The state of global lung cancer research: 2004-2019

A report from the Global Lung Cancer Coalition and the Institute of Cancer Policy

July 2020

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Executive summary

Research saves lives. Scientific advances have led to improvements in the prevention, screening, diagnosis and treatment of lung cancer. But there is still much more that we need to understand if we are to save more lives from the most common and deadly cancer in the world.[1]

In 2014 the Global Lung Cancer Coalition (GLCC) commissioned the Institute of Cancer Policy (ICP) to examine the state of global lung cancer research. The study:[2]

- Identified the **top 24 countries publishing the most research** into lung cancer
- Analysed whether **research outputs had changed over time**
- Showed that **lung cancer research lagged behind both breast and colorectal cancers** in terms of the volume of papers published
- Demonstrated that **some aspects of the disease and its treatment were under-investigated,** such as screening, diagnostics and supportive and palliative care

A new 2020 study from the ICP revisits and updates the findings.[3] Encouragingly, it shows the volume of lung cancer papers published between 2004 and 2018 has increased. The proportion of overall global cancer research dedicated to lung cancer has also increased, though it still lags behind that dedicated to breast cancer. Every country in the top 24 has increased their research output. Some countries – notably China, South Korea, India and Brazil – have risen up the country rankings.

We publish this research at a significant moment. Lung cancer research is funded by many different private and public sources. However, the COVID-19 pandemic has meant Government and industry rapidly refocussing research budgets towards diagnostics, vaccines and treatments for coronavirus. Research charities and not-for-profit organisations are also feeling the shock; half of the GLCC's members have seen a decrease in income since the start of the pandemic.[4]

It is hard to imagine that COVID-19 will not have a profound impact on lung cancer research. But it is essential that lung cancer research budgets are protected as far as possible. **This study provides an important benchmark for pre-COVID-19 lung cancer research output, from which we will be able to judge impact in the coming years.**

The past decade has shown that research investment brings rewards. Advances have been made across the board in lung cancer – from improved screening and diagnostics, to surgical techniques and precision radiotherapy, to new targeted treatments and immunotherapies. These advances are saving lives from lung cancer.

The investments we make in lung cancer research today will make a difference for patients tomorrow. We call on all countries to protect and invest in lung cancer research.

[1] GLOBOCAN 2018, *Lung cancer fact sheet* http://gco.iarc.fr/today/data/factsheets/cancers/15-Lung-fact-sheet.pdf

[2] Aggarwal A, Lewison G, Idir S, et al. *The State of Lung Cancer Research: A Global Analysis,* Journal of Thoracic Oncology, available here: http://dx.doi.org/10.1016/j.jtho.2016.03.010

[3] Begum M, Urquhart I, Lewison G, et al. Research on Lung Cancer and its Funding, 2004-18, https://ecancer.org/en/journal/article/1132-research-on-lung-cancer-and-its-funding-2004-2018

[4] Global Lung Cancer Coalition, *Impact of COVID-19: findings from a GLCC members survey*, June 2020, available here: http://www.lungcancercoalition.org/news/189/21/Impact-of-COVID-19-findings-from-a-GLCC-members-survey.html

Methodology

The ICP investigators designed a complex validated mathematical bibliometric algorithm to:

- Identify the total number of papers in cancer research for each year and in 24 leading countries
- Isolate the number of papers referencing lung cancer or other relevant key words in their title

This allowed the ICP investigators to identify a total number of papers and their topic, and to interpret trends. The authors' research institutes were used to identify which country or countries had contributed to each paper.

Key findings

Who is doing lung cancer research?

The 24 countries responsible for the majority of lung cancer research are: Australia, Austria, Belgium, Brazil, Canada, China, Denmark, France, Germany, Greece, India, Italy, Japan, the Netherlands, Norway, Poland, South Korea, Spain, Sweden, Switzerland, Taiwan, Turkey, the UK, and the USA.

All countries in the top 24 have increased their research output between 2004 and 2018. Overall, the volume of published research has nearly tripled, rising from 12,508 papers between 2004 and 2008 to 35,720 papers published between 2014 and 2018 (figure 1).

Some countries have increased their research output substantially, rising up the country rankings (figure 2). China now heads the table with the most papers published in 2014-2018, up from sixth place in 2004-2008. China has multiplied its research output by twenty times, and now publishes 1.5 times as much research as the USA.

