The state of global lung cancer research 2004 to 2019: USA deep dive

Overview

Lung cancer has been the most common cancer in the world for several decades. Lung cancer is the most commonly occurring cancer in men and the third most commonly occurring cancer in women.[1] The American Cancer Society estimated around 228,000 new cases of lung cancer in 2020 (116,000 for men and 112,000 for women).[2] Research is essential to reduce the death toll from lung cancer and drive improvements in cancer prevention, screening, diagnosis and treatments.[3]

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:[4]

- Identified the **top 24 countries publishing the most research** into lung cancer: the USA was then ranked number 1, with the largest volume of papers published
- 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.[5] Encouragingly, every country in the top 24 has increased their research output. This briefing sets out the key findings for the USA, now ranked as number 2 in the world in terms of volume of papers published.

However, these findings are published at a significant moment, with the COVID-19 pandemic meaning that many research budgets are being refocussed. It is hard to imagine that COVID-19 will not have a profound impact on lung cancer research, but it is essential that budgets are protected as far as possible.

The Global Lung Cancer Coalition is calling 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 all national governments:

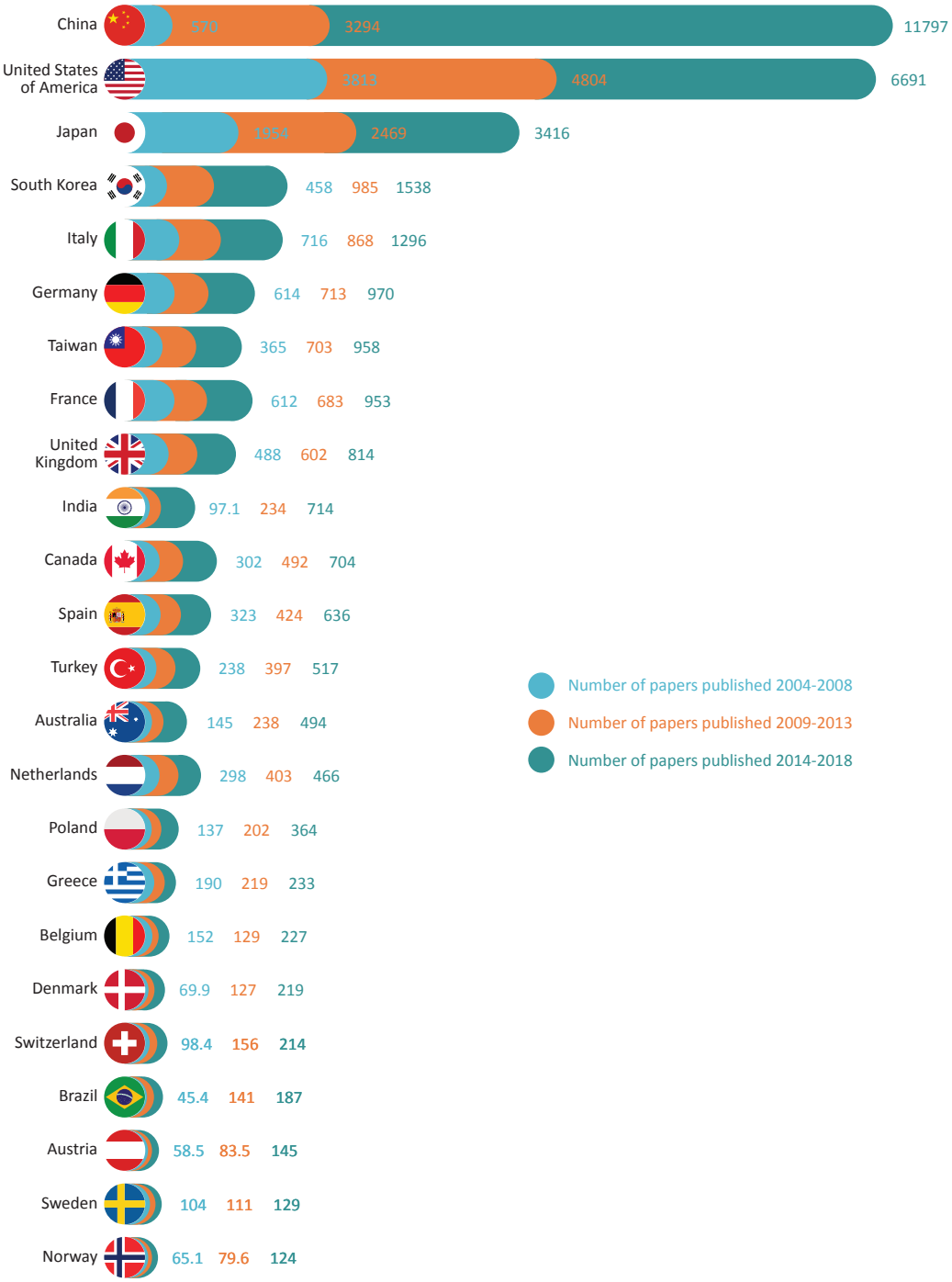
1. **Protect and invest in lung cancer research programmes**
2. **Encourage industry to continue investing in lung cancer research**
3. **Support research charities, particularly those with a drop in income due to COVID-19**
4. **Publish research spend on lung cancer on an annual basis**
5. **Collaborate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

