SCIENTIFIC FORUM
NUCLEAR SCIENCE FOR HEALTH

# Role of Radiotherapy in Treating Cancer

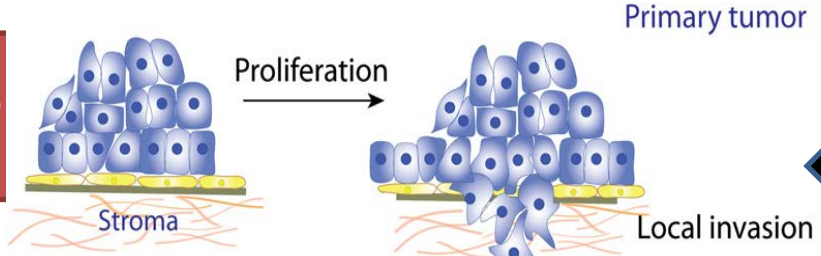

Soehartati A. Gondhowiardjo, MD, PhD

Professor, Senior Medical Staff, Radiotherapy Department Cipto Mangunkusumo Hospital,
Faculty of Medicine Universitas Indonesia


2022

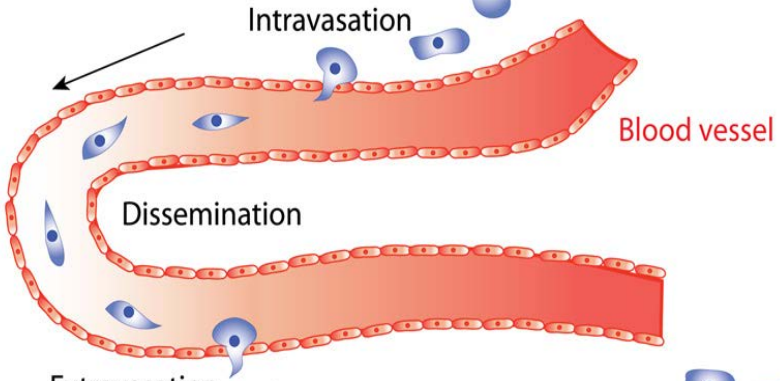
# What is Cancer?

