International Atomic Energy Agency Scientific Forum

A Decade of Action on **Cancer Control** and the Way Forward

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Atoms for Peace and Development

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The Economic Impact of Cancer

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General considerations

over 18 million new cases of cancer

9.5 million cancer related deaths

Education

Tobacco Interventions

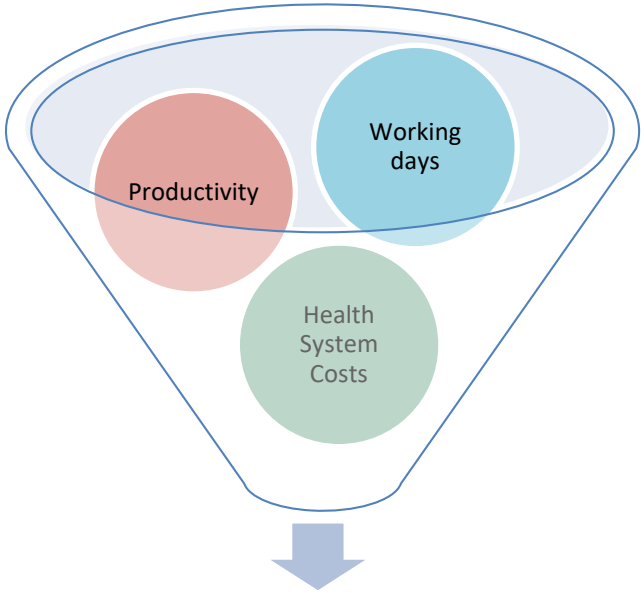
Preventative measures

Vaccinations

Screening

- New cancer cases each year is projected to rise globally by 45% before 2030- greatest increase likely in low- and middle-income countries.
- Epidemiological transition: more chronic, or non-communicable, diseases- from increased life spans as a result of improved health care and disease prevention.
- Non-communicable diseases + communicable diseases = 'double burden' of disease in many LMICs- Challenges health, poverty, equality, and sustainable development.
- Death and disability from lung cancer, colorectal cancer, and breast cancer account for the largest economic costs on a global scale. In low income countries, cancers of the mouth and throat, cervix, and breast have the greatest impact, especially in low- and middle-income countries where the loss of income due to sickness or death can quickly undermine family finances.

- In high-income regions such as the EU, 15% of social welfare system costs and 20% of health systems costs go toward cancer care.
- Productivity costs due to premature cancer-related mortality in the EU fall €42.6 billion a year and lost working days amount to €9.43 billion a year.
- Developing countries consume only 5% of cytotoxic drugs, with the remaining 90% being sold in richer nations, where 39% of global cancer occurs.



