



**PAN AFRICAN CANCER
RESEARCH INSTITUTE**
DEFEATING CANCER TOGETHER

PAN AFRICAN CANCER RESEARCH INSTITUTE (PACRI)

STRATEGIC PLAN 2021-2030

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"Transcending disciplinary silos to create a genuine delivery continuum for cancer research, from bench to bedside and back again"

<https://www.up.ac.za/the-university-of-pretoria-pan-african-cancer-research-institute-pacri>

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VISION

To be a world-class Pan African Cancer Research Institute dedicated to cancer prevention, innovative translational research, precision convergence approaches and developing optimal therapeutic strategies.

MISSION

- To be the home for basic, clinical, convergence translational, population-based cancer research and individualized patient care in Africa.
- To advance the understanding of cancer biology by designing cancer therapies and prevention strategies that are relevant and beneficial to diverse populations.
- To pursue excellence by promoting collaboration between researchers and clinicians to reduce the incidence and progression of cancer while contributing to the creation of personalised therapy.

PAN AFRICAN CANCER RESEARCH INSTITUTE

OUR CORE VALUES

The Pan African Cancer Research Institute's core values are at the heart of what we do. These guiding principles will shape our past, present and future and we commit to living these core values in how we act, speak and decide. These core values reflect the practice's commitment to providing high quality, evidence-based patient-centered care to cancer patients.

DIVERSITY

Intentionally striving for equity through inclusion and respect and driving collaborative research addressing cancer health disparities and their impact on underserved and socio-economically disadvantaged populations through research, training, and community outreach.

INTEGRITY

Driven by the highest standards of professional conduct and ethical behaviour.

COLLABORATION

In the spirit of "Defeating Cancer Together", deal with diversity with an open mind and value the contributions of all who are working together to achieve our common goals.

COMPASSION

Sensitive to patients and their families' needs and their right to privacy.

TRANSPARENCY

Open in our decision making, our findings and our funding sources.

EXECUTIVE SUMMARY

Cancer is a major global public health problem. In 2018, the World Health Organisation (WHO) reported that cancer was the second leading cause of death worldwide, including African countries. In recent decades, advances in tumour prevention, diagnosis and therapy have revolutionized cancer treatment in developed countries, with much emphasis on using a multidisciplinary approach to develop an optimal therapeutic strategy for each patient. This multidisciplinary approach is necessary due to the diversity of the therapeutic modalities and the complexity of treatment options available for treating complex tumours. In South Africa, the Pan African Cancer Research Institute (PACRI) aims to harness this multidisciplinary approach. PACRI's strategy aligns with both international and national priority areas. It aligns with various national plans including the Department of Science and Innovation, Grand Challenges and Science Missions, the National Research and Development Strategy, the National Development Plan (Vision 2030), the Science, Technology and Innovation Strategy for Africa: 2024 and the United Nations Sustainable Development Goals 3, 4, 9, 10, 17. Whilst aligning with important policy structures, PACRI's research strategy strives to reduce the burden of cancer in South African populations.

PACRI aims to consolidate existing cancer research efforts and resources, it will provide a platform for research growth and development throughout South Africa, as well as internationally. This consolidation of cancer research provides an opportunity to form multidisciplinary teams working under certain themes, that will tailor treatments to individual patients and therefore allow us to provide precision oncology treatment. PACRI allows physicians to allocate research expertise more effectively, as well as identify multiple researchers who may be able to contribute to our understanding of precision oncology.

PACRI harnesses existing expertise and resources, providing an opportunity to expand research offerings. Currently, PACRI brings together researchers working on cell analysis and immunology, genomics, histopathology and image analysis. In the future, PACRI will complete the building of the bio-specimen core laboratory, the biostatistics core and a pre-clinical research core dedicated to cancer research. PACRI aims to build the first whole cancer genome and transcriptome sequencing facility in Africa, providing state of the art resources to African researchers studying the human genome and cancer. PACRI transcends disciplinary silos to create a genuine delivery continuum for health science, "from bench to bedside and back again" PACRI is supported by a strong Management Committee and International Scientific Advisory Committee. PACRI's 10 Year Strategic Plan (Vision 2030) will be supported by PACRI's Annual performance Plan.



PAN AFRICAN CANCER RESEARCH INSTITUTE

UNITED NATIONS SDGs INCORPORATED IN THE PACRI STRATEGIC PLAN 2021-2030



Good Health and Well-being for all

Is underpinned by PACRI's research on cancer to reduce premature-mortality from this disease through prevention and treatment.



Quality Education for all

PACRI's programmes aim to develop a critical mass of cancer researchers by expanding its number of fellowships and scholarships for predoctoral and postdoctoral education including short term international fellowships.



Industry, Innovation and Infrastructure

PACRI aims to enhance the technological capabilities and encourage innovation and substantially increase the number of R&D research, while facilitating sustainable and resilient infrastructure development for cancer research.



Reducing Cancer Health Disparities

PACRI's key challenge in the development of effective personalized cancer treatment strategies is a better understanding of the mechanisms involved in these racial disparities in the African Region.



Promote Global Partnerships to Achieve the Goals

PACRI will share knowledge, expertise and technology through projects, and through strategic partnerships that support its efforts of strengthening resource mobilization and targeted capacity building through national and international support, including promoting effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships.



STRATEGIC FRAMEWORK MATRIX



PACRI STRATEGIC FRAMEWORK 2021-2030



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COMPASSION

Sensitive to patients and their families' needs and their right to privacy.

TRANSPARENCY

Open and clear in what we do, why we do it, and how it's benefits are translated.

UN SDGs



PACRI OBJECTIVES

A centre of excellence underpinned by research and healthcare for all, using cutting edge research focused on developing new and better approaches to preventing, diagnosing, and treating cancer and advancing precision/personalised oncology in Africa and addresses cancer health disparities and its impact on underserved and socio-economically disadvantaged populations.

PACRI is about building a critical mass of cancer researchers with critical skills and is dedicated to cutting edge integrated translational cancer research, education and clinical care and is aimed at developing internationally competitive cancer research capabilities in Africa with an emphasis on Afrocentric solutions.

PACRI's emphasis in innovative strategies is based on Afrocentric solutions, enhancing the probability of finding homegrown solutions for the cancer challenges faced by the continent and increase cancer research infrastructure, including the Cancer Genomics Program and aims to do this, through the empowerment of individual cancer scientists and collaboratively with pharmaceutical companies, industry and government.

PACRI's research will emphasise Cancer Racial Disparities/inequalities. Having in mind that incidence and death rates, as well as treatment outcomes for various cancers, differ among people from different socio-economic, racial and cultural groups. PACRI's key challenge for development of effective personalized cancer treatment strategies is a better understanding of the mechanisms involved in these disparities. Thus, research to identify biological, genetic, and social conditions that contribute to these health disparities is being undertaken.

PACRI shares knowledge, expertise and technology through projects, and through strategic partnerships that support its efforts to achieve its five (5) SDGs and this is done by partnerships mainly with locally based partners, other African countries, the BRICS, EUROPE, UK, USA and AUSTRAL-ASIA.

