

# Less Survivable Cancers

*the next **research** priority*



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## Executive summary

Every eight minutes, a person in England is told that they have a cancer of the brain, lung, liver, stomach, pancreas or oesophagus. Every eight minutes, someone is told that their treatment is limited, the research is limited and too often, their survival is limited. This is the reality for the less survivable cancers, with the collective survival rate for the six less survivable cancers at just 14%.

Patients diagnosed with a less survivable cancer have the worst outlook of all cancer diagnoses, with decades of underfunding and neglect resulting in these diseases being under-researched, and their prognoses remaining poor.

### Less Survivable Cancers Taskforce (LSCT)

The Less Survivable Cancers Taskforce (LSCT) is a coalition of charities with a common goal – **everyone with a less survivable cancer deserves to have the same opportunities for treatment and survival as other cancers.**

The Less Survivable Cancers Taskforce wants to see survival doubled for the six least survivable cancers to 28% by 2029.

The central challenge to doubling the 5-year survival over the next decade is addressing the slow progress of research. Therefore, to start to deliver treatment breakthroughs and transform survival we need to remove the current barriers to research that are currently impeding progress.

### The key issues

Over the last decade, the more survivable cancers (MSCs) received **five times more research** funding from charities and government than less survivable cancers (LSCs).

LSCs suffer from a “**vicious cycle**” where poor survival outcomes contribute to fewer researchers and less research investment, which in turn, leads to fewer positive research breakthroughs, continued low survival, even fewer researchers and less funding.

Despite accounting for half of common cancer deaths, the less survivable cancers still suffer from low awareness among the public and health practitioners.

All this must change so that we can start to double survival for less survivable cancers.

## Approach

The Less Survivable Cancers Taskforce sought to identify and understand the barriers to the research of LSCs. Research leads across the six charities that make up the Less Survivable Cancers Taskforce (LSCT) were invited to take part in a survey, with the responses analysed, and a number of themes and potential recommendations were determined.

### Recommendations:

The report sets out five recommendations to reduce the barriers to research for the LSCs through:

- Improved strategic target-setting
- Greater and more targeted research funding
- Increasing patient engagement in clinical research
- Partnerships and coordination
- Changing the way that the less survivable cancers are described

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1. More survivable cancers (MSC) include Breast, Prostate, Uterus, Non-Hodgkin Lymphoma, Kidney, Rectum, Colon, Bladder, Leukaemia, Ovary and Myeloma.

# Introduction

The Less Survivable Cancers Taskforce (LSCT) is a coalition of six charities representing the cancers in England that have a survivability of less than 30% over the course of five years from diagnosis.

The charities and the cancers they represent are:

- Roy Castle Lung Cancer Foundation – Lung cancer
- British Liver Trust – Liver cancer
- The Brain Tumour Charity – Brain cancers
- Guts UK – Stomach cancer and gastric cancers
- Action Against Heartburn – Oesophageal cancer
- Pancreatic Cancer UK – Pancreatic cancer

Despite accounting for **half of common cancer deaths**, the less survivable cancers still suffer from low awareness among the public and health practitioners. Delays in diagnosis have a detrimental effect on survival of these rapidly advancing diseases, which are currently difficult or impossible to treat at later stages. Currently, the collective **five year survival** rate for all six less survivable cancers stands at only **14%**.

**The Less Survivable Cancers Taskforce wants to see survival doubled for its cancers to 28% by 2029.**

This report follows the recent publication of the NHS Long Term Plan, specifically within the context of the aim to increase early diagnosis at stage one and stage two from 52% to 75% for all cancers, by 2028.

This document has been produced with the intention of understanding the logistical, technical and policy barriers faced by researchers of the less survivable cancers and, where possible, identifying potential ways to remove them.

The report sets out the perceived barriers to research, drawing on the feedback from lead research contacts working with the charities represented by the Taskforce. It also sets out practical ways of reducing the barriers and incentivising research, drawing on the suggestions from researchers working within the field.

Medical advances towards a cure are often made by incremental steps that prolong life, and this report aims to open a constructive dialogue on the challenges to achieving this progress



## Current research priorities

Each of the charities working to tackle the six LSCs have their own individual set of research priorities at present, with unique treatments, procedures and insights that show promise for each disease. These individual priorities are outlined in the appendix at the close of this report. However, all the charities share collective interests in diagnostic improvement, innovative new treatments, and improving outcomes through personalised medicine, to ensure patients with LSCs are consistently receiving the best treatment and care.

