Improving Cancer Care in Low- and Middle-Income Countries: What Does that Mean for Radiation Sources and Alternative Technologies?

C. Norman Coleman, MD
Senior Scientific Advisor
International Cancer Expert Corps, Inc.
Washington, DC

Radioactive Sources: Applications and Alternative Technologies
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Disclaimer: The presentation is the personal opinion of the presenter. It does not represent opinion or policy of the US Government, National Cancer Institute nor NIH. Dr. Coleman is employed by the NCI, however, **ICEC is an official "outside activity".**

No conflict of interest.

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Outline: my assignment

1. Please introduce the organization and scope.
2. Please provide examples of success stories with advancing radiation therapy in LMICs.
3. How many countries is ICEC working with and planning to work with? What is the global/regional coverage?
4. What are the challenges that your organization faces and who supports the efforts and how?
5. What are ICEC's observations about use of cobalt versus LINAC in LMICs and trends of use of the different technologies the past 10 years?
6. What are some factors that lead these trends?
7. What do you anticipate the trends will be the next 10 years?
8. What are the factors that lead these trends?
9. How does ICEC balance the need for security risk reduction versus availability of radiation therapy?
10. Please provide any additional information or advice that you think is relevant to this committee's work

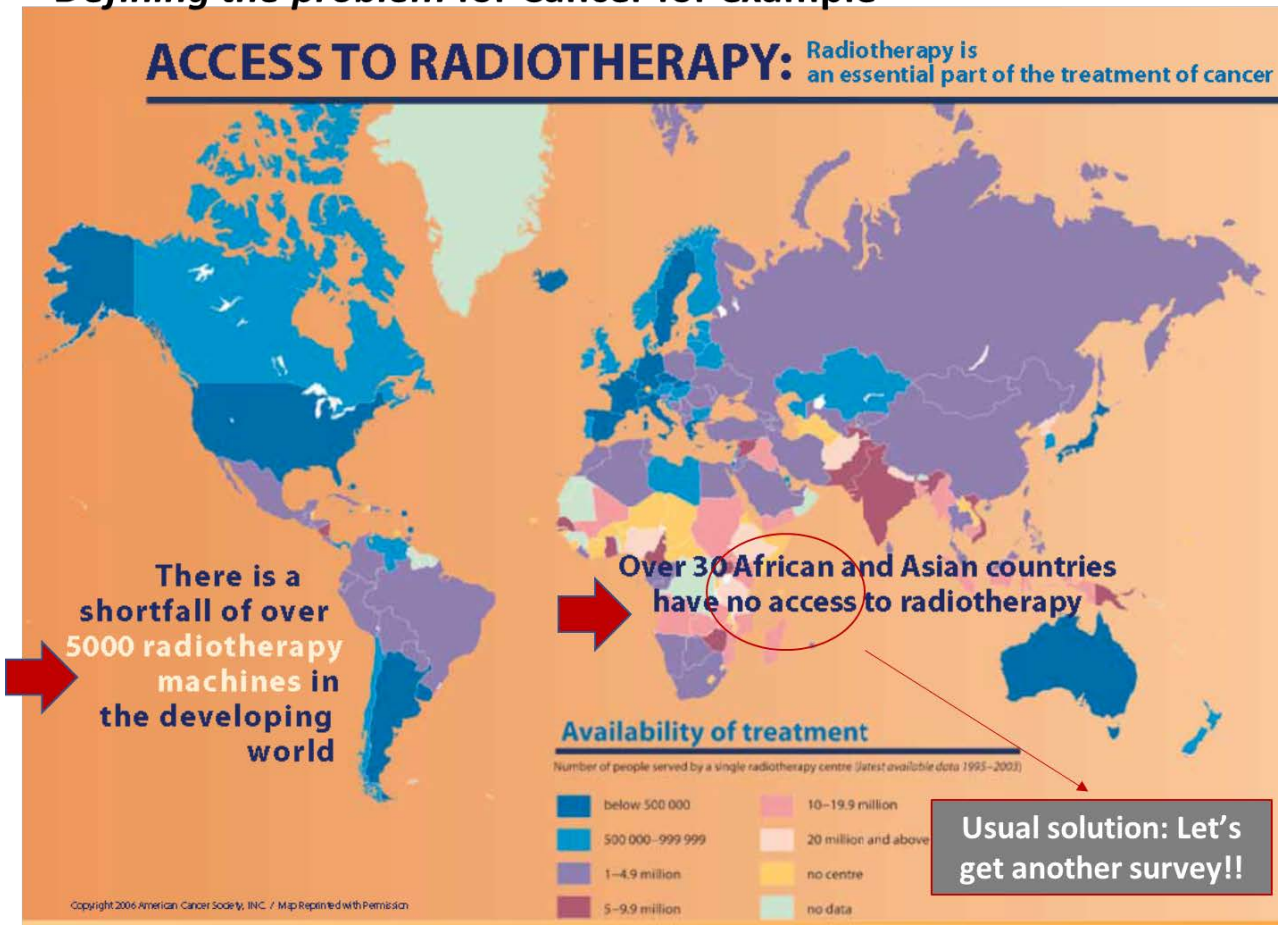
1. Please introduce the organization and scope.- What is the problem we are addressing?
2. Please provide examples of success stories with advancing radiation therapy in LMICs and in rural settings in High Income Countries (HICs) that have similar access issues as LMICs

