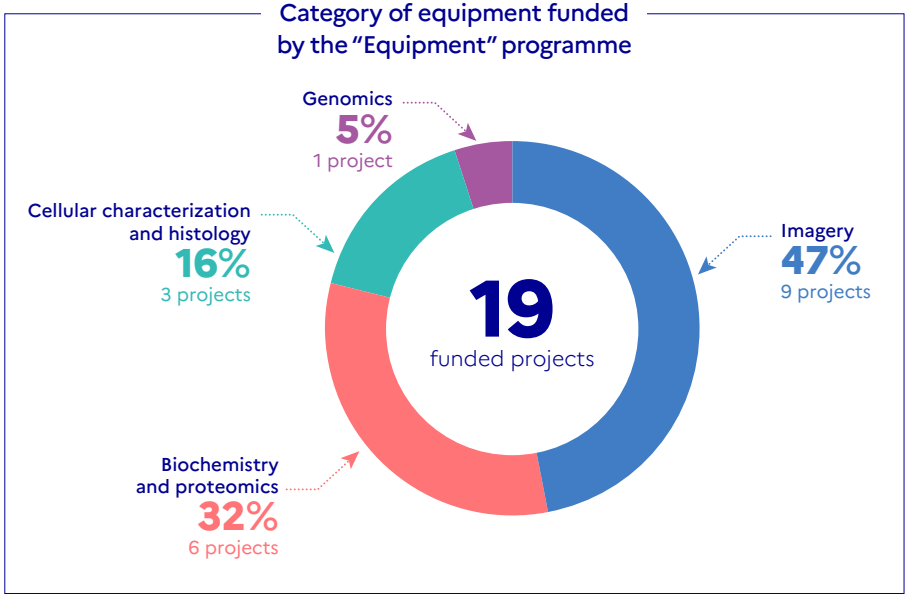
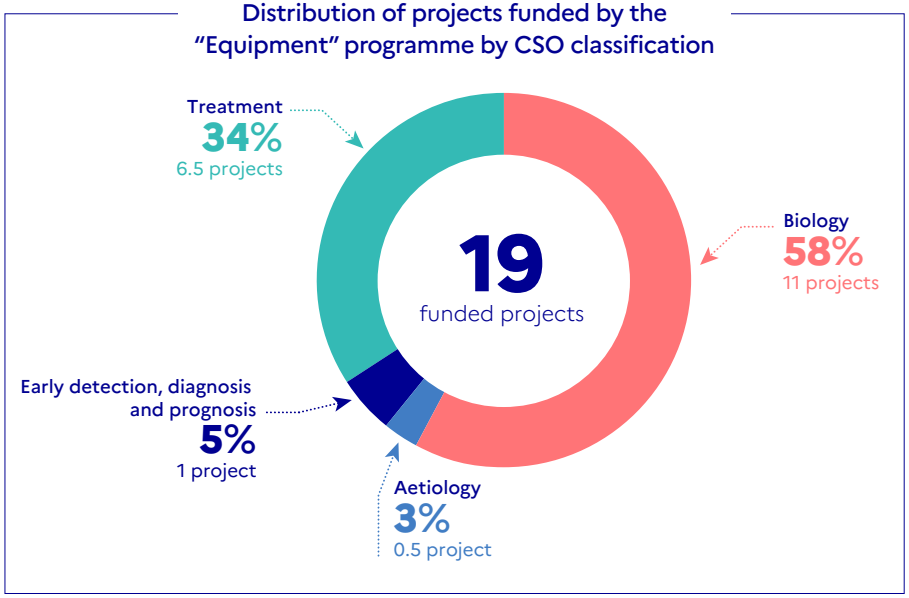



Figure 47
Distribution of projects funded by the "Equipment" programme by CSO classification



Some devices were also intended for research into individual and environmental factors in cancer, epigenetic markers, and tissue biomarkers to enable patient stratification.

## 4.3. Support for Training programmes and career programmes

### Basic and translational research PhD training programme (FRFT)

The FRFT programme is aimed at supporting the training of students or junior medical, pharmacy and veterinary science graduates in translational research by funding doctoral theses on cancer. In 2023, 4 projects were funded for a total amount of €553,088.

The projects were aimed at:

- Deciphering mechanisms involved in the expression of transposable elements in relation with aging and their contribution to tumour growth,
- Exploring the role of dipeptidyl peptidase 4 and its tumour microenvironment molecular partners in the invasive behaviour of pituitary tumours,
- Characterising the spatial heterogeneity of soft-tissue sarcoma and predicting the response to neoadjuvant radiotherapy by MRI-based relative oxygen extraction fraction mapping,
- Identifying clinically relevant drug combinations, highlighting the metabolic changes in acute myeloid leukaemia and providing a framework for exploring drug combinations in patients' primary tumours.

### FIRE Doctoral school

The Frontiers of Innovation in Research and Education (FIRE) doctoral school (Paris-Cité and Paris Sciences et Lettres universities) is an international, interdisciplinary doctoral programme. ITMO Cancer has been supporting the FIRE programme since 2010 to promote multidisciplinary training to adapt and meet the needs of cancer research.

In 2023, 2 projects were funded for a total amount of €230,140.

The programmes were aimed at:

- developing a colorectal-cancer-on-chip to study the effect of peristalsis, luminal flow, and pressure applied by the bolus on tumour growth, invasion, and metastasis formation, with a focus on the involvement of cancer-associated fibroblasts,
- investigating cell behaviour over time and linking initial cell heterogeneity to cell fate in various situations, such as resistance to treatment or evolution into a cancerous malignant phenotype as found in acute myeloid leukaemia.

### ATIP-Avenir Programme

The ATIP-Avenir programme enables young scientists to create and lead their own research team within an established Inserm or CNRS laboratory in France. ITMO Cancer contributes to the funding of the awardees pursuing a cancer research project.

In 2023, 1 project was funded for a total amount of €300,000. It was aimed at characterising how repriming and post-replicative gap accumulation modulate genome and epigenome stability, and testing whether affecting these steps synergises with replication stress-inducing therapy.

### JCJC Programme

The JCJC (Jeunes chercheurs ou jeunes chercheuses) programme of the French National Research Agency (ANR) enables young scientists to access funding in addition to their recurring grants. Since 2020, ITMO Cancer has been funding JCJC projects focusing on cancer.

In 2023, 3 projects were funded for a total amount of €936,639. They were aimed at:

- Deciphering new functions associated with p53 mutants, and mechanisms by which they can promote leukaemia progression into acute myeloid leukaemia,
- Demonstrating the central role of the ion channel ORAI3 in evasion mechanisms of prostate cancer cells,
- Understanding the role of the group 3 innate lymphoid cells on tertiary lymphatic structure formation, in order to overcome therapeutic resistance.

# 4.4. ITMO's building tools to inform cancer research strategy

## Research Strategy: Current Challenges in Oncology Research 2022

At the end of 2021, a working seminar brought together the management of ITMO Cancer, its committee of experts and the INCa Research and Innovation Department, with the following objectives:

- Carry out a critical review of previous studies: Strategic Orientations (2017) and Contribution of ITMO Cancer to the Ten-Year Cancer Control Strategy (2019),
- Update and explore themes that were not sufficiently covered at the time in greater depth,
- Identify and document new areas of research that have emerged since then.

Four themes were identified in the course of the review, and then broken down into priority work areas:

- Dynamic spatiotemporal analysis of tumours,
- New models and new technologies,
- Therapeutic innovation and access to innovation,
- Modelling, data and artificial intelligence.

The document "Current Challenges in Oncology Research 2022" develops the scientific rationale for each of the priority work areas and proposes a number of levers for action, tools and resources to be mobilised. It is available on the ITMO Cancer website.

## French Research in Paediatric Oncology: A Bibliographic Review (2015-2020)

In 2019, the French Ministry of Higher Education, Research and Innovation decided to give new impetus to basic research into paediatric cancers. One of the recommended actions was to map the status of research in this field, with the aim to raise the profile of basic research being conducted in France on childhood, adolescent and young adult cancers. With this in mind, ITMO Cancer and the INCa Research and Innovation Division carried out a bibliographic review of French publications on paediatric cancers for the 2015-2020 period, with the support of the CNRS Institute for Scientific and Technical Information. The following general data could be identified[20]:

- 3,218 publications with at least one author "France" (i.e., affiliated to a French research structure);
- 1,573 publications with at least one corresponding author "France";
- 6,561 single authors "France";
- 22 regions and 63 departments concerned;
- 737 different reviews;
- 120 collaborating countries, accounting for 54% of publications;
- 6 main themes: leukaemias and lymphomas; rare tumours; brain and brainstem tumours; bone tumours; soft tissue sarcomas; neuroblastomas.

20 The complete review is available on the ITMO Cancer website.

# REVIEW OF 2023 CANCER RESEARCH FUNDING

In 2023, 260 projects were selected for funding for a total budget amounting to 144.7 million euros through 27 programmes to support cancer research:

- 121 million euros from INCa (18 programmes-184 funded projects) including 30 million euros from DGOS (Table 8);
- 23.7 million euros from Inserm for ITMO Cancer (9 programmes – 76 funded projects) (Table 9).

Since 2007, 1.8 billion euros have been invested in actions to promote oncology research.

## 5.1. Programme type distribution of total investment in cancer research (INCa and ITMO)

### 2023 Multi-year Funding, programmes and funded projects

In 2023, a total of 144.7 million euros have been allocated to 260 cancer research projects. Figure 48 and Figure 49 shows the breakdown of this multi-year funding according to programme type:

- Investigator-driven projects concerning the 4 major research areas (biology, translational, clinical, human and social sciences, epidemiology, and public health)
- Strategic research initiatives and thematic programmes funded by INCa, and thematic research programmes managed by ITMO Cancer;
- Support for platforms, resources, and infrastructures;
- Research training and support for young teams of excellence, especially covering the PhD programme in human and social sciences and ATIP-Avenir.

Figure 48 shows that 53% of total funding was allocated to research with themes freely defined by the researchers also known as inverstigator-initiated research.

Figure 48
2023 multi-year investment for cancer research per programme type (INCa and ITMO)

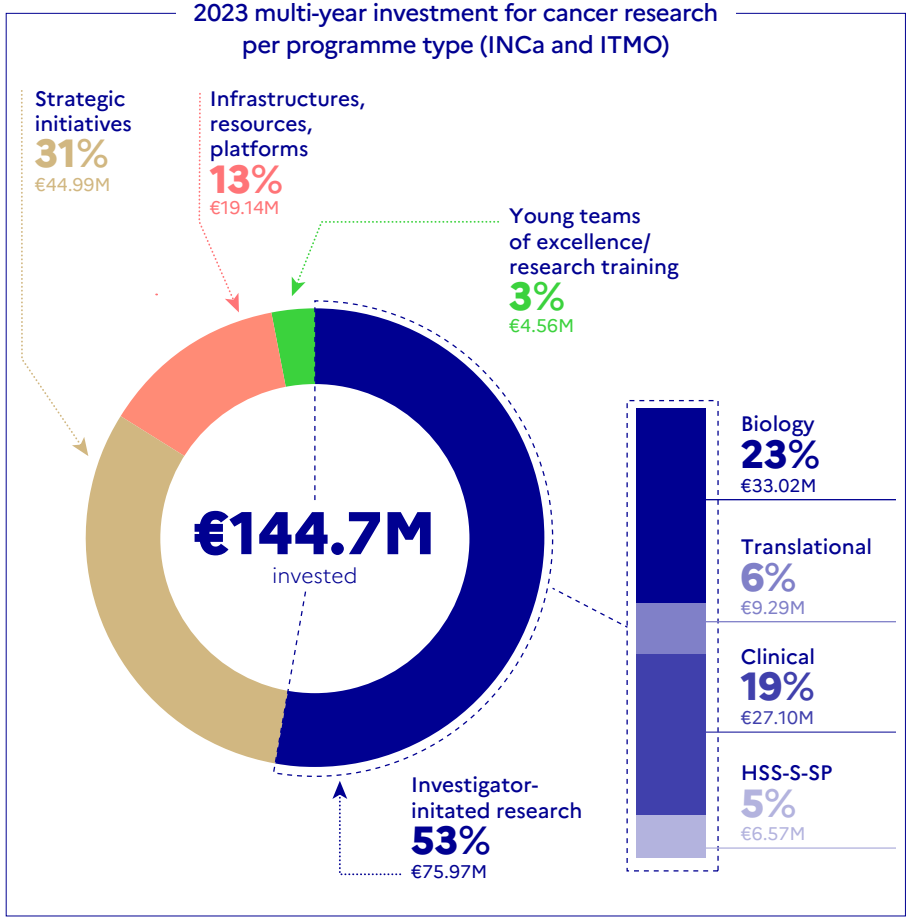


Figure 49
2023 programmes and funded project for Cancer Research (INCa + ITMO) by Programme type

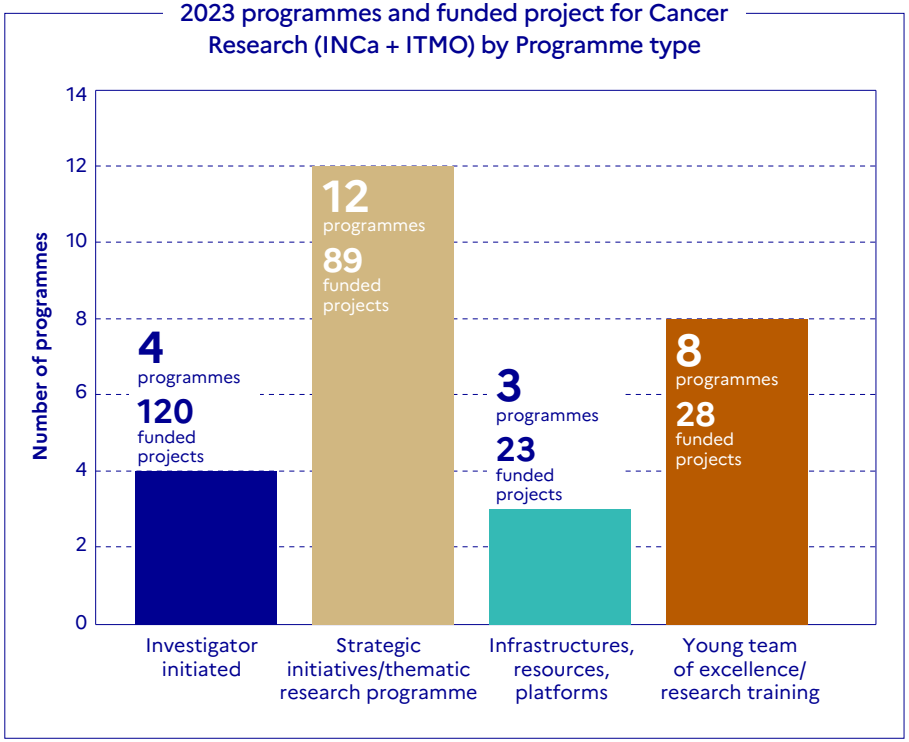
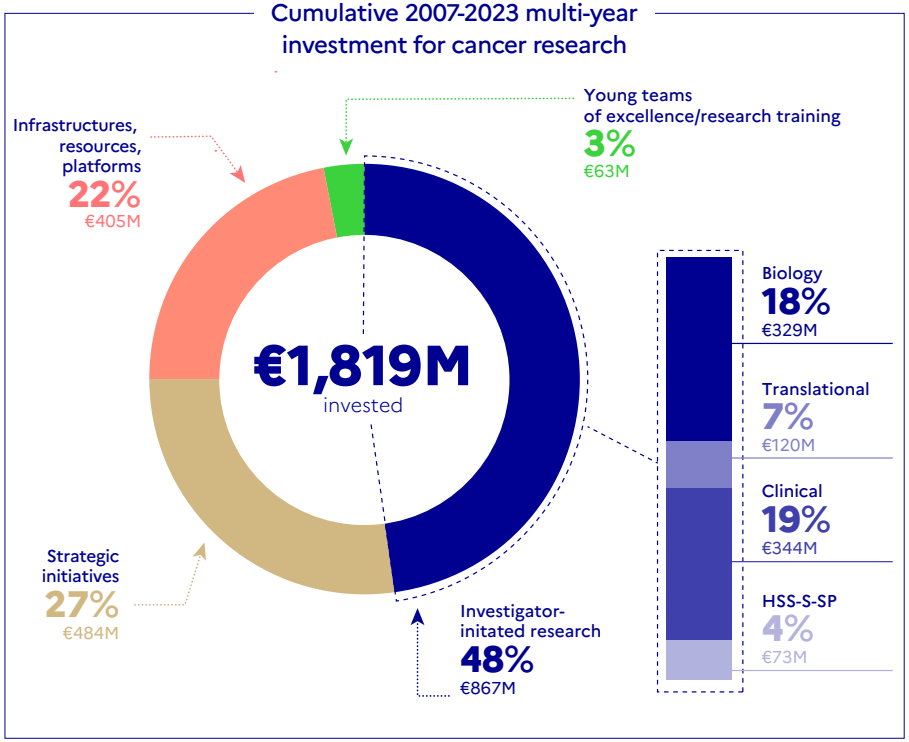