STRATEGIC FRAMEWORK MATRIX

PACRI PILLARS	1. Developing improved tools for cancer early detection, treatment, prevention and precision oncology.	2. Enhancement of human capital in cancer research.	3. Reinforcing of cancer research expertise and technological skills.	4. Reducing Cancer Health Disparities.	5. Building a Cancer Science Hub for R&D and International Cooperation.
OUTCOME/S	<p>1. A collection of detailed lifestyle information and biospecimens to search for risk factors and biological mechanisms that address gene-environment interaction in cancer aetiology through activities in cancer epidemiology, prevention and control.</p> <p>2. Selection of emerging therapies and strategies to offer to patients as experimental alternatives to routine care through clinical trials of new drugs and pushing the envelope of early detection and treatment and personalized care.</p> <p>3. Facilitating the movement of new ideas and treatments from the laboratory to the clinic, as well as the movement of clinical observations from the clinic to the laboratory. By transcending disciplinary silos to create a genuine delivery continuum for cancer research "from bench to bedside and back again.</p>	Training a critical mass of cancer researchers particularly at PhD and postdoctoral level enhancing research capabilities in cancer research.	Promoting in house innovation, new business models e.g. spin out companies and partnerships to ignite change and deliver value to society. This will be achieved by improved diagnostics (point of care diagnostics), cancer clinical genomics core for advancing precision oncology/ personalised care, roadmap for creation of a precision oncology innovation hub, new screening methods and technologies, and social networks to engage the public in their own care.	Research to identify biological, genetic, and social conditions that may be associated with cancer health disparities undertaken.	Targeted and beneficial national and international partnerships to enhance funding applications, training, co-supervision of graduate cancer researchers, joint projects for development, training and resource sharing.
PERFORMANCE INDICATORS	<p>1. Number of: projects in population and prevention (PPS) sciences, number of students registered in PPS, number of papers published in PPS, number of activities in PPS.</p> <p>2. Numbers of: projects leading to personalised healthcare/precision oncology including clinical trials; projects in clinical cancer research; papers published in clinical cancer research.</p> <p>3. Number of: translational cancer research projects; post-graduates registered on translational cancer research projects; papers published in translational research; projects jointly supervised by physicians and basic scientists.</p>	<p>Number of: postgraduates trained; number of PhD projects; training fellowships; post-doctoral fellowships;</p> <p>Successful career transitions into cancer research in industry or academia.</p>	<p>Number of: spinoff/spinout companies established.</p> <p>Sums of sold/ exploited patents/ services.</p> <p>Creation of a precision oncology biotech cluster.</p> <p>Number of industry partnerships; new treatments reaching the clinic; investment in cancer research in Africa from within, and from outside Africa.</p>	<p>Number of: projects in cancer health disparities, papers published in cancer health disparities, postgraduate registered in cancer health disparities projects.</p>	<p>Number of: beneficial partnerships, joint funding applications, postgraduates co-super-vised, courses co-offered, number of papers co-published.</p>
OUTPUTS	Publications, research infrastructure, postdoctoral and postgraduates trained, conferences, technologies, diagnostic and treatments, diagnostic kits, patents.			Meetings and courses, international cooperation projects, Establishment of a centre of excellence. International collaboration also indicated in research outputs. Partnerships including formal and informal agreements, joint appointments with international partners.	

MAIN LINES OF ACTIONS

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|---|--|---|---|---|
| <ul style="list-style-type: none"> • Prostate cancer • Cervical Cancer • Breast Cancer • Colorectal Cancer • Oesophageal cancers • Head and Neck Cancers • Anal Cancer • Penile Cancer • Endometrial cancer • Brain tumours • Rectal Tumours | <ul style="list-style-type: none"> • MSc Course in Cancer Sciences • Postdoc Fellowships • Translational Cancer Research short course • Onco-genomics Postgraduate Short Course • Virtual Seminars/E-learning platforms • Targeted national and international fellowship schemes | <ul style="list-style-type: none"> • Technology transfer and technical assistance offered by both national and international partners • Collaborative research programme grants • Early career research grants • Physician Scientist PhD Grants | <ul style="list-style-type: none"> • Rural based diagnostic kits for cancers • Rural clinics and district hospital training on cancer awareness and screening • Training of rural health care workers on cancer screening and awareness and prevention • Provision of equity in clinical trials | <ul style="list-style-type: none"> • Partnership development and implementation • Targeted international cooperation projects to support National Development Plans • Establish a Cancer Genomics Centre |
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CROSS CUTTING PRIORITIES

Gender Equality and Career Development

Africa and BRICS Cooperation



FOREWORD

Cancer rates continue to increase worldwide, responsible for an estimated 9.6 million deaths in 2018, with approximately 70% of cancer deaths occurring in low and middle-income countries (WHO, 2018). Cancer remains one of the world's greatest clinical challenges. Cancer is among the deadliest diseases in the developed world with a rapidly growing mortality and incidence rate despite efforts of researchers and clinicians¹. Cancer incidence and, subsequent mortality is also increasing in several developing countries. In developing countries, rising cancer prevalence has been attributed to aging populations, combined with a shift to a more Western diet and lifestyle, and reduced mortality from cardiovascular related diseases. There are over 200 different types of cancer, each with unique characteristics and treatment challenges. Along with this, diversity in patients and their individual genetic variability creates numerous obstacles for providing patients with effective, safe and high-quality treatment.

Cancer is emerging as a major public health problem in Sub-Saharan Africa (SSA) due to an aging and growing population, as well as increased prevalence of other key risk factors, including those associated with social and economic transition. Countries in SSA carry a high residual burden of infectious agents (HIV/AIDS, human papillomavirus (HPV), hepatitis B virus (HBV), which drives the rates of certain cancers. About one-third of all cancers in the region are estimated to be infection-related. Cancer control in SSA will require measures that address the persistently high incidence of cancers associated with poverty and infection (including a residual burden of AIDS-associated cancers), in addition to addressing emerging cancers associated with economic developments.



FOREWORD

The Pan African Cancer Research Institute (PACRI) aims to be a world-class research institute, discovering new worlds of cancer medicine, leading efforts in cancer prevention and cure in Southern Africa, contributing to solving the problems of cancer in the region and the world. PACRI will promote pioneering interdisciplinary research using a collaborative model, to translate new knowledge into product development, better prevention and treatment, and to provide effective and compassionate clinical care that improves the lives of patients with cancer. PACRI's strategy aligns with various national plans including the Department of Science and Innovation, Grand Challenges and Science Missions; the National Research and Development Strategy; the National Development Plan (Vision 2030); the Science, Technology and Innovation Strategy for Africa: 2024 and the five (5) United Nations Sustainable Development Goals 3, 4, 9, 10, 17. Whilst aligning with important policy structures, PACRI's research strategy strives to reduce the burden of cancer in South African populations and the African region

PACRI's research strategy will promote research that improves prevention, early detection, and therapeutics. The development of personalised cancer medicine is a strategy to improve the outcome of treatment by tailoring it as closely as possible to the individual patient's genome and immune system. Breakthroughs may lead to transforming cancer into a chronic disease, improving long-term remission and cure rates. Early detection provides the link between prevention and efficient therapeutics. PACRI will thus harness translational cancer research to develop effective strategies for prevention, early detection and personalised cancer medicine.