- The International Cancer Expert Corps is a non-for-profit 501 (c) 3, incorporate in Delaware, 2013

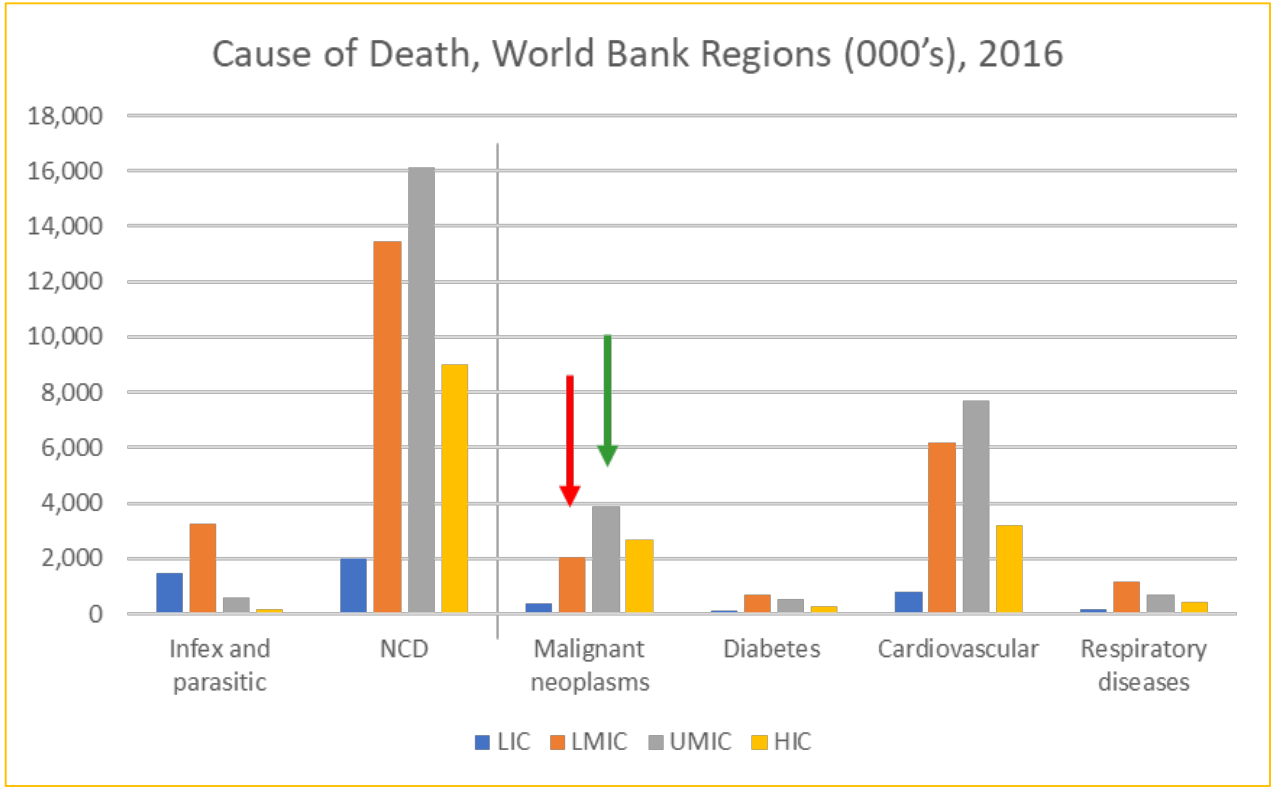
The mission

- Reduce mortality and improve the quality of life for people with cancer in low- and middle-income countries and regions worldwide through a
- Global mentoring network of cancer professionals who work with local and