Figure 50
Cumulative 2007-2023 multi-year investment for cancer research




## Cumulative 2007-2023 Multi-year investment

From 2007 to 2023 a total of 1.82 billion euro were invested to support cancer research. Figure 50 shows the breakdown of the funding by programme type:

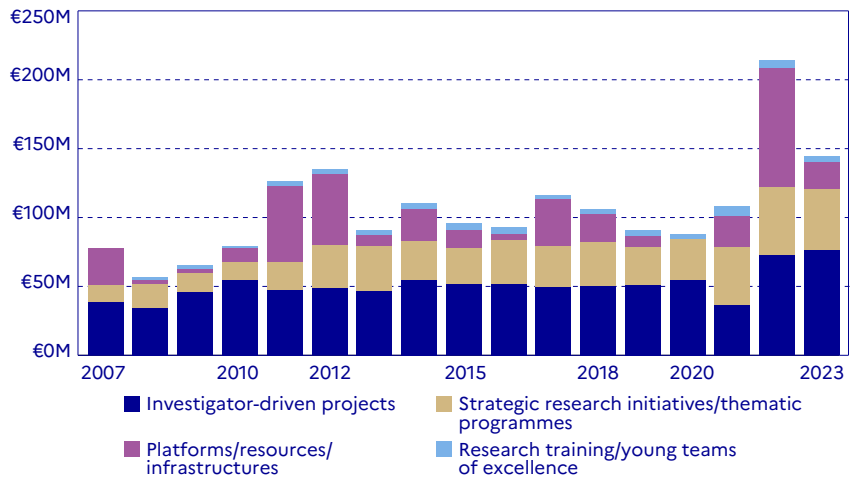
- Investigator-driven projects of the four main research areas represented a total of 48% of 2007-2023 investments, or approximately 867 million euro;
- Strategic research initiatives and thematic programmes represented 27% of cancer research investments (484 million euros);
- Support for resources and infrastructures represented nearly 22% of total funding, approximately 405 million euros, which highlights the drive to reinforce the organisational framework and the coordination of cancer research activities. Alongside support for investigator-driven projects, INCa has developed a proactive policy for fostering cancer research excellence through the designation of and support for dedicated infrastructures aimed at promoting coordinated, integrative, and effective cancer research;
- Support for young teams and cancer research training represented a total of 3% of total investments (63 million euros).

### Trends from 2007-2023

Figure 51 represents the trends in total funding according to the programme type over the 2007-2023 period, respectively. It shows the continued effort to provide increasing support to cancer research. The 2022 designation programme of Canceropôles and SIRIC have induced an important increase of the allocated budget that year.

Figure 51

**Trends from 2007-2023 of investment for cancer research by programme type**




## 5.2. Scientific objectives distribution of total investment in cancer research (INCa and ITMO Cancer)

Figure 52 depicts the 2023 funding allocation according to the scientific objective targeted by the funded research (based on the CSO classification). This analysis does not include the PEDIACRIEX and the UNITC research structuring projects.

Contribution to treatment strategies and cancer biology understanding represent 55% of the total cumulative 2007-2023 investment (Figure 53).

Figure 52

**2023 Multi-year investment by scientific objectives**

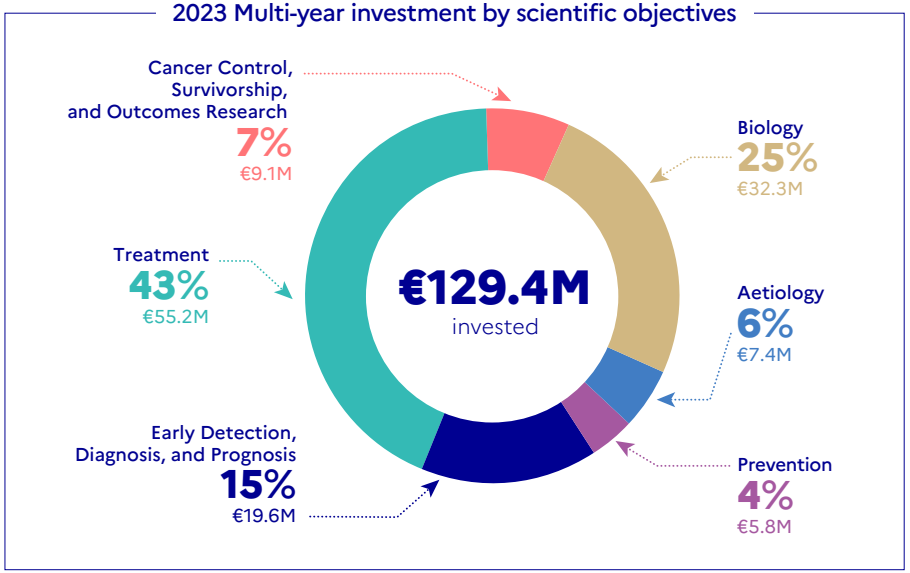


Figure 53
Cumulative 2007-2003 Multi-year investment by scientific objective

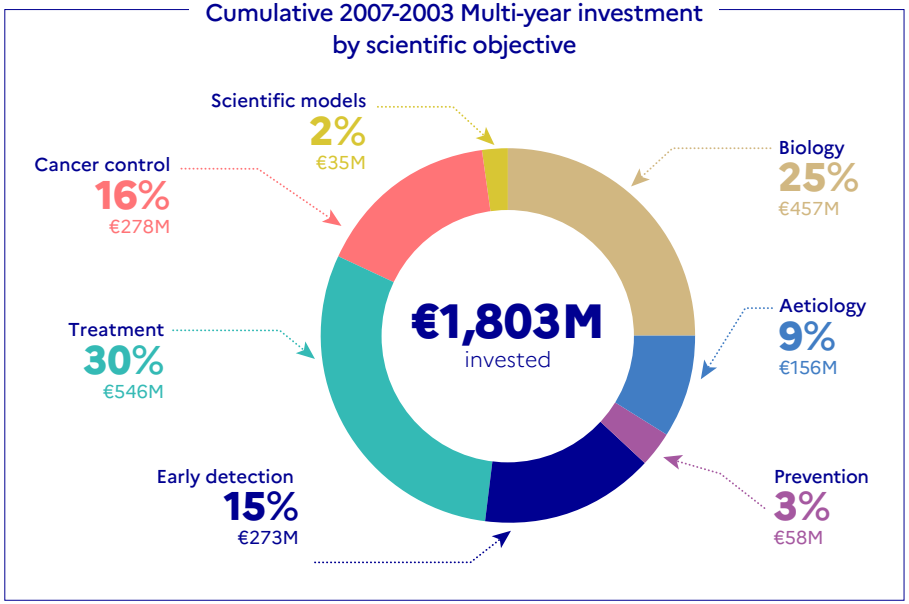
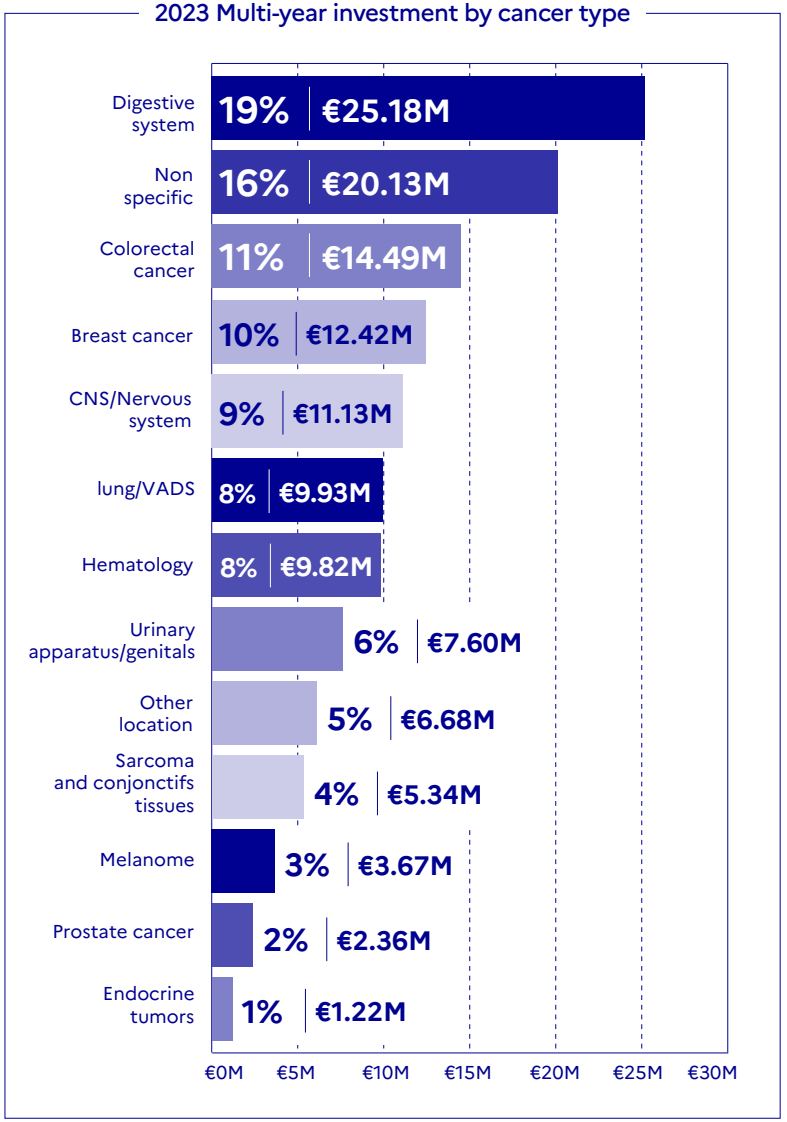



Figure 54
2023 Multi-year investment by cancer type




## 5.3. Cancer type distribution of total investment in cancer research

The breakdown of 2023 funding by cancer types studied shows that the main cancer type sites funded for investigation were digestive system cancers (19%), colorectal cancers (11%) and breast cancer (10%). 16% of allocated budget went to research non-specifically targeting site (Figure 54).

This analysis does not include the 2 PEDIACRIEX and the UNITC research structuring projects.

## 5.4. Discipline distribution of total investment in cancer research

Figure 55 and Figure 56 show the multi-year investment by discipline in 2023 and its evolution over the 2007-2023 period.

## 5.5. Ten-Year Cancer Control Strategy investment

In 2023, six programmes were managed within the framework of the Ten-Year Cancer Control Strategy: DROM, MI-AMGEN, the New AcSé, PEDIACRIEX, PAIROBC programmes and the partnership with Cancer Grand Challenges programme allowed the funding of 24 projects focusing on 3 areas of the Ten-Year Cancer control Strategy. **In total, 35.15 million euros were invested to continue the Ten-Year Cancer Control** Strategy (Figure 57 and Figure 58).

While the PEDIACRIEX (15 million euros) aims at structuring the paediatric cancer research community, the DROM, MI-AMGEN and the New AcSé objectives are to provide therapeutic options to cancer patients and by building innovative clinical trials and facilitating their access to patients. The funded research within the PAIROBC and Cancer Grand Challenges has the ambition to extend our understanding of cancer to develop efficient preventive and therapeutic strategies.

**From the beginning of the 2021-2030 Ten-Year Cancer Strategy, 78.2 million euros were invested for to fund actions of the Ten-Year Cancer Strategy** (7.2 million euros in 2021, 35.9 million euros in 2022 and 35.1 million euros in 2023, Figure 60).

Figure 55
2023 Multi-year investment by scientific discipline

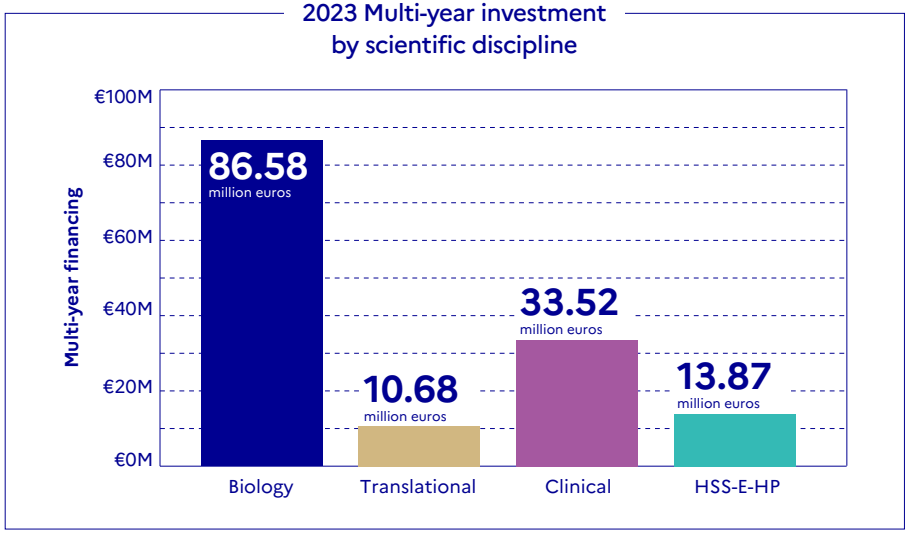



Figure 56
2007-2023 trend of multi-year investment by scientific discipline

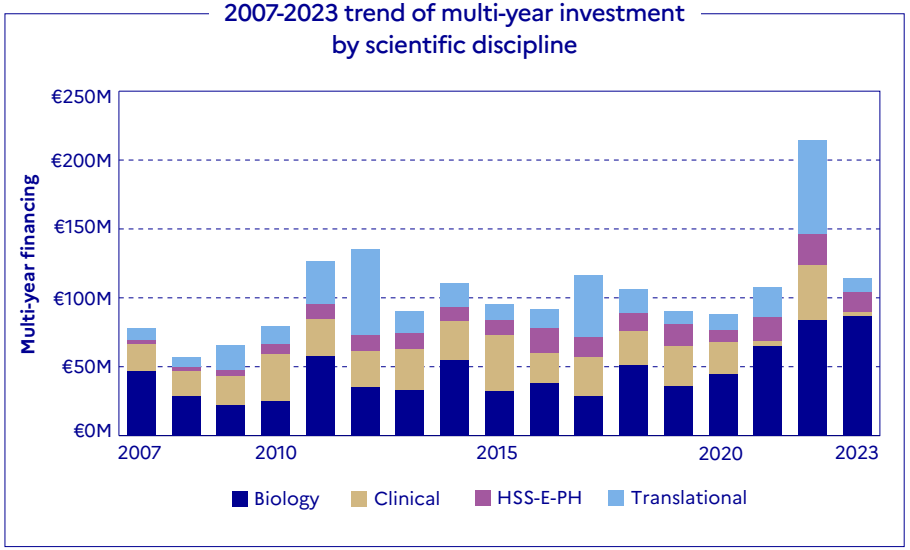


Figure 57

## 2023 multi-year investment to the Ten-Year Cancer Control Strategy per scientific objectives

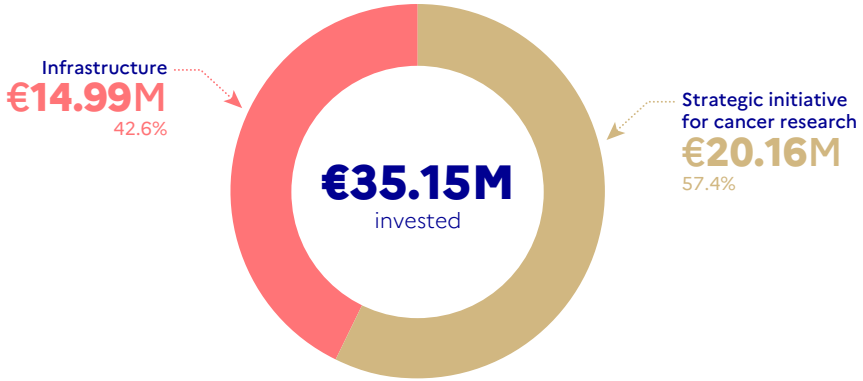
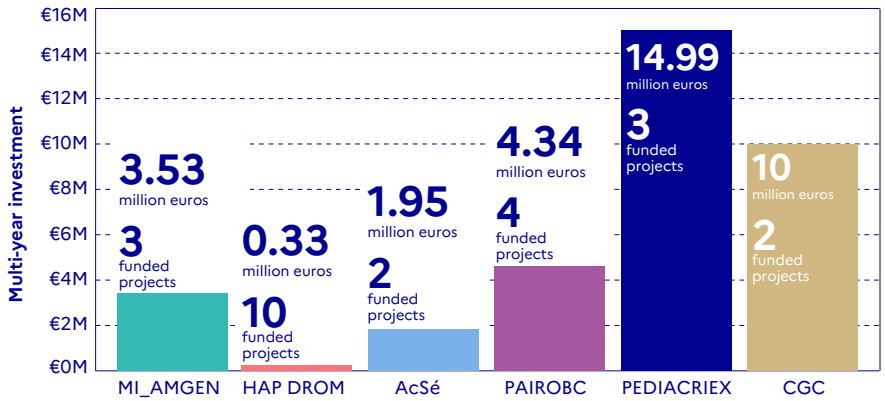