PRINCIPLES FOR IMPLEMENTATION

Scientific excellence and competencies	The driving force of PACRI's research activities and the foundation of its scientific reputation will be exemplified by the number of its internationally peer-reviewed publications, international collaborations, and recognition within the international scientific community.
Leave no one behind	This is essential to achieve the Sustainable Development Goals by 2030 and entails focusing on disadvantaged, marginalised people and geographical areas. Existing, and potential, inequalities are identified and analysed. For example, reducing racial cancer health disparities.
Accountability	This entails periodical reporting on efforts made and progress achieved. The impact is considered successful where it is verifiable and transparent.
Shared responsibility	Global challenges require global solutions. Stakeholders at all levels are encouraged to pull together to ensure a sustainable future. PACRI will promote scientific diplomacy through multi-stakeholder partnerships with Governments, businesses, civil society groups, citizens and researchers, enabling all to cooperate as equals, in line with the 2030 Agenda.
Integrated approach	Characteristic of the 17 SDGs, PACRI operations promote a connected number of activities in the field of cancer research, ranging from research to teaching, training and technology transfer, each impacting on several of the Goals.

LEGAL BASIS

PACRI's OBJECTIVES (PACRI Constitution August 2019)

PACRI aims to:

- Develop new therapeutic concepts based on individual molecular, imaging and immunological characteristics with the goal to tailor tumour therapy on an individual basis. This includes all available treatments including conventional chemotherapy, signal inhibitors, targeted therapies, antibodies, precision radiotherapy, immunological approaches as well as combination therapy.
- Implement patient-oriented, high-throughput diagnostics, including the possibility to sequence the tumour genome, as well as to characterize the immune system of each PACRI patient. Sequencing and bioinformatics platforms to the SA-MRC and the other participating research institutions, as well as from the cooperation partners will be used.
- Position itself as a national center of early cancer detection, prevention and translational research.
- Promote stronger integration of basic oncological research into translational concepts, through interaction between the SA-MRC and the oncological clinics involved, as well as with the cooperation partners of the University of Pretoria and the National Department of Health.
- Recruit researchers and clinicians to implement joint research projects between the clinical and laboratory groups, to enhance Human Capital Development in cancer research.
- Train researchers and medical personnel in new technologies and processes required for the implementation of the PACRI's strategic objectives.
- Establishment of multidisciplinary tumour boards, with the goal to develop an individualized, therapeutic concept for each PACRI patient.
- Develop translational and clinical research structures, including a PACRI clinical trial centre, a PACRI cancer registry and a PACRI biobank.

METHODOLOGY

- Clinical Trials
- Research Laboratories
- Training Cancer Researchers
- Research collaboration and funding
- Cancer Scientific Events
- Research and Development (R&D)
- International partnerships and networking

GOVERNING BODIES AND SUPPORT SERVICES

Governing Bodies, Direction and Programme Services: PACRI's direction will be guided by the PACRI Advisory Board (PAB), PACRI International Scientific Advisory Committee (PISAC) and the PACRI Management Committee (PMC) Chaired by the Director. Program offices will include Global Engagements, Fundraising and Infrastructure Development, Technology Transfer, Communication and Outreach.

STRATEGIC VISION AND FOCUS AREAS



Pillar 1: Developing improved tools for early detection, treatment, prevention and advancing precision oncology.

VISION: Accelerating discoveries to prevent and cure cancer in the African region. PACRI is about research and healthcare for all Africans by Africans. It is distinguished by meeting rigorous standards for transdisciplinary, state-of-the-art research focused on developing new and better approaches to preventing, diagnosing, and treating cancer and advancing precision/personalised oncology in South Africa and the African region in the spirit of "Defeating Cancer Together".

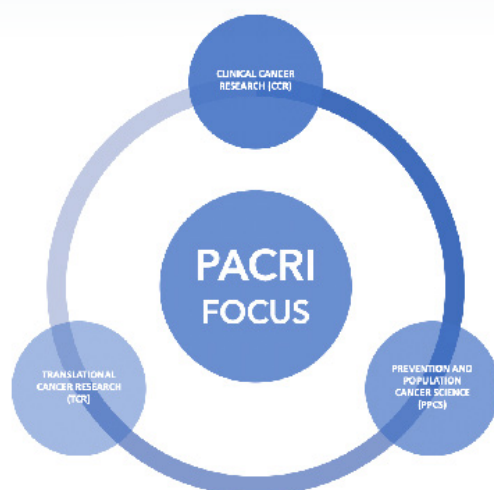
To accelerate discoveries to prevent and cure cancer in the African region.

Pillar 1: Developing improved tools for early detection, treatment, prevention and advancing precision oncology

FOCUS AREAS

Over the past decade, research has provided a tremendous understanding of the molecular events leading to cancer. These molecular changes represent the ideal targets for the development of new diagnostic and therapeutic strategies. Most of the molecular changes that cause cancer can be found in a broad range of different tumour sites. PACRI's goal is to facilitate research and clinical studies that take advantage of these new advances. PACRI's approach will focus on three key areas: translational research, clinical research, and prevention. Basic science researchers seek to understand fundamental aspects of genetics, molecular biology, cell and developmental biology, and tissue regulation. Translational research facilitates the movement

of new ideas and treatments from the laboratory to the clinic, as well as the movement of clinical observations from the clinic to the laboratory. Clinical research drives innovations in early detection and treatment, personalized care, and immunotherapy which are key to achieving PACRI's mission. Prevention is a cornerstone of PACRI's approach to fighting cancer. PACRI's proposed focus areas are built around the most prevalent cancers, the needs of the medically underserved, as well as the strengths of our partner institutions and investigators.



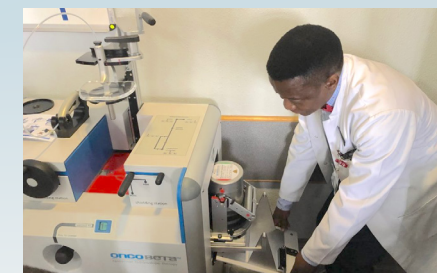
Population and Prevention Cancer Sciences (PPCS)

The best way to cure cancer is to prevent it from developing in the first place. The PPCS thematic area focusses on research that will reduce an individual's risk of developing cancer. Subsequent discoveries will be translated into advances in clinical care and recommendations to the community as a whole. The PPCS research theme aims to keep people in a state of health and wellness, preventing them from crossing the threshold to disease and requiring treatment. Almost 70% of all cancers can be prevented, but significant data gaps exist in this field. Combined with an aging population and record success in survivorship, population-based cancer research is pivotal to South Africa's health and wellbeing. Cancer prevention and control research has an important cascading effect on the entire continuum of care. Under the PACRI umbrella, investigators engaged in this area of research use holistic "bench to trench" methodologies to solve real risks to real people. Their research involves developing and testing new biomarkers of effect and susceptibility in at-risk populations; epidemiologic studies of specific cancer sites; early detection and screening intervention research; and environmental oncology studies. Researchers are already engaged in health disparities cancer research, with an emphasis on educational and behavioural intervention. Findings of cancer epidemiology, prevention and control research are influential in developing and strengthening national public health policy and practice and will benefit South Africa's most vulnerable populations in a demonstrable fashion.

Clinical Cancer Research (CCR)

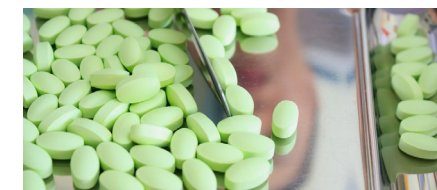
The clinical research program will select emerging therapies and strategies to offer to our patients, as experimental alternatives to routine care. We will test new drugs and new strategies developed by our PACRI academics and in collaboration with colleagues throughout the world. Through the PACRI partner institutions, we will be affiliated with several governments, nationally and internationally funded cooperative research groups and collaborate with industry, in drug development or smart therapeutics. One of the new strategies included in this thematic area is targeted radionuclide therapy. Targeted radionuclide therapy or molecular theragnostics has the potential to selectively deliver radiation to diseased cells with minimal toxicity to surrounding tissues. The basis for successful radionuclide therapy is a theragnostic approach that integrates diagnostic testing for the presence of a molecular target for which a specific treatment/drug is intended. Theragnostics is a revolutionary approach that promises improved therapy selection on the basis of specific molecular features of the disease, greater predictive power for adverse effects due to improved patient-specific absorbed dose estimates, and new ways to objectively monitor therapy response.