## Research funding overview

Research priorities across the UK may, in part, be inferred from the levels of funding associated with different areas and different cancer sites. Levels of investment in cancer research across different cancer sites are monitored and tracked by the National Cancer Research Institute (NCRI).

In the decade 2007 - 2016, the MSCs received **five times** more funding overall combined, compared to LSCs. MSCs received **£1.6 billion** (30.7%), whereas LSCs received **£0.35 billion** (6.5%) of the total national research spend.

Government research spend over the period 2007-2016 is around **four times** more for MSCs (£0.51billion) when compared to LSCs (£0.14 billion). A legacy of low levels of research investment in LSCs means survival for these cancers has remained stagnant over the past 40 years, whilst other cancers such as breast cancer have seen their survival double.<sup>2</sup>

### Tessa Jowell Brain Cancer Research Mission

All those working in the sector welcome the **Tessa Jowell Brain Cancer Research Mission**, which consists of funds dedicated specifically to research into brain cancer. This will initially consist of £65 million, sourcing £40 million from the Government and £25 million already committed from Cancer Research UK. This initiative will bring more researchers and we look forward to seeing the innovations and improvements in brain cancer care and outcomes that will be developed as a result. The Less Survivable Cancers Taskforce now wishes to see a greater level of investment and research across all of the LSCs.

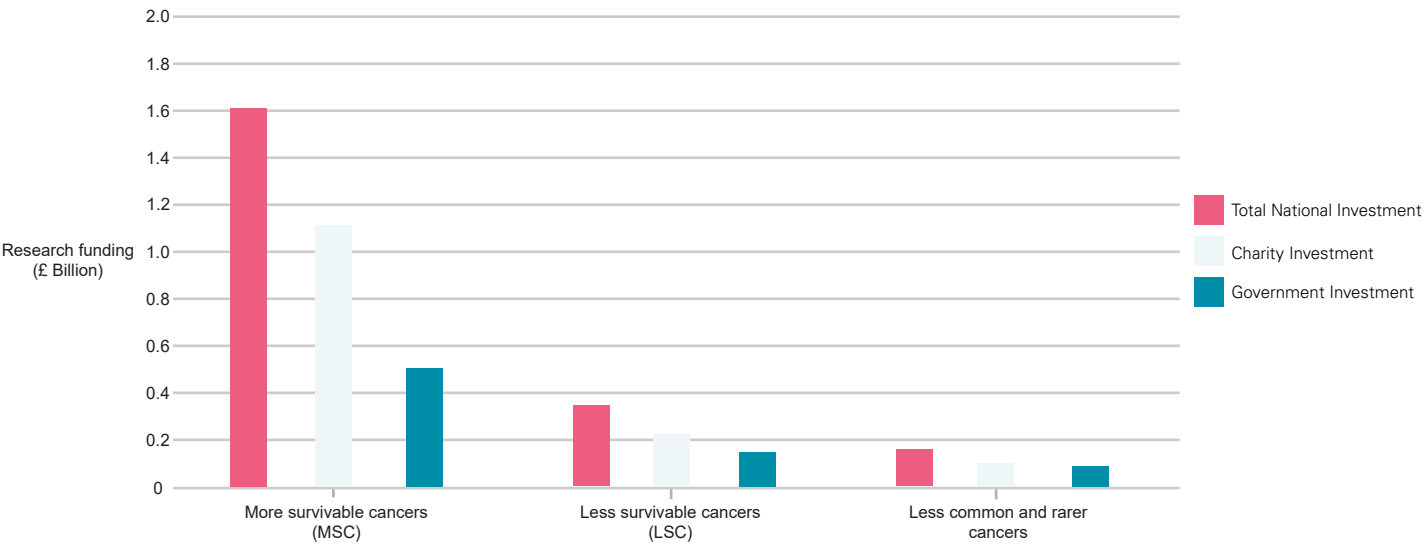


Figure 1: National research funding in the decade 2007 - 2016 split by charity investment and government investment

2. <https://www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/breast-cancer/survival>

## Approach

The Less Survivable Cancers Taskforce (LSCT) wanted to identify and understand the barriers to research into LSCs. Research leads across the six charities were identified and invited to take part in a short survey by email. For the smaller charities in the taskforce, responses were obtained from researchers working in the field and known to the charities. Detailed responses were received from research leads and contacts representing all six of the less survivable cancers.