Figure 58

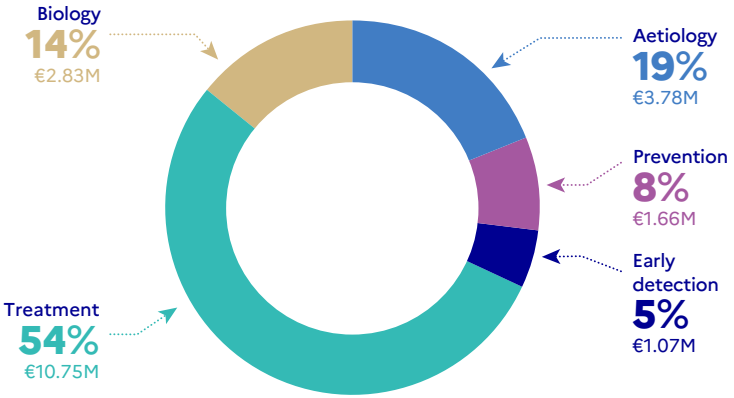
## Multi-year funding allocated in 2023 by programme of the Ten-Year Cancer Control Strategy




For more information:
On MI-AMGEN, see part 3.1.; on PAIROBC, see Focus 5; on DROM, see Focus 4; on CGC, see Focus 6; on PEDIACRIEX, see Focus 2; on AcSé, see part 3.1.

Figure 59

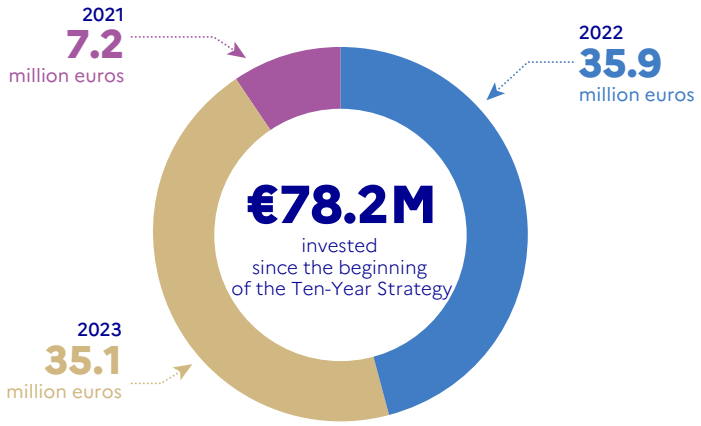
## Scientific domains of projects funded under the Ten-Year Cancer Control Strategy




*The PEDIACRIEX structuring programme is not included in this analysis.

Figure 60

## Cumulative 2021-2023 Ten-Year Cancer Control multi-year funding



# APPENDICES

## 1 Detailed list of 2023 funding programmes

Table 8: Detailed list of 2023 INCa's funding programmes

| INCa 2023 programmes | Objective | 10 Year-Cancer Control Plan | Contributing institutions | | | | Funding by institutions | | | | Projects selection for funding | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Programming institution | Operating institution | Funding institution | Partner institution | INCa | SUBTOTAL INCa + DGOS + ARC + Ligue + CNAM | Other Partner | TOTAL | Year of funding | Number of evaluated proposals | Number of funded projects | Selection rate | Projects funded/ funded by INCa |
| AcSé | To enable the clinical evaluation of targeted therapies in patients with tumors presenting the alteration targeted by the drug but with no exisiting marketing autorisation | Yes (III-5-1) | INCa | INCa | INCa | Unicancer | 1,953,650€ | 1,953,650€ | - € | 1,953,650€ | 2023 | 2 | 2 | NA | 2 |
| Cancer Grand Challenges | International partnership funding programme co-founded by CRUK and NCI to support international, interdisciplinary teams to solve cancer toughest challenges | YES (IV-1-1) | Cancer Grand Challenges | Cancer Grand Challenges | Cancer Grand Challenges | CRUK | 10,000,000€ | 10,000,000€ | 115,000,000€ | 125,000,000€ | 2023 | 176 | 5 | 3% | 2 |
| DOCSHS | To promote research in the fields of human and social sciences, public health and epidemiology applied to cancer control | No | INCa | INCa | INCa | None | 846,033€ | 846,033€ | - € | 846,033€ | 2023 | 18 | 6 | 33% | 6 |
| DROM | To promote access to clinical trials for French overseas cancer patients by supporting the opening of investigator centres in French overseas territories (DROMs) | Yes (III-5-2) | INCa | INCa | INCa | GIRCI-SOHO | 332,882€ | 332,882€ | - € | 332,882€ | 2023 | 10 | 10 | NA | 10 |
| HAP PHRC | | No | INCa | INCa | INCa | None | 300,000€ | 300,000€ | - € | 300,000€ | 2023 | 1 | 1 | NA | 1 |
| Interpedia | To foster the emergence of ambitious interdisciplinary research projects in paediatric oncology research | No | INCa | INCa | INCa | None | 1,051,812€ | 1,051,812€ | - € | 1,051,812€ | 2024 | 5 | 2 | 40% | 2 |
| MI-AMGEN | To support early-phase clinical trials to assess innovative molecules from pharmaceutical companies for undeveloped indications, addressing unmet medical needs. | Yes (III-5-1) | INCa | INCa | INCa/ARC | ARC | 1,765,755€ | 3,531,509€ | - € | 3,531,509€ | 2024 | 16 | 3 | 19% | 3 |
| PAIROBC | To promote cooperation between all scientific disciplines around improving knowledge, prevention and care for obese or overweight people with or without cancer and accelerate knowledge transfer to clinical practice | Yes (I-1-4) | INCa/Ligue | INCa | INCa/Ligue | Ligue | 2,169,888€ | 4,339,775€ | - € | 4,339,775€ | 2023 | 17 | 4 | 24% | 4 |
| PEDIACRIEX | To strengthen paediatric oncology structuring through the designation of integrated research centres of excellence in paediatric oncology | Yes (V-2-12) | INCa | INCa | INCa | None | 14,988,600€ | 14,988,600€ | - € | 14,988,600€ | 2024 | 4 | 3 | 75% | 3 |
| PEDIAMOB | To reinforce the attractiveness of paediatric cancer research for young talent by funding doctoral thesis and Post-Docs and enabling interships abroad for Masters, PhD students, Post-docs and statutory personnel | No | INCa | INCa | INCa | None | 252,590€ | 252,590€ | - € | 252,590€ | 2023 | 12 | 2 | 17% | 2 |
| PHRC-K | To support national academic clinical cancer research | No | | | DGOS | DGOS | - € | 27,102,191€ | - € | 27,102,191€ | 2023 | 146 | 33 | 23% | 33 |
| PLBIO | To support basic sciences research projects to expand our understanding of the biology of cancer diseases | No | INCa | INCa | INCa | None | 33,017,148€ | 33,017,148€ | - € | 33,017,148€ | 2023 | 224 | 52 | 23% | 52 |
| PRT-K | To support translational research and accelerate the transfer of scientifc and medical knowledge to clinical practice by giving incentive to develop interdisciplinary projects bringing together researchers and clinicians | No | INCa/DGOS | INCa | INCa/DGOS | DGOS | 6,138,659€ | 9,286,843€ | - € | 9,286,843€ | 2023 | 84 | 16 | 19% | 16 |
| Réseau CAR-T UNITC | To federate the French academinc research to promote clinical research and development of CAR-T cells and cell therapy | No | INCa | INCa | INCa | None | 300,000€ | 300,000€ | - € | 300,000€ | 2024 | 1 | 1 | NA | 1 |
| SHS-RISP | To promote the development of multidisciplinary cancer research in the fields of human and social sciences, public health and public health intervention | No | INCa | INCa | INCa | No | 6,565,565€ | 6,565,565€ | - € | 6,565,565€ | 2023 | 49 | 19 | 39% | 19 |
| SPA-CPA | To support research and production of knowledge in the field of psychoactive substance use and behaviours with addictive potential | No | INCa and IReSP | INCa and IReSP | INCa through CNAM Addiction Fund (FLCA) | IReSP | 4,605,813€ | 4,605,813€ | 3,370,919€ | 7,976,732€ | 2023 | 50 | 24 | 48% | 14 |
| SPA-CPA-DOC | To support the research community addressing psychoactive substance use and addiction through the funding of doctoral theses | No | INCa/ IReSP | INCa (in 2023) | INCa and IReSP through CNAM Addiction Fund (FLCA) | IReSP | 446,865€ | 446,865€ | 416,775€ | 863,640€ | 2023 | 24 | 6 | 25% | 3 |
| TABAC-JC | To enbale the development of tobacco and/or alcohol research by supporting junior researchers with innovative proposals in the field of human & social sciences, public health and intervention research | No | INCa | INCa | INCa through CNAM Addiction Fund (FLCA) | None | 998,401€ | 998,401€ | - € | 998,401€ | 2023 | 14 | 7 | 50% | 7 |
| TRANSCAN JTC-2022 | Cross-national cooperation of 31 funding organisations from 20 countries to support high-impact translational cancer research | No | TRANSCAN network | Alliance Against Cancer (Italy) | INCa through TRANSCAN network | TRANSCAN network | 1,167,810€ | 1,167,810€ | 13,932,190€ | 15,100,000€ | 2023 | 70 | 14 | 20% | 4 |
| **TOTAL** | | | | | | | **86,901,470€** | **121,087,487€** | | | | | | | **184** |

Table 9: Detailed list of ITMO's Cancer 2023 funding programmes

| ITMO 2023 programmes | Objective | Contributing institutions | | | | Funding by institutions | | Projects selection for funding | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Programming institution | Operating institution | Funding institution | Partner institution | TOTAL | Year of funding | Number of evaluated proposals | Number of funded projects | Selection rate | Projects funded by ITMO |
| ANR JCJC | To support established junior researchers with additional funding for their cancer research projects | ANR | ANR | INSERM for ITMO | ANR | 936,639€ | 2023 | NA | 3 | NA | 3 |
| Anses PNR EST | To support the production of scientific knowledge on various public health issues related to the environment and workplace | ANSES | ANSES | INSERM for ITMO | ANSES | 411,143€ | 2023 | NA | 2 | NA | 2 |
| Atip-Avenir | To promote the establishment of promising junior principal investigators in cancer research | CNRS-INSERM | CNRS-INSERM | INSERM for ITMO | CNRS-INSERM | 300,000€ | 2023 | NA | 1 | NA | 1 |
| Equipment | To support the acquisition of shared equipment to support ambitious cancer research projects and foster research teams' interaction | ITMO | INSERM | INSERM for ITMO | None | 3,849,017€ | 2023 | 48 | 19 | 40% | 19 |
| FIRE | To promote the use of a broad range of academic disciplines for ambitious cancer research projects | FIRE graduate school | FIRE graduate school | INSERM for ITMO | FIRE graduate school | 230,140€ | 2023 | | 2 | NA | 2 |
| FRT-DOC | To promote the training of students or junior graduates from medical, pharmacy and veterinary sciences in tanslational research through doctoral theses on cancer | ITMO | INSERM | INSERM for ITMO | None | 553,088€ | 2023 | 23 | 4 | 17% | 4 |
| MIC | To promote the contribution of mathematic and computer sciences to cancer research | ITMO | INSERM | INSERM for ITMO | None | 2,317,835€ | 2023 | 23 | 6 | 26% | 6 |
| PCSI | To support the use of concepts and tools from physics, chemistry or engineering sciences for cancer diseases understanding and for patients' prognosis improvement | ITMO | INSERM | INSERM for ITMO | None | 10,597,274€ | 2023 | 83 | 32 | 39% | 32 |
| PNP | To contribute to a better understanding and modelling of preneoplastic lesions to enable their progression risk stratification and target identification | ITMO | INSERM | INSERM for ITMO | None | 4,376,495€ | 2023 | 18 | 7 | 39% | 7 |
| **TOTAL** | | | | | | **23,571,631€** | | **195** | **76** | | **76** |

## 2 Support programme

Table 10: Features of the 7 clinical research projects supported in 2019 in French overseas departments

| Projects | Funding | Duration of the project | Investigation centres |
|---|---|---|---|
| **LEANOX**<br>LEAn Body Mass Normalization of OXaliplatin Based Chemotherapy for Stage III Colon Cancer Patients Treated in Adjuvant Setting: Impact on Oxaliplatin-induced Sensitive Neurotoxicity. A Multicentre Phase II Randomised Trial. | €25,915 | 36 months | CHU de Martinique |
| **SIMPA-01**<br>Efficacy of an Oral Immunomodulatory Nutrient on Survival During Postoperative Concomitant Chemoradiotherapy in Head and Neck Cancer. | €57,614 | 48 months | CHU de Martinique<br>CHU de La Réunion<br>Clinique Ste Clotilde |
| **EMUTRAS**<br>Detection of the Emergence of RAS Mutations in Circulating DNA in Patients With Metastatic Colorectal Cancer During Treatment With Anti-EGFR Therapy. | €10,248 | 36 months | CHU de Martinique<br>CHU de La Réunion |
| **OPEN**<br>Trismus Prevalence and Preventive Rehabilitation Associated With Therapeutic Education for Patients With Head and Neck Cancer Treated With Concomitant Radiochemotherapy. | €5,936 | 12 months | CHU de La Réunion |
| **ONCOCOL**<br>Phase III Study Comparing Neoadjuvant Chemotherapy with Carboplatin and Paclitaxel Followed by Standard Therapy, With Standard Therapy Alone in Women With Cervical Cancer and Para Aortic Positive Lymph Node. | €68,871 | 48 months | CHU de Guadeloupe |
| **DEXAML-03**<br>Dexamethasone Plus Salvage Chemotherapy Versus Salvage Chemotherapy Alone in Patients with First Relapsed or Refractory Acute Myeloid Leukaemia: a Randomised, Controlled, Open-label, Multicentre, Phase III Study. | €29,000 | 48 months | CHU de La Réunion |
| **ONCOGRAM**<br>Study of the Therapeutic Response and Survival of Patients with Metastatic Colorectal Cancer (Stage IV) and Treated According to the Guidelines of a Chemosensitivity Test, Oncogramme®. | €94,455 | 36 months | CHU de Martinique |