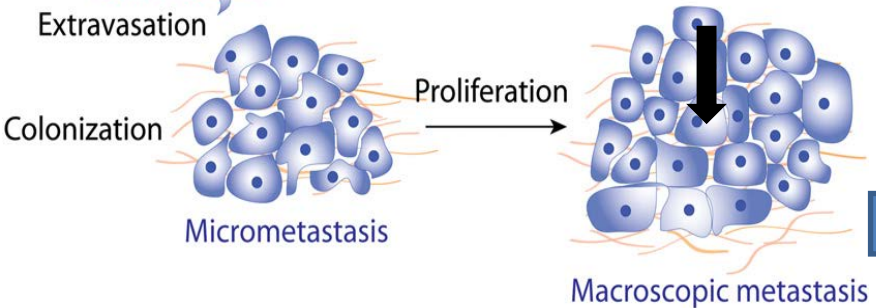
**What is Cancer?**

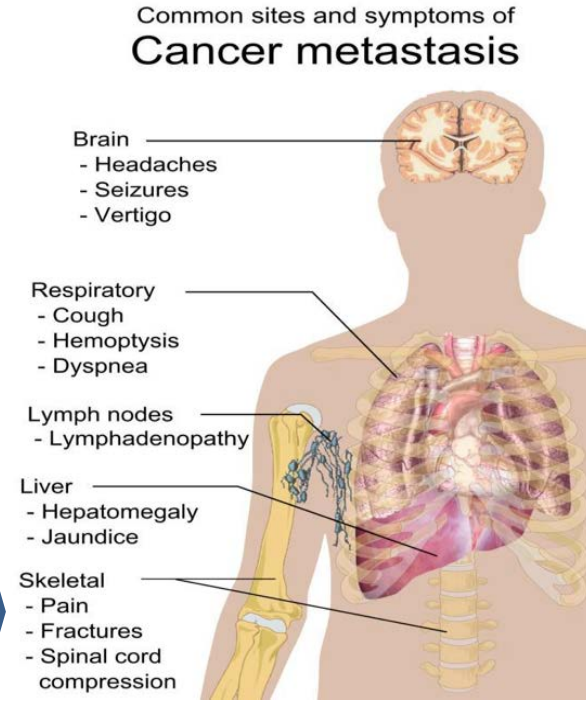



Nucleus

Membrane



SCIENTIFIC FORUM
NUCLEAR SCIENCE FOR HEALTH

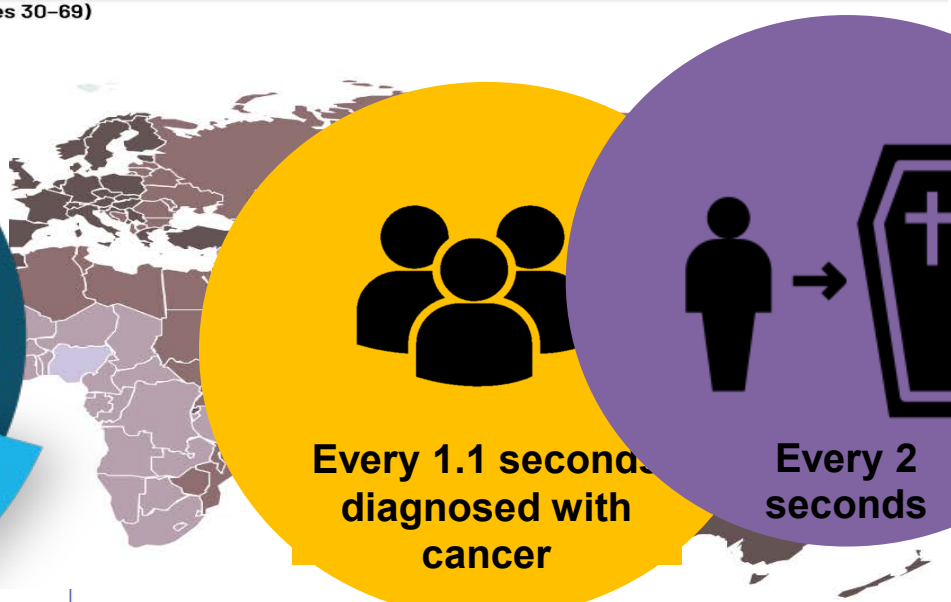
# Cancer is getting close to us? Is it true?

## The global cancer burden is significant and increasing





**Cancer ranks as the first or second leading cause of premature death (among those 30-69 years of age) in 134 countries of the world.**




**Only 5% of global spending on cancer goes to LMICs.**

:/;2018

SCIENTIFIC FORUM
NUCLEAR SCIENCE FOR HEALTH

# We share the Common Goals..

A blueprint to achieve a better and more sustainable future life for all – created by 2015 by UN general assembly


**400 million**

At least 400 million people have no basic healthcare, and 40 percent lack social protection.

**2 seconds**

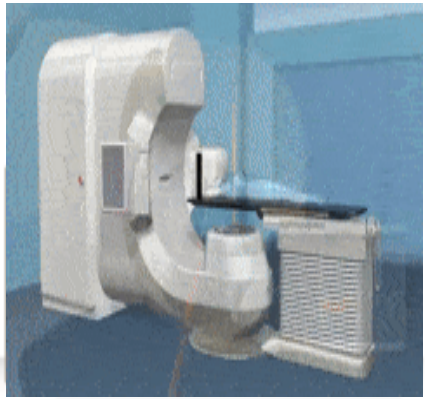
Every 2 seconds someone aged 30 to 70 years dies prematurely from noncommunicable diseases - cardiovascular disease, chronic respiratory disease, diabetes or cancer.


## REDUCE MORTALITY FROM NON-COMMUNICABLE DISEASES AND PROMOTE MENTAL HEALTH

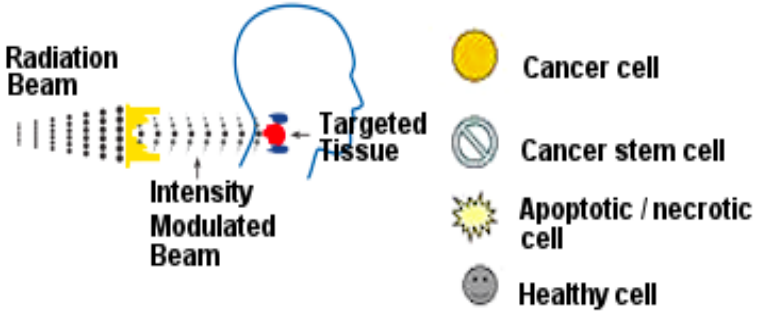
By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being.