Large economic impact

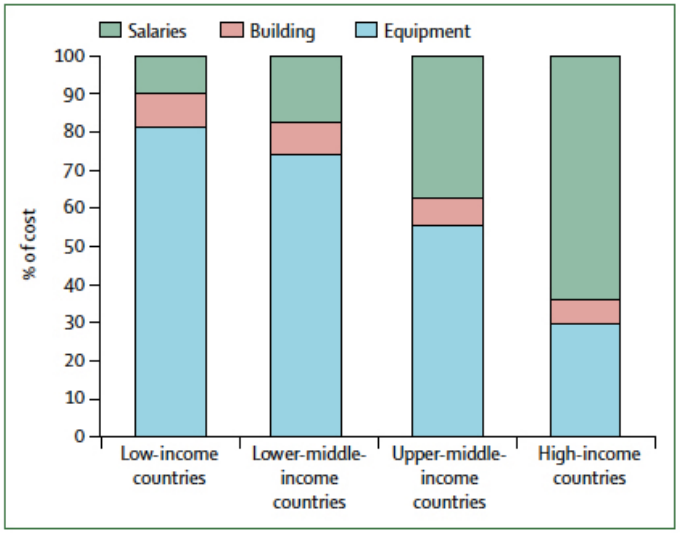
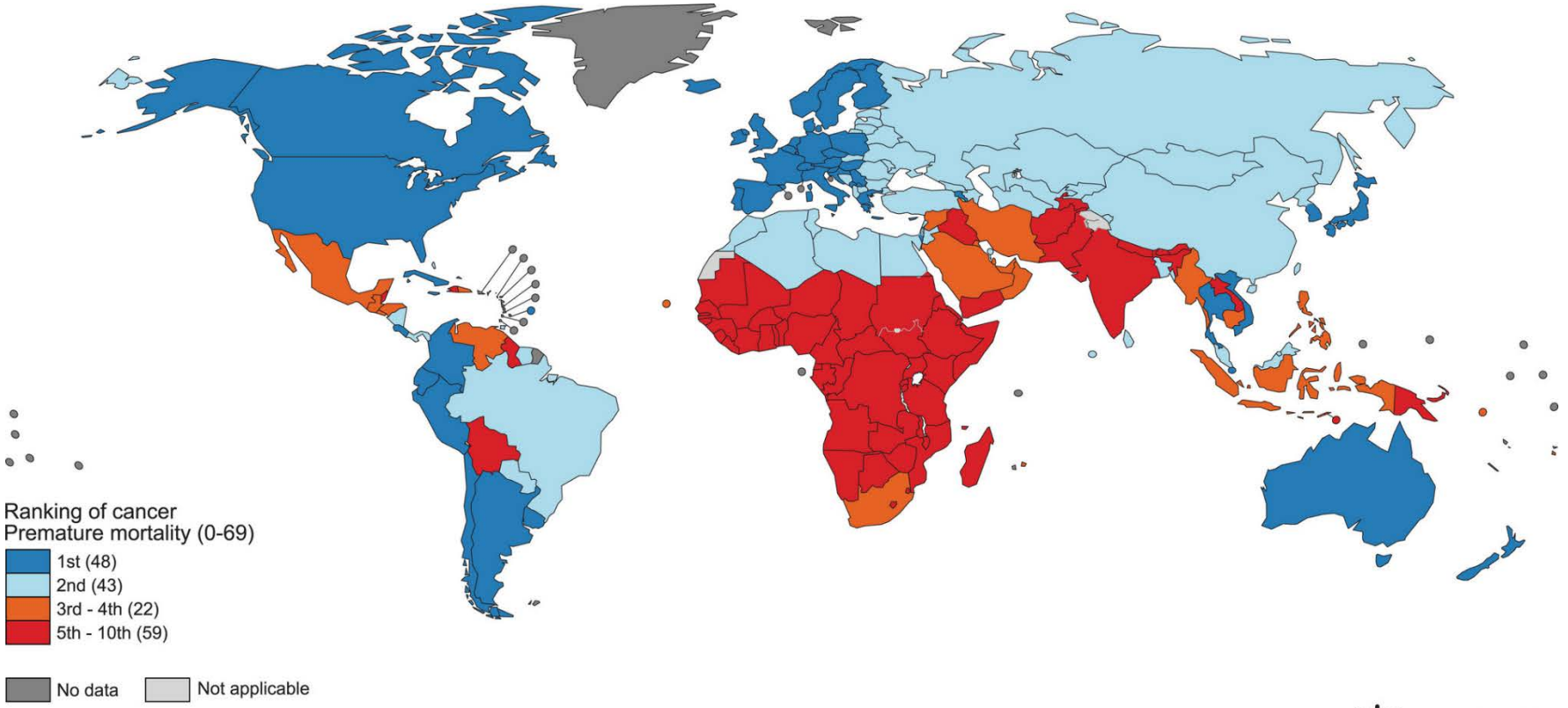


Figure 8: Cost breakdown for salaries, buildings, and equipment needed for radiotherapy, by gross-national-income region

- It is interesting to see how capital and human resources varies by income regions. In high-income countries total operating costs for a health system were divided between 30% for equipment, 6% for facilities, and 64% for salaries.
- Whereas, in low-income countries these were 81% for equipment, 9% for facilities, and 10% for salaries (Expanding global access to radiotherapy, Lancet Oncol. 2015 Sep;16(10):1153-86).