regional in-country groups to develop and sustain expertise for better cancer care.
- Included in the mission are underserved rural indigenous people in resource-rich countries who by geographic, cultural and socioeconomic issues have similar limitations in access to cancer care.

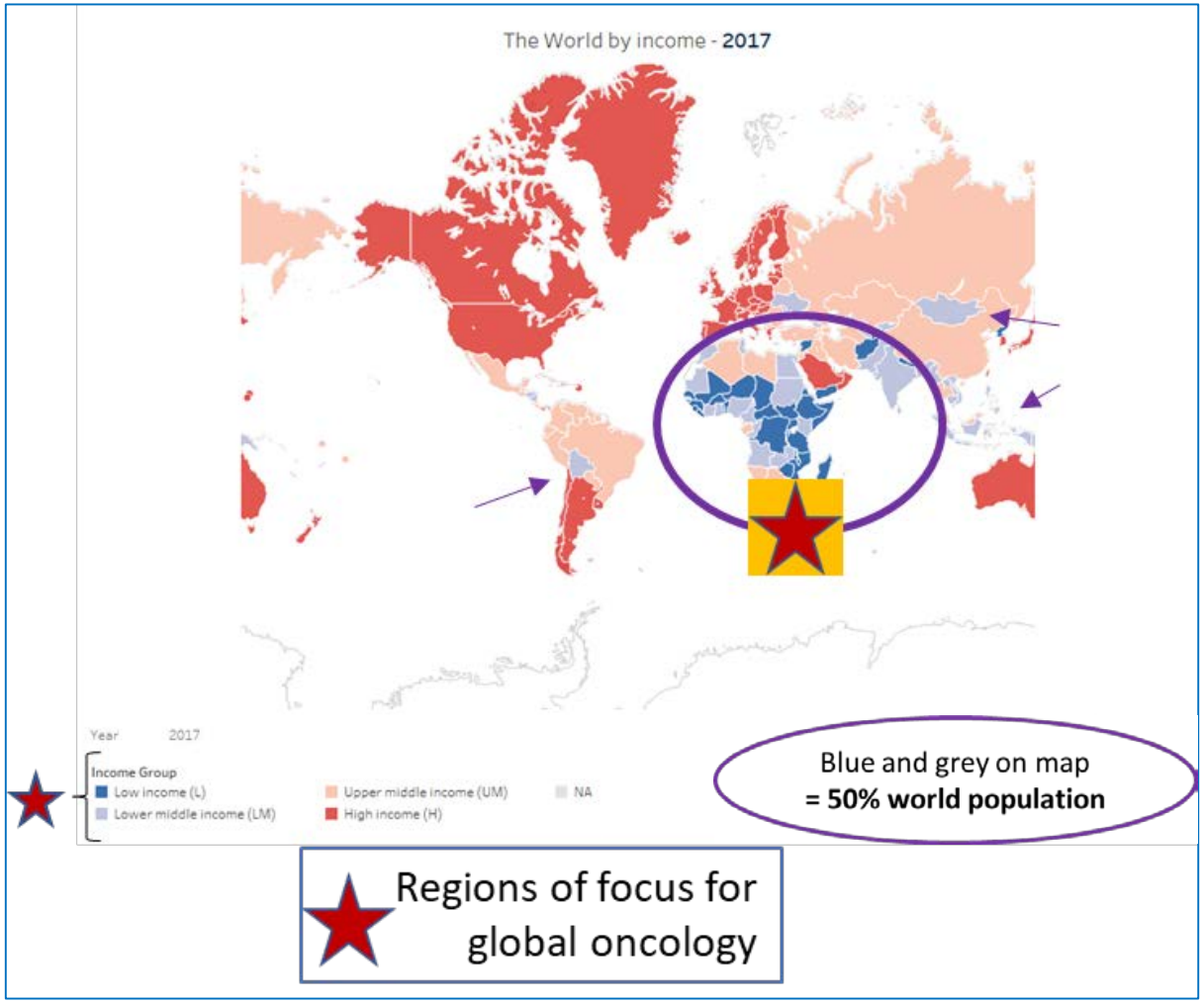
***Defining the problem* for Cancer for example**