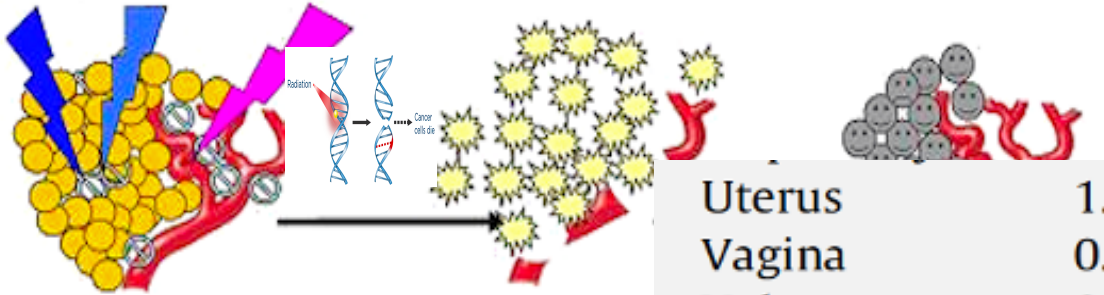
# What Is Radiation Therapy

**Around 50% cancer patients need radiation treatment**



Radiation beam (IMRT or IMPT)




Tumor volume prior to radiation therapy

Tumor volume po radiation treatme

Optimal radiotherapy utilisation rate and number of fractions.

| Cancer site | Proportion of all cancers in Australia (%) | Optimal radiotherapy utilisation (%) | Optimal number of fractions per cancer patient | Optimal number of fractions per treatment course |
|---|---|---|---|---|
| Bladder | 2.0 | 47 | 4.9 | 10.4 |
| Brain | 1.4 | 80 | 23.3 | 29.1 |
| Breast | 12.2 | 87 | 14.3 | 16.4 |
| Cervix | 1.0 | 71 | 15 | 21.1 |
| Colon | 8.4 | 4 | 0.1 | 2.5 |
| Gallbladder | 0.6 | 17 | 4.1 | 24.1 |
| Head and neck | 3.3 | 74 | 20 | 27.0 |
| Kidney | 2.3 | 15 | 0.3 | 2.0 |
| Leukaemia | 2.3 | 4 | 0.3 | 7.5 |
| Liver | 1.2 | 0 | 0 | – |
| Lung | 9.0 | 78 | 12.1 | 15.5 |
| Lymphoma | 4.2 | 73 | 10.4 | 14.2 |
| Melanoma | 9.9 | 21 | 3.9 | 18.6 |
| Myeloma | 1.2 | 45 | 1.6 | 3.6 |
| Oesophagus | 1.2 | 71 | 10 | 14.1 |
| Uterus | 1.8 | 32 | | 7.1 |
| Vagina | 0.1 | 94 | | 20.7 |
| Vulva | 0.3 | 39 | | 9.4 |
| Other | 5.0 | 19 | | 3.5 |
| Total | 100.0 | 48.4 | | 9.4 |

Nguyen GH, Murph MM, Chang JY. Cancer stem cell radioresistance and enrichment: where frontline radiation therap
Widel M. Radionuclides in radiation-induced bystander effect; may it share in radionuclide therapy? Neoplasma. 2017;
Wong K, Delaney GP, Barton MB. Evidence-based optimal number of radiotherapy fractions for cancer: A useful tool t

Radiotherapy is a key component of effective cancer treatment

Contents lists available at ScienceDirect

Clinical Oncology

journal homepage: www.clinicaloncologyonline.net

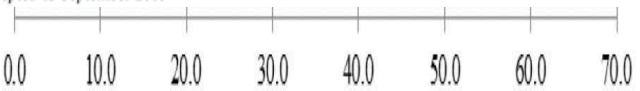
Editorial

# Radiotherapy in Low- and Middle-income Countries. What Can We Do Differently?

M.B. Barton *, E. Zubizarreta †, M. Gospodarowicz ‡

* Collaboration for Cancer Outcomes Research and Evaluation, Ingham Institute for Applied Medical Research, UNSW Australia, Liverpool, NSW, Australia
† Applied Radiation Biology and Radiotherapy Section, Division of Human Health – Department of Nuclear Sciences and Applications, International Atomic Energy Agency, PO Box 100, 1400 Vienna, Austria
‡ Department of Radiation Oncology, Princess Margaret Hospital, Toronto, Ontario, Canada

