Affordable Approaches to Cancer
Research challenges

Remit
You can apply to tackle one of our 7 key research challenges. When submitting a research proposal please keep in mind that all proposals must:

- Build on the complementary research strengths in both India and the UK, building research alliances between the two countries
- Show potential to have impact because they address a cancer of high unmet need in India, the UK and globally
- Clearly address the key theme of ‘affordable approaches to cancer’
- Aim to produce outputs that are readily translatable to patients e.g., a proposal focusing solely on basic biological research would fall outside the remit of this scheme (though may be eligible for other CRUK or DBT funding schemes)
- Be innovative and involve multidisciplinary work e.g., we encourage proposals that utilise affordable technology alongside biomedical research
- Be feasible within the constraints of the funding and time available:
  - Seed funding: up to £30,000 (approx. Rs 27 lakhs) for up to 6 months
  - Programme funding: up to £1.5m (approx. Rs 13.6 crores) for up to 4 years
Challenge 1

Title
Identify and quantify cancer risk factors to better understand regional variations in incidence, enabling new approaches to cancer prevention

Context
In 2018, there were 18 million new cases of cancer worldwide. India accounted for over 1 million of these and the UK, just over 400,000. While there are significant differences in the age-standardised incidence rates of different cancers between India and the UK, substantial heterogeneity also exists on a regional level within countries.

In 2016, age-standardised incidence rates for the four most frequent cancers - lip and oral, breast, lung, and stomach – varied between 3.3 and 11.6 times among Indian states.

Part of this variation may be explained by variations in known risk factor prevalence. The remaining part, however, is still unexplained and may be due to novel, undiscovered risk factors. The wide variation in age-standardised incidence rates across India provides researchers with a rich resource to understand the differences.

Aim & opportunities
The aim of this challenge is to explain the large variations in incidence of specific cancers, particularly those common in India, by identifying new cancer risk factors, as well as quantifying established risk factors.

In both India and the UK, information on cancer risk factors such as family history, reproductive history, place of residence (which can be used to infer air pollution exposure), physical activity, occupation, chemical and pesticide exposures, diet, anthropometry, alcohol use, and use of tobacco and smokeless tobacco is not routinely collected in cancer patients.

There are opportunities to inexpensively collect this data from patients at first presentation or diagnosis, but it needs to be standardised and shared to examine the contribution of these risk factors to the geographic variation of specific cancers.

There is a need for new, innovative and affordable approaches and technologies to rapidly acquire, store and share information on potential cancer risk factors in a confidential manner, and in India, to acquire the information from patients who speak different languages in a broad variety of contexts.

When addressing this challenge, proposals should articulate how an improved understanding of regional differences in cancer incidence could lead to new or enhanced approaches to cancer prevention in India, the UK and globally.

Impact & affordability
Cancer risk factor discovery and quantification of known risk factors is the first necessary step to the development of cancer prevention programmes that are locally optimised. Identifying and quantifying cancer risk factors will provide policy-makers with information on measures to reduce cancer incidence and provide the public with accurate information on reducing their personal risk of cancer.


**Challenge 2**

**Title**
Devise affordable screening tools to improve early detection of cancer

**Context**
For many common cancers, survival triples when a patient is diagnosed at an early stage. It is recognised that early detection of cancer leads to treatments with improved survival outcomes, but also less toxicity. In the UK, 46% of people present with late stage cancer, and in India this is as high as 60%.

In 2016, the Indian government published an operational framework for the country’s first national cancer screening programme for oral, breast and cervical cancer. This has not been implemented beyond the pilot phase and is likely to have considerable implementation challenges. The UK currently has three national screening programmes, for bowel, breast and cervical cancer.

Despite these advances, population-based early detection tools are either not that effective or are expensive. Existing tools can have low sensitivity and/or specificity resulting in missed cases or false-positives, leading to over-treatment and an economic health burden. Existing screening programmes that are based on low cost approaches could be improved through applying technology e.g. HPV-based screening for cervical cancer.

Current screening tools also face issues around poor uptake in certain demographic and socioeconomic groups. Reasons for this include, but are not limited to, a lack of education on the importance of early detection, myths/stigma about cancer screening and/or reluctance to attend screening appointments, particularly in women, for privacy reasons. There are also particular challenges in India in terms of access to screening, given that 80% of the population live in rural areas.

Therefore, there is a need to develop and/or evaluate and validate affordable early detection tools for cancer. These tools also need to be usable in a wide variety of contexts/settings, as set out below.

**Aim & opportunities**
This research challenge aims to devise affordable screening tools for the early detection of cancer that will result in a stage shift in diagnosis leading to better survival in a large population of cancer patients.

Tools which exploit recent technological advances can be used in low resource settings and where relevant, are less invasive, have the potential to make an enormous impact on survival in India and the UK. They could include those used in a field-based setting or at home. New approaches that make current screening methods more affordable also fall in scope, as does the evaluation of new technologies which have already been developed.