How has research output changed globally and in the USA?

All countries in the top 24 responsible for the majority of lung cancer research 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.

The USA is now ranked number 2 in the top 24 in terms of lung cancer research output, having been overtaken by China.

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



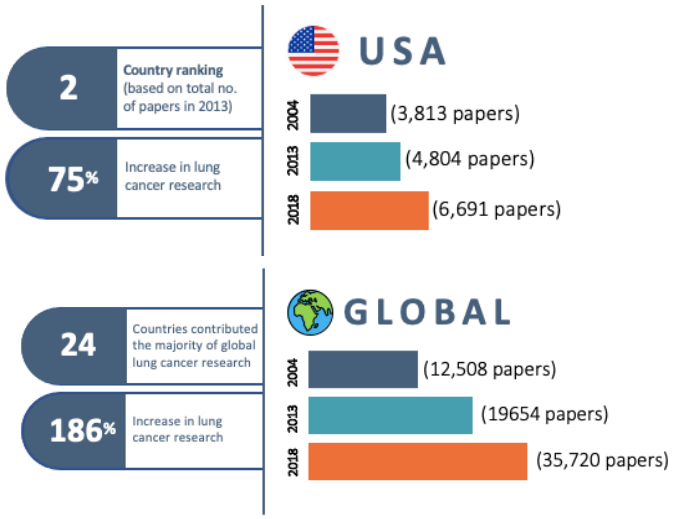
The table below shows the breakdown of papers published by each country over time and ranks each country by the volume of papers published. Between 2014 – 2018, the USA published 6,691 papers compared to 3,813 between 2004-2008.

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**				

A comparison of the USA's increase in lung cancer research output to that in global research output can be seen in Figure 3 below:

Figure 3: Comparing USA lung cancer research output to global output



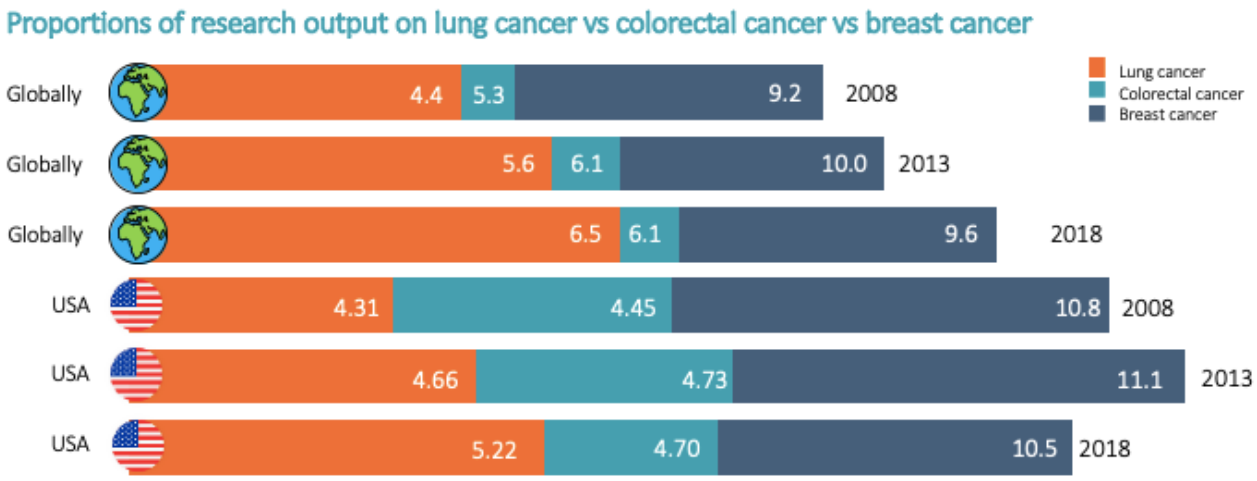
How does research into lung cancer in the USA compare to research into other cancers?

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.

Globally, lung cancer has overtaken colorectal cancer, in terms of number of published papers and proportion of all research dedicated to it. However, it still lags behind breast cancer. The same is true for the USA, as set out in figure 4 below:

Figure 4: Change in volume and proportion of research output on lung cancer, vs colorectal cancer and breast cancer, 2004 to 2018