## 3 Cooperative intergroup research activity

Table 11: List of cooperative groups designated in 2022

| Cooperative intergroup | Diseases covered |
|---|---|
| ARCAGY-GINECO | Gynaecological cancers |
| CIGAL | Acute leukaemia |
| DIALOG | Geriatric oncology |
| GETUG-AFU Alliance | Urological cancers |
| GRRR-OH | Intensive care unit – all cancers |
| IFCT | Thoracic cancers |
| IGCNO | Neuro-oncology |
| IFM | Myeloma |
| Intergroupe ORL | ENT cancers |
| INTERSARC | Sarcomas |
| LYSA-LYSARC | Lymphomas |
| PRODIGE | Digestive cancers |
| SFCE | Paediatric oncology |
| UCBG | Breast cancers |

## 4 Innovative drugs programme

Figure 61

Appendix MI programme: Breakdown of selected early clinical trials according to cancer sites studied over the 2011-2023 period

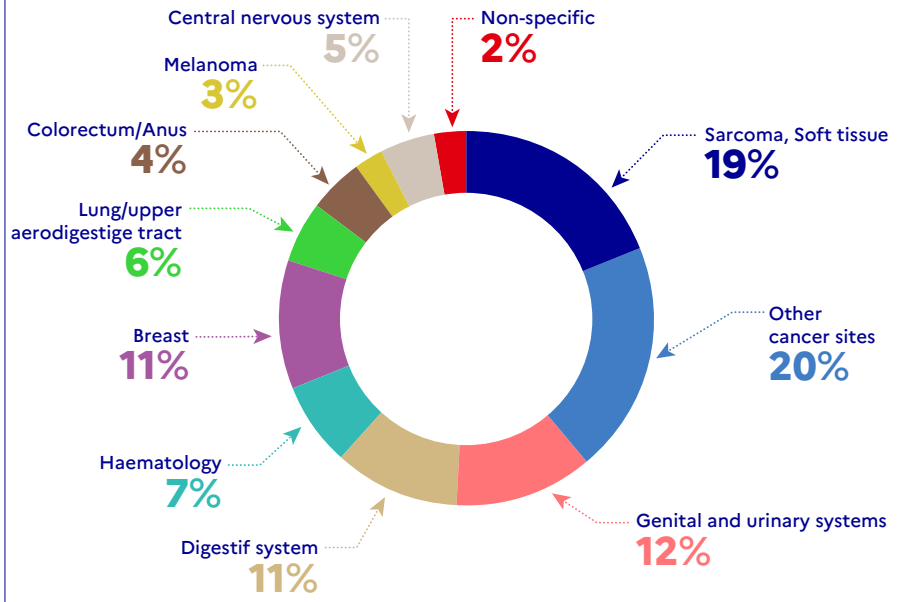
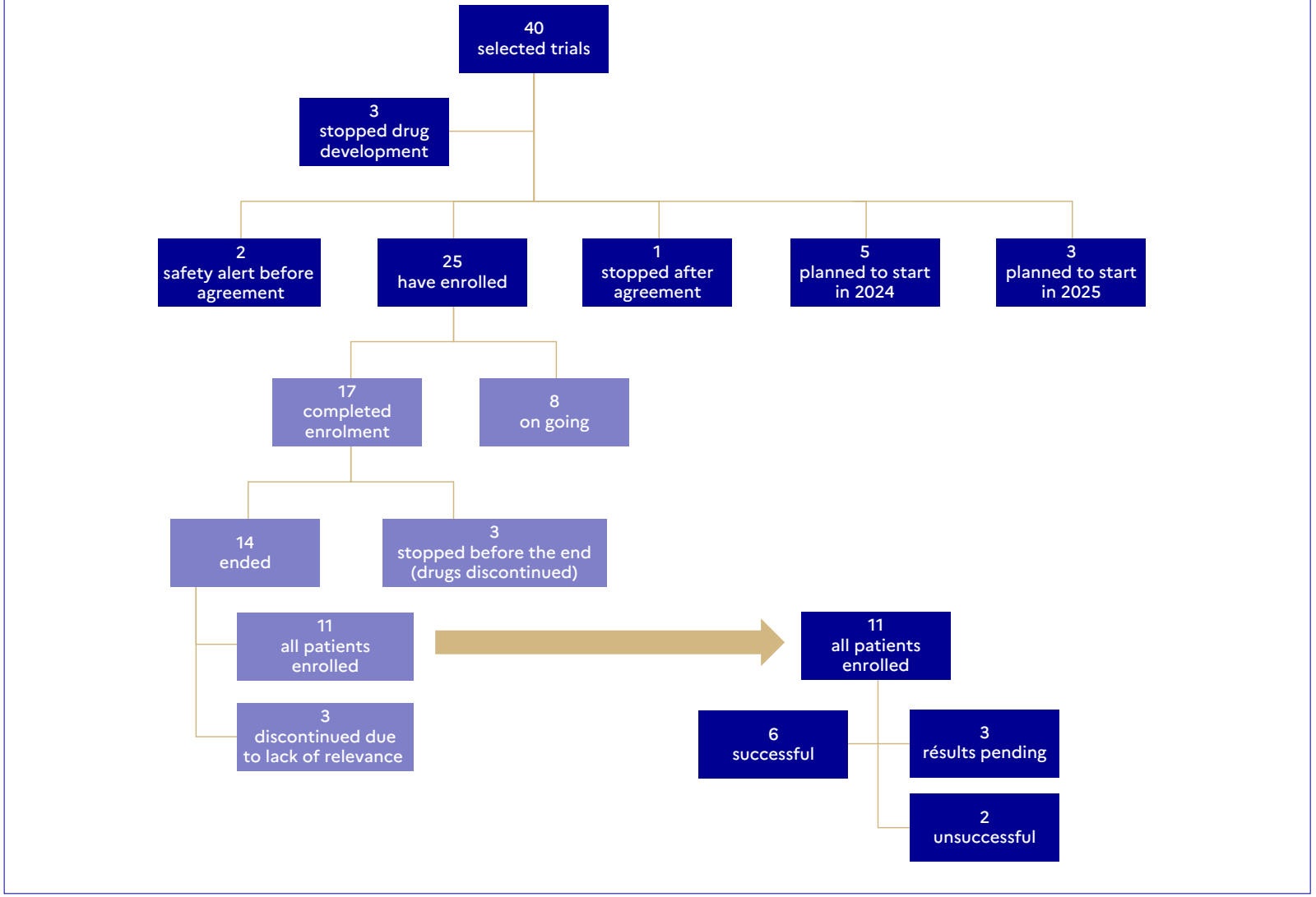


Figure 62

Appendix MI programme: Outcomes of selected projects (Trials)



## 5 National Clinical research monitoring

Table 12: Appendix Clinical research monitoring: Main results of clinical cancer research activity survey in 2022

| | Academic | Industrial | TOTAL 2022 |
|---|---|---|---|
| Number of inclusions | 45,323 | 9,234 | 54,557 |
| Number of inclusions in therapeutic clinical trials | 20,290 | 8,614 | 28,904 |
| Number of inclusions in clinical trials in solid tumours | 37,148 | 7,105 | 44,253 |
| Number of inclusions in clinical trials in haematology | 9,491 | 1,574 | 11,065 |
| Number of inclusions of children (0-18) | 2,091 | 279 | 2,370 |
| Number of adolescent and young adult inclusions (15-25) | 1,602 | 359 | 1,961 |
| Number of elderly adult (≥75 years old) inclusions | 2,401 | 553 | 2,954 |

Figure 63

Appendix Clinical research monitoring: Distribution of cancer clinical trials according to therapy over the 2017-2022 period

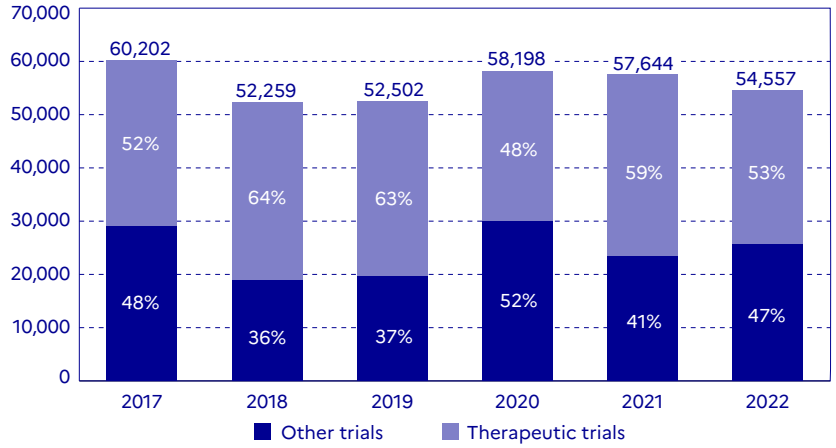
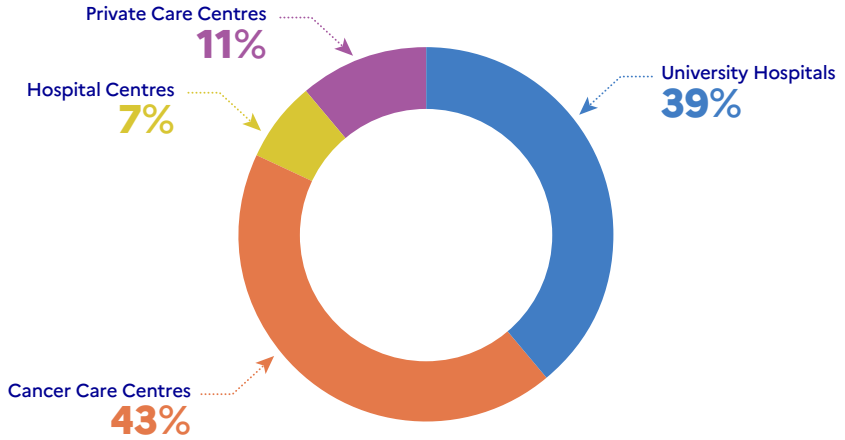



Figure 64

Appendix Clinical Research monitoring: Distribution of patients enrolled in cancer clinical trials among different care providers in 2022



## 6 Analysis of 2011-2020 publications and patents related to cancer worldwide

Table 13: Number and global share of patents in the field of cancer from leading inventor countries

| | Patents families | | | Global share (%) | |
|---|---|---|---|---|---|
| | 2011-2015 | 2016-20 | Growth rates 2016-2020/2011-2015 (%) | 2011-2015 | 2016-2020 |
| United States | 13,754 | 14,507 | +5 | 39.9 | 39.7 |
| China | 2,790 | 6,359 | +128 | 8.1 | 17.4 |
| Japan | 2,868 | 2,596 | –9 | 8.3 | 7.1 |
| Korea, South | 1,872 | 2,277 | +22 | 5.4 | 6.2 |
| Germany | 2,207 | 1,426 | –35 | 6.4 | 3.9 |
| United Kingdom | 1,500 | 1,346 | –10 | 4.4 | 3.7 |
| France | 1,459 | 1,104 | –24 | 4.2 | 3 |
| Canada | 807 | 712 | –12 | 2.3 | 1.9 |
| Switzerland | 601 | 520 | –14 | 1.7 | 1.4 |
| India | 707 | 513 | –27 | 2.1 | 1.4 |
| Taiwan | 534 | 491 | –8 | 1.6 | 1.3 |
| Italy | 655 | 482 | –26 | 1.9 | 1.3 |
| Israel | 482 | 467 | –3 | 1.4 | 1.3 |
| Netherlands | 476 | 428 | –10 | 1.4 | 1.2 |
| Spain | 463 | 395 | –15 | 1.3 | 1.1 |
| Rest of the world | 1,841 | 1 732 | –6 | 5.3 | 4.7 |
| **World** | **34,456** | **36,524** | **+6** | **100** | **100** |

## 7 Common scientific outline

ICRP International Cancer Research Partnership

Established in 2000, the International Cancer Research Partnership (ICRP) is a unique alliance of cancer organisations, working together to enhance global collaboration and strategic coordination of cancer research. It includes 150 worldwide organisations from Australia, Canada, France, Japan, the Netherlands, United Kingdom, and the United States. INCa joined this partnership in 2009.

This consortium aims to improve access to information about cancer research being conducted, explore opportunities for cooperation between funding agencies, and enable our members to maximise the impact of their independent efforts.

ICRP organisations share funding information in a common format (known as the Common Scientific Outline or CSO) to facilitate pooling data and evaluating data across organisations.

The Common Scientific Outline, or CSO, is a classification system organised around seven broad areas of scientific interest in cancer research. The development of the CSO is laying a framework to improve coordination among research organisations, making it possible to compare and contrast the research portfolios of public, non-profit, and governmental research agencies. The current version (v2) of the CSO was adopted by the International Cancer Research Partnership in April 2015 and used by the Institute since 2022.

This classification is subdivided in 6 categories:
- Biology
- Aetiology (causes of cancer)
- Prevention
- Early Detection, Diagnosis, and Prognosis
- Treatment
- Cancer Control, Survivorship, and Outcomes Research

N.B. Item removed from the update CSO v2: Scientific Model Systems.

As a member of the ICRP consortium, INCa and its partners use this classification. The types of research projects funded by INCa, the French Ministry of Health (DGOS) and Inserm for ITMO Cancer that are presented in this report are based on this CSO classification.

The different CSO categories include:
- **CSO 1 Biology**
  - 1.1 Normal functioning
  - 1.2 Cancer initiation: alterations in chromosomes
  - 1.3 Cancer initiation: oncogenes and tumour suppressor genes
  - 1.4 Cancer progression and metastasis
  - 1.5 Resources and infrastructure
- **CSO 2 Aetiology**
  - 2.1 Exogenous factors in the origin and cause of cancer
  - 2.2 Endogenous factors in the origin and cause of cancer
  - 2.3 Interactions of genes and/or genetic polymorphisms with exogenous and/or endogenous factors
  - 2.4 Resources and infrastructure related to aetiology
- **CSO 3 Prevention**
  - 3.1 Interventions to prevent cancer: personal behaviours that affect cancer risk
  - 3.2 Nutritional science in cancer prevention
  - 3.3 Chemoprevention
  - 3.4 Vaccines
  - 3.5 Complementary and alternative prevention approaches
  - 3.6 Resources and infrastructure related to prevention

- **CSO 4 Early Detection, Diagnosis, and Prognosis**
  - 4.1 Technology development and/or marker discovery
  - 4.2 Technology and/or marker evaluation with respect to fundamental parameters of method
  - 4.3 Technology and/or marker testing in a clinical setting
  - 4.4 Resources and infrastructure related to detection, diagnosis, or prognosis
- **CSO 5 Treatment**
  - 5.1 Localised therapies – Discovery and development
  - 5.2 Localised therapies – Clinical applications
  - 5.3 Systemic therapies – Discovery and development
  - 5.4 Systemic therapies – Clinical applications
  - 5.5 Combinations of localised and systemic therapies
  - 5.6 Complementary and alternative treatment approaches
  - 5.7 Resources and infrastructure related to treatment
- **CSO 6 Cancer Control, Survivorship, and Outcomes Research**
  - 6.1 Patient care and survivorship issues
  - 6.2 Surveillance
  - 6.3 Behaviour
  - 6.4 Cost analyses and health care delivery
  - 6.5 Education and communication
  - 6.6 End-of-life care
  - 6.7 Ethics and confidentiality in cancer research
  - (item removed from the update CSO v2: 6.8 Complementary and alternative approaches for supportive care of patients and survivors)
  - 6.9 Resources and Infrastructure related to cancer control, survivorship, and outcomes research
- **CSO 7 Scientific Models**
  - 7.1 Model development and characterisation
  - 7.2 Model application
  - 7.3 Scientific model resources and infrastructure

## 8 Detailed CSO and cancer type breakdown of 2023 funded projects

### METHODE: CSO and cancer type breakdown

The distribution by CSO and cancer type found in these appendices is performed as follow and differs from the method in section PART 5: Scientific areas covered by funded research.

As one project can cover several CSO and cancer type, a fraction of the project will be allocated toeach categorie (Example: 1 project belongs to 3 CSO: 0.3 will go to CSO1, 0.3 will to CSO2 and 0.3 will go to CSO3).