**Impact & affordability**
Having affordable and less invasive tools that detect cancer earlier will have a significant impact on survival, improve quality of life for patients, and bring economic benefits to society, not only in India and the UK, but around the world.
**Challenge 3**

**Title**
Identify affordable approaches to improve early diagnosis of symptomatic cancers

**Context**
Almost two-thirds of patients with cancer in India present at late stages of the disease; in the UK, this is just under half. Diagnosing and treating patients while their cancers are still at an early stage has the potential to not only improve survival, but to improve the outcome of treatment at a lower cost.

In both India and the UK, there are a range of reasons for late diagnosis, including a lack of awareness amongst the general public as well as primary care physicians. In India in particular, ignorance about the warning signs of cancer as well as myths about cancer being incurable are also prevalent.

In the UK, a number of studies over recent years have developed greater understanding of the underlying causes of late diagnosis and built an evidence base around which interventions can deliver a stage shift in a UK context. For example, studies on awareness and beliefs about cancer from the International Cancer Benchmarking Partnership have provided evidence to support the roll-out of national campaigns such as ‘Be Clear on Cancer’ in England. However, despite this progress, there is a shortage of research in LMICs regarding the effectiveness of such approaches.

Research is required to understand which interventions are effective in different contexts and how they can be delivered cost effectively at scale.

**Aim & opportunities**
This research question aims to identify approaches to improve early diagnosis of patients with signs and symptoms of cancer. The lack of previous systematic attempts, particularly in India, to educate the public and primary care physicians on early diagnosis means there is an urgent need to test several approaches using both conventional tools as well as modern technology.

Approaches could include: assessment of novel diagnostic pathways; developing targeted information and tools for primary healthcare professionals; and/or using digital platforms, mobile phones and social media to raise public awareness.

The effectiveness of specific interventions might be different in different regions of the country, depending on the sociocultural context. Likewise, approaches could be tested in varying socioeconomic situations to identify the most effective strategies.

Early diagnosis research seeks to understand the role of patients, healthcare professionals and healthcare providers, and to develop interventions in a population or clinical context. It can include population, behavioural and policy research. This is distinct from research into screening or early detection, which seeks to detect cancers in the absence of distinguishable symptoms and has entirely different logistic considerations.

**Impact & affordability**
Creating a shift at presentation in patients with cancer will have high impact on reducing cancer mortality and will optimise scarce healthcare resources and funds. Targeting early diagnosis in symptomatic patients has the potential for considerable stage shift without overdiagnosis, at low implementation costs, and would translate to superior outcomes of treatment.
Challenge 4

Title
Develop computational approaches that can reduce the cost of cancer care delivery

Context
Novel computational solutions have revolutionised many areas by enabling rapid decision making and predictive interventions using big data sets. To meet the future needs of our populations and improve cancer outcomes these technologies must be exploited for rapid, efficient and effective cancer care delivery.

In both India and the UK, there is a significant lack of key health professionals, such as radiologists, endoscopists and pathologists, that play a critical role in cancer care. Tools that support the rapid analysis and interpretation of large patient data sets can help health systems that lack resource to meet demand. In addition, novel computational approaches, including the use of artificial intelligence (AI), have the potential to change models and approaches for diagnosis and treatment of cancer in ways that can maintain or improve efficiency, while reducing overall cost.

Aim & opportunities
This research challenge aims to develop effective methods to rapidly analyse big patient data sets to best inform clinical decisions in under-resourced health systems. Developing these mechanisms will enable diagnosis of, and personalised treatment planning for cancers at a lower cost, thereby increasing access for larger numbers of patients.

A huge amount of patient data is available in digital form at different stages of the cancer pathway, and there are significant opportunities to leverage existing data sets from both India and the UK. This data may include patient-specific demographic information, family cancer history, radiological images, results of diagnostic, pathological and biological tests, surgical and non-surgical interventions, post-treatment follow-up data and population statistics.

Opportunities for using these data include:
- Developing AI and deep learning-based approaches to identify affordable, effective diagnosis and/or treatment approaches
- Developing algorithms that help in treatment planning using retrospective data
- Transferring learning models from one type of cancer to another, and/or one patient population to another
- Newer approaches to personalised medicine using real-world data annotated with oncological outcomes

NB Algorithms would need to be robust to missing data.

These approaches could increase productivity of healthcare workers in tertiary hospitals and could also be used in more remote areas where healthcare workers are under-resourced and facing additional pressures.

Impact & affordability
Both India and the UK have health systems which are under considerable pressure, with limited resources and funding gaps being regular occurrences. If we are to improve cancer outcomes, we need to bridge these gaps in our healthcare delivery systems, and support healthcare professionals through collation and analysis of large data sets, using affordable, AI tools.
Challenge 5

Title
Identify novel, affordable treatment approaches for hard to treat cancers using small molecules

Context
The traditional model for drug discovery is costly and is one of a number of factors that results in the high price of cancer medicines. The majority of novel drugs are unaffordable for patients in LMICs. Additionally, there has been limited research and/or success in the discovery and development of treatments for hard-to-treat cancers that have a high prevalence in LMICs.