Currently, radionuclide therapy remains an important treatment option because ionising radiation from radionuclides can kill cells and inhibit growth in benign and cancerous lesions that result from proliferative diseases. Radiation kills cells by damaging the DNA in the cell nucleus, thereby inhibiting cellular reproduction. Rapidly developing studies also demonstrate the beneficial effect of combining radionuclide therapy with chemotherapy.



Translational Cancer Research (TCR)

Cancer cannot occur without multiple genetic changes. Among these changes is the addition of viral gene expression to the cell, as well as mutations to cellular genes, either sporadic or induced by environmental mutagens. These changes ultimately lead to an overall genetic instability that contributes to the formation and progression of tumorigenesis. This theme unites investigators who study aspects of the human genome, that naturally contribute to genetic instability, investigators working on the genes, which play a primary role in maintaining or altering genomic stability, as well as investigators studying the mutagenesis process and the environmental contribution to mutagenesis. These studies are relevant to translational research, both in the diagnostic arena and in the identification of targets for therapeutic intervention.



Normal cells have a complex series of molecular signals that allow communication between cells, as well as transmitting signals to the cell nucleus. These signals are critical for regulating cell growth, apoptosis, angiogenesis and immune avoidance of the tumour. Changes in the signalling pathways, either through mutation or changes in gene expression, are necessary for the continued growth of the tumour. An understanding of these aberrant signalling

pathways, both in the tumour and in normal tissues, represent ideal targets for therapeutic intervention in translational cancer research. Significant drug discovery research activities, including drug design, drug synthesis, drug activity determinations, and the development of drug delivery systems, will be underway within the PACRI. This research theme will also be home to the discovery of natural and synthetic anti-cancer drugs. Improved drugs to address resistance to chemotherapy and eventually to a recurrence of cancer are essential. Identifying microenvironment-specific mechanisms for resistance to chemotherapeutic agents are of utmost importance. The PACRI's objective will also be to better understand the role that the lymph node microenvironment plays in cancer recurrence through its interaction with tumour initiating cells and to identify biomarkers that may be useful in identifying patients at high risk of recurrence. Additionally, PACRI, together with its partners, aims to offer whole genome and RNA transcriptome sequencing. PACRI will be the first to offer whole genome sequencing to test for oncology in Africa. Whole-genome and transcriptome sequencing (WGTS) for oncology is a complex genetic test developed by New York Genome Centre (NYGC). WGTS involves sequencing the genome of the tumour, the matched normal (unaffected) specimen, and the transcriptome of the tumour specimen. Unlike gene panels or whole exome-sequencing, this new test includes sequencing the coding and non-coding regions of the genome. WGTS doesn't rely on enriching the protein-coding part of the genome or make any assumptions about the most relevant genes. It probes the transcriptome of the tumour, revealing an unbiased and more complete depiction of the patient's cancer from a genomic and molecular perspective. The ultimate advantage of WGTS is that it can lead to more comprehensive disease diagnosis and personalized treatment decisions than tests that sequence only the coding region. PACRI's WGTS facility aims to test for all types of cancer, examining the similarities and differences among the genomic and cellular alterations found across diverse tumour types. As such, WGTS is indicated for both solid tumours and hematological malignancies where a mutational profile with multiple types of mutations would assist clinicians in determining disease stratification, prognosis, or treatment options, including targeted therapies and eligibility for clinical trials. The test has been validated for fresh, frozen and FFPE (formalin fixed paraffin embedded) specimens. Significant driver and therapeutic-associated mutations will be included as part of the PACRI's WGTS clinical report. PACRI will also report secondary findings from the whole genome sequencing of the germline specimen for variants contributing to cancer predisposition and the ACMG-59 gene list when consented. These germline findings could have a significant impact on the clinical management of patients and their families. Developing novel approaches to cancer genomics such as WGTS will be part of the PACRI's scientific focus, combining state-of-the-art genomic tools and analysis with whole-genome sequencing to help identify more effective cancer treatments and therapies based on the tumour's

genetic profile. At a later stage, PACRI will also offer a separate clinical whole genome sequencing test for undiagnosed disease and predisposition testing, in ostensibly healthy individuals. This will be done in collaboration with the New York Genome Centre.

Immunology, viral infection and inflammation

Altered tumour cells should appear 'foreign' to the body's immune system but have developed strategies that either suppress or evade the patient's immune system. There is tremendous therapeutic potential in working to strengthen or artificially inducing an appropriate immune response to the tumour. These types of therapies are often very effective as an adjunct to more traditional therapies and add another valuable tool to the translational armoury. Also, research related to the link between viral infections and cancer has become stronger over the last decade. New tools in molecular biology, epidemiology and immunology have clearly shown how certain viruses cause certain tumours. PACRI investigators will be collaborating to translate their basic laboratory discoveries into clinical programs, including work in the following areas: Human papillomavirus (HPV) infection research will contribute to understanding how to prevent HPV. This sexually transmitted virus is known to cause cervical cancer and has also been linked with very aggressive tumours of the head and neck. This theme creates an umbrella for testing new HPV vaccines, now approved for use in young girls and more recently in young boys. Cervical cancer is one of the two most important cancers in women in South Africa, and more prevalent in black women. The basis for this health disparity is becoming clearer by the day. This thematic area aims to develop culturally relevant interventions that will promote healthy behaviours and acceptance of vaccines against cancer causing viruses in collaboration with the Health Disparities, Precision Oncology (HDPO) thematic research area.

Health Disparities & Precision Oncology

Cancer cannot occur without multiple genetic changes. Diseases such as cancer do not affect all people equally. There are substantial differences in incidence, diagnosis, progression, response to treatment, and fundamental molecular biology in people with different racial, socioeconomic or cultural groups. Similarly, an effective treatment in one racial, socioeconomic or cultural group may not work in another. Therefore, researchers in this theme aim to identify biological, genetic, and social conditions that cause these health disparities. All PACRI partners will be engaged in different aspects of health disparities research, training and community outreach. This diversity allows PACRI to comprehensively focus on these important components in the search for successful preventive measures, treatment options and cures. PACRI partners will manage a research flagship aimed at addressing health disparities (Flagship for Health Disparities in Cancer-FHDC). This flagship will help to

study racial socioeconomic and cultural differences in prostate cancer and infection-associated cervical cancer along with other cancer projects. PACRI's support will help to create the FHDC, which will be established to conduct research about underrepresented health concerns, train under-represented minorities to conduct biomedical research, and provide educational outreach to underserved communities. Additionally, the flagship is aimed at increasing the number of qualified cancer research nurses (Clinical Research Associates – CRA). One objective of this effort is to increase the access and enrolment of underrepresented patients into clinical trials, contributing important knowledge in an era of personalized medicine. Clinical trials research performed on a diverse population of patients can help in the evaluation of treatment outcomes and their varying degrees of effectiveness among different groups, as well as provide the benefit of targeted treatments that might otherwise be unavailable to underserved populations. These will be the essential steps in reducing health disparities in cancer.