The responses were analysed, and a number of themes and potential recommendations were established.

The identified barriers and recommendations are set out in this report. Many of the themes and recommendations were common across all LSCs, suggesting that implementation of the recommendations could have broad benefits across all LSCs. Some of the barriers identified may be inevitable and unsurmountable, but they are all set out below to give a broad understanding of the challenges being faced.

The challenges, identified by researchers, have been grouped as follows: **perception and attitudes, funding, increasing patient engagement, partnerships and coordination.**

A summary of the key recommendations is included at the end of the report.

# Perception and attitudes

## “Vicious” cycle

The responses from the research leads, and contacts from across all the less survivable cancers, indicated a strong belief that the LSCs suffer from a **“vicious cycle”** where poor survival outcomes contribute to fewer researchers and less research investment, in turn, leading to fewer positive research breakthroughs, continued low survival and even fewer researchers and less funding.

Conversely, research success in more survivable cancers incentivises more researchers and more funding in the field, generating more success.

Funding would appear to be directed into fields where there have already been substantial breakthroughs and there is thought to be a better chance of progress. This leads to research into the LSCs being **“left behind”**.

One researcher expressed the view that funding for cancer research tends to be directed towards projects where there are fewer, smaller barriers to research.

This contributes to the vicious cycle, where investors and donors are only likely to fund research they can already see having a substantial impact, with new recruits then flocking to these positions. Researchers working in areas outside of the set funding priorities are then further discouraged.

## Early career researchers

Researchers reported that a career in cancer research is not easy; however, due to the perceived difficulties and lack of progress in the area of LSCs, young researchers are more likely to be attracted to well-established research teams with a track record of success.

**The necessary infrastructure and funding to build a research career is not in place for the LSCs compared to more progressed cancer fields.**

## Negative perception

The perceived challenge of LSCs has an impact on investment decisions in the pharmaceutical sector. One researcher reported that a clinical trial coordinator from a major pharmaceutical company told them that the cancer they were working on was **“the place where clinical trials go to die.”**

**The prevalence of a negative attitude towards the prospect of successful research into the LSCs would appear to be having a direct impact on the amount of research being undertaken in these areas. It is seen to be contributing to a vicious cycle of underinvestment.**

For some LSCs there may be other additional perception factors influencing levels of research investment and fundraising success. In cases where the cancer is seen as preventable, for example, lung cancer’s link to smoking and liver cancer’s link to drinking, researchers have reported that these cancers are seen as less “deserving” of funding.

## Cancer data availability

The public availability of good data about LSCs may also influence research investment. In May 2016, Public Health England and NHS England launched a dedicated dashboard of cancer related information. Most of the LSCs are not currently included in the data available on the Cancer Dashboard.

This is thought likely to have a negative impact on project initiation compared to those that are included on the Cancer Dashboard, as it means that LSCs have less visibility. Thus the need to enact action to change outcomes will be less imperative where the poor outcomes for these cancers are not evident.

**Underpinning many of the barriers to research for LSCs is a perception that the cancers themselves are, in some fundamental way, more difficult to cure and that research will inevitably be unsuccessful.**

## Recommendations

Our recommendations to break the “**vicious cycle**” and combat the problem of perception would entail a combination of strategic focus, highlighting the LSCs within the research community, and reframing the way they are discussed and approached.

A high-profile Government call to encourage researchers to focus on less survivable cancers could have a huge impact on perception and attitudes towards LSCs. This could be carried out alongside the **adoption of a formal survival target**, such as the Taskforce’s target of **doubling survival to 28% by 2029** for LSCs. By setting a strategic goal for tackling LSCs, the Government may also encourage other funders, such as charities and pharmaceutical companies, to invest in this area.

We would also encourage the inclusion of specific data about the LSCs on the **NHS England Cancer Dashboard**, alongside breast and colorectal cancers. It is helpful to see the inclusion of lung cancer as part of this data set, and it would be useful if it were expanded to also cover liver, brain, oesophageal, pancreatic, and stomach cancers. A specific focus on LSCs might also help to shift perceptions and encourage investment.