Premature Mortality due to Cancer Worldwide



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data source: GHO
Map production: CSU
World Health Organization

World Health Organization

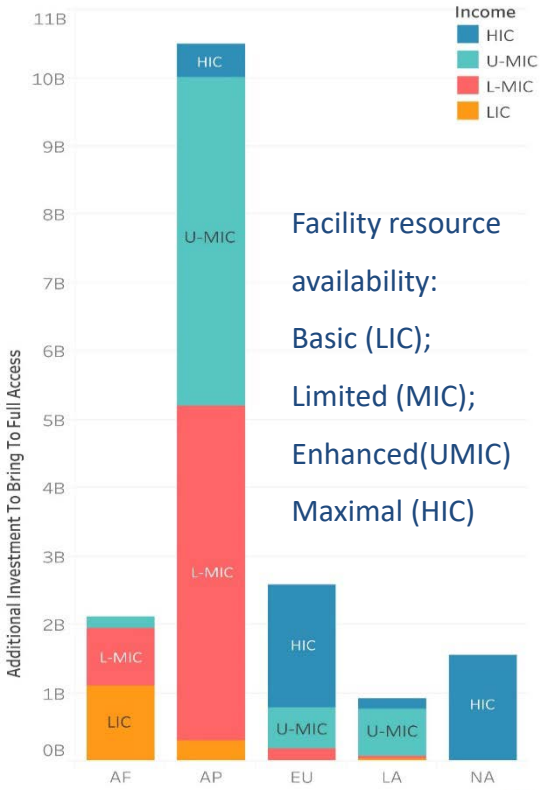
CA: A Cancer Journal for Clinicians, Volume: 68, Issue: 6, Pages: 394-424, First published: 12 September 2018, DOI: (10.3322/caac.21492)

Approximately 70% of deaths from cancer occur in low- and middle-income countries.

Summary of actual status and total needs to provide full access to radiotherapy in the different regions of the world

	Africa	Asia Pacific	Europe	Latin America	North America
Population and courses					
Population (million)	1070	4108	893	601	350
Actual radiotherapy courses	148 600	1 914 454	1 712 000	503 000	934 746
Total radiotherapy courses	437 624	3 277 387	1 884 893	573 385	934 746
Resources					
Actual radiotherapy centres	140	2585	1431	620	2787
Total radiotherapy centres needed for full access (working 12 h/day)	407	3503	1449	624	1200
Actual megavoltage machines	277	3894	3751	968	4243
Percentage cobalt machines	30.0%	19.8%	16.0%	30.1%	3.6%
Total megavoltage machines needed for full access (working 12 h/day)	813	6406	4098	1106	2175
Actual coverage of the needs	34%	61%	92%	88%	195%
Costs					
Capital + training costs needed to bring to full access (million US$)	2118	10 497	2573	918	1558
Actual operational costs/year (million US$)	182	4638	5868	975	6151
Total operational costs/year (million US$), assuming full access	571	6968	6573	1192	6588
Actual cost per radiotherapy course (US$)	1226	2423	3428	1939	6581
Total cost per radiotherapy course (US$), assuming full access	1306	2126	3487	2079	7048

Additional investment per geographical region



Facility resource availability:

Basic (LIC);

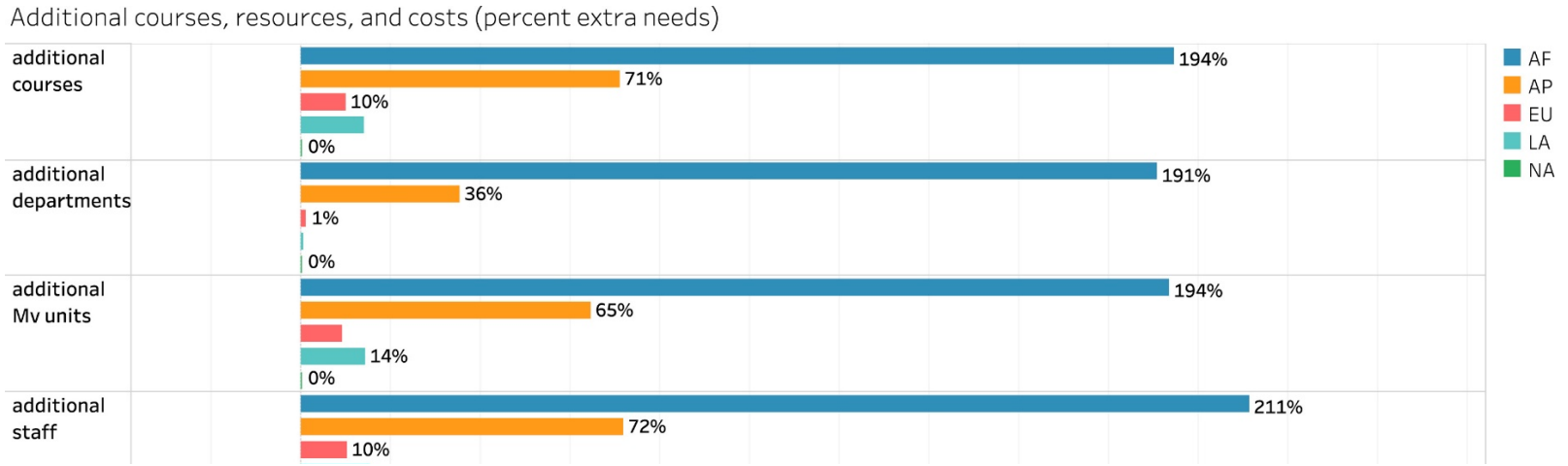
Limited (MIC);