The proposed Flagship also aims to improve the health outcomes of diverse communities disproportionately impacted by health and health care disparities through community engagement and partnerships in research, education, and practice. It will work to coordinate other existing efforts; develop new initiatives to promote health disparities research; build capacity to conduct future clinical trials; develop necessary health information and telecommunications infrastructure; and increase the pool of under-represented students and academic researchers conducting basic, clinical, and behavioural research related to cancer. Prostate cancer incidence and mortality rate is higher among black males. Research is required to identify the possible causes of these disparities. For instance, researching whether there is a connection between higher levels of circulating oestrogens, higher body mass index, and more aggressive forms of prostate cancer in black men as well as examining the ability of stem cells derived from the fat tissue of prostate cancer patients to migrate to and enhance the growth of prostate tumours, exploring a possible link between obesity and prostate cancer development and progression. Cervical cancer is also more prevalent in black women than in white women and this also needs to be properly investigated.

Clinical trials

The clinical research program will offer emerging therapies and strategies to our patients as investigational alternatives to routine care. We will examine innovative treatments and medical approaches designed by our PACRI academics in collaboration with colleagues throughout the world. The PACRI consortium will be affiliated with multiple internationally funded cooperative research groups in addition to industry-sponsored drug developers. In order to contribute breakthroughs to the national cancer program and reduce the immediate devastation of cancer, the PACRI will be operating on three fronts: Educating people about prevention through pre-screening and lifestyle changes; offering people with cancer humane and up-to-the-minute

treatment options and performing basic research and clinical trials. To provide these services, we will pioneer partnerships with all oncologists, both private and public hospitals across South Africa and the region.

Research core facilities

As a research institute, PACRI aims to enhance scientific interaction and productivity by providing PACRI members with Support Cores and Shared Resources. The Support Cores and Shared Resources will provide PACRI members with access to technologies, services, and scientific consultation. Each PACRI member will also support shared services for the entire institute, providing stability, reliability, cost-effectiveness, access to specialized technology and methodology, and quality control. The organization and successful implementation of core initiatives are a critical piece of demonstrating international competitiveness and attracting grant funding support. Shared resources should provide support to the various programmes in PACRI programs in a cost-effective and supportive manner. Each Core must be able to effectively describe the following structure: Services and technologies provided and their importance in relation to the scientific needs and objectives of the PACRI. Qualifications of the resource staff and the competence of key technical staff. Institute's policies regarding operation and use of the shared resources, e.g., access, priorities, limitations and chargeback systems. Cost-effectiveness of the resource relative to other options for obtaining the service, such as outside vendors, and the approach used to evaluate the current extent of use by peer-reviewed, funded PACRI investigators. Maintenance of user logs for each shared resource is required and must be available to site visitors for review. The PACRI will use a system of core research facilities that provide state-of-the-art technologies necessary to assist researchers in their work. Core equipment and services facilitate research across programs and affordable resources that no single research laboratory could provide. The following core facilities are proposed within the PACRI framework.

Biospecimen Core Laboratory (BCL)

The Biospecimen Core Laboratory (BCL) will be a part of the PACRI Biobanking. The goal of the repository is to support PACRI programmatic research to further improve our understanding of those molecular factors that contribute to cancer and that may lead to prevention, early detection, and cure. The mission of the BCL will be to collect high-quality samples of normal and diseased human material (e.g., whole blood, cellular blood components, bone marrow, plasma, serum, urine, benign and tumour tissue) with appropriate clinical, pathological and demographic data and to make this material available to qualified researchers at the PACRI while ensuring ethical informed consent, safety, donor anonymity, and all regulatory safeguards are in place. The Head of BCL should oversee this facility, with day-to-day procurement coordination and staff supervision provided. Access to biospecimens and corresponding data will be restricted to PACRI investigators who have

successfully filed an online application to be reviewed by the Tissue Utilization Review Committee (TURC).

The Biostatistics Core (BC)

The mission of the Biostatistics Core will be to provide biostatistical support to investigators in the planning, conducting and reporting of their research projects. Biostatistics support will 1) ensure that medical studies are designed appropriately with sufficient sample size and statistical power to detect the relevant study effect size, 2) analyse the study data correctly with valid statistical models, 3) interpret the study findings correctly and 4) collaborate in reporting and writing the manuscript for publications. The Biostatistics Core will provide these services and collaborate with all medical researchers. Biostatistics Core members will be providing services in each of the following areas: 1). Refining study objectives and identifying study endpoints; 2). choosing the study design that will best accomplish the investigator's objectives; 3). designing the statistical analyses that are appropriate for the study design; 4). calculating the appropriate sample size, establishing methods of randomization and blinding when needed; 5). preparing the statistical analysis section of a grant proposal and/or study protocol; 6). assisting with the design of data collection procedures and construction of research databases; 7). conducting and interpreting statistical analyses of research data; 8). reporting research results, including the development of abstracts, presentations for professional meetings, and manuscripts submitted to professional journals.

Cancer Clinical Genomics and Genome Analysis Core (CCGGAC)

The Clinical Translational Genomics and Genome Analysis Core will be developed into a state-of-the-art facility capable of developing next-generation sequencing (NGS) protocols including whole-transcriptome, RNASeq, whole-exome sequencing and SNP analysis, and transcriptional profiling. The CCGGAC will serve multiple projects through the establishment of service contracts, collaborations at the institutional, local and international levels. We will plan to keep our services up to date and offer new platforms for ChIP-Seq optimization, single-cell sequencing, and single-molecule sequencing. These services will allow us to increase the number of researchers and institutions using our facilities. Additionally, we plan to enter the field of clinical genomics through a partnership with the New York Genomics Centre (NYGC), a major international player in this field. This will present a unique opportunity for genomic medicine and clinical research in our area and not only limited to cancer research. To take advantage of this opportunity we will develop a clinical genomics laboratory in collaboration with NYGC and other partners. This core's long-term goal is to become the regional genomics

reference centre serving basic, translational and clinical researchers with state-of-the-art technology, training, and service.



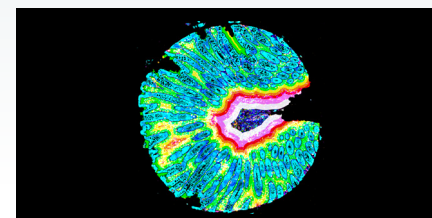
The CCGGAC will serve the UP-FHS scientific community studying the molecular mechanisms and genomic signatures in human diseases. This core facility will become the site to generate genomic information for researchers, from neighbouring universities including Sefako Makgatho Health Sciences University (SMU), University of Limpopo (UL), University of Johannesburg (UJ), University of KwaZulu-Natal (UKZN), Nelson Mandela University (NMU) and the University of Witwatersrand (WITS). In addition, the Core will be instrumental for the establishment of national and international collaborations that would benefit not only our external partners but also our researchers.