One further tactical intervention is required to break the vicious cycle that leads to a diminishing research workforce. The critical point in the career of every researcher is the early years after completing their PhDs, when they are starting to specialise and build their own teams and secure funding. If the Government funded a batch of **new, early career fellowships in LSCs**, it would help to build a cohort of researchers, principle investigators and tenured professors of the future to bring about the breakthroughs that are needed.

There is also a need for more long-term funding opportunities to continue to support and incentivise early career researchers to stay in the field of LSCs after their fellowship.

Consideration could also be given to overcome some of the negative perceptions of LSCs by changing the way they are described. Framing LSCs as “**research priority cancers**” could help to change attitudes and investment decisions.

## Funding

LSC researchers perceive that funding decisions appear to be prioritised according to disease prevalence, with **four** of the **five most common cancers** (Breast, Prostate, Lung, Bowel and Melanoma) in the top five cancers for research spending.

Among the LSC research leads and contacts it is thought that the pharmaceutical industry in particular will also tend to prioritise research into cancers with a higher prevalence, rather than the most lethal cancers.

Another funding barrier is that pharmaceutical companies can take a long time to agree to fund research. For one researcher, this took so long that the original funding for their trial was withdrawn.

It was also highlighted that there is a general tendency from the Government to adopt an all cancer approach and they have been resistant to prioritise specific cancers, with the recent exception of brain cancer.

## Recommendations

A specific LSC funding call, set up in a similar fashion to the **Tessa Jowell Brain Cancer Research Mission**, with dedicated funds set aside by Government for studying these six specific diseases, would help to encourage research into these neglected cancers.

Government agencies, such as the National Institute for Health Research (NIHR) and UK Research and Innovation (UKRI), and cancer charities should be encouraged to **prioritise funding high quality research** into the cancers that are **currently the least survivable** rather than those with a higher prevalence. This would help to start to reverse the historic legacy of underfunding.

**A proportion of LSC targeted funds should be prioritised into research focused on improving early diagnosis.**

Many patients with early stage less survivable cancers are either asymptomatic or have vague and non-specific symptoms. Studies aiming to reduce diagnosis times and improve the accuracy of diagnosis will ensure that a higher proportion of patients are treated earlier, which may improve clinical outcomes and quality of life.

This falls in line with NHS England's aim to see three-quarters of all cancers detected at an early stage by 2028. As well as improving the chances of survival for individual patients diagnosed at an earlier stage, early detection and intervention allows for a wider pool of patients for researchers to recruit for clinical trials at all cancer stages.

# Increasing Patient Engagement in Clinical Research

According to the National Cancer Research Institute people diagnosed with a LSC are less likely to participate in a clinical trial.

- **4.6%** of people with a less survivable cancer took part in a clinical trial, compared to **7.5%** of cancer patients overall (2016-2017)
- **81%** of people believe that everyone diagnosed with a cancer should be offered the opportunity to take part in a clinical trial. <sup>3</sup>

Proportion that take part in a clinical trial (%)

Pancreas	4.6%
Lung	5.5%
Upper GI	6.0%
Brain	2.3%

## LSC researchers have suggested a number of reasons why patients with LSCs are less likely to take part in trials:

People with LSC may often be too unwell to undergo trials, and often not survive for long enough to complete a clinical trial programme. Some people with a poor prognosis may also be less willing to spend time on a clinical trial, and would rather spend time with friends and family. These factors coupled with the relatively low incidence of some of the less survivable cancers can also mean that there is less material for researchers to work from, and many trials can be open for years without attracting enough patients to be statistically significant.

Practical challenges can limit the work of researchers studying many cancers and other conditions. It is technically difficult to biopsy the brain, lung, liver, or gastrointestinal tract compared to more physically accessible cancers, such as breast or skin cancer. This can make access to consistent and high quality patient samples and data very difficult, therefore, researchers must rely on tissue extracted post mortem, which further limits the research due to limited donations and viable numbers.

There is also a need to develop robust protocols for the collection, processing, analysis and storage of tissue and samples to improve the quality and consistency of the samples available for research.