Cancer and other noncommunicable diseases (NCDs) (respiratory, cardiovascular, metabolic) are major causes of morbidity, mortality and economic loss → a consequence of inequality



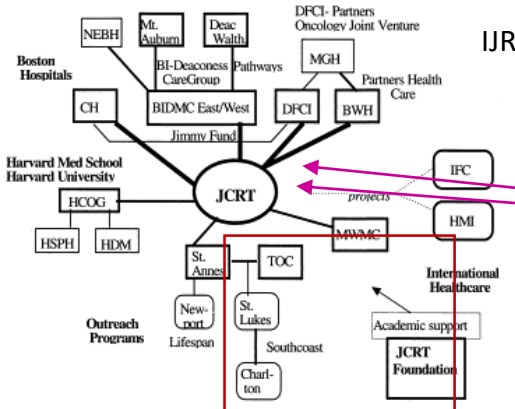
LMIC's- 75% of global cancer deaths by 2030



Success stories – developing on-site cancer care expertise where needed

1. Boston- Harvard Medical School community outreach program

Academia



IJROBP: 47:1357-1369 , 2000,

Harvard, NCI, CDRP

2. Cancer Disparities Research Partnership (CDRP)- Radiation Research Program, NIH

Community practitioners

Dan Petereit

Community physicians

Patti Hardenburg

Tim Williams

3. King Hussein Cancer Center, Jordan, through NCI Director

US-Jordan

Dr. Samir Khlief, NCI

Dr. Jamal Khader

4. ICEC- twinning partnerships

~20 Twinning Relationships- HIC <-> LMIC

3. How many countries is ICEC working with and planning to work with? What is the global/regional coverage?

Linkage between ICEC, ASPR/HHS, DOE/NNSA, academia & alternative technology

- ICEC and alternative technologies have linkage through radiological and nuclear preparedness.
  - Office of Assistant Secretary for Preparedness and Response→NCI Radiation Research Program and NIAID (Radiation and Nuclear Countermeasures Program)→ DOE, National Nuclear Security Agency: so there is a broad platform for global interest and outreach

- ICEC has~20 partnerships between HIC (Hubs) and LMIC with the interest from many more.