## PLBIO programme: 52 projects

Figure 65

Appendix PLBIO: Breakdown of selected projects according to cancer sites studied for the biology and basic sciences programme in 2023

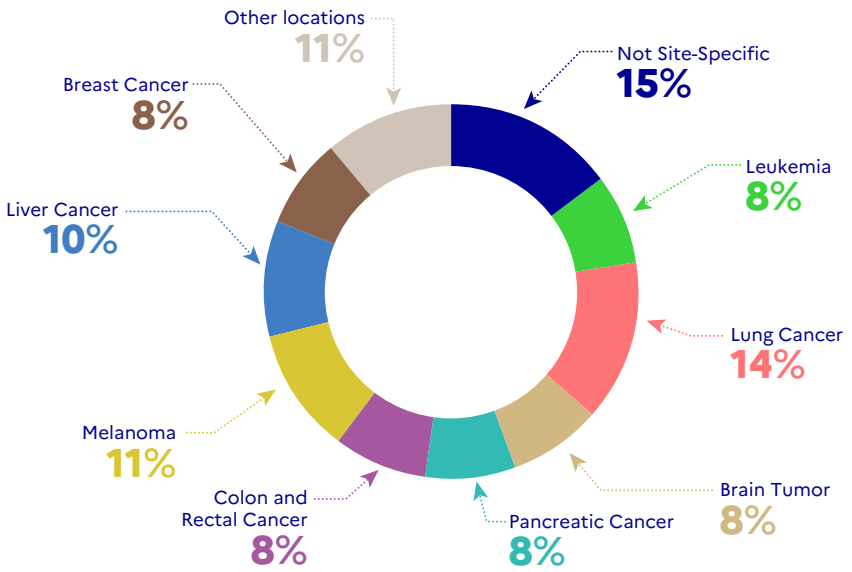



Figure 66

Appendix-PLBIO detailed CSO

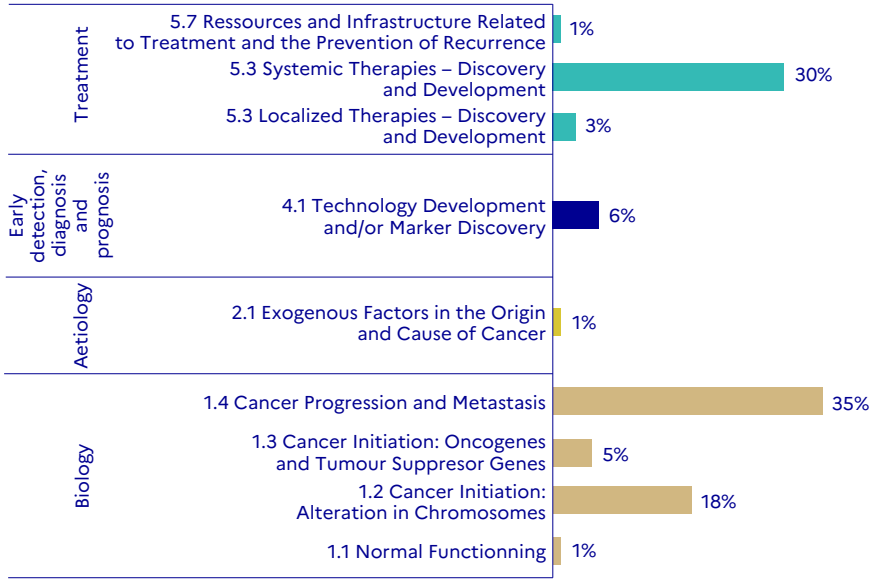
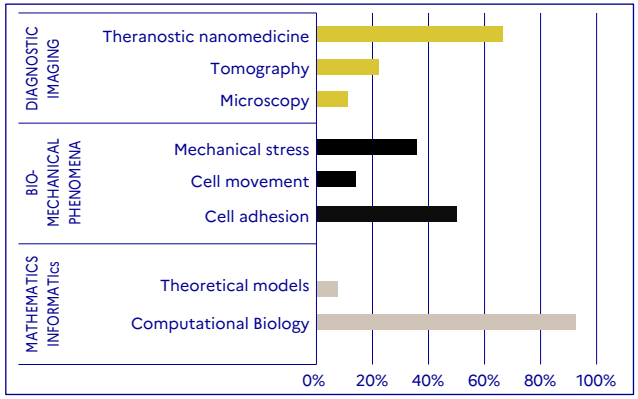
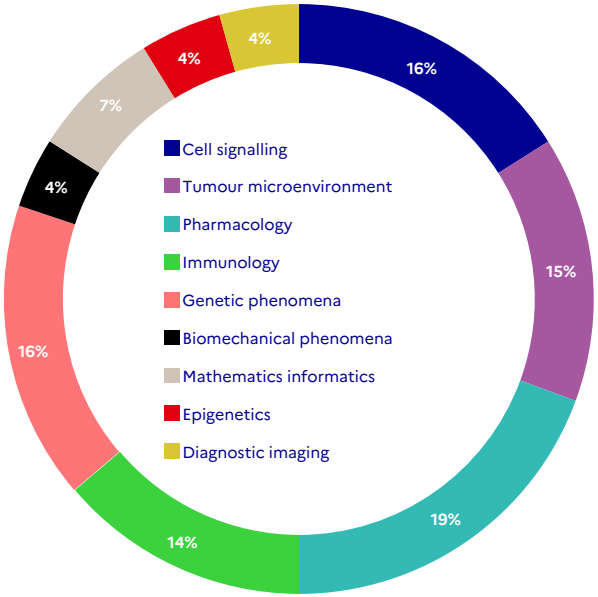
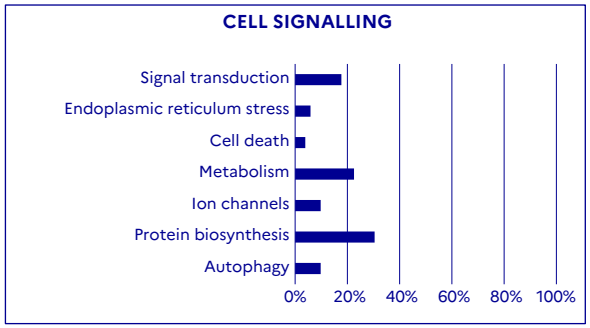


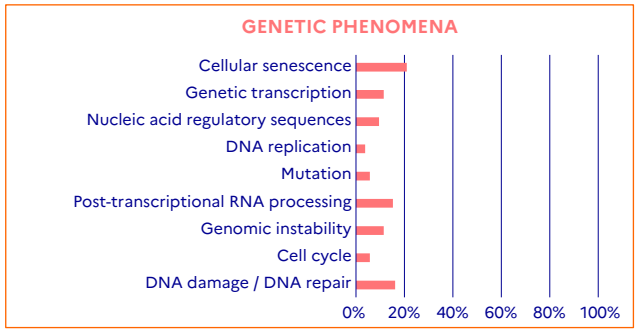
Figure 67

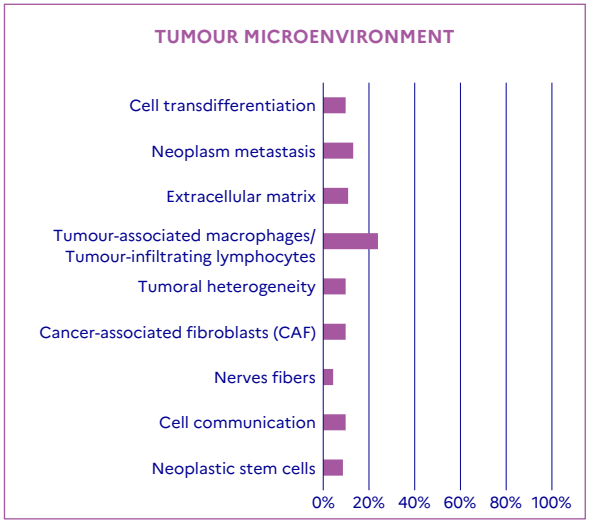
## Appendix-Analysis of the main research topics studied by the projects funded in 2023 and breakdown of research fields into these main topics

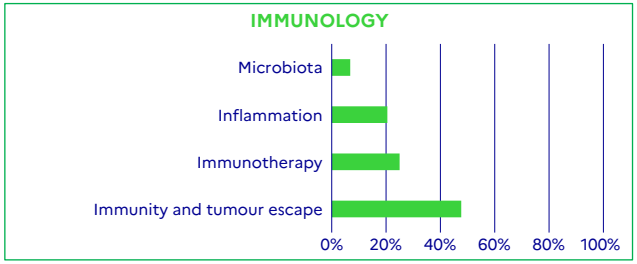


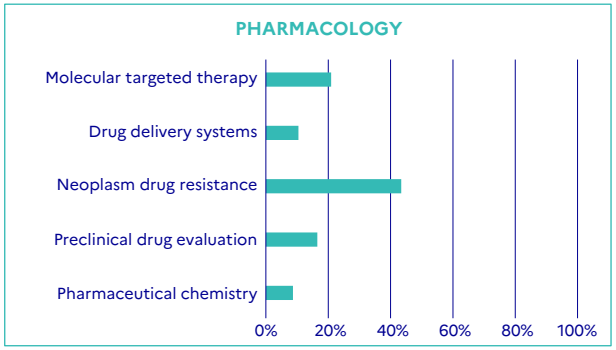



## PRT-K programme: 16 projects

Figure 68
Distribution of PRTK-funded projects by detailed CSO

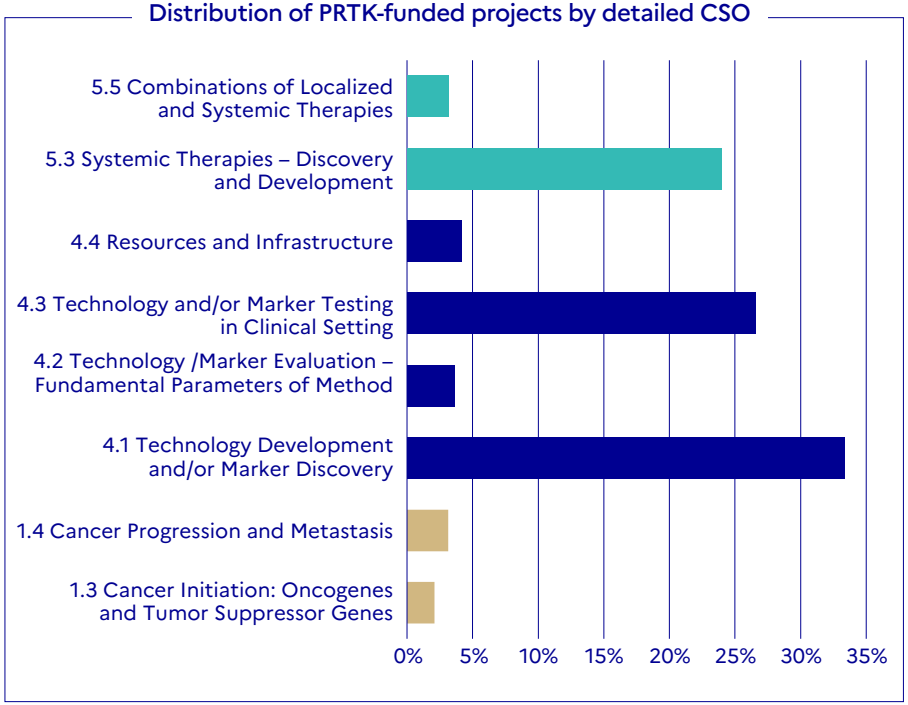
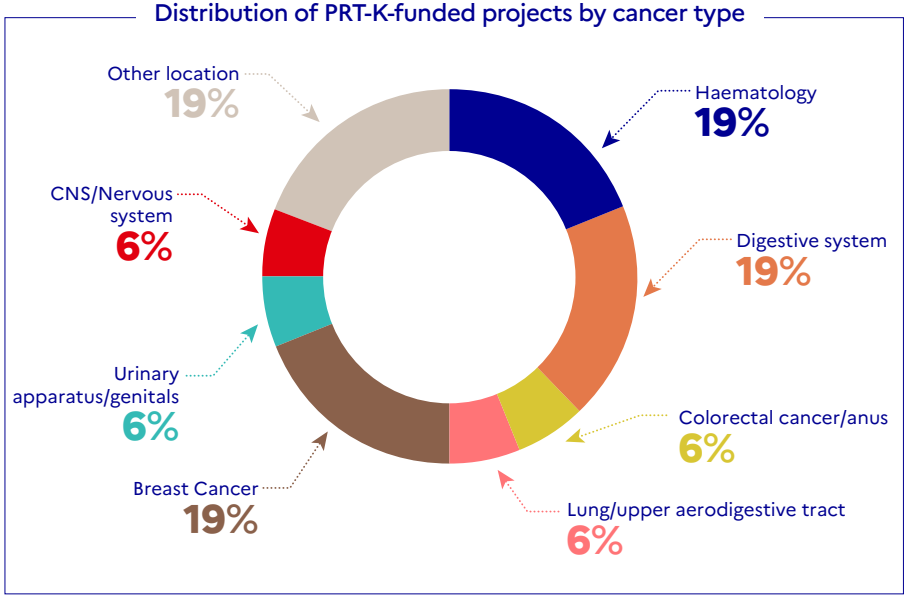



Figure 69
Distribution of PRT-K-funded projects by cancer type



## PHRC- programme: 33 projects

Figure 70
Distribution of PHRC-K-funded projects by detailed CSO

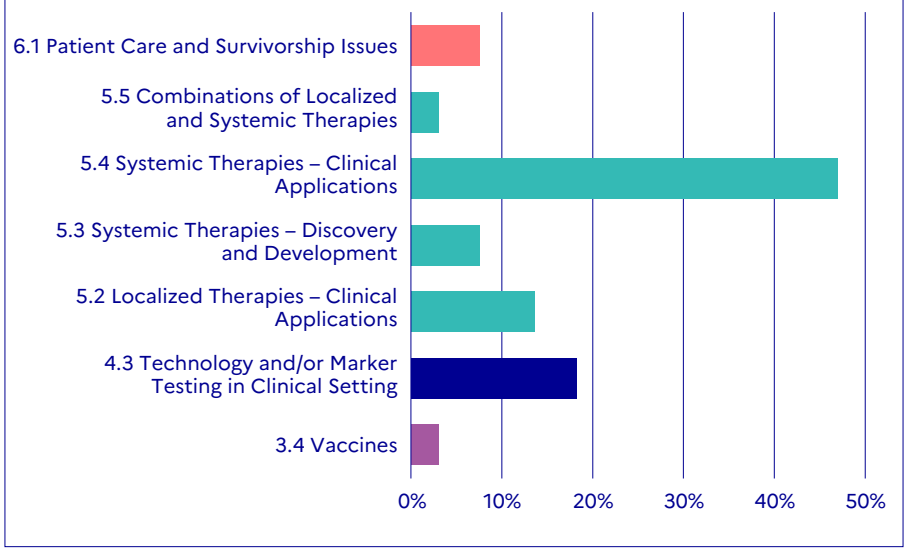
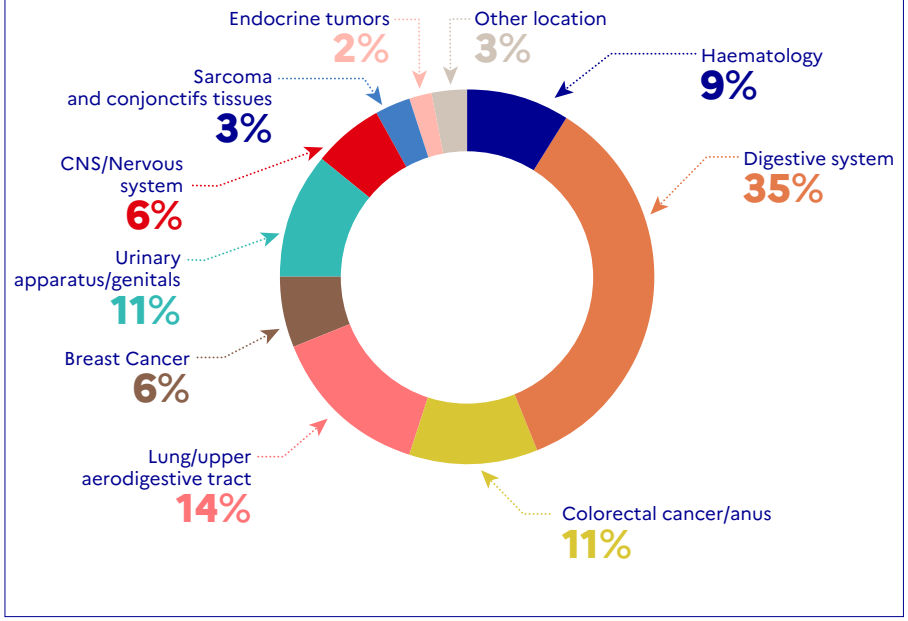