Histopathology and Image Analysis Core (HIAC)

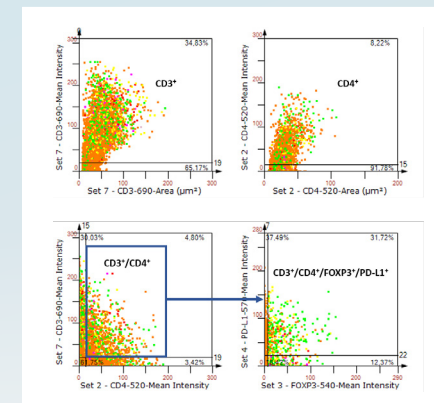
Experimental histopathology offers extensive immunohistochemistry services. The laboratory will use automated immunochemistry stainers which offer consistency and standardized protocols on large and small scale projects. Antibodies will be provided by the user or Experimental Histopathology Laboratory. We will have several antibody protocols worked up for a number of species. We will use various detection methods including immunoperoxidase, alkaline phosphatase, and fluorescence. Protocols will include dual IHC and multi-colour IF. The staff will have a great deal of experience with antigen retrieval techniques for formalin fixed tissue and with staining human and animal tissue.



The staff in Experimental Histopathology Laboratory (EHL) will have established protocols that allow for bright and specific multi-colour immunofluorescence on FFPE samples. Many antibodies work in formalin fixed tissue, however, some do not.



The staff will help determine Image Analysis. The staff will also develop novel digital pathology services (e.g., digital spatial profiling, etc.) The purpose of this core laboratory is to assist investigators requiring detection, imaging, and morphometric analysis of gene and protein expression in any type of cell and tissue. Services, expertise and state-of-the-art biomedical imaging services will be provided with the hope of broadening and streamlining all morphological research. A core requirement of Precision Medicine is to understand the molecular mechanisms of diseases – in particular with various forms of cancer. Signal transduction cascades – or dysregulation of such cascades – are crucial for carcinogenesis as well as tumour progression. In precision medicine we have to quantify multiple molecular markers in tumour cells as well as the tumour microenvironment in order to understand which molecular mechanism is acting in a certain patient and what promising targets for therapeutic intervention are. Quantifying molecular markers in single cells is exactly what the Digital Pathology Cytometry system offers.



Pre-Clinical Research Core (PRC)

Cancer represents a devastating disease. The mission of the PACRI will be research on the molecular mechanisms of carcinogenesis and the improvement and development of cancer therapies. Scientists at PACRI will work whenever possible with cells grown in culture and try to answer scientific questions by computer simulation. In many cases, due to the complexity of tumourigenesis the significance of alternative in vitro or in silico systems is limited so that animal experiments are indispensable. These are restricted to the necessary dimension; animals will be treated with respect and with the most refined techniques. For their experiments, PACRI scientists will preferably use rodents. To mimic the development of distinct cancer in humans, cancer researchers employ various tumour models; genetically manipulated mice with a tissue-specific gain or loss of one or several genes serve to evaluate the functional role of such genetic factors in cancer development. To some extent, the mechanisms of tumour development are analysed in mice that have been treated with carcinogenic agents. To study the characteristics of human tumour cells, mice with a compromised immune system are often used, since they tolerate the transplantation of cells from other species and allow their growth.



The staff of the Preclinical Research Core (PRC) will support cancer scientists who are in need of animal models or who experiment with animals that were bred in-house or selectively purchased. A team of clinical veterinarians and biologists will advise and assist researchers in the design and realization of their experiments. The Head of PRC will train technicians and caretakers and provide technical courses for scientific personnel. By these means, it is assured that all animals are kept according to national and international animal protection regulations.

In addition, the welfare of animals is ensured by maintaining them under the highest level of hygiene. The health status of the animals will be regularly checked.

The genetically modified mouse lines that serve for investigation of distinct human tumour diseases will be acquired from partners. The most important mouse strains will be preserved for further studies by collecting spermatozoa or early-stage embryos from mutant mice and subsequent freezing in liquid nitrogen. In addition, a database of all mouse mutants available in-house will be provided. PACRI will realize cancer studies in experimental animals by application of carcinogenic agents and by transplantation of tumour cells into immune-deficient mice. Moreover, interventional studies will be carried out, and development of patient derived xenografts, co-clinical trial and humanized immune systems in mice.



Pillar 2: Enhancement of human capital in cancer research

VISION: Building a critical mass of cancer researchers in South Africa and the African region. It is aimed at developing internationally competitive cancer research capabilities in Africa with an emphasis on Afrocentric solutions, enhancing the probability of finding homegrown solutions for cancer challenges faced by the continent.

To enhance highly-skilled and trained personnel by fostering knowledge transfer with a focus on preventive, diagnostic and treatment solutions.

Pillar 2: Enhancement of human capital in cancer research

FOCUS AREAS

There is a serious skills shortage in cancer research in South Africa and the African region and that limits the capacity for country-led development and increases dependency on foreign expertise; this is particularly true for the African region. In this context, PACRI's mandate to act as a Centre of Excellence for training in cancer research is timelier than ever. PACRI already offers a short online course in basic cancer genomics first offered to its predoctoral contingent and later this will be open for all South Africans and the African region. PACRI is also engaging with partners both locally and internationally to offer a multifaceted skills development platform to cancer scientists from the African region, comprising an International PhD Fellowship Programme, several mobility schemes and training opportunities. PACRI will also recruit researchers and clinicians to implement joint research projects between the clinical and basic laboratory groups to enhance Human Capital Development in cancer research. Training researchers and medical personnel in new technologies and processes is required for the implementation of the PACRI's strategic objectives.

1. Predoctoral/PhD and Short Term Fellowship Programme in Cancer Research

PACRI is currently having predoctoral/Doctoral candidates and short term cancer science training fellowships funded by the National Research Foundation, South African Medical Research Council and Discovery Health. PACRI is currently also talking to international partners for joint training grants from the Forgy International, National Institute of Health, Fulbright Scholar fellowships, Oppenheimer Trust International Training Fellowships, Wellcome Trust Fellowships, Horizon 2020 Fellowships, American Association for Cancer Research, and others. This Programme aims to develop a strong cancer knowledge base for PACRI, offering transdisciplinary and multidisciplinary projects that cover a wide range of topics within cancer research; addressing issues relevant to the needs of the PACRI Constituency. The advantage of these fellowships is that fellows have to spend some time in state of the art laboratories overseas to gain critical skills in cancer research and also partners are offered positions as extraordinary professors and they co-supervise

Predocctoral/PhD candidates and this is an ideal skills transfer base. In addition, they take part in the wide range of activities organised at each PACRI, courses on grant writing and grant application processes.

2. Postdoctoral Fellowships

Besides the completion of a specific cancer project, and the advancement of the cancer scientific skillset of the cancer scientists involved, this programme directly supports individual cancer scientists. It allows them to build a network of contacts at the international level, to gain exposure in an international scientific environment, with teaching, and supervising experience; all of which are crucial for the further development of their cancer scientific careers. Upon completion of their fellowships, cancer scientists are expected to increase the pool of well-trained university lecturers and researchers, thereby improving standards and widening the scope of the education programme of the country. These fellowship schemes produce highly-trained scientists and educators who will progress beyond a PhD and have established an international scientific network. This means that upon concluding their fellowships they can have a major impact on the quality of the cancer educational programmes in PACRI and within Africa and further afield. One highly-trained PhD or post-doc, can also further train numerous students per year, has massive potential for capitalising upon a relatively small investment and ensuring sustainability of the education provided.

3. Mobility for Advanced Training in Cancer Research (MATCR)

This scheme will promote International Cooperation and the mobility of researchers between PACRI and International Partners all over the world. Through the short-term training programme, fellowships for researchers mainly offered by international partners will offer researchers from the PACRI, working in cancer research that has a potential translational benefit for their PACRI home laboratory. The MATCR Programme is a concrete tool for boosting direct collaboration between PACRI and Overseas countries for skills transfer. Physician scientists can also spend some time working in cancer hospital overseas and also overseas partners spending time with PACRI.