Received 9 September 2016; accepted 15 September 2016




i Ling Yap and Michael
ton, Ingham Institute
Applied Medical
search, University of
w South Wales
stralia, Liverpool, New

## Access to Radiotherapy Services: e Made Progress During the Past ?

**Need to close the gaps!**

**Essential part of cancer treatment!**

**27 million lives could be saved (2015-2035) in LMIC US$278 billion net economic benefit !**

Radiotherapy is an important cancer treatment in the curative and palliative setting. We aimed to estimate

Materials and Methods Cancer incidences for 27 cancer types in 184 countries were extracted from the International Agency for Research on Cancer GLOBOCAN database. The Collaboration for Cancer Outcomes Research and Evaluation radiotherapy utilization rate (RTU) model was used to estimate the number of

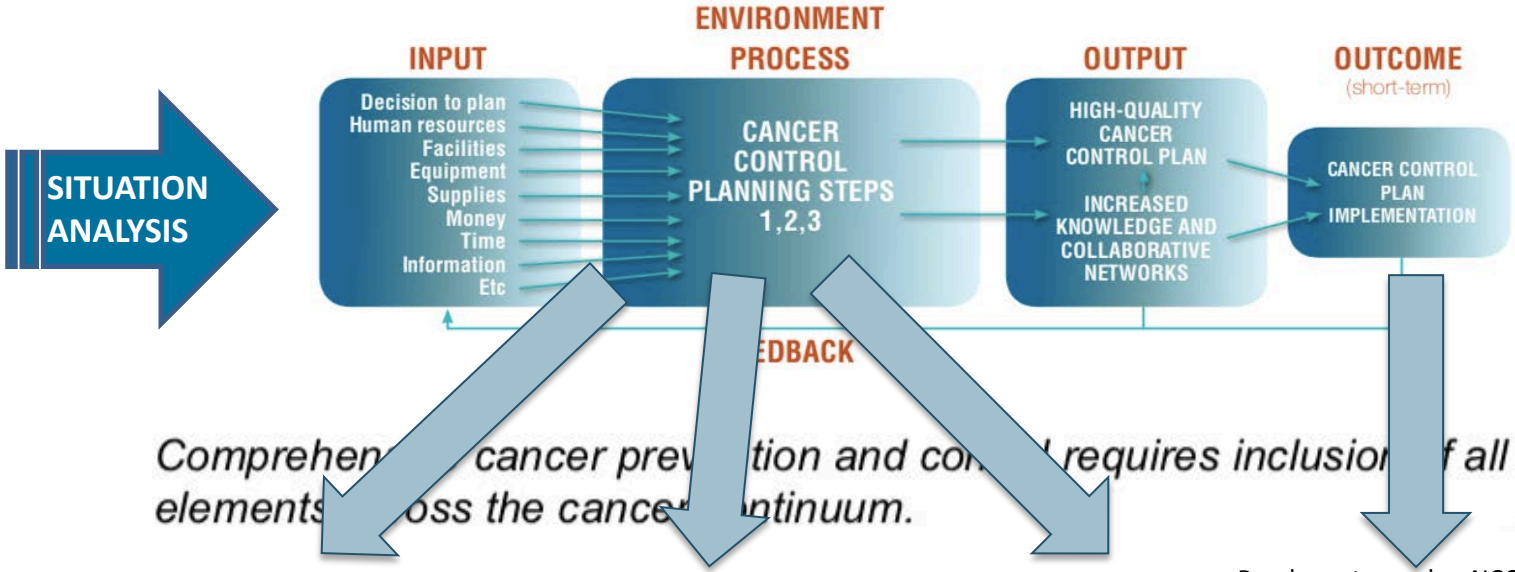
was 50%, equating to 7 million people in 2012 who would benefit from radiotherapy. There remains a deficit of more than 7,000 machines worldwide. During the past decade, the gap between radiotherapy demand and supply has widened in low-income countries.

Conclusion RTU varies significantly between countries. Approximately half of all patients with cancer worldwide should receive radiotherapy; however, more than 2 million people are unable to access it because of a lack of MVMs. Low- and middle-income countries are particularly disadvantaged by this deficit.