New, innovative and affordable approaches to drug discovery are therefore required for hard to treat cancers, such as oral, gall bladder, oesophageal and nasopharyngeal cancer.

Aim & opportunities
The aim of this research challenge is to find affordable approaches to drug discovery for hard to treat cancers. A bilateral approach between India and the UK could allow existing knowledge, expertise and assets to be leveraged in both countries.

Affordable approaches could include, but are not limited to:
- Repurposing of small molecules that have either already been marketed, are well annotated and/or have a defined mechanism of action, in order to use as new anticancer treatments
- Reformulating small molecules to improve their effectiveness and/or affordability for a specific indication
- New approaches that build on the work of academic cancer drug discovery groups in the UK, medicinal and synthetic chemistry expertise in India, and existing screening libraries from academic or commercial organisations in both countries
- Phenotypic screening approaches that exploit novel models of cancer biology associated with hard to treat cancers
- Pre-clinical or clinical studies to validate the use of a repurposed/reformulated small molecules in different disease settings

Commercial partners could be involved with a view to accessing screening libraries and/or to support ongoing affordable clinical development.

Impact & affordability
Bringing forward new, affordable drug treatments for cancers such as oral, gall bladder, oesophageal and nasopharyngeal would have an impact not only in India and the UK, but also globally.

This challenge also has the potential to build on expertise and innovation in India and UK that could be harnessed for other drug discovery research.
**Challenge 6**

**Title**
Improve the affordability of effective cancer treatments

**Context**
Efficient use of healthcare resources is a world-wide challenge and the demand for cancer treatment is increasing. Many standard cancer treatments have been developed in high-income countries where affordability was not a key priority. Increasingly, costs of cancer treatment are a major barrier for patients accessing care not just in LMICs but also in developed countries.

The causes of cancer, types of cancers and healthcare systems in countries such as India are different compared to high-income countries. In LMICs, where affordability of treatments is critical, research is required to see if effective cancer treatments can be optimised in a lower cost setting – this could also guide developed countries which are currently struggling with unrealistic healthcare budgets.

**Aim & opportunities**
This research challenge aims to optimise the affordability of effective cancer treatments, encompassing all major treatment modalities, to improve access and overall cancer outcomes.

Examples of relevant research questions include, but are not limited to:

- **Chemotherapy**: Do shorter or alternative treatment schedules provide similar or better outcomes with less toxicity?
- **Immunotherapy**: Can we simplify/optimise the delivery of immunotherapy? Can strategies be developed that are scalable thereby reducing per-patient cost?
- **Radiotherapy**: How can technology increase the efficiency of radiotherapy delivery? Are there opportunities to use hypo-fractionated regimens or novel radiosensitisers to deliver treatment more efficiently?
- **Surgery**: Can alternative surgical techniques be developed that have superior outcomes to existing ones, reducing further downstream costs? Can novel intra-operative imaging improve surgical resection outcomes, making surgery more efficient?

NB Advocacy for fair drug pricing is outside the scope of this challenge.

**Impact & affordability**
Making cancer treatments more affordable would have a major impact on the accessibility and delivery of cancer therapy and cancer outcomes.
**Challenge 7**

**Title**
Develop approaches to improve long-term quality of life in children and young people with cancer

**Context**
In the UK there are around 4,500 new cancer cases in children and young people every year; in India this is around 50,000. For this group, treatment is usually received at a time when patients are still growing and developing. This can often lead to long-term side-effects including infertility and hearing loss, as well as short-term side effects typically experienced as part of cancer treatment (e.g. hair loss). In India, preoccupation with primary cancer treatment and their oncological outcomes results in survivorship issues being side-lined.

Research is needed that addresses the long-term side effects of treatment for children and young people who survive cancer.

**Aim & opportunities**
The aim of this research challenge is to develop new tools, approaches or treatments that cause fewer long-term side effects and/or improve the quality of life of young cancer survivors, their families and the community they live in.

Approaches could include but are not limited to: developing and/or evaluating treatments that cause fewer long-term side effects; developing affordable devices/technology which can reduce the long-term physical effects that children and young people who survive cancer face and interventions that mitigate and help patients manage them better.

There is potential for this challenge to have applications across multiple tumour sites, and to have global relevance.

**Impact & affordability**
Developing approaches to improve the long-term quality of life of children and young people who survive cancer would not only have a positive impact on the cancer survivors and their families, but could also have a broader societal and economic benefit. Low-cost tools would be more widely available for those who need them most, particularly in LMICs, and fewer follow-up hospital visits could result in a reduction of healthcare costs.