SCIENTIFIC FORUM
NUCLEAR SCIENCE FOR HEALTH

Benefits of upscaling access to imaging and nuclear medicine

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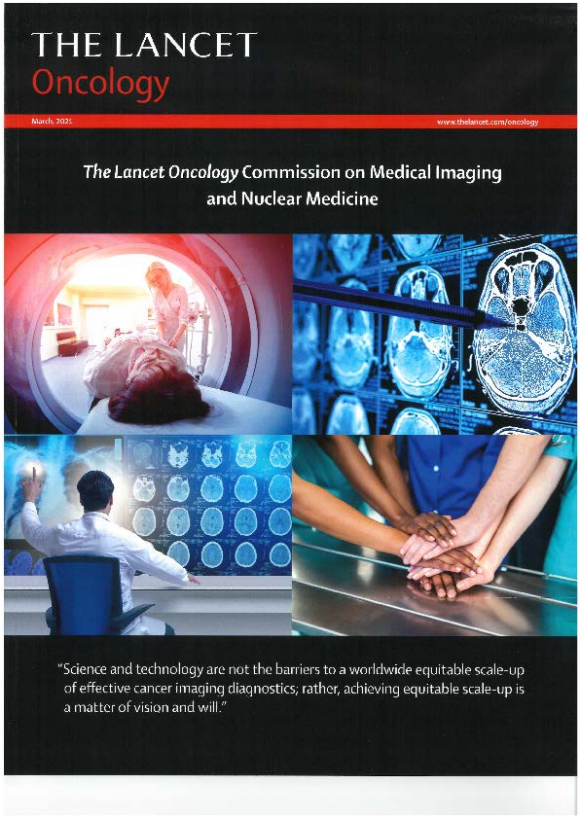

The Lancet Oncology Commission

Medical imaging and nuclear medicine: a *Lancet Oncology* Commission

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The diagnosis and treatment of patients with cancer requires access to imaging to ensure accurate management decisions and optimal outcomes. Our global assessment of imaging and nuclear medicine resources identified substantial shortages in equipment and workforce, particularly in low-income and middle-income countries (LMICs). A microsimulation model of 11 cancers showed that the scale-up of imaging would avert 3·2% (2·46 million) of all 76·0 million deaths caused by the modelled cancers worldwide between 2020 and 2030, saving 54·92 million life-years. A comprehensive scale-up of imaging, treatment, and care quality would avert 9·55 million (12·5%) of all cancer deaths caused by the modelled cancers worldwide, saving 232·30 million life-years. Scale-up of imaging would cost US$6·84 billion in 2020–30 but yield lifetime productivity gains of $1·23 trillion worldwide, a net return of $179·19 per $1 invested. Combining the scale-up of imaging, treatment, and quality of care would provide a net benefit of $2·66 trillion and a net return of $12·43 per $1 invested. With the use of a conservative approach regarding human capital, the scale-up of imaging alone would provide a net benefit of $209·46 billion and net return of $31·61 per $1 invested. With comprehensive scale-up, the worldwide net benefit using the human capital approach is $340·42 billion and the return per dollar invested is $2·46. These improved health and economic outcomes hold true across all geographical regions. We propose actions and investments that would enhance access to imaging equipment, workforce capacity, digital technology, radiopharmaceuticals, and research and training programmes in LMICs, to produce massive health and economic benefits and reduce the burden of cancer globally.

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https://www.thelancet.com/commissions/medical-imaging-nuclear-medicine

The aim of the commission was to provide data and guidance to act as a catalyst for sustainable change in medical imaging and nuclear medicine for cancer management

1. Global data collection on equipment and workforce (focus on LMICs) .
2. Microsimulation model: estimate cancer mortality which can be averted by upscaling imaging in combination with treatment
3. Investment case
4. Outline actions toward realizing the health and economic benefits of upscaling medical imaging and nuclear medicine to reduce the global burden of cancer.