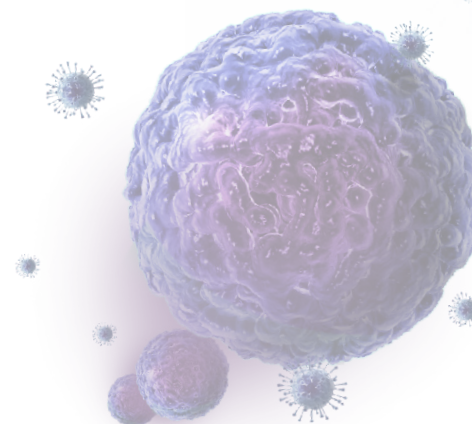
4. In-country training through PACRI's Meetings and Courses

Every year the PACRI will organise numerous events on cutting-edge topics in cancer research, with the aim of promoting education, scientific dissemination, and interaction between internationally-renowned scientists and young researchers. Events will range from **practical workshops**, through **theoretical courses**, to major scientific **conferences**. These events will be evaluated by an International Scientific Advisory Committee and will include high-level international speakers. An increase in the practical training component, through the development of new partnerships with manufacturers of state-of-the-art scientific equipment, will be increasingly pursued, as well as support by co-sponsors and the development of collaborations with partner organisations for the co-organisation of events in areas of common interest in cancer. Participation in the PACRI events will constitute, for many scientists worldwide, a valuable first approach to the Institute's activities, leading to new collaborations, access to fellowships and other opportunities.

5. Development of on-line educational resources

PACRI Seminars and selected Meetings and Courses will also be available for free download on the PACRI Website, iTunes and YouTube channels. PACRI will provide free, on-line resources, as a cost-effective approach for teachers, trainers and students across the PACRI constituency.

As the demand for training across the PACRI is constantly increasing, PACRI will identify new partners willing to contribute to its Skills Development Programmes, and to contribute to the mission of promoting cancer science. A major strategic goal of PACRI is to double the funding capacity of such Programmes to reach, in order to expand the PhD and the Postdoctoral Fellowship programmes, increase the number of International exchanges and specifically targeting women scientists. Also, there is a strong need to conduct more practical training courses across the PACRI. The more reason of establishing the PACRI Fundraising and Infrastructure Committee (PFIC).





Pillar 3: Reinforcing Cancer Research Expertise and Technological Skills.

VISION: Building innovative and R&D capabilities to enhance the probability of finding homegrown solutions for the cancer challenges faced by the continent. To collaboratively promote in-house innovation, new business models/spin out companies and partnerships to ignite change and deliver value to society, PACRI's vision is to foster knowledge transfer with a focus on innovative preventive, diagnostic and treatment solutions and highly-skilled and trained personnel, which, together with a fertile business environment, are the crucial drivers of inclusive economic growth and development, as recognized by the African Union's Agenda 2063 and the UN 2030 Agenda.

Fostering knowledge transfer with a focus on innovative preventive, diagnostic and treatment solutions with a fertile business environment, will be crucial drivers of inclusive economic growth and development.

Pillar 3: Reinforcing Cancer Research Expertise and Technological Skills

FOCUS AREAS

1. Partnerships

As the demand for training within PACRI is constantly increasing, PACRI wishes to identify new partners willing to contribute to its Skills Development Programmes, and to contribute to the mission of promoting cancer science for sustainable development. A major strategic goal of PACRI is to acquire funding through its Funding and Infrastructure Committee in order to expand the PhD and the Postdoctoral Fellowship programmes, increase the number of International Exchanges and also targeting women scientists. Also, there is a strong need to conduct more practical training courses across the PACRI.



Implementing patient-oriented high-throughput diagnostics including the possibility to sequence the tumour genome as well as to characterize the immune system of each PACRI patient will be of utmost importance. Sequencing and bioinformatics analysis in collaboration with PACRI's national and international participating partners are being used to implement these initiatives.

2. Knowledge transfer of novel cancer solutions

Novel applications of biotechnology offer unique possibilities for innovative drug development and unprecedented options for economic exploitation. Innovative drug research is now carried out by small biotech companies, initially with limited economic support, but possessing knowledge-intensive capacity. These are usually initiated as spin-offs from universities or research centres and endowed with specific intellectual property and expertise strictly related to the application under development. Their activities usually rely on investment by business angels and venture capitalists to the pre-clinical, or even first phases of clinical studies, and show success, when they then attract the interest of the larger pharma companies. While this represents a conceptual revolution in the common practice of large pharmaceutical industries in developed countries, it also offers an unprecedented opportunity for developing countries: a new class of biotech companies that are small and focused, that can rely on relatively limited economic support to achieve competitive success. This opportunity, however, relies on the creation of capacities that extend beyond laboratory

skills, including knowledge of intellectual property protection, the fostering of innovative applications, and the nurturing of entrepreneurship skills. Knowledge Transfer is now a recognised activity, has been adopted as part of the "Third mission" alongside teaching and research and industry is an integral part of the triple helix innovation model. Students' entrepreneurship is becoming the next driver of technology transfer and this implies that specific training will need to be offered to young scientists active at PACRI at Predoctoral, Postdoctoral level to forge an entrepreneurial mindset.

3. Collaborative Research Programme (CRP) Grants

Although efforts are being made in STI to boost employment, competitiveness and growth, and in addressing societal challenges such as cancer, a Non-Communicable Disease, the world's research output from developing countries such as Africa and the investment in research is still low.

Research and innovation (R&I) capabilities and infrastructures are yet to be fully optimized due to several impeding factors – from insufficient funding and poor governance to a shortage of women in science, poorly equipped laboratories, and little practical research training for science students including cancer science. The CRP Programme will enhance the R&I capabilities of Principal Investigators (PIs) across PACRI, empowering them through direct support for research activities in loco, feeding local expertise in cancer research. Selected candidates will receive financial and technical support to carry out a project in collaboration with a PACRI PI, intended to improve the capacity of existing research groups and/or to help in establishing new ones, whilst also improving locally available equipment and infrastructure. The direct beneficiaries of the CRP Programme are scientists across the PACRI Constituency, selected on scientific merit and the relevance of the proposed research topic to the aims of the Programme. This Programme will promote international research cooperation attuned to PACRI's national interests and ownership.



Pillar 4: Reducing Cancer Health Disparities

VISION: A strong drive in collaborative transdisciplinary research that addresses cancer health disparities and its impact on underserved and socio-economically disadvantaged populations. Cancer does not affect all racial, socioeconomic or cultural groups equally. For example, an effective treatment in one racial group may not work in another and therefore the aim to identify biological, genetic, and social conditions that cause these health disparities in the search for successful preventive measures, treatment options and cures. PACRI will conduct research about underrepresented health concerns, train under-represented minorities to conduct biomedical research, and provide educational outreach to underserved communities and increase the number of qualified cancer research nurses. One objective of this effort is to increase the access and enrolment of underrepresented patients into clinical trials, contributing important knowledge in an era of personalized medicine. Clinical trials research performed on a diverse population of patients can help in the evaluation of treatment outcomes and their varying degrees of effectiveness among racial groups, as well as provide the benefit of targeted treatments that might otherwise be unavailable to underserved populations. These will be the essential steps in reducing health disparities in cancer.