Figure 71
Distribution of PHRC-K-funded projects by cancer type



## SHS-RISP programme: 19 programmes

Figure 72
Distribution of CGC-funded projects by detailed CSO classification

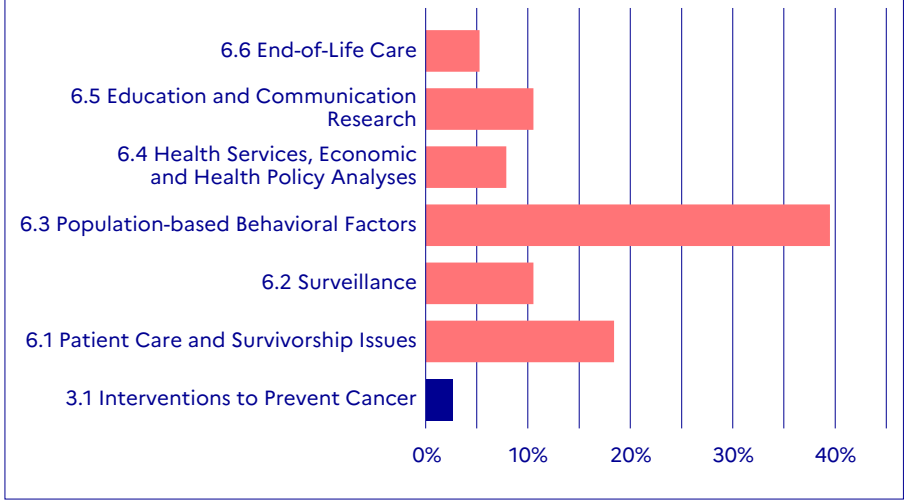
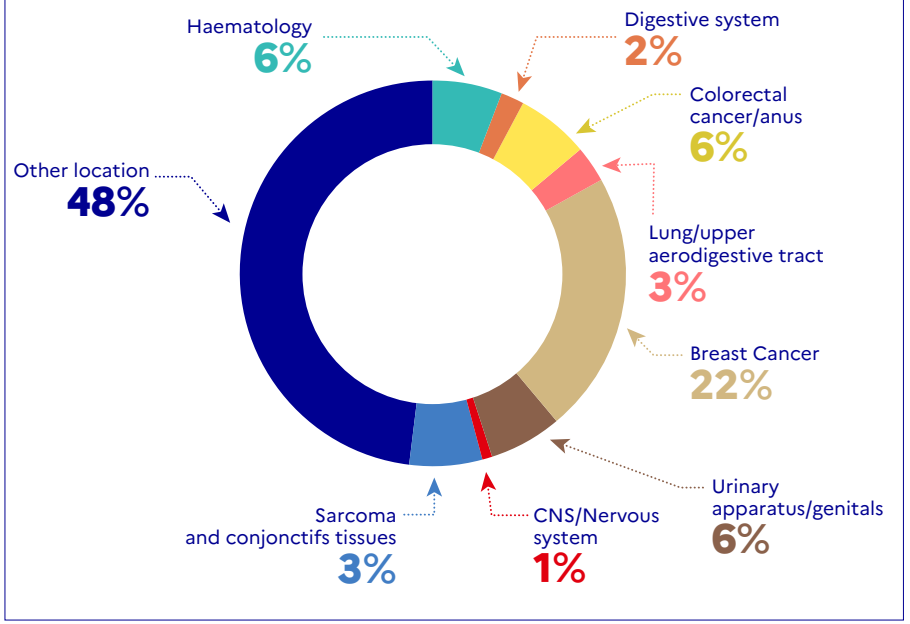



Figure 73
Distribution of SHS-RISP-funded projects by cancer type



## PAIROBC programme: 4 projects

Figure 74
Distribution of PAIROBC-funded projects by detailed CSO

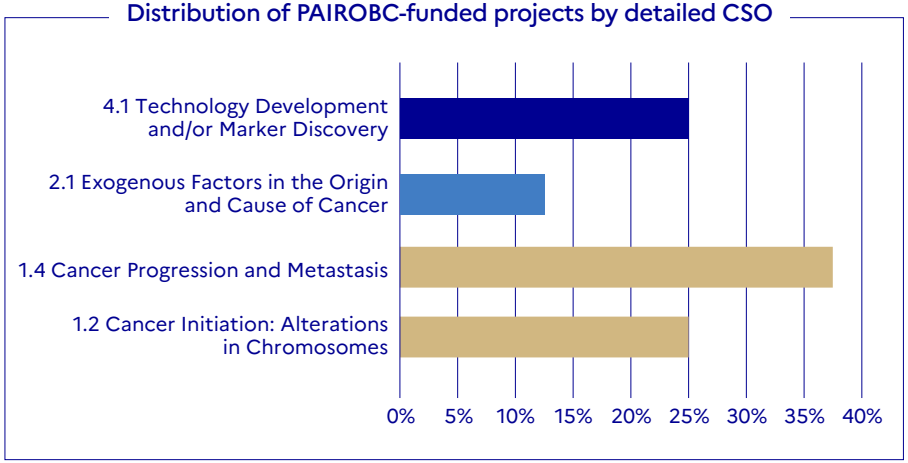
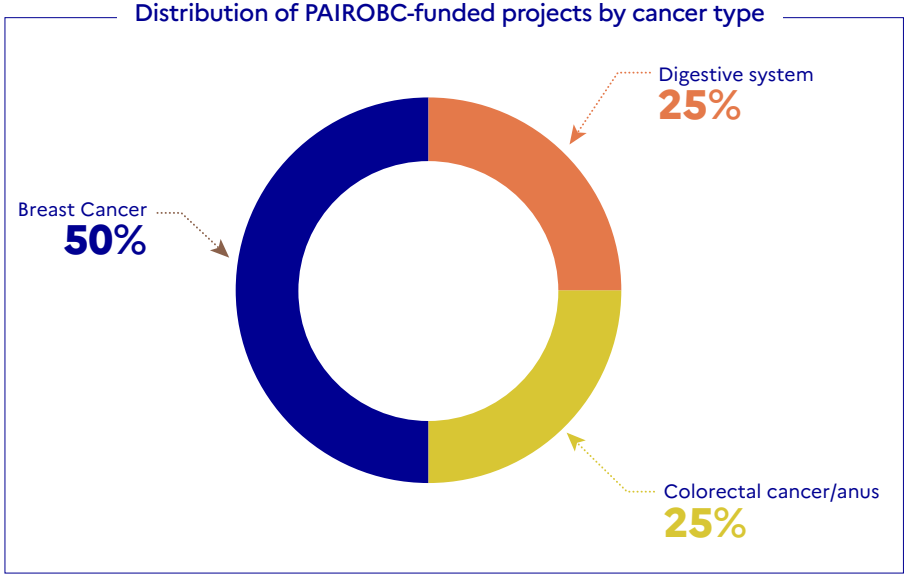



Figure 75
Distribution of PAIROBC-funded projects by cancer type



## AcSé programme: 2 projects

Figure 76
Distribution of AcSé-funded projects by detailed CSO

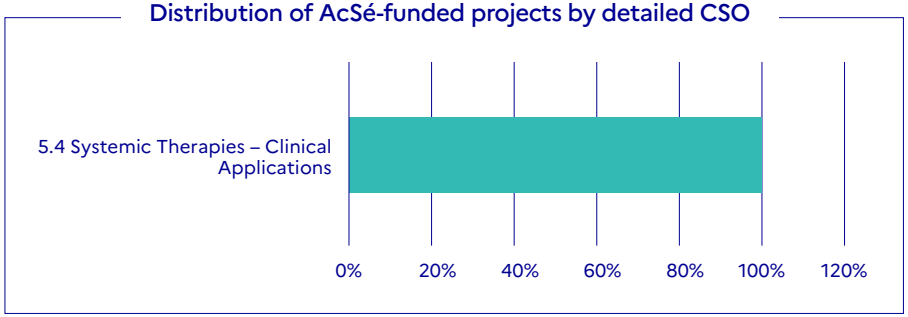
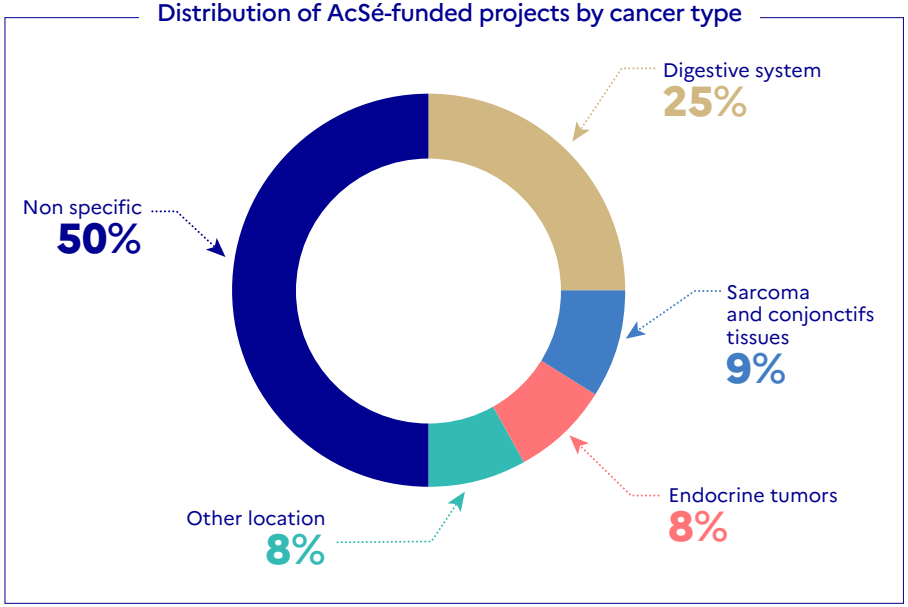



Figure 77
Distribution of AcSé-funded projects by cancer type



## MI-AMGEN programme: 3 projects

Figure 78
Distribution of MI-AMGEN-funded projects by detailed CSO

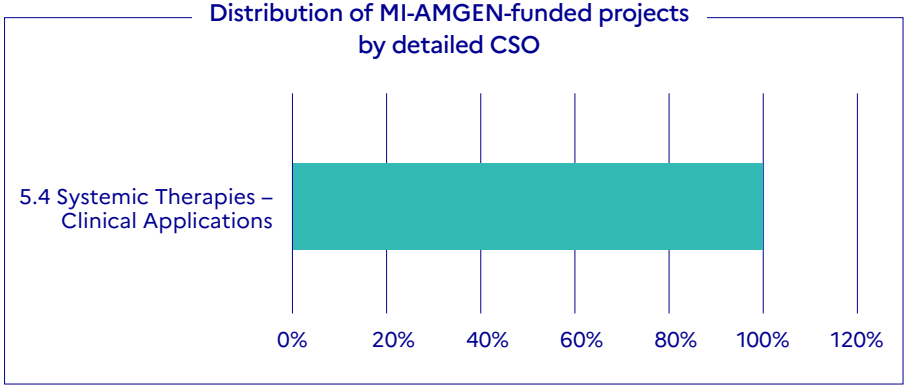
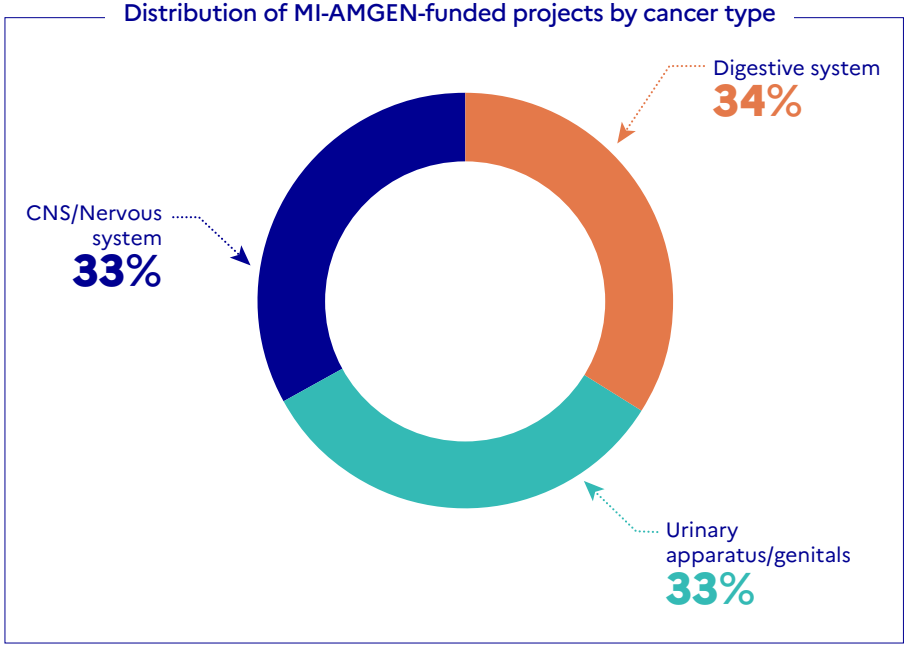



Figure 79
Distribution of MI-AMGEN-funded projects by cancer type



## DROM programme: 10 projects

Figure 80
Distribution of DROM-funded projects by detailed CSO

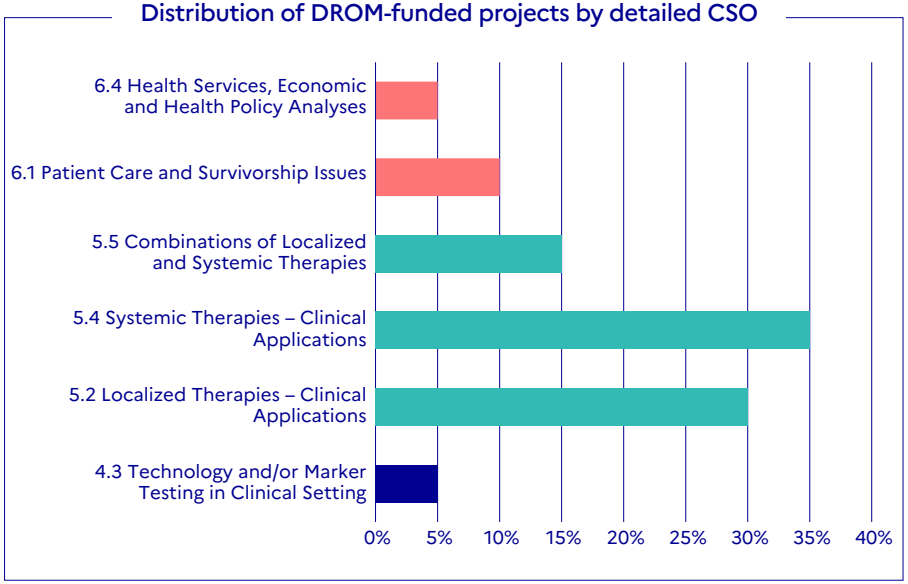
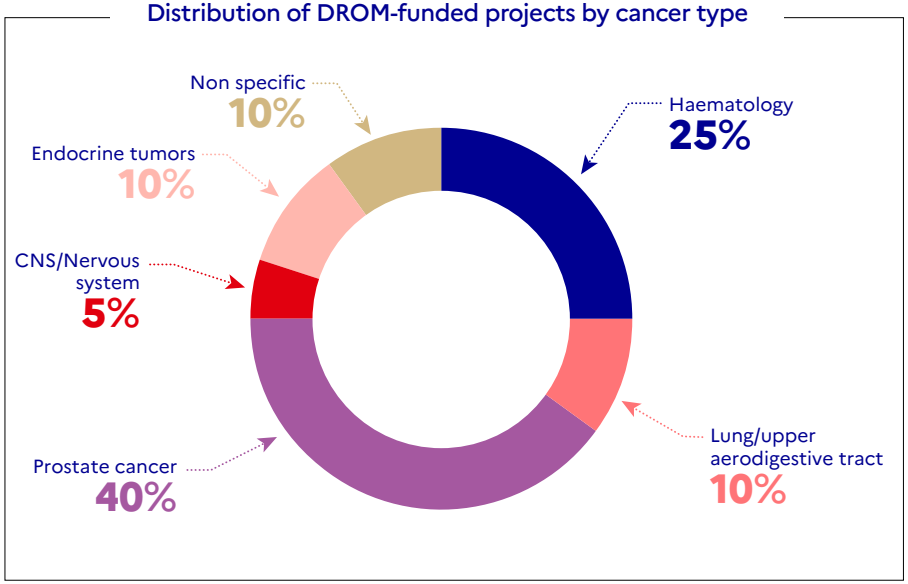