Major Data Sources for IMAGINE

International Atomic Energy Agency (IAEA)	62.09%
World Health Organization (WHO)	9.48%
Professional Societies or Non-State Actors**	4.32%
Scientific publications	4.16%
COCIR*	4.00%
OECD***	2.95%
Pan-American Health Organization (PAHO)	2.74%
Eurostat	2.69%
Official bodies/authorities	2.42%
Non-IAEA scientists/experts	1.79%
International Society of Radiology (ISR)	1.63%
Congresses and/or Conferences	1.21%
Health and country articles in the press	0.37%
Market reports	0.16%

*COCIR is the European trade association of medical imaging, radiotherapy, health ICT, and electromedical industries.
**COCIR and the ISR have been considered separately from the Professional Societies or Non-State Actors category as each independently contributed >1% data in IMAGINE.
***OECD is the Organization for Economic Co-operation and Development.

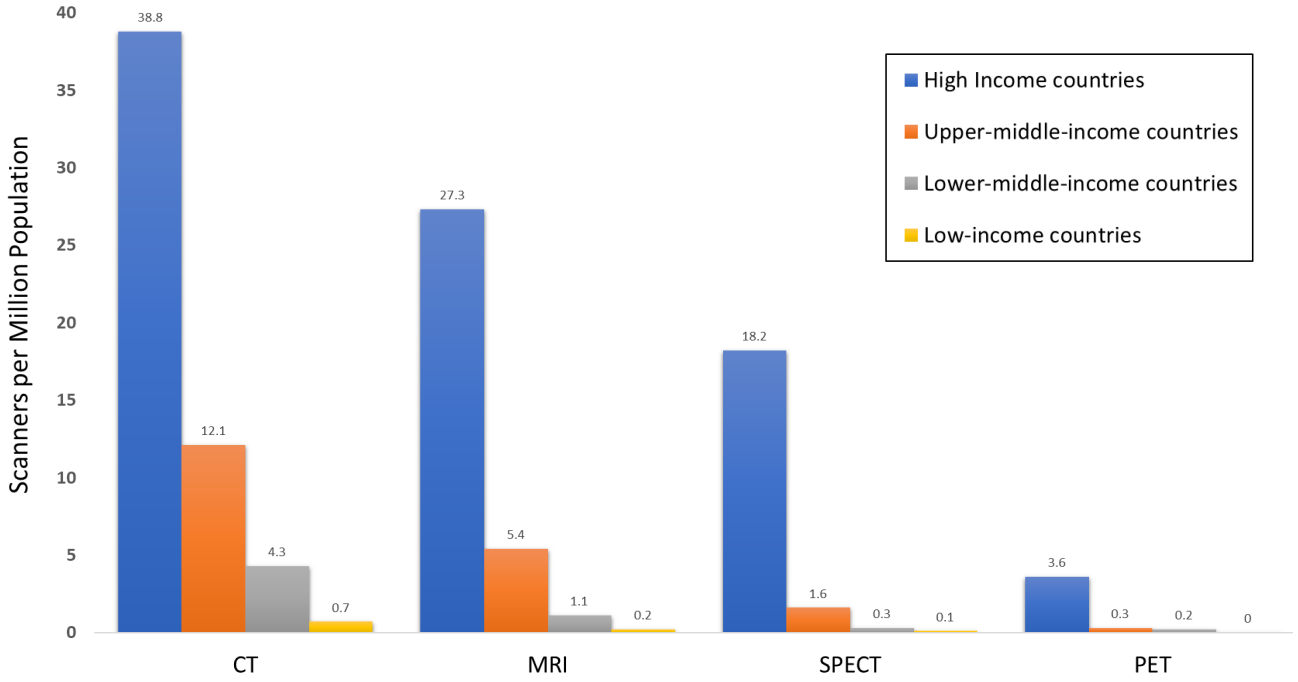
iMAGiNE
IAEA Medical Imaging and Nuclear Medicine Global Resources Database
IAEA