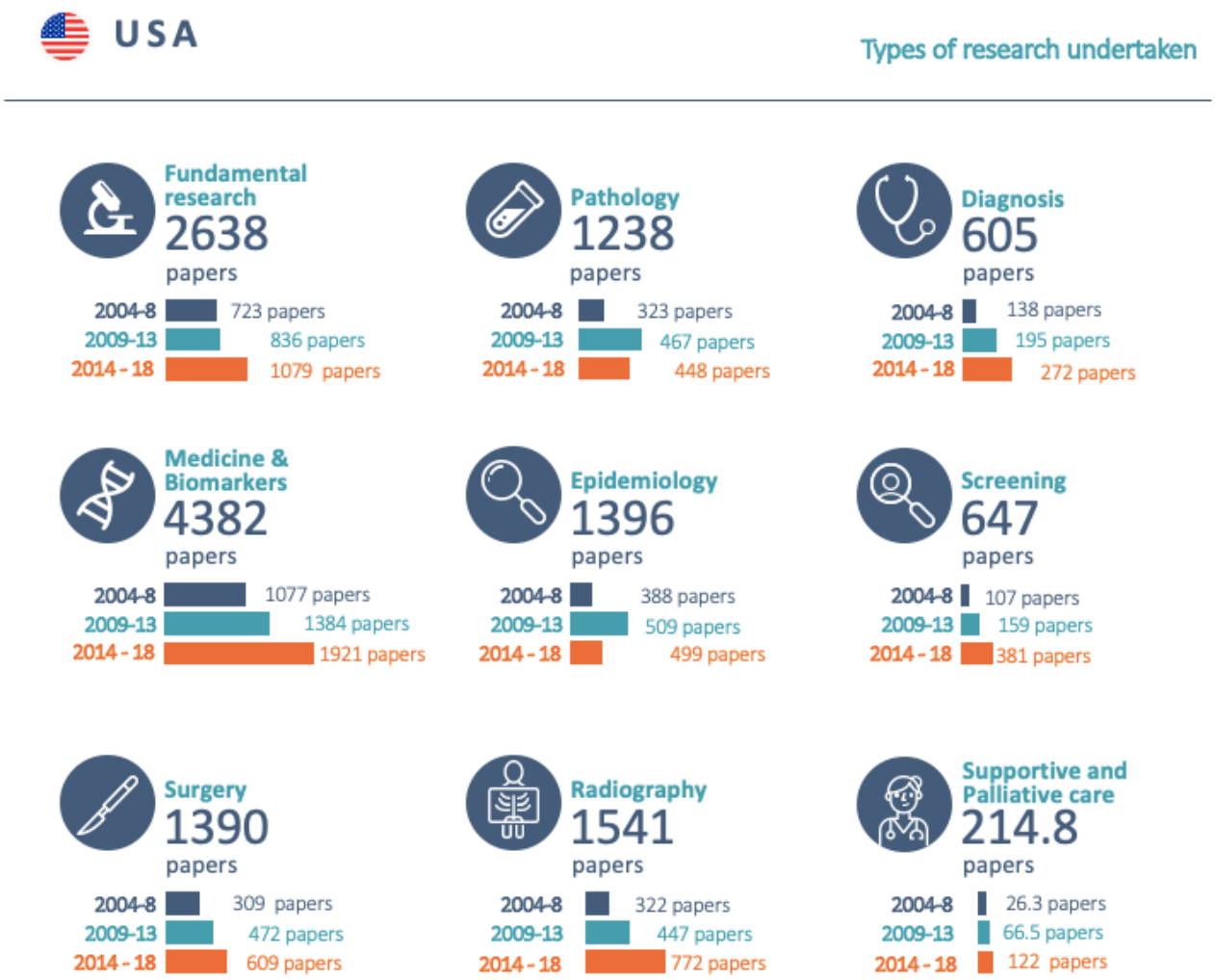


What lung cancer topics are being researched in the USA?

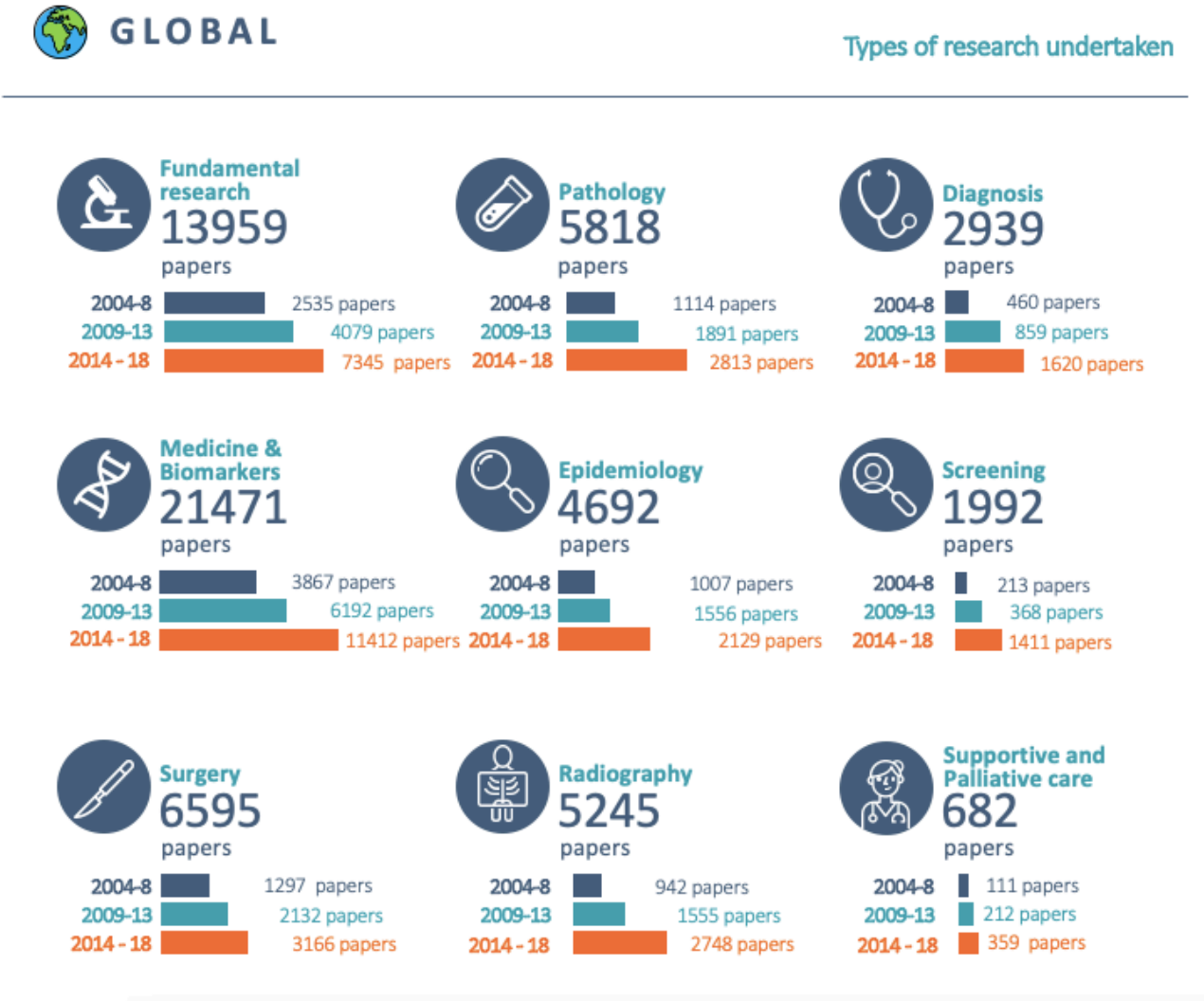
The ICP investigators categorised the published papers by their topic. Although the number of papers published has increased in each topic area, the proportions remained relatively static.