Figure 81
Distribution of DROM-funded projects by cancer type



## Cancer Grand Challenges initiative: 2 projects

Figure 82
Distribution of Cancer Grand Challenges-funded projects by detailed CSO

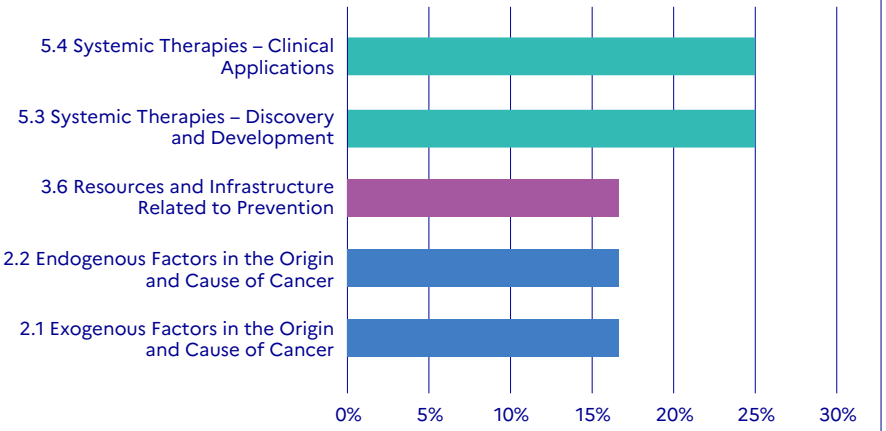
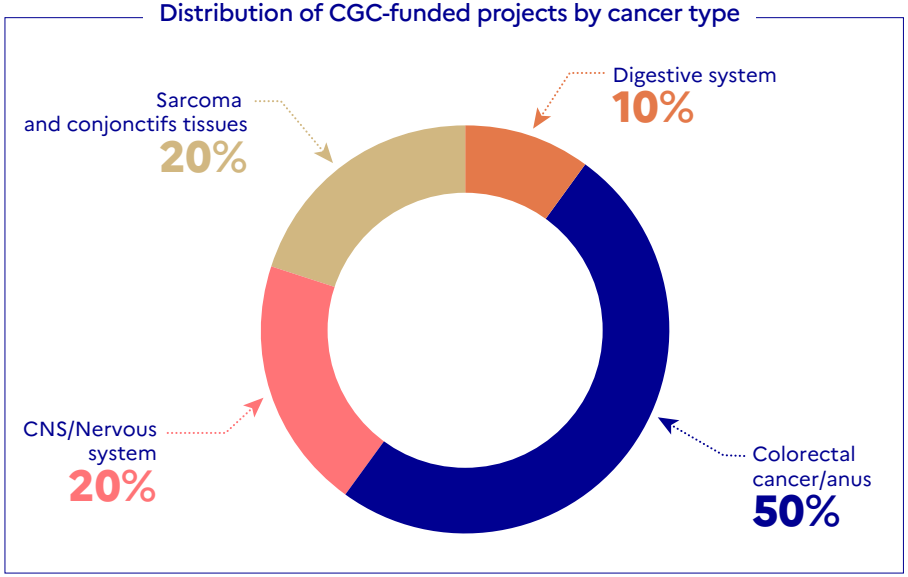



Figure 83
Distribution of CGC-funded projects by cancer type



## TRANSCAN programme: 4 projects

Figure 84
Distribution of TRANSCAN-funded projects by detailed CSO classification

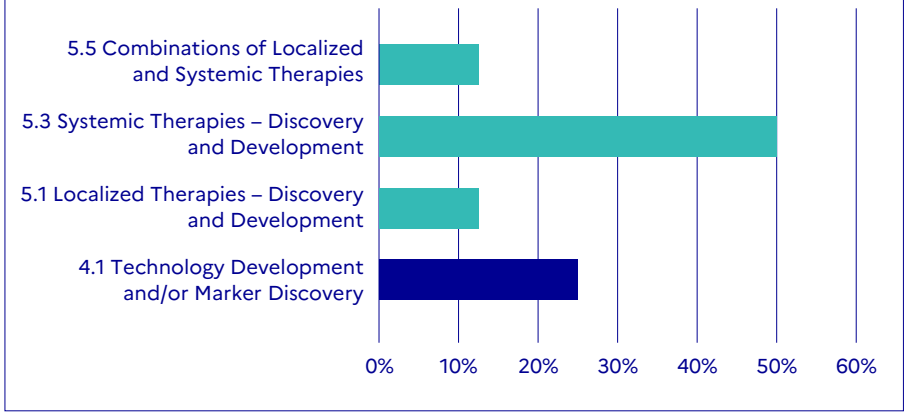
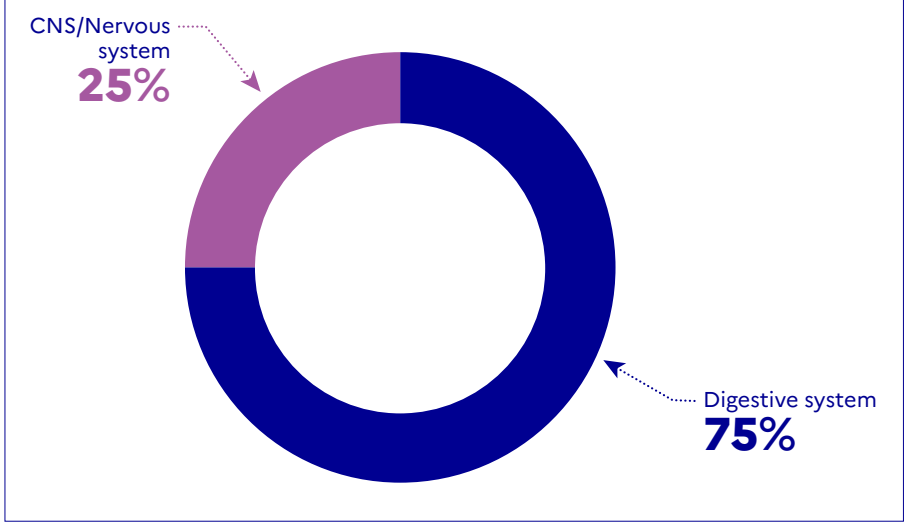



Figure 85
Distribution of TRANSCAN-funded projects by cancer type



## TABACJC programme: 7 projects

Figure 86
Distribution of TabacJC-funded projects by detailed CSO classification

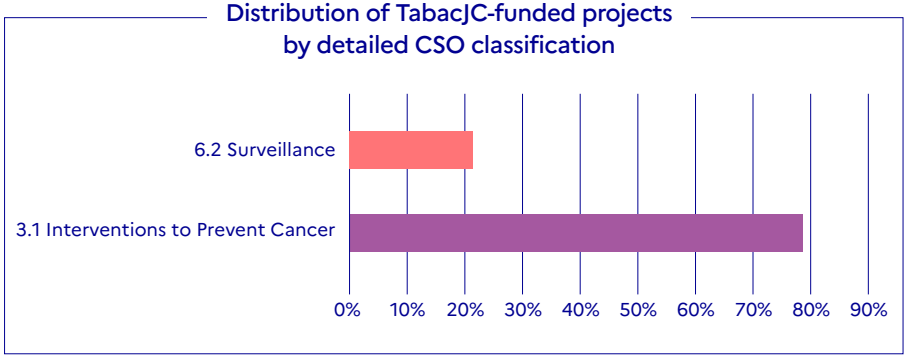
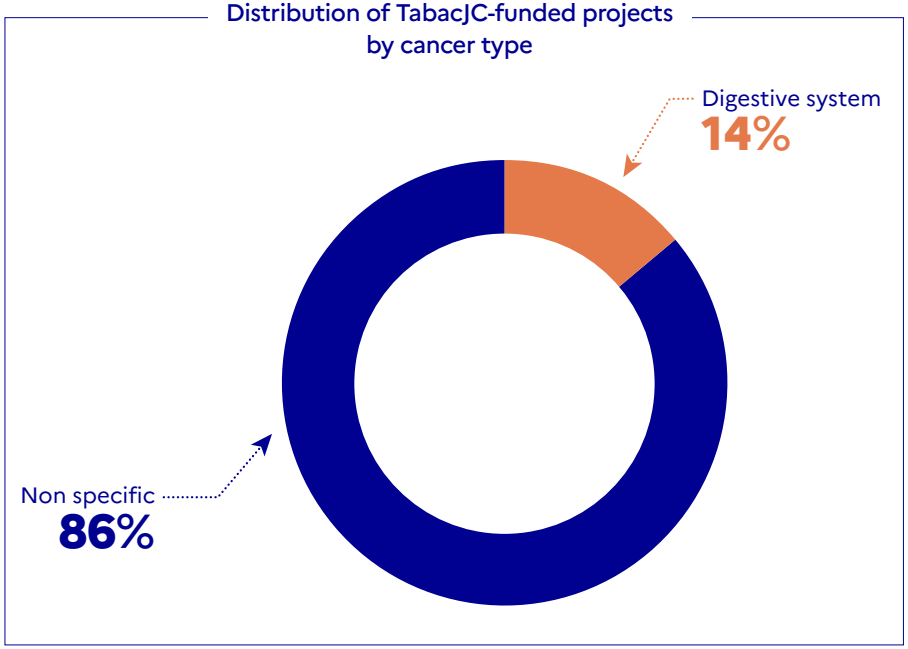



Figure 87
Distribution of TabacJC-funded projects by cancer type



## SPA-CPA programme: 14 projects

Figure 88
Distribution of SPA-CPA-funded projects by detailed CSO classification

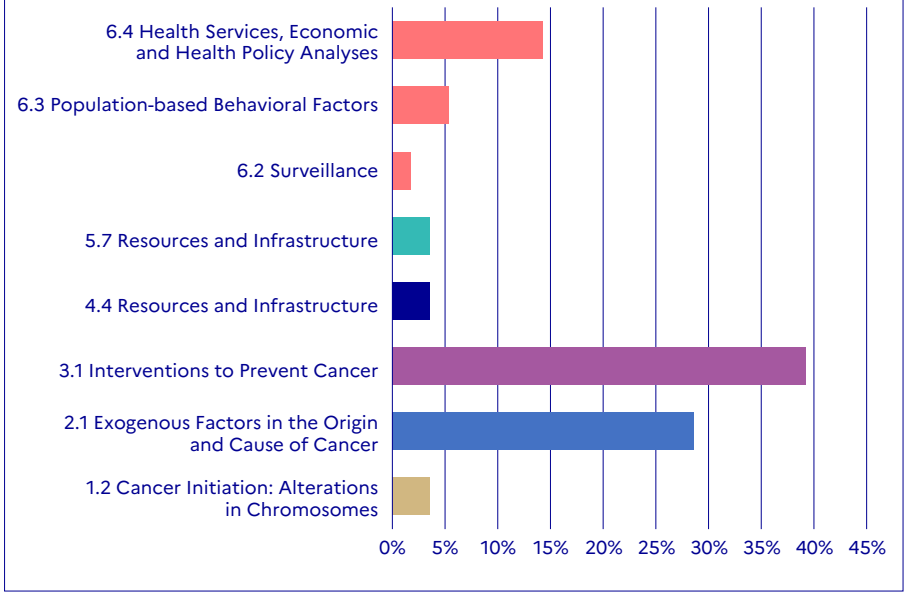
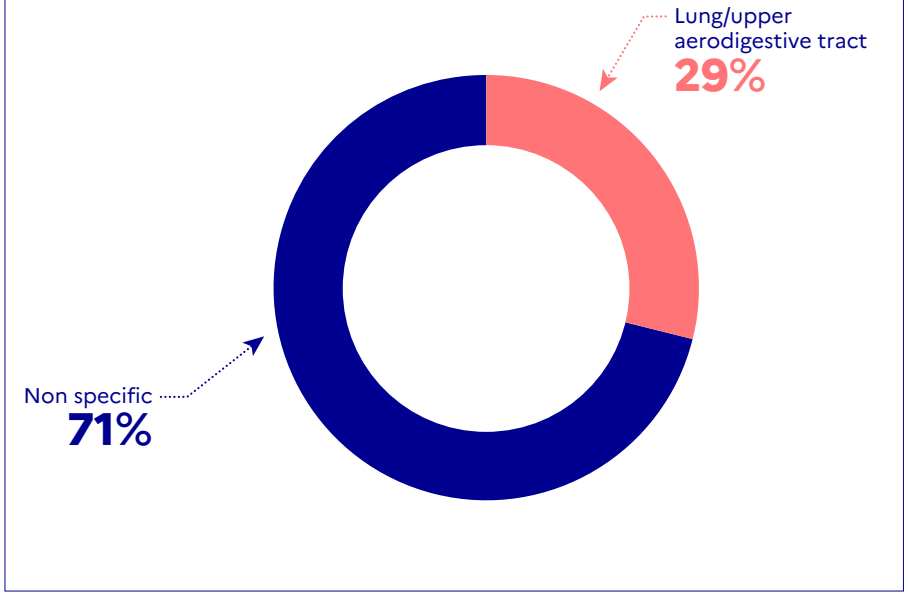



Figure 89
Distribution of SPA-CPA-funded projects by cancer type



## SPA-CPA-DOC programme: 3 projects

Figure 90
Distribution of SPA-CPA-DOC-funded projects by detailed CSO classification

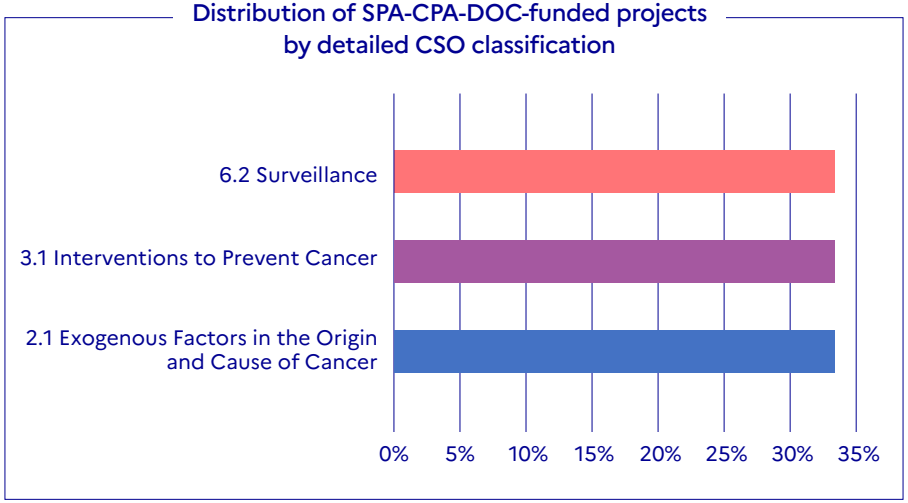
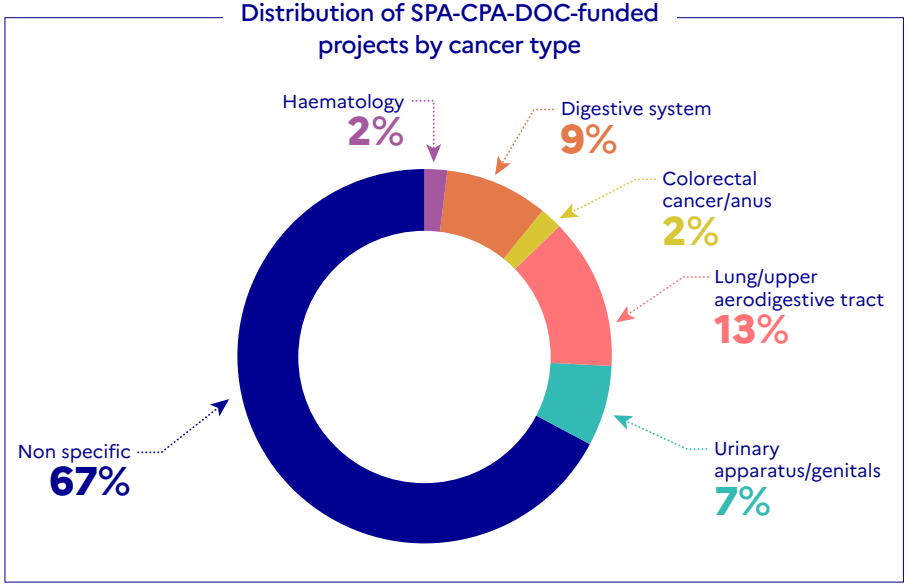