IAEA data collection started on
Nuclear Medicine 2006 (NUMDAB)
Radiology 2014 (IMAGINE)

https://humanhealth.iaea.org/HHW/DBStatistics/IMAGINE.html

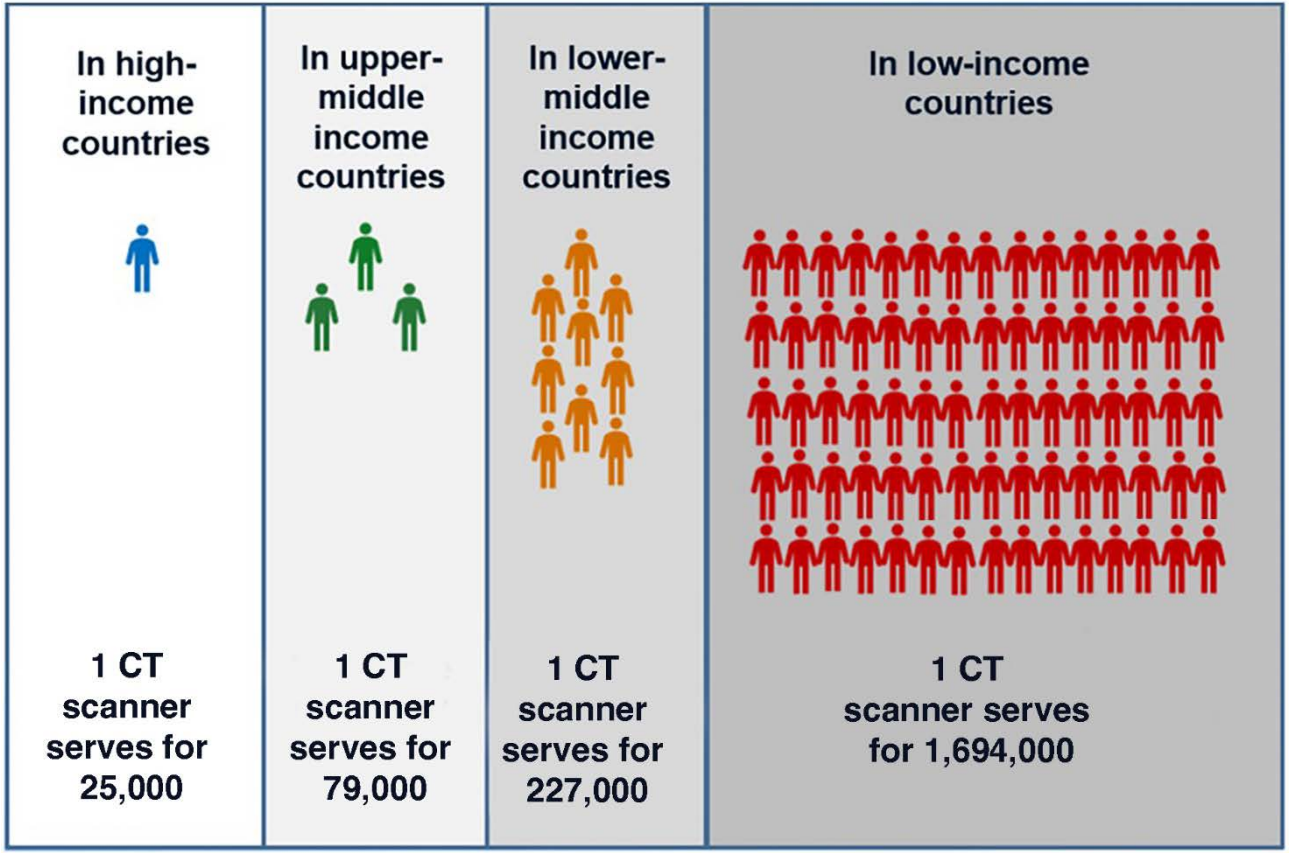
Equipment and Workforce for Medical Imaging and Nuclear Medicine