## Recommendations

There needs to be a recognition across healthcare professionals and patients that research progression for LSCs is predicated on more patients engaging in research. There needs to be a better understanding of how we incentivise people with a LSC, and their healthcare professionals, to engage in research and recognise how significant their contribution (whether trial participation, tissue samples or organ donation) is to progressing research.

There needs to be a continuation of effort, investment and collaboration across Government, Research Bodies, Industry, Professional Bodies and Charities to raise awareness of clinical trials and to signpost patients living with LSCs to trials who may be able and willing to take part.

For people with a LSC diagnosis there will always be greater barriers to participation due to the health of individuals, which due to later diagnosis can often be poor at the point of diagnosis.

3. Charity Awareness Monitor, July 14, nfpSynergy

## Partnerships and coordination

As highlighted above, researchers working on LSCs suffer from underfunding which leads to a lack of progression, therefore, the research workforce in these areas tends to be smaller. This not only exacerbates the issue of slow progression but also means that the community tends to be spread thinly across only a handful of institutions in the UK. As a result, the community, although trying to address similar issues, can end up working in silos.

**This means that there is generally a lack of coordination, collaboration and active sharing of data and results in these communities.**

There can also be a lack of consensus about the most critical issues that need to be addressed, compounded by a lack of leadership and the absence of a central coordinating hub for the community to coalesce around. The impact of this is significant. The finite funding that does go towards the LSCs may not always be spent as effectively as possible and the research community can have the perception of being fractured with a lack of strategy and consensus.

If we are to secure the vital increase in research funding there needs to be an investment in capacity building for these research communities, facilitating greater central coordination of research, leading to greater collaboration and an efficient and effective use of research funding collectively. Ultimately, this will lead to greater research funding.

Any strategic direction should also focus on utilising money to focus on the delivery of new diagnostics, therapies and care, quickly and with the highest quality standards.

So far there have been some admirable initiatives to bring the community together but they tend to be isolated from each other such as the Tessa Jowell Brain Cancer Mission, CRUK Lung Cancer Centre of Excellence at Manchester and UCL, and Pancreatic Cancer UK's Early Diagnosis Research Alliance.

## Recommendations

There needs to be a dedicated long-term support of initiatives that aim to **coordinate and network** the **LSC research communities** such as international conferences and steering groups. This will develop a greater understanding of other work in the field to ensure **research efforts complement and synergise** with each other instead of duplicate and undermine. This will also encourage the cross-fertilisation of ideas.

Building on research priorities that individual charities in the LSC space have set, the LSCs as a whole would benefit from higher level and global research prioritisation in line with work that Cancer Research UK has undertaken on brain cancer research.<sup>4</sup>

**Infrastructure investment**, through universities and clinical and research networks, is very effective in **establishing leadership and direction** in the research community. It can leverage extra funding, nurture impactful research, support numerous researchers' careers and thus attract and retain people within a field of research.

Infrastructure investment also provides state of the art technology for the community to utilise. Dedicated infrastructure, such as centres of excellence, would revolutionise the way LSC research is carried out and progresses.

Researchers working on LSCs should be supported to allow their findings, data sets, cohorts, and negative results to be made available on platforms that are **open access** (e.g. AMRC Open Access or Europe Pub Med Central).

Open access where research is free to view will allow a more informed approach to research. This will avoid duplication and will streamline research efforts through the sharing of powerful data available to all.



# Recommendations

## Strategic target setting

As called for by the Less Survivable Cancers Taskforce, the Government should highlight LSCs by adopting a strategic goal of **doubling survival for LSCs to 28% by 2029**. This will encourage others to invest in research into LSCs.

Government agencies and cancer charities should be encouraged to begin prioritising research programmes and investment decisions according to the current survivability and mortality rather than prevalence.

## Greater and more targeted research funding

As funding rounds are announced, the Government should specifically call for and encourage research funding applications for those working on the LSCs.

The Government should create and fund a set of new, designated **LSC early career fellowships** to encourage researchers to build their careers in tackling LSCs, and in the longer term look to create more long term funding opportunities to continue to support and incentivise early career researchers to stay in the field of LSCs after their fellowship.

## Increasing patient engagement in clinical research

There needs to be a better understanding of how we incentivise people who have a LSC, and their healthcare professionals, to engage in research.

There needs to be a continuation of effort, investment and collaboration to **raise awareness of clinical trials** and to signpost patients living with LSCs to trials who may be able and willing to take part.