Figure 91
Distribution of SPA-CPA-DOC-funded projects by cancer type



## DOC-SHS programme: 6 projects

Figure 92
Distribution of DOC-SHS-funded projects by detailed CSO classification

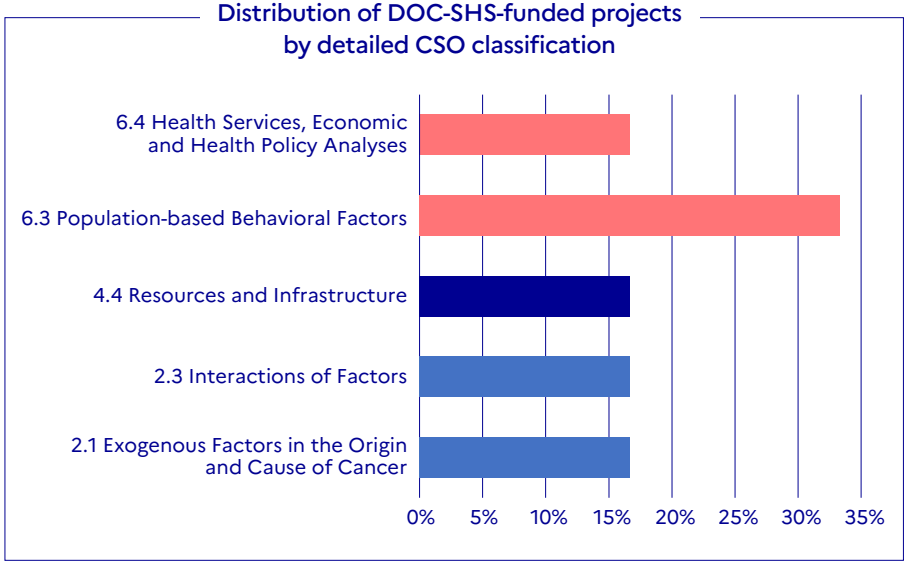
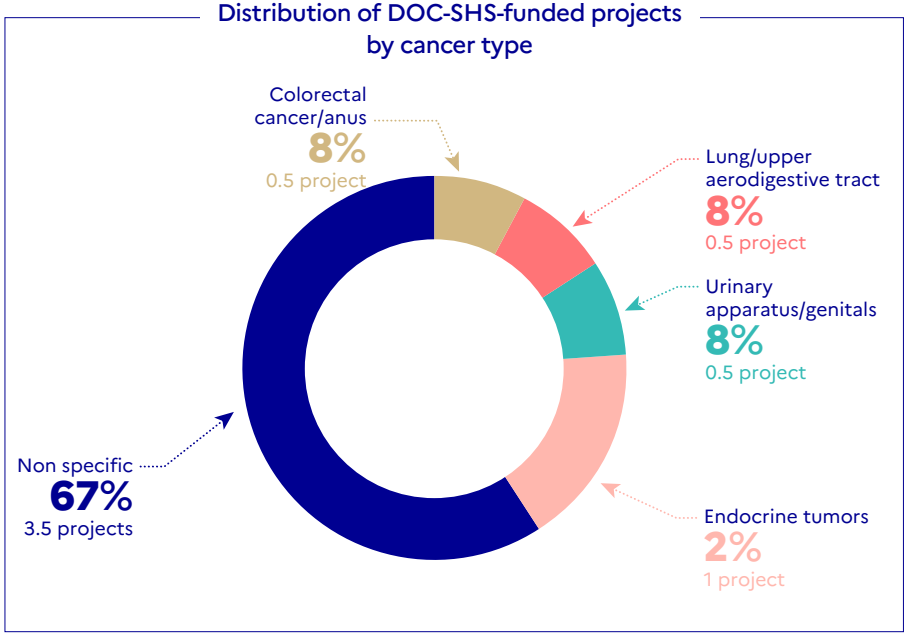



Figure 93
Distribution of DOC-SHS-funded projects by cancer type



## PEDIAMOB programme: 2 projects

Figure 94
Distribution of INTERPEDIA-funded projects by detailed CSO classification

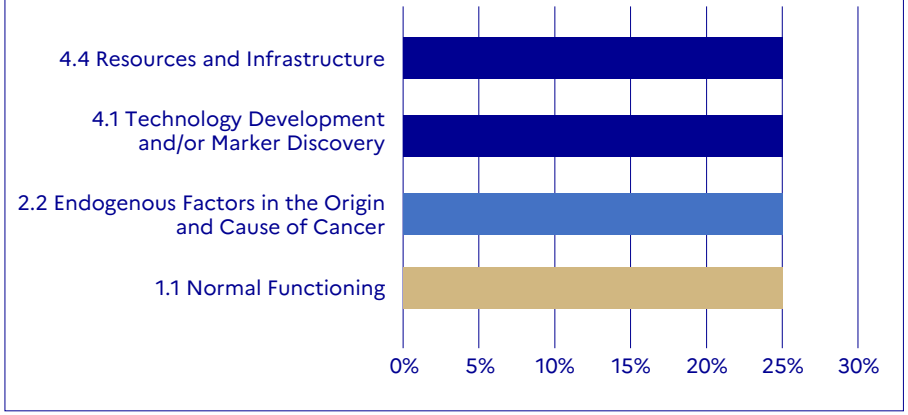
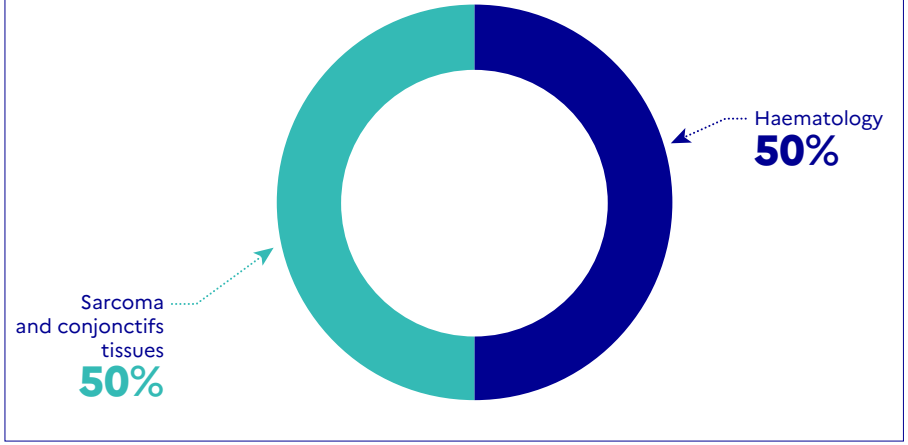



Figure 95
Distribution of INTERPEDIA-funded projects by cancer type



## PEDIAMOB programme: 2 projects

Figure 96
Distribution of PEDIAMOB-funded projects by detailed CSO classification

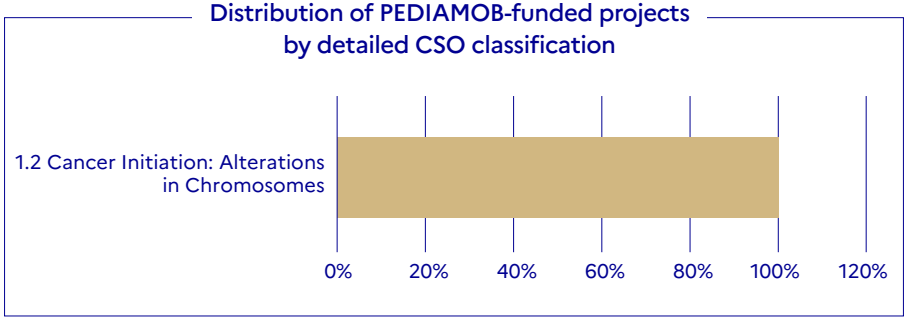
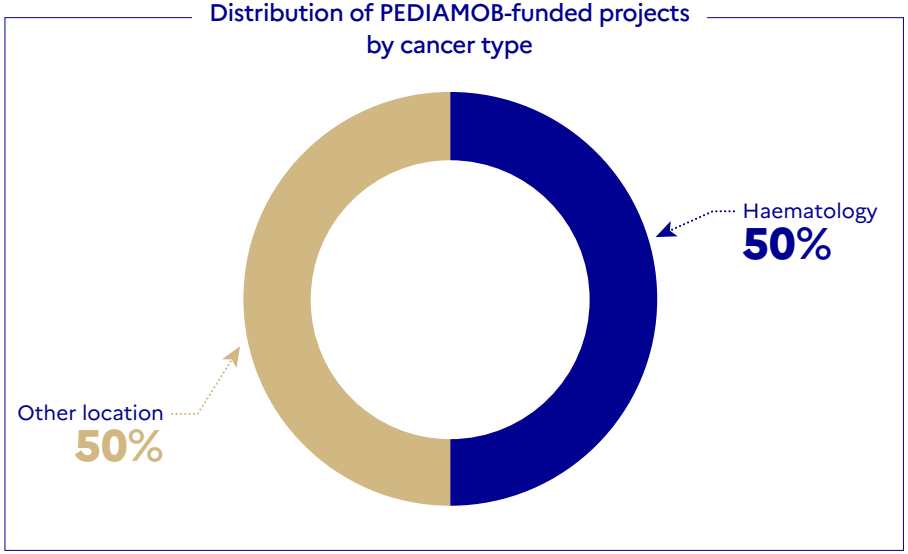



Figure 97
Distribution of PEDIAMOB-funded projects by cancer type



# ABBREVIATIONS

**AcSé:** programme d'Accès Sécurisé à des thérapies ciblées innovantes (Secured Access to innovative therapies programme)
**ADEME:** Agence de la transition écologique (French Agency for Ecological Transition)
**ANR:** Agence Nationale de la Recherche (French National Research Agency)
**ANRS MIE:** Agence nationale de recherche sur le sida, les hépatites virales et les maladies infectieuses émergentes (French National Agency for research on AIDS, Viral Hepatitis Research and Emerging Infectious Diseases)
**Anses:** Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (French National Food, Environment and Occupational Health Safety Agency)
**Aviesan:** Alliance nationale pour les sciences de la vie et de la santé (French National Alliance for Life Sciences and Health)
**BCB:** Bases de données clinico-biologiques (Clinical and Biological Databases)
**CAR-T:** Chimeric Antigenic Receptor T
**CLIP²:** Centres labellisés de phase précoce (Early-phase clinical trial centres)
**CNAM:** Caisse nationale d'assurance maladie (French National Health Insurance Fund)
**CPE:** Cancer prevention Europe
**CSO:** Common Scientific Outline of the international cancer research partnership ICRP
**DGOS:** Direction générale de l'offre de soins (Directorate of Health Care, in the French Ministry of Health)
**DMP:** data management plan
**DOC-SHS:** Subventions doctorales – « Recherches sur le cancer en Sciences humaines et sociales, épidémiologie et santé publique » Doctoral Grants – "Cancer Research in Social and Human Sciences, Epidemiology, and Public Health"
**DROM:** programme to support cancer clinical research in French overseas territories (DROM)
**FRFT-DOC:** *Soutien pour la formation à la recherche fondamentale et translationnelle en cancérologie – Doctorat en sciences* (Basic and translational research PhD training programme)
**HCERES:** Haut Conseil de l'évaluation de la recherche et de l'enseignement supérieur (French High Council for Evaluation of Research and Higher Education)
**HCP:** Health Cloud Platform
**HSS:** Human and Social Sciences
**HSS-E-PH:** human and social sciences – epidemiology – public health
**IMI:** Innovative Medicines Initiative
**INCa:** Institut national du cancer (French National Cancer Institute)
**Inserm:** Institut national de la santé et de la recherche médicale (French National Institute of Health and Medical Research)
**INTERPEDIA:** Recherche en cancérologie pédiatrique : apports des approches interdisciplinaires (Pediatric Cancer Research: Interdisciplinary Approaches contribution)
**IReSP:** Institut pour la recherche en santé publique (Institute for Public Health Research)
**ITMO (-AVIESAN):** Institut thématique multi-organisation (theme-based Multi-Organisation Institute for Cancer)
**MI-AMGEN:** Molecule innovantes-Amgen (Innovative molecules-AMGEN)
**MIC:** programme pour la contribution des mathématiques et de l'informatique à l'oncologie (mathematics and computer science contribution to oncology programme)
**NGS:** Next Generation Sequencing
**OSIRIS:** GrOupe inter-SIRIC sur le paRtage et l'Intégration des donnéeS clinico-biologiques en cancérologie (French group on the sharing and integration of clinico-biological data in oncology)
**PAIROBC:** Programme d'actions intégrées de recherche (PAIR) – Obésités et cancers-Integrated (Integrated Research Action Programme (PAIR) – Obesities and cancer) – see FOCUS section
**PCSI:** Apports de la physique, de la chimie et des sciences de l'ingénieur à l'oncologie (Contributions of physics, chemistry, and engineering sciences to oncology programme)
**PCSI:** programme pour la contribution de la physique, de le chimie et des sciences de l'ingénieur à l'oncologie (Physics, Chemistry, and engineering Sciences contribution to oncology programme)
**PEDIAMOB:** Recherche en cancérologie pédiatrique : allocations doctorales, post-doctorales et aides à la mobilité internationale. (Pediatric Cancer Research: Doctoral and Postdoctoral Grants, and International Mobility Support)
**PH:** Public Health
**PHIR:** Population Health Intervention Research
**PHRC-K:** Programme hospitalier de recherche clinique en cancérologie (French national programme for hospital clinical research on cancer)

# ABBREVIATIONS

**PLBIO:** Programme pour les projets libres de recherche en biologie du cancer (the Biology and basic sciences for cancer research programme)
**PNP:** Caractérisation des lésions pré-néoplasiques et stratification de leurs risques évolutifs (programme for preneoplastic lesions charactérization and risk stratification)
**PRT-K:** Programme de recherche translationnelle en Cancérologie INCa-DGOS (French National clinical research programme on cancer)
**SAB:** Scientific Advisory Board
**SHS-RISP:** Sciences humaines et sociales-recherche interventionnelle en santé publique (Human and Social Sciences-Population health intervention research)
**SIRIC:** Site de recherche intégré sur le cancer (cancer integrated cancer research site)
**SPA-CPA:** Programme pour les Recherches sur les substances psychoactives et les comportements avec pouvoir addictif (Research on Psychoactive Substances and Addictive Behaviours)
**SPA-CPA-DOC:** subventions doctorales : « Recherches sur les substances psychoactives et les comportements avec pouvoir addictif » (Doctoral Grants: "Research on Psychoactive Substances and Addictive Behaviours")
**TABAC-JC:** jeunes chercheurs sur tabac et/ou alcool (junior researchers in the fields of tobacco and alcohol)
**WGPC:** Working Group of Patients and Caregivers
**WP:** Work Package

# FIGURE AND TABLE LIST

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