- detailed information on equipment and workforce in 200 countries established (IAEA IMAGINE database)
- substantial differences found in numbers of scanners per million population between high and low- and middle-income countries
- variations also exist between countries in each income groups



GNI per capita: Low < $1045; Low middle $1,046 - $4,095; Upper middle $4,096 - $12,695; High > $12,696

https://humanhealth.iaea.org/HHW/DBStatistics/IMAGINE.html


In high-income countries
1 CT scanner serves for 25,000
In upper-middle income countries
1 CT scanner serves for 79,000
In lower-middle income countries
1 CT scanner serves for 227,000
In low-income countries
1 CT scanner serves for 1,694,000

Impact of Medical Imaging and Nuclear Medicine on Cancer Survival

Patients diagnosed with **one of 11 common cancers** from 2020-2030:

Cancer Deaths

PROJECTED — AVERTED

With No Scale-Up:	Scale-up of Treatment & Quality of Care:	With Imaging Added:
76M	5.4M	9.6M

Lancet Oncol 2021; 22: 341–50

Return on investment for a comprehensive scale-up of treatment, imaging, and quality of care in LMICs

$1 = **$6.15**

Scale-up of only Treatment & Quality of Care

$12.43

Scale-up of Treatment, Quality of Care & IMAGING

Economic Costs and Benefits from 2020-2030 for 11 Modelled Cancers

	Incremental cancer treatment costs (2020–30), US$ billion (95% UI)		Lifetime return on investment: full income (95% UI)		
	Difference	Percentage increase	Productivity gains, US$ billion	Net benefit, US$ billion	Return per US$ invested
Global					
Imaging only	6·84 (1·77–15·86)	0·2% (0·1–0·3)	1226·21 (540·05–2161·8)	1219·37 (535·47 to 2157·29)	179·19 (84·71–625·09)
Treatment only	50·72 (14·92–111·88)	1·5% (0·8–2·4)	1183·24 (504·9–2206·54)	1132·51 (489·13 to 2114·69)	23·33 (12·40–60·40)
Quality of care only	169·17 (61·73–302·53)	5·0% (4·7–5·7)	136·75 (13·31–469·15)	−32·42 (−237·28 to 285·24)	0·81 (0·08–3·61)
Treatment plus quality of care	225·50 (83·87–408·34)	6·7% (5·7–7·8)	1386·07 (726·42–2342·19)	1160·56 (484·04 to 2053·7)	6·15 (2·66–16·71)
Traditional* plus CT plus quality of care	198·56 (78·47–357·58)	5·9% (5·3–7·0)	1302·58 (649·69–2619·3)	1104·01 (458·58 to 2367·68)	6·56 (2·81–17·83)
Comprehensive	232·88 (85·92–421·97)	6·9% (6·0–8·0)	2894·41 (1794·55–4025·16)	2661·54 (1631·20 to 3775·64)	12·43 (6·47–33·23)
High-income countries					
Imaging only	2·22 (0·25–6·64)	0·1% (0·0–0·2)	286·40 (78·23–761·73)	284·18 (77·9 to 757·19)	128·86 (67·81–480·88)
Treatment only	16·29 (2·63–41·08)	0·6% (0·2–1·0)	273·20 (91·72–537·19)	256·91 (81·96 to 502·44)	16·77 (8·34–61·05)
Quality of care only	144·73 (52·22–260·20)	5·2% (5·0–5·4)	37·89 (0·02–204·28)	−106·85 (−240·28 to 54·13)	0·26 (0·00–1·54)
Treatment plus quality of care	162·40 (58·15–291·05)	5·8% (5·4–6·3)	311·51 (120·33–581·47)	149·11 (−85·18 to 429·55)	1·92 (0·65–6·11)
Traditional* plus CT plus quality of care	148·97 (54·24–265·06)	5·3% (5·1–5·7)	198·94 (61·12–508·28)	49·96 (−151·78 to 374·44)	1·34 (0·32–4·93)
Comprehensive	164·78 (58·45–296·55)	5·9% (5·4–6·4)	610·24 (338·86–1080·65)	445·46 (135·09 to 898·39)	3·70 (1·61–10·57)