# What should we do?

*Prior to investing in cancer control programmes, decision-makers must consider:*

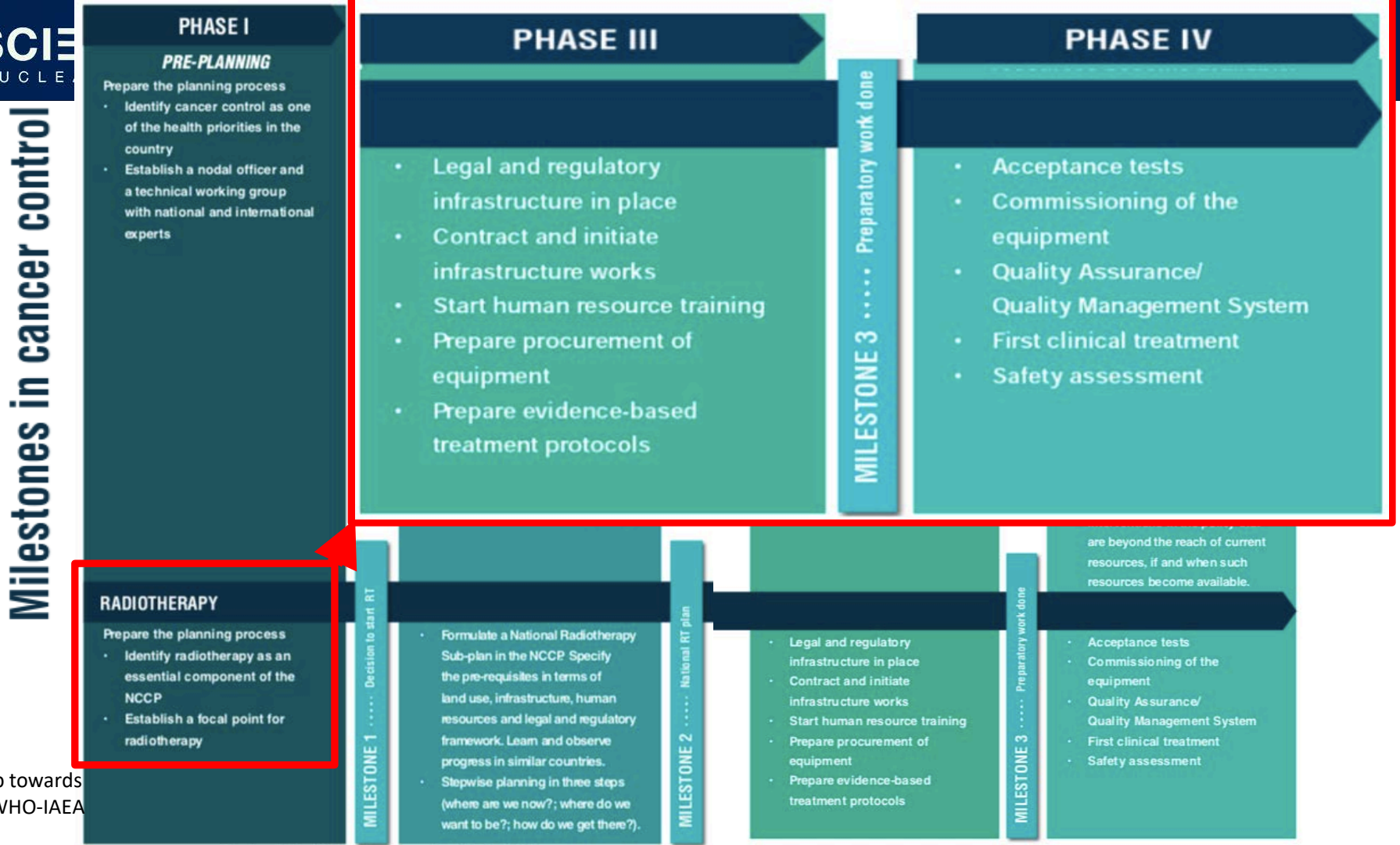
- National cancer priorities;
- A country's health system capacity to deliver a sustainable programme.