Several other countries have also risen up the table. South Korea has tripled its research output, rising four places from 8th place in 2004-2008 to 4th place in 2014-18. India has also leapt up the table, multiplying its research output by seven times, and moving from 20th place in 2004-2008 to 10th place in 2014-2018. Brazil more than tripled its research output, moving up three places, from 24th to 21st.

Although still increasing the volume of papers published, a number of countries have fallen back, including France (from 5th to 8th place), The Netherlands (12th to 15th place), Greece (14th to 17th place) and Belgium (15th to 18th place). Sweden has seen the largest fall in ranking, dropping five places from 18th to 23rd place, despite almost doubling its the volume of research from 65 papers to 124.

Figure 1: Volume of global lung cancer research output, 2004 to 2018

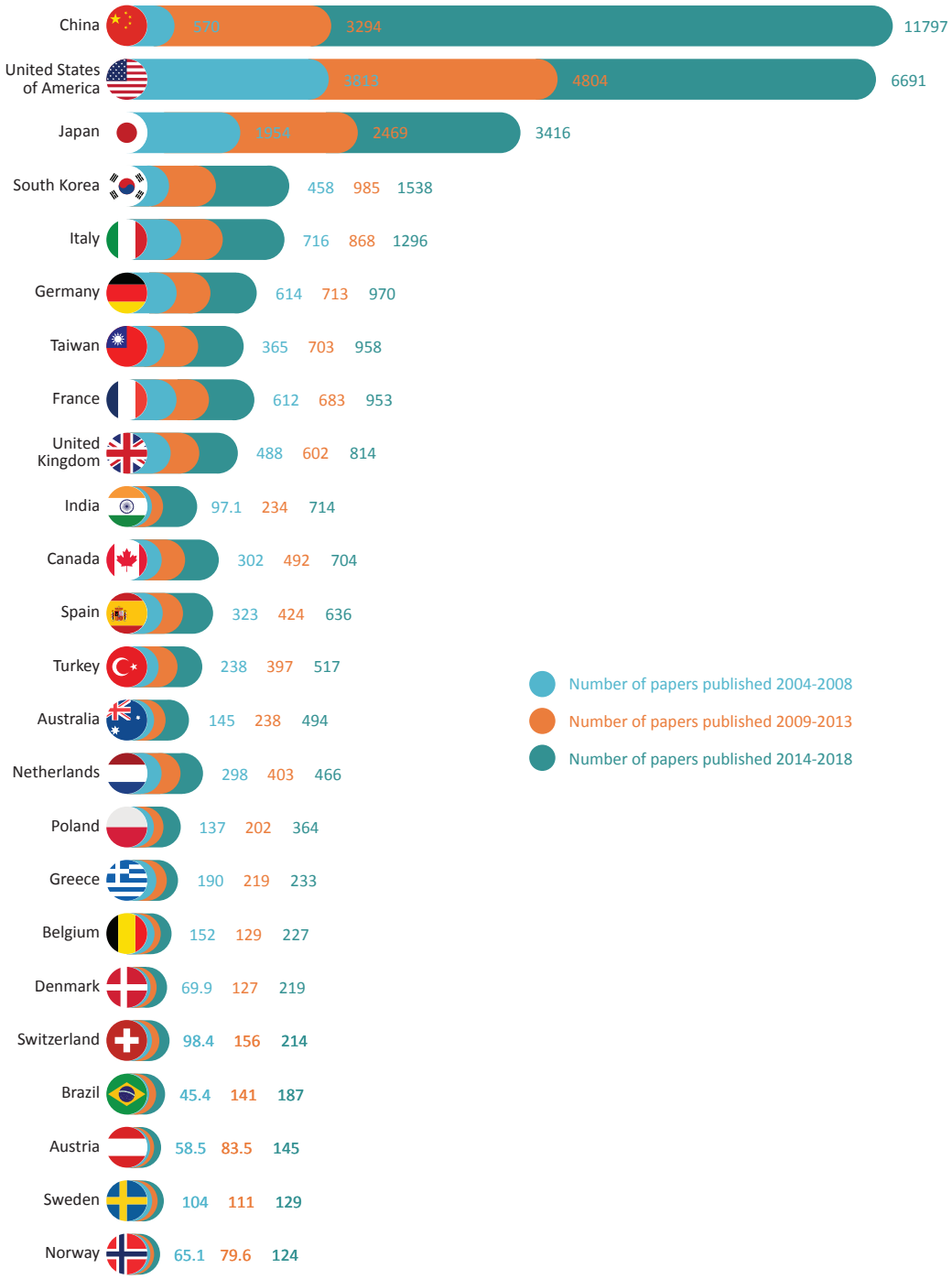


Figure 2: Volume of papers published by each country 2004-2018, and country ranking over time