Improving cancer health outcomes of diverse communities disproportionately impacted by race and health care disparities

Pillar 4: Reducing Cancer Health Disparities

The proposed research also aims to improve health outcomes of diverse communities disproportionately impacted by health and health care disparities through community engagement and partnerships in research, education, and practice. It will work to coordinate other existing efforts; develop new initiatives to promote health disparities research; build capacity to conduct future clinical trials;

develop necessary health information and telecommunications infrastructure; and increase the pool of under-represented students and academic researchers conducting basic, clinical, and behavioural research related to cancer.



Pillar 5: Building a Science Cancer Hub for R&D and International Cooperation

VISION: To improve the capacity of PACRI local and international partners to connect and cooperate in the field of cancer research through competence sharing and improved coordination amongst existing bilateral, multilateral and other mechanisms; to become a privileged scientific forum for cutting-edge cancer research and scientific debate among PACRI's constituency; to channel resources and promote synergies in cancer research sector between various national and international actors.

Local and International cooperation in the field of cancer research to become a privileged scientific forum for cutting-edge cancer research and scientific debate.

Pillar 5: Building a Science Cancer Hub for R&D and International Cooperation

FOCUS AREAS

1. Partnership development and implementation

PACRI's uniqueness creates a special and permanent opportunity when taking into account its mandate, the increasingly competitive landscape of international cooperation as a Centre of Excellence for Research in Cancer. During the timeframe of the present Strategic Framework, PACRI will further promote its positioning in the international environment, with a view to enhancing decision-makers' perception that backing PACRI is a smart investment that is good for cancer research, for African communities' health and well-being and, ultimately for societal and financial progress and prosperity. Strengthening PACRI's relationships with bilateral partners and international cooperation is vital.

PACRI benefits from a strong cooperation with the South African Government and its entities (Department of Health-DoH, Department of Science and Innovation-DSI and the Department of International Relations and Cooperation-

DIRCO), Science Councils: South African Medical Research Council, The National Research Foundation. During the timespan of this Strategic Framework, PACRI will focus on strengthening such relationships and forging new bilateral partnerships, and establishing synergies with the existing programmes, particularly with those supporting cancer research, technology transfer and PACRI's cross-cutting priorities, in order to maximise impact in cancer research. Country or African Region-specific scientific cooperation projects will also be pursued, in order to increase the cancer scientific capacity of targeted PACRI. Other members who are in a position to undertake more responsibility to support PACRI's mandate through implementing the Strategic Framework, are also urged to strengthen cooperation with PACRI.

This vision goes hand-in-hand with the increasing internationalisation of PACRI's personnel and management structure. PACRI will work towards increasing its visibility and relations with multilateral partners especially in the United States, the European Union and the United Kingdom. In this regard, PACRI will actively participate in the next Research Framework Programme, Horizon 2020 Europe, USA (NIH grants, Forgy Training Grants, American Association for Cancer Research Grants, etc), UK (Wellcome Trust, Cancer Research UK, MRC UK grants, etc) contributing to forging increase funding and collaboration opportunities with the European Union, UK and USA. PACRI will undertake the Pillar Assessment procedure to be entrusted with implementation. With regards to multilateral partnerships, PACRI needs to strategically articulate its unique value-added role and build trust through ongoing engagement. Modalities of cooperation include direct funding, trust funds, developing an inter-sectoral agenda based on the SDGs, sharing good practices and results, and exchanging professionals.

Engagement with the United Nations will be instrumental in advancing the promotion of knowledge sharing and creation amongst PACRI's Constituency.

2. Cancer Hub for PACRI Partners

PACRI will continue to act as a scientific reference point, involving, as far as possible, scientists from Africa and abroad in its scientific events and activities. It will also organise specific dissemination and information activities for its partners on burning scientific issues and the latest scientific discoveries. Cancer research capacity building in PACRI and partners, in diagnostics and the development of point-of-care devices for the detection of cancer, are of particular interest to PACRI.

In the next few years, PACRI will promote activities directed at its partners in the field of cutting edge cancer research and additional topics will be identified during the timespan of this Framework based on the needs of PACRI's partners.



CROSS-CUTTING PRIORITIES

Cross-cutting priorities are thematic or geographical areas considered of crucial importance for realising the present Strategic Framework and the goals it is set to achieve. These priorities affect all PACRI Pillars and will be integrated in all phases of PACRI activities, from planning to impact evaluation. Such priorities are not intended as new focus areas, but rather as a tool that will help in the monitoring of the implemented activities, allowing PACRI and partners to ensure that adequate financial and human resources are allocated to make an impact in the identified priorities. During this Framework, PACRI will focus on two cross-cutting priorities: **Gender Equality and Career Development, African and BRICS Cooperation.** We believe that such priorities are interdependent, when considered in the wider context of the PACRI mandate and the overall contribution to the UN Sustainable Development Goals.

Gender Equality and Career Development

According to published data from 500 scientific institutions worldwide, half of all undergraduate students in the Life and Health Sciences are women, but only one in four are professors, and less than 30% of scientific researchers and only 25% of Professors are women. On the International Day for Woman and Girls in Science, the UN Secretary-General said that "dismantling gender stereotypes" is an essential step towards ending the gender imbalance in science. PACRI confirms the above data and the need to advocate for change through the promotion of gender equality. To this end, PACRI will enhance its efforts, both externally with partners and internally through awareness discussions and dedicated undertakings, to encourage the integration of gender equality requirements, while also trying to increase participation of women scientists in its research programmes. PACRI will collaborate with partners active on this priority, such as the Organization for Women in Science for the Developing World (OWSD).



According to the United Nations, 85% of the world's young people live in developing countries including Africa. Investing in young people's future health and education is the best way for a country to unlock productivity and innovation, cut poverty, create opportunities, and generate prosperity. Human capital has played a pivotal role in the success of emerging economies around the world. Projections show that human-capital investments can do the same for developing countries such as Africa. Young people also face challenges in their job prospects, so career development is critical for them. These challenges are well recognized in the 2030 Agenda, with SDGs aiming to broaden employment and education opportunities for youth to reduce the mismatch between skills and market needs. PACRI acknowledges that young people constitute the main driving force for the future of science including cancer science and of their countries and will continue to invest in young scientists throughout its programmes.

African and BRICS Cooperation

PACRI implements African Cooperation in all of its actions, to promote scientific cooperation, capacity building and technology transfer. PACRI operations are also aligned to the BRICS countries Cooperation and these are currently India, Brazil and China, and are in line with the National Government of South Africa as a member of the BRICS countries.



During the present Framework, PACRI Africa/BRICS Cooperation will also focus on the following strategic actions: i) promoting dialogue, exchange and internationalisation of science in low resource settings; ii) provision of fellowships to increase human capital development iii) convening meetings promoting visibility and capacity, through the presentation of their science to a wider, international audience; iv) providing platforms for scientific exchange; v) advocacy and global outreach actions vi) engaging in and promoting scientific diplomacy at all levels.

RESEARCH MACRO AREAS

Clinical Cancer Research

Pushing the envelope of early detection and treatment, personalized care by selecting emerging therapies and strategies to offer to patients as experimental alternatives to routine care.

Translational Cancer Research

Creating a "from bench to bedside and back again" delivery continuum by facilitating the movement of new ideas and treatments from the laboratory to the clinic, as well as the movement of clinical observations from the clinic.

Population and Prevention Cancer Research

Improving survival outcomes with activities in cancer epidemiology, prevention and control and collecting detailed lifestyle information and biospecimens in search for risk factors and biological mechanisms to address gene-environment interaction in cancer aetiology.