Enhanced(UMIC)

Maximal (HIC)

Analysis of Global Radiotherapy Needs and Costs by Geographic Region and Income Level, *Clinical Oncology* 2017 29, 84-92
DOI: (10.1016/j.clon.2016.11.011)

Summary of actual status and total needs to provide full access to radiotherapy in the different regions of the world



Return on investment

	Low-income countries		Lower-middle-income countries		Upper-middle-income countries	
	Nominal	Efficiency	Nominal	Efficiency	Nominal	Efficiency
Net monetary benefit (US$, billions)						
Human-capital approach	−14·9	−2·4	−18·7	10·7	50·5	95·9
Full-income approach	0·265	12·8	38·5	67·7	239·3	284·7
Return on investment (US$, billions)						
Human-capital approach	−0·56	−0·17	−0·3	0·32	0·53	1·94
Full-income approach	0·01	0·91	0·62	2·03	2·52	5·77

Net monetary benefit=cost of investment−economic return. Return on investment=net monetary benefit/ cost of investment. Costing models are described in the text and include both operational and capital costs.

***Table 6*: Cost and benefits of investments to scale up radiotherapy services in low-income and middle-income countries, 2015–35**

Clinical Oncology 2017 29, 84-92DOI: (10.1016/j.clon.2016.11.011)
Expanding global access to radiotherapy, Lancet Oncol. 2015 Sep;16(10):1153-86

Nuclear Medicine Alleviating the Burden

Prevention → Screening → Diagnosis → Staging → Response prediction → Therapy → Response assessment

Quality of cancer care and health outcomes depend on:

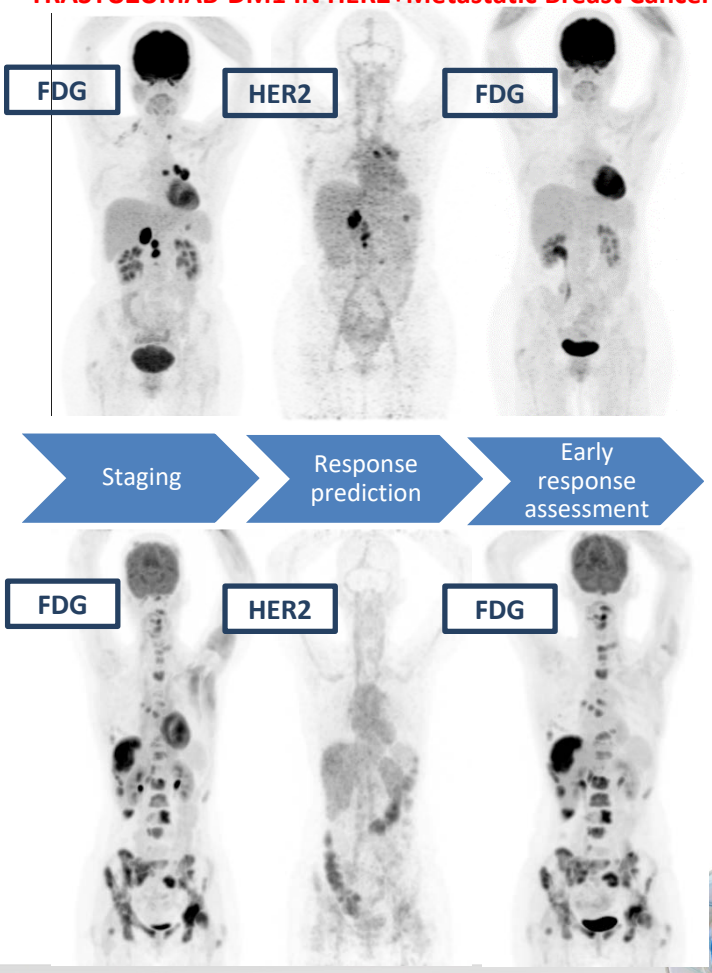
- medical professionals
- imaging facilities
- surgical facilities
- pathology
- laboratory services
- public/private health insurance

PET/CT:

- Over 5,200 combined PET/CT systems in operation worldwide- detecting early cancer presentations providing accurate diagnostics, therapy, and follow-up data.