Country	2004-2008	2009-2013	2014-2018	Country ranking, 2004-08	Country, ranking, 2009-13	Country ranking, 2014-18	Ranking change over decade
China	570	3,294	11,797	6	2	1	↑5
USA	3,813	4,804	6,691	1	1	2	↓1
Japan	1,954	2,469	3,416	2	3	3	↓1
South Korea	458	985	1,538	8	4	4	↑4
Italy	716	868	1,296	3	5	5	↓2
Germany	614	713	970	4	6	6	↓2
Taiwan	365	703	958	9	7	7	↑2
France	612	683	953	5	8	8	↓3
UK	488	602	814	7	9	9	↓2
India	97	234	714	20	15	10	↑10
Canada	302	492	704	11	10	11	→
Spain	323	424	636	10	11	12	↓2
Turkey	238	397	517	13	13	13	→
Australia	145	238	494	16	14	14	↑2
Netherlands	298	403	466	12	12	15	↓3
Poland	137	202	364	17	17	16	↑1
Greece	190	219	233	14	16	17	↓3
Belgium	152	129	227	15	20	18	↓3
Denmark	70	127	219	21	21	19	↑2
Switzerland	98	156	214	19	18	20	↓1
Brazil	45	141	187	24	19	21	↑3
Austria	59	84	145	23	23	22	↑1
Sweden	104	111	129	18	22	23	↓5
Norway	65	80	124	22	24	24	↓2
World	**12,508**	**19,654**	**35,720**				

How does research into lung cancer compare to other cancers?

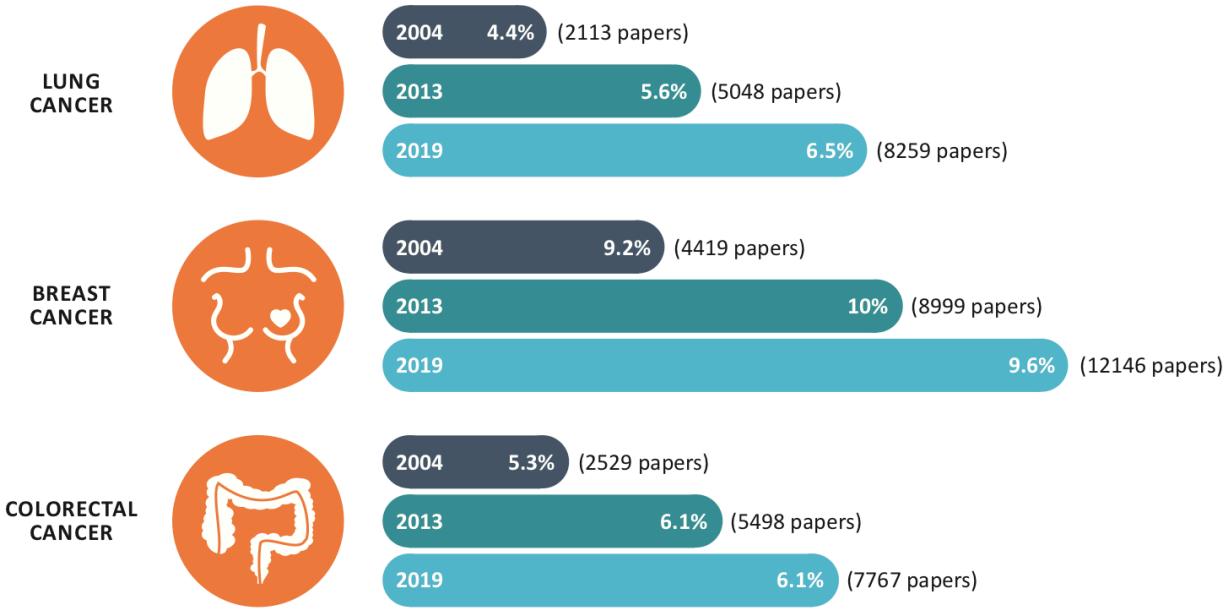
The ICP compared lung cancer to breast and colorectal cancers, which have a similar global burden of disease. The ICP's first analysis in 2014 showed that lung cancer lagged behind both breast and colorectal cancers in terms of volume of research and proportion of all cancer research dedicated to the disease.