Globally, the topic of medicines and biomarkers remains the most researched topic, with 32% of papers published (11,412 papers) from 2014-2018. This is also the most researched topic in the USA, with 4382 papers published (figure 5):

Figure 5: Types of research undertaken



Globally, supportive and palliative care is still the least researched area, with 1% of research papers (359 papers) dedicated to it from 2014-2018. In the USA, just 214.8 papers were published on supportive and palliative care. 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.



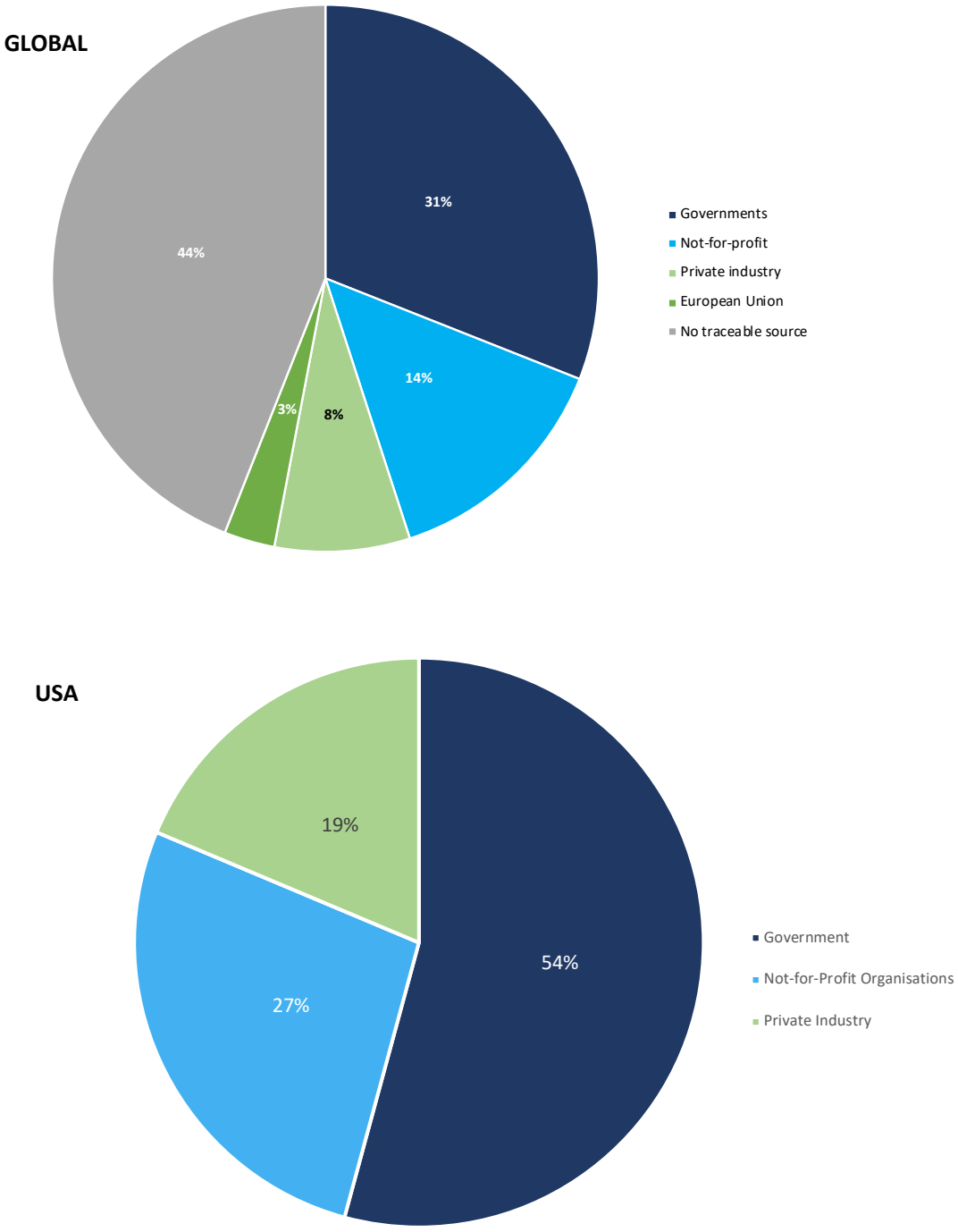
Who funds lung cancer research, globally and in the USA?