- Early diagnosis, adequate staging, response prediction, treatment and response assessment using nuclear technology helps to improve overall prognosis, and therefore helps with related costs.

ZEPHIR TRIAL:
TRASTUZUMAB-DM1 IN HER2+Metastatic Breast Cancer



Gebhart G. et al, Ann Oncol. 2016 Apr;27(4):619-24

Thera(g)nostics with ^{68}Ga-/ ^{177}Lu-PSMA

Response prediction → Therapy → Response assessment

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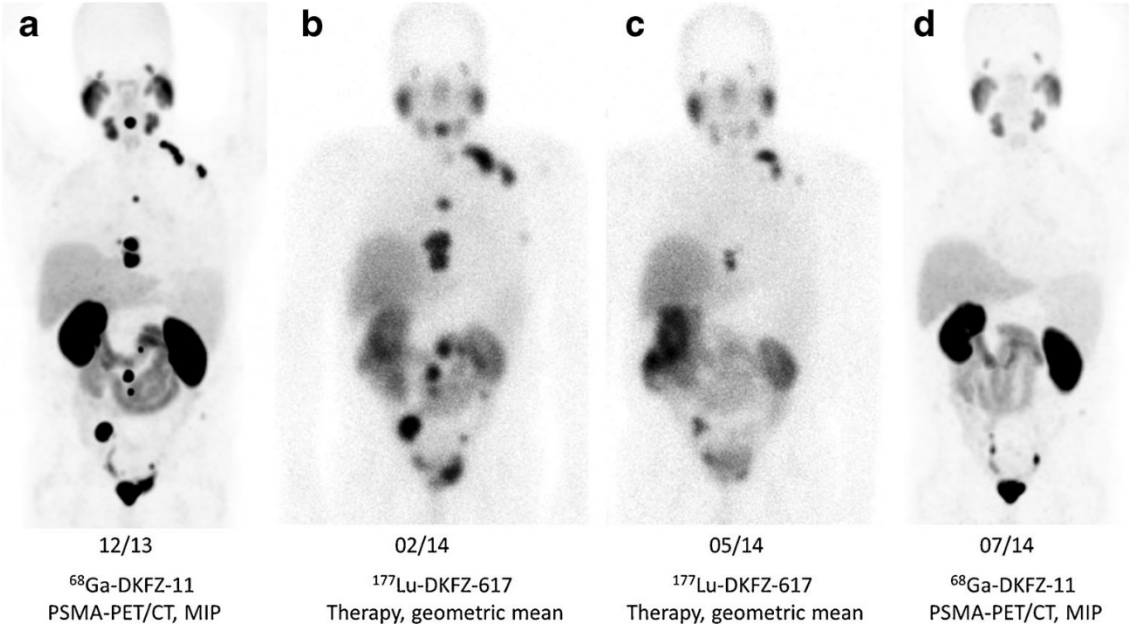


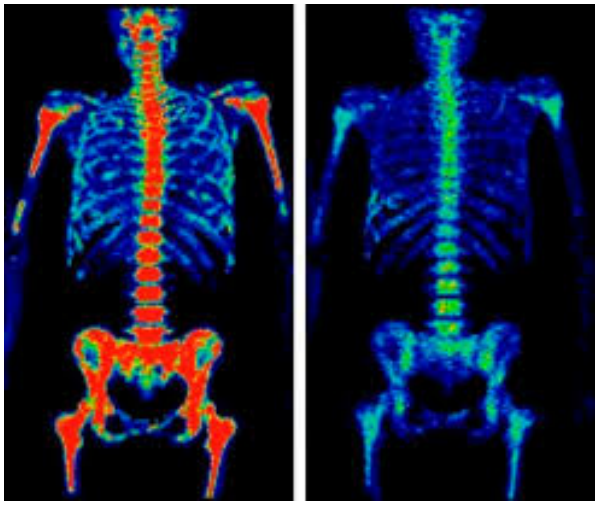
Kratochwil et al, EJNM, 2015

Potential economical impact of Nuclear Medicine on cancer management

Diagnosis → Staging → Response prediction → Therapy → Response assessment

- avoid unnecessary toxicity and costs by better / upfront selection of patients
- provide efficient and well tolerated therapeutic options
- In-house production / labelling > reduction of costs