The new study shows that, worldwide, the volume of all cancer research has risen by more than 2.5 times, from 47,989 papers published in 2004 to 126,473 papers published in 2019.

Within that, the number of lung cancer papers published nearly quadrupled, from 2,113 papers published in 2014 to 8,259 published in 2019. As a proportion of all global research, lung cancer has increased its share, from 4.4% in 2004 to 6.5% in 2019 (figure 4).

This means lung cancer has overtaken colorectal cancer, both in terms of number of published papers and proportion of all research. However, lung cancer still lags behind breast cancer in terms of the number of papers and proportion of global research dedicated to it.

Figure 3: Change in volume and proportion of research output on lung cancer, vs colorectal cancer vs breast cancer, 2004 to 2019



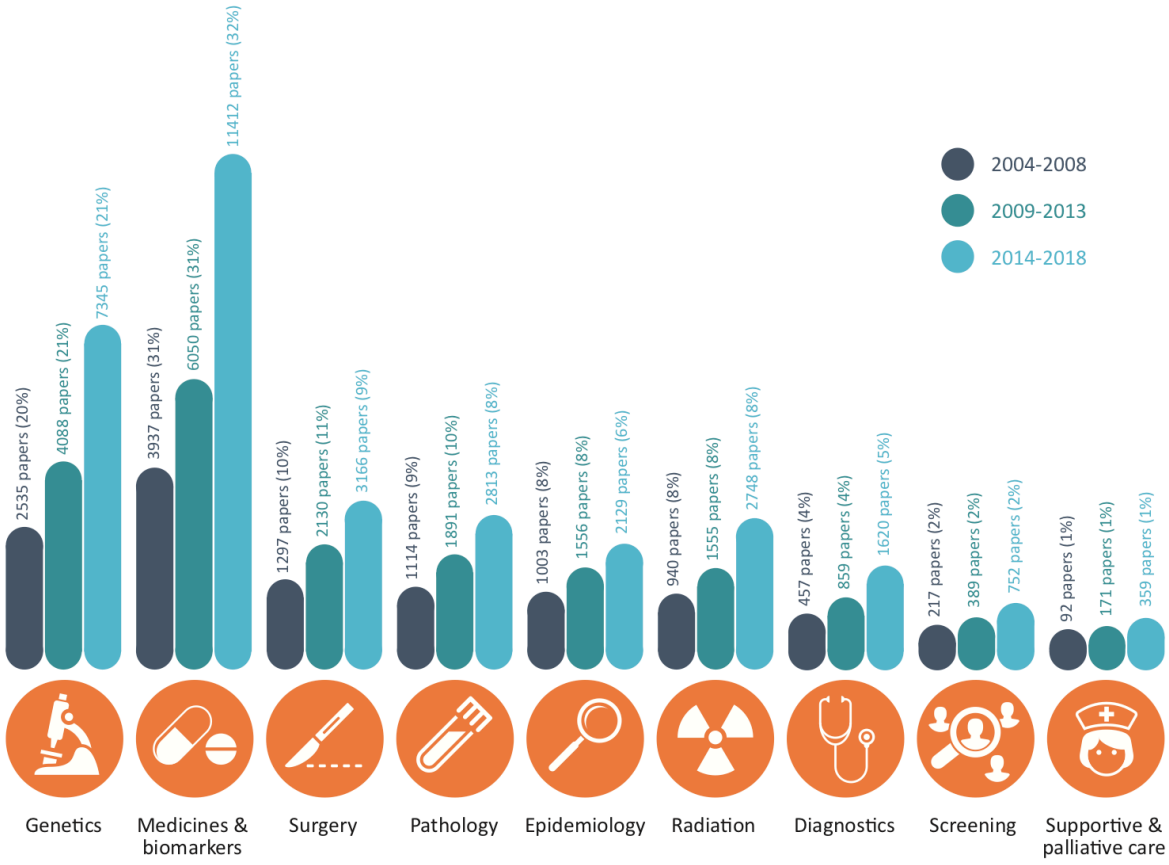
Which lung cancer topics are being researched?

The ICP investigators categorised the published papers by their topic. As set out in Figure 4, the number of papers published has increased in each topic area. However the proportion of research dedicated to each area remained relatively static.