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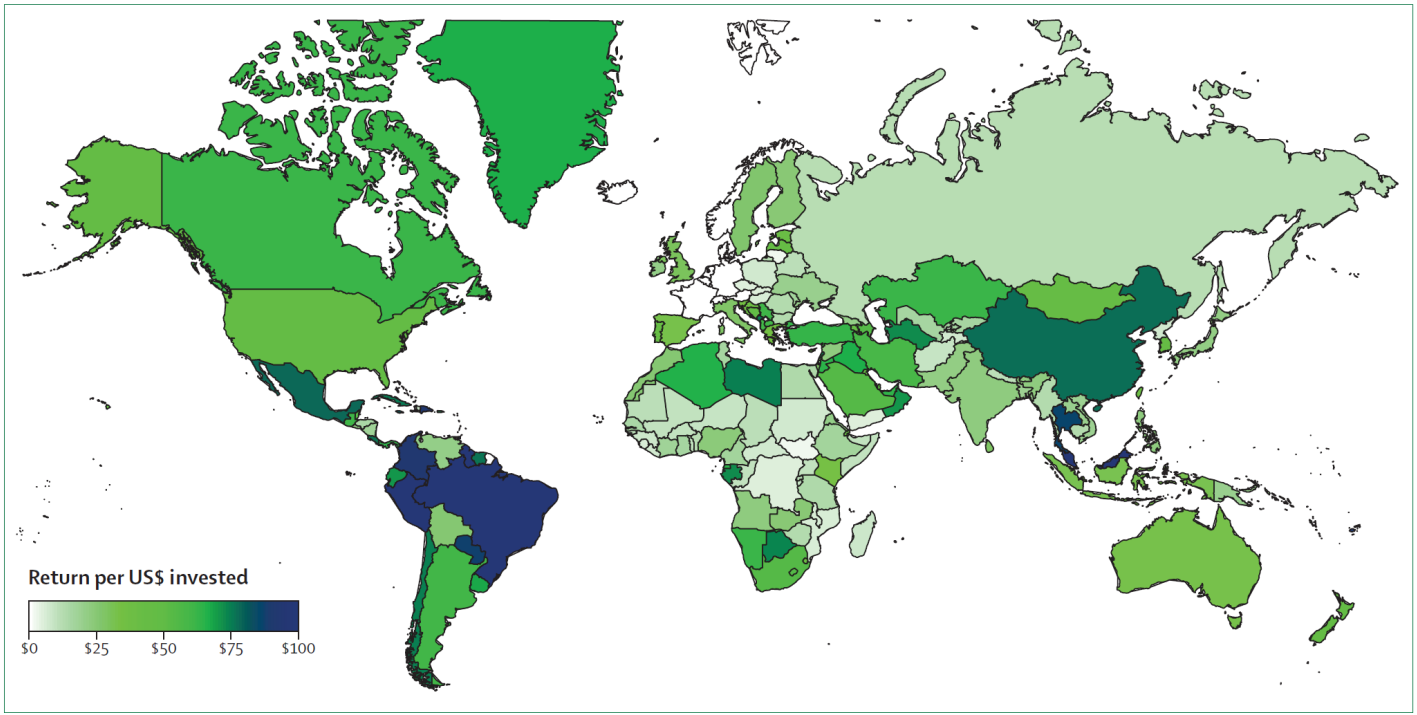
Estimated Return on Investment (2020-2030)



Comprehensive scale-up of imaging, treatment and quality of care