*Comprehen cancer prev tion and co requires inclusio f all elements oss the cance ntinuum.*

Roadmap towards a NCCP WHO-IAEA 2019

# Milestones in cancer control




Roadmap towards a NCCP WHO-IAEA 2019

# What can we do?

**Theory of Change Radiotherapy**


Economic benefits

Increased lifespan and quality of life

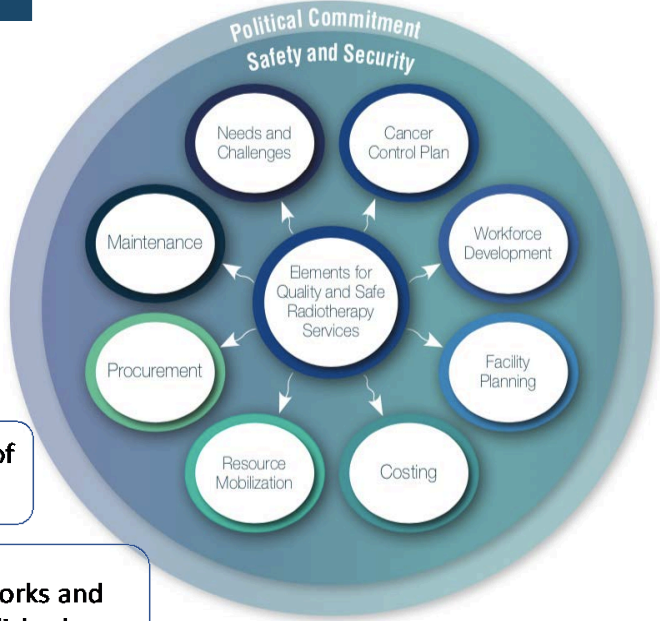
Increased patient access to quality radiotherapy

Strengthened radiotherapy workforce

Increased adoption & use of radiotherapy technology

Training, education, professional development and certification of ROs, MPs, RTTs

Professional networks and societies established



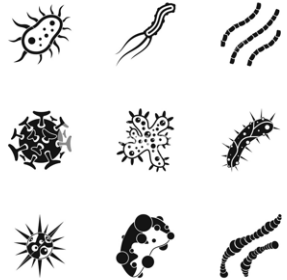

Resources invested by IAEA and government parties in RCA activity – & complementary health sector investment

King, J., Arau, A., Schiff, A., Garcia Aisa, M., McKegg, K. (2021). Social and Economic Impact Assessment of the RCA Programme: Radiotherapy Case Study. Vienna, Austria: International Atomic Energy Agency
Roadmap towards a NCCP WHO-IAEA 2019

SCIENTIFIC FORUM
NUCLEAR SCIENCE FOR HEALTH

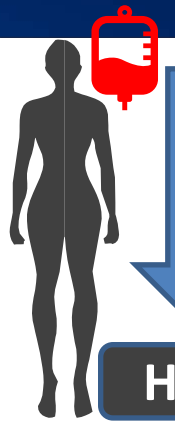
# Political will and commitment is the KEY for NCD!

## CD



Disease

transmission



Incidence

Host

## NCD


Transnational Industry

National Industry

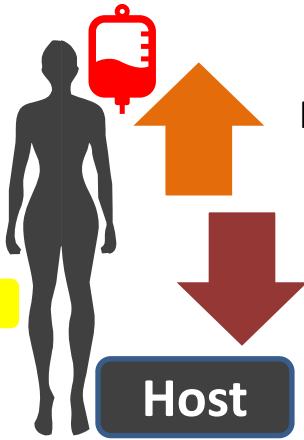
Politic

Broker

Media

Risk factors

Conflict of Interest



Policies

Political will

Incidence

Host

# Conclusion

**Half of cancer patients who need radiotherapy in low- and middle-income countries do not have access to it. This is a sobering statistic. And it is unacceptable.**

*— Rafael Mariano Grossi, IAEA Director General*

## PARTNERSHIPS AND RESOURCE MOBILIZATION MODALITIES

The IAEA is focusing on forging new partnerships and tapping into diverse funding sources, including from governments, international financing institutions and the private sector to ensure maximum reach, impact and sustainability of Rays of Hope. By organizing a coalition of donors and partners, in collaboration with Member States who want to implement these activities, we can best support the enhancement of radiation medicine and save lives.

IAEA

**Rays of Hope**
Cancer care for all

*TERIMA KASIH..*
*Thank you..*

Special thanks to my team : Steven MD, Handoko MD, Mayang MD PhD, GB Prajogi MD