The topic of medicines and biomarkers remains the most researched area, with 32% of papers published (11,412 papers) from 2014-2018.

Supportive and palliative care is still the least researched area, with 1% of research papers (359 papers) dedicated to it from 2014-2018. This is despite the fact that the majority of patients will require supportive care, given the poor survival rates in lung cancer. This area of research may be particularly vulnerable to any drop in income from research charities as a result of COVID-19.

Figure 4: Types of research undertaken by topic area, 2004-2008 to 2014-2018

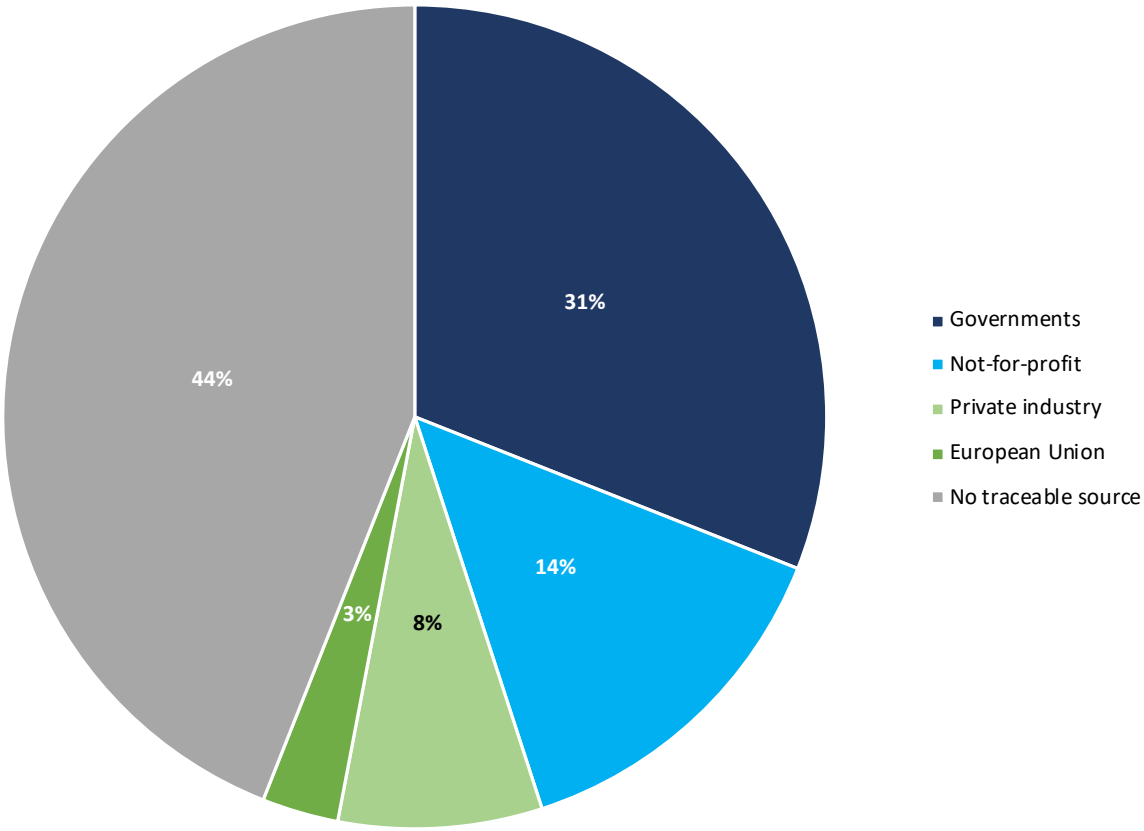


Who funds lung cancer research?

In 2018, the GLCC commissioned the ICP to examine the sources of lung cancer research funding.[5] Lung cancer research is funded by many different private and public sources. The funders can be broadly categorised into four groups: government funders; the European Union; private industry; not-for-profit organisations (including research charities).

The ICP investigators looked at papers published between 2009 and 2013. Of the 19,644 papers published in these five years, 56% (11,015) had some acknowledged source of funding. Of these, 31% of papers had funding attributable to governments, 14% to not-for-profits, 8% to private industry and 3% to the European Union (figure 5). Please note that this does not make any estimate of the size of spend, but purely the number of resulting papers:

Figure 5: Funding sources of global lung cancer research papers, 2009-2013



44% of papers published between 2009 and 2013 had no traceable funding source. It is likely that these are funded by individual research institutes or hospitals. If so, this could make the funding less sustainable for the long-term than having a fixed budget from a government, not-for-profit, or industry partner.