4. What are the challenges that your organization faces and who supports the efforts and how?

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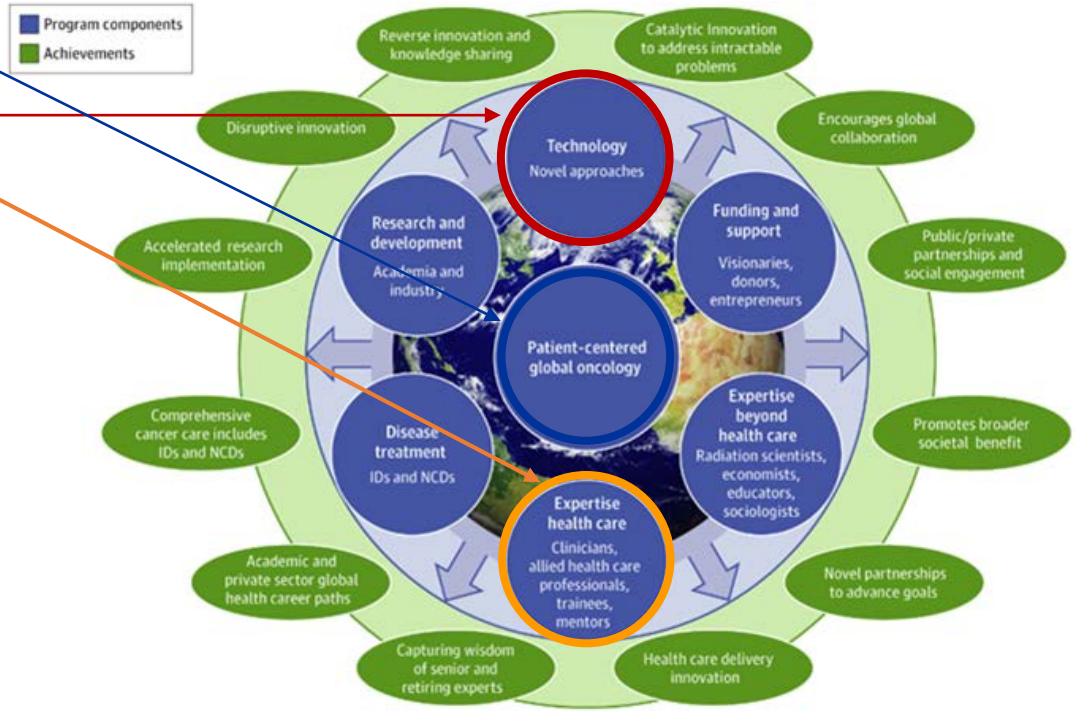
Complex system

- Patient-centered care
- Alternative technology
- Built on Expertise
- Current support- individual donations; support for workshops;
  - Extensive in-kind per year (>$300k/yr)
- Seeking support from foundations, in-kind for academics, global oncology industry
- Includes rural cancer disparities in HICs
- Needs buy-in: issues we face:
  - is it bona fide academic pursuit? Is it "too expensive", "too hard" or "unfortunate… but not our problem"?



A Broad Impact for Global Oncology
JAMA Oncology, Aug 2019

5. What are ICEC's observations about use of cobalt versus LINAC in LMICs and trends of use of the different technologies the past 10 years?
6. What are some factors that lead these trends?

Not a formal study!

- Radiation oncology is moving more and more to high technology: image-guided radiotherapy (IGRT); MR-guided RT; Intensity modulated RT (IMRT), charged particle therapy; FLASH (ultra-high dose rate).
- LINACs provide superior treatment in technical capability and throughput. Need for 5,000 – 10,000 LINACS in next 2-3 decades globally.
- Many LINACs purchased or deployed in Africa without sufficient training. Many are never used at all or not used to anywhere close to their capacity
- LINAC servicing can be slow and very expensive. Service contract expensive and often not purchased. Long down times (months or more). Unreliable treatment discourages investment.
- Fewer clinicians experienced with Co-60 in HICs and probably UMICs. Skill set is fading.
- Limited number of experts with brachytherapy skill. American Brachytherapy Society working to increase number of skilled people.
- Generally, well-trained people want to use their skills. Low quality or perceived lower quality is disincentive to recruiting and retaining personnel. Indeed, it may be wrong to suggest that a lower standard of care is acceptable[1].
- Cobalt still being deployed. IAEA is part of the Alt Tech; limited data is available on cobalt deployment.
- Expense of cobalt disposal is an issue finally being considered in price.