## Partnerships and coordination

There needs to be long term support of initiatives that aim to coordinate and network the LSC research communities.

**Infrastructure investment** is very effective in establishing **leadership and direction** in the community. This type of investment in LSCs, such as centres of excellence, would revolutionise the way LSC research is carried out and progresses.

Researchers working on LSCs should be supported to allow their findings, data sets, cohorts, and negative results to be made available on platforms that are **open access** for the benefit of the whole community.

## Branding

Consideration should be given to overcoming some of the **negative perceptions** of less survivable cancers in research, by changing the way in which they are described. Framing LSCs as the “**research priority cancers**”, or something similar, could help to change attitudes and investment decisions.



## Conclusion and Next Steps

The less survivable cancers suffer from a lack of investment in research. The barriers to research are many and varied and include issues around **perception, current funding priorities, patient engagement in research, partnerships and coordination**. Many of the factors combine to create a **vicious cycle** of underfunding, lack of positive results and further neglect.

Co-ordinated action will be required to break the vicious cycle and to secure some successes similar to those that have been achieved for other cancers. Researchers from the field have suggested a number of potential ways to remove some of the barriers to research.

The next step forward is for Governments, other research funders and organisations working within LSCs to begin a period of discussion to **review and refine the potential strategies and tactics**, to prioritise them and **build consensus** around the **critical research questions** and priorities for each LSC and where possible priorities that cross cut all LSCs.

LSCs as a whole would benefit from higher level and global research prioritisation in line with work that Cancer Research UK has undertaken on brain cancer research. To a large degree, LSCs can build on learning from the Tessa Jowell Brain Cancer Mission which has admirably brought together different actors to tackle brain cancer research.

Once this work is in place, public bodies, charities and pharmaceutical companies can then be encouraged to make the structural changes needed to **reverse the research deficit for those cancers that are currently less survivable**.

## Appendix

The six LSCs have a diverse and varying scope of individual research needs. These have been listed briefly below for the future reference and interest of the NIHR, outlining specific breakthroughs and developments into which the constituent charities of the Taskforce will be keen to focus on going forward.

### Brain

At present, there are over 140 known types of brain tumours, and clinical trials are vital in making sure new treatments are means tested and converted into real life, accessible treatments for patients. Presently, only 3% of brain tumour patients are enrolled in clinical trials, compared with 7.5% of cancer patients overall.

Priorities for brain tumour research are as follows:

- Gather and analyse clinical data alongside patient reported outcome measures (PROMs)
- Create further medical oncologist positions in the UK to help drive new drug trials
- Radically increase the number and frequency of tissue samples banked for research, and ensure samples are accessible and available for high-quality research projects.
- Better understand the diagnostic pathway for brain tumours in adults, and identify ways to facilitate an earlier and more accurate diagnosis.
- Promote and incentivise collaboration between clinicians and industry leaders for repurposing drugs and accelerating access to potential new drugs.
- Longitudinal studies to collect data on the long-term and late effects of a brain tumour to help inform treatment decision making and improve quality of life.

### Stomach

There are several different types of stomach cancer, but over 95% of these are adenocarcinomas, much like cancers of the oesophagus. Research priorities include:

- Improving understanding of the mechanisms of metastases and finding the pathways to block this, studying the disease from pre-cancer stages and looking for biomarkers to identify high-risk patients
- Studying patients already providing stool samples for bowel cancer screening, looking to test the benefit of simultaneously screening for *Helicobacter Pylori* infection, the commonest cause of gastric cancer. In addition, we are keen to study the use of blood markers that could be tested through a simple blood test, to screen higher risk patient groups.

- An expansion of the **ESTIMATE Study**, which seeks to define a more accurate and reliable approach to diagnosing pre-cancer changes in the gastrointestinal tract, making use of new endoscopy camera technologies and more accurate sampling techniques to aid earlier detection of this condition.
- Wider introduction of **robotic ESD (Endoscopic Surgical Dissection)** devices, a minimally invasive endoscopy technique allowing removal of early cancer tissue with an excellent chance of cure.

### Pancreas

Pancreatic cancer has one of the poorest survival outlooks of all the less survivable cancers, with a five-year survival rate of less than 7% - with less than 1% of patients surviving ten years or more. This has failed to improve in the UK for the past 45 years.