The ICP investigators also considered where the funding for lung cancer research came from. The funders can be broadly categorised into four groups: government funders; the European Union for EU countries; 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.
In the USA, the majority of funding came from Government with 54% of all research funded through this route. Not-for-profits and private industry made up for 27% and 19% respectively.

A comparison of the global and USA funding patterns is set out in figure 6. Please note that this does not make any estimate of the size of spend, but purely the number of resulting papers:

Figure 6: Funding sources of global and USA lung cancer research papers, 2009-2018



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.

With the arrival of the COVID-19 pandemic, the GLCC is concerned that:

- If government budgets are redeployed from cancer to COVID-19, the impact for lung cancer research will be profound. Government bodies command large budgets which can, in normal times, be delivered reliably and sustainably.

- Many global healthcare companies have moved rapidly to commit resources to the search for diagnostics, treatments and vaccines for COVID-19, including companies with big cancer programmes. The impact for their R&D spend on cancer remains to be seen.

- Early evidence from GLCC members demonstrates that COVID-19 has led to a drop in income for many not-for-profit organisations, [6] which are another important research funder. This will likely affect the funds that research charities have to spend in future years.

About the partners and contact information

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 at: www.lungcancercoalition.org

The GLCC's members from the USA are:

- CancerCare
- GO2 Foundation for Lung Cancer
- Lung Cancer Research Foundation
- Prevent Cancer Foundation

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

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 issue 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 the ICP's work at: http://instituteofcancerpolicy.org

References

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[2] American Cancer Society, Key Statistics for Lung Cancer (2020), available here: https://www.cancer.org/cancer/lung-cancer/about/key-statistics.html#:~:text=The%20American%20Cancer%20Society's%20estimates,men%20and%2063%2C220%20in%20women)

[3] Yarden Y, Carols C, on behalf of the European Association for Cancer Research, *Basic cancer research: why it is essential for the future of cancer therapy.* European Journal of Cancer 2013, 49 issue 12. Accessed June 2015

[4] 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

[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

[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