It is important that policy makers know who is funding the research undertaken in their country and the potential influence different funders can exert on that research. Funders will have varying interests, aims, budgets and expectations, that can have both positive and potentially negative effects on the direction and quality of lung cancer research undertaken.

[5] Begum M, Urquhart I, Lewison G, et al. Research on Lung Cancer and its Funding, 2004-18, https://ecancer.org/en/journal/article/1132-research-on-lung-cancer-and-its-funding-2004-2018

All research funders are likely to be affected by COVID-19, though the extent of the impact and the implications for lung cancer research are not yet clear:

- Government bodies, including the European Union, command large budgets which can, in normal times, be delivered reliably and sustainably over the long-term. Research into larger, population-based questions in lung cancer treatment, such as large population screening trials, demands significant budgets which, realistically, are only likely to be provided by national governments. **If government budgets are redeployed from cancer to COVID-19, the impact for lung cancer research will be profound.**

- Like governments, funding from private industry can also be significant in its scale. However, the scope and ambition of industry-funded research is geared towards identifying new targets for commercial treatments. This means that industry-funded research into cancer is more likely to skew toward chemotherapies and blood biomarkers. Industry is less likely to direct budget towards other important aspects of care that matter to patients, for example supportive and palliative care research. **Many global healthcare companies have moved rapidly to commit resources to the search for diagnostics, treatments and vaccines for COVID-19. These include companies with big cancer programmes; the impact for their R&D spend on cancer remains to be seen.**

- Not-for-profit organisations are another important research funder in lung cancer. They may choose to focus on specific issues in lung cancer neglected by other research, such as patient experience and quality of life. In some countries there are large not-for-profit organisations which have significant budgets to direct. However, the charitable sector is not well developed in all nations, and not all cancer charities will focus exclusively on lung cancer. Smaller charities may also be reliant on donor contributions, meaning that their ability to commit funding for major research programmes running over many years is more limited than government or industry funding bodies. **Early evidence from GLCC members demonstrates that COVID-19 has led to a drop in income for many.[6] This will likely affect the funds that research charities have to spend in future years.**

[6] Global Lung Cancer Coalition, *Impact of COVID-19: findings from a GLCC members survey*, June 2020, available here: http://www.lungcancercoalition.org/news/189/21/Impact-of-COVID-19-findings-from-a-GLCC-members-survey.html

Call to action

The Global Lung Cancer Coalition calls on all countries to protect and invest in lung cancer research.

We welcome the increase in research into lung cancer from 2004 to 2018. This investment has contributed to advances in treatment, care and survival for people with lung cancer. The investments we make in lung cancer research today will make a difference for patients tomorrow. It is essential that national governments:

1. **Protect and invest in lung cancer research programmes**
2. **Encourage industry to continue investing in lung cancer research**
3. **Support research charities, particularly those with a drop in income due to COVID-19**
4. **Publish research spend on lung cancer on an annual basis**
5. **Collaborate with global partners to share research findings to improve patient care**

Contact the partners

The Global Lung Cancer Coalition

The Global Lung Cancer Coalition (GLCC) is the international 'voice' of lung cancer patients. Established in 2001, the GLCC is a unique partnership of 40 non-governmental patient organisations from 29 nations: Argentina, Australia, Brazil, Bulgaria, Canada, Czech Republic, Denmark, Egypt, France, Germany, Ireland, Israel, Italy, Japan, Mexico, Netherlands, Norway, Peru, Portugal, Russia, Slovenia, South Africa, Spain, Sweden, Switzerland, Taiwan, Turkey, UK and USA.

The GLCC is dedicated to improving disease outcomes for all lung cancer patients worldwide. You can read more about our work on our website: **www.lungcancercoalition.org**

To contact our secretariat, please email: **glcc@roycastle.org**

Institute of Cancer Policy

The Institute of Cancer Policy (ICP) brings together a distinguished global faculty dedicated to policy to improve care, education and research in global cancer. Based at King's College, London and King's Health Partners, the ICP conducts research into some of the world's most important cancer public policy issues affecting the most vulnerable cancer patients. Collaborating through a network of local, national and global partners, the ICP's mission is to conduct high quality, critical cancer policy research to improve the lives and outcomes of all cancer patients, in all settings.

You can read more about their work on their website: **http://instituteofcancerpolicy.org**