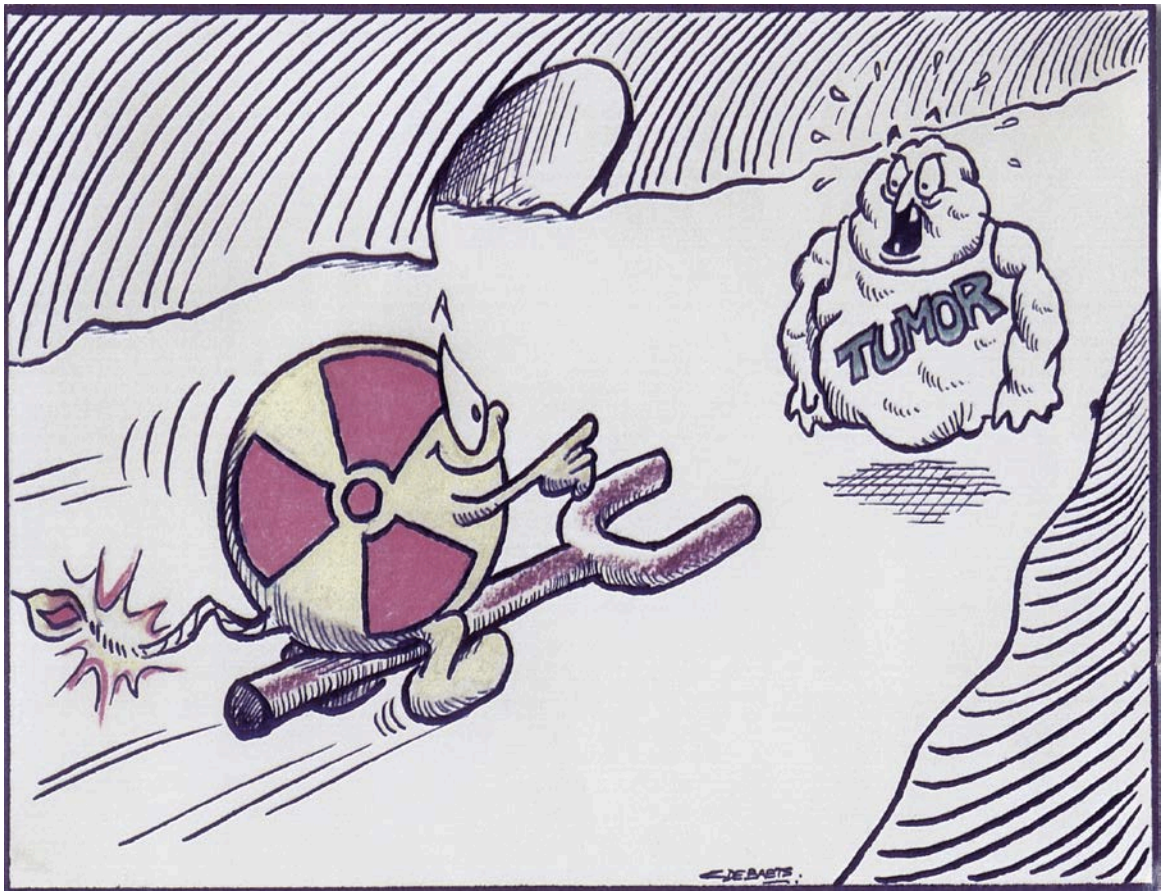
The Economic Case for Investing in Cancer Control



- Preventable cancers: changing behaviours or controlling cancer-associated infections.
- Cancers with unknown causes: the only effective control comes from early detection and treatment.
- Good health policy- priorities identified, investments made to make maximum health gains
- Cost-effectiveness analysis provides guidelines

- Facility resource availability: Basic (preponderance in LIC); Limited (MIC); Enhanced (UMIC); Maximal (HIC)
- Appropriately allocated funding in services such as nuclear medicine and radiotherapy allows for greater cancer control and subsequently fewer financial consequences to health systems and individuals.

Atoms for Health



Thanks