Key research priorities for pancreatic cancer are:

- Improving diagnosis
- Discovering new treatments
- Personalised medicine
- Research into identifying the best care and how to implement this care

The **NICE guidelines** on pancreatic cancer published identified the following research priorities:

- Prospective randomised trials should be undertaken to compare preoperative (neoadjuvant) therapy with standard post-operative therapy in people with resectable pancreatic cancer.
- A cohort study followed by phase II and III studies should be undertaken in people with pancreatic cancer and cachexia or pre-cachexia, to compare cachexia assessment methods and anti-cachexia interventions with standard care.
- Prospective randomised trials should be undertaken to compare the effectiveness of minimally invasive pancreatectomy or pancreatoduodenectomy (laparoscopic or robotic) with open pancreatectomy or pancreatoduodenectomy in people with pancreatic cancer.
- A randomised trial should be undertaken comparing early endoscopic ultrasound-guided neurolytic coeliac plexus (EUS-guided NCP) interventions with on-demand EUS-guided NCP interventions in people with unresectable pancreatic cancer.
- A qualitative study should be undertaken to evaluate information and support interventions to address psychological needs at different points in the care pathway for people with pancreatic cancer.

- A randomised trial should be undertaken comparing nutritional interventions 17 (including pancreatic enzyme replacement, types of feed, route of administration, 18 timing) against standard of care or against each other for people with resected or 19 unresectable pancreatic cancer

Current promising developments in the field of pancreatic cancer research, which we would like to see built upon include:

- The **PRECISION-Panc** study, which currently looks to understand the individual makeup of pancreatic cancers through the study of tissue samples, with plans to expand to practical treatment trials in stage two
- Trials into **Nanoknife** or **Irreversible Electroporation (IRE)** in the UK, which uses needles to pass electrical currents into cancer cells and destroy them.
- Targeted cancer treatments such as **PARP inhibitors**

## Oesophageal

70% of oesophageal cancer cases are adenocarcinoma, which is linked with Barrett's Oesophagus and gastro-oesophageal reflux disease. As such, research priorities of oesophageal cancer are as follows:

- Development of diagnostic systems, particularly for patients suffering Barrett's Oesophagus who can then be monitored closely for development of oesophageal cancer, particularly through the **Cystosponge BEST3 trial**, which can replace the more invasive endoscopy
- **SPIT tests** for diagnosis
- Greater resources to be applied to research and development of breath tests (e.g. as being undertaken at Imperial College under Professor George Hanna), and saliva tests.

## Liver

Over the past decade, liver cancer has increased by almost two-thirds (63%) in the UK and rates are projected to rise by 38% by 2035, the equivalent of 15 cases per 100,000 people.

The route to diagnosis is strongly associated with survival. Over a third (34%) of people are currently diagnosed as an emergency in A&E. The majority of patients cannot be offered any form of curative therapy. Around 6,000 people are diagnosed each year.

Research priorities for liver cancer include:

- Liver cancer is asymptomatic yet most patients who develop liver cancer have long-standing cirrhosis (scar tissue formation from liver cell damage), although for many this has not been diagnosed. More research is needed to ensure the effective early diagnosis of liver disease and effective screening of those diagnosed so that cancer is detected early.
- Research into whether combining treatments, such as RFA and chemoembolization, is more effective than using these treatments separately.
- Pharmacogenomics - how genetics can affect a liver cancer patient's response to particular therapies.
- More research into innovative interventional oncology treatments and how we can improve patient access.
- More research into whether existing therapies for other cancer types would be suitable for liver cancer patients.
- How can systemic therapies, which spread throughout the whole body to treat cancer cells wherever they may be, be used to treat HCC (primary liver cancer).

## Lung

Lung cancer is the disease, which, of all the less survivable cancers, receives the most funding and recognition from researchers and pharmaceutical companies, due to its high prevalence.

Despite this, it remains an incredibly lethal disease and we are hoping to see the following breakthroughs expanded upon:

- Pembrolizumab combination therapy, which has been seen to give patients nearly four additional months without their cancer progressing, compared with standard treatment of pemetrexed with platinum chemotherapy.
- The exploration of **CRISPR-Cas9 gene** editing technologies in relation to lung cancer.
- Utilising new technologies to map out the immune hotspots of lung cancer tissue.