[1]Remais JV, Zeng G, Li G, Tian L, Engelgau MM. Convergence of non-communicable and infectious diseases in low- and middle-income countries. Int J Epidemiol. 2013;42(1):221-7.

7. What do you anticipate the trends will be the next 10 years?
8. What are the factors that lead these trends?

Not a formal study!

- Increasing recognition of the need for cancer care. Increasing cases in LIC, LMIC and UMIC
- Increasing trend to LINACs vs Co-60. Necessary for sophisticated modern cancer care and for recruiting and retaining well-trained staff.
- Increasing interest in the emerging generation in radiation oncology and healthcare in social and societal causes. Potential for growth of mentorship networks.
- Growth in the biological understanding of cancer and more expensive treatments.
  - Radiation oncology starting to define dose in biological as well as physical terms (Gy). This will increase use of RT in all countries.
- Increasingly complex technology with potential AI/ML assuming tasks. May make complex LINACs more easy to operate.
- Economic pressure on healthcare to reduce costs. Ultracomplex LINAC expense will be an issue.
- Depending on many factors, potential increase in activity in global health (note: it is theme of American Society of Radiation Oncology 2020 meeting.)
- Potentially, recognition of the price of inequality on health, wellbeing, societal instability and economic entrapment to initiate effective changes

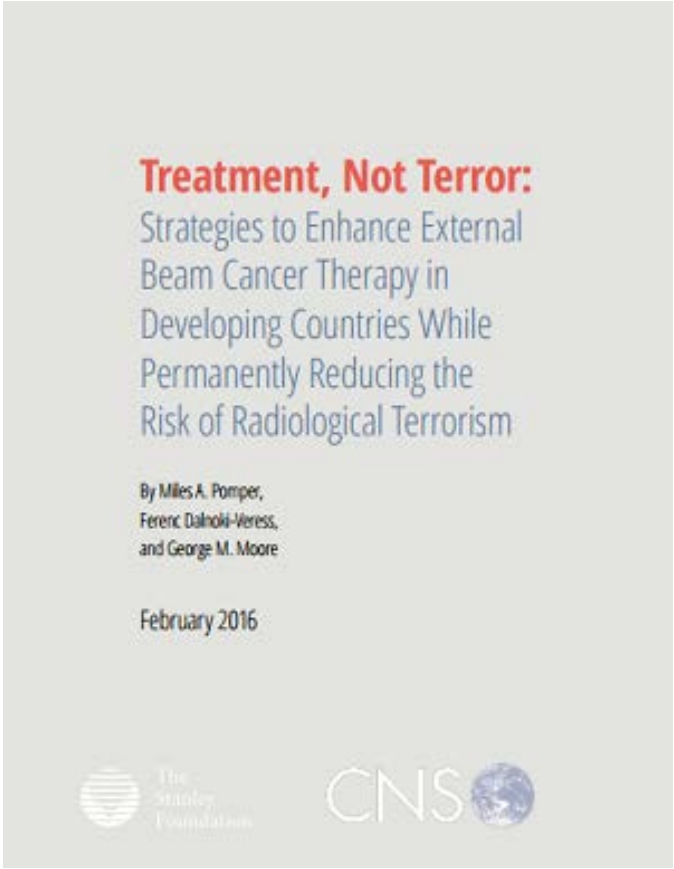
9. How does ICEC balance the need for security risk reduction versus availability of radiation therapy?

- We work with the agencies that have security as their mandate: IAEA, DOE/NNSA.
- We understand that global security comes from healthy societies.
- We aim to build a true global partnership model, respecting the needs of all participants. And we aim to build trusted partnerships.
- We listen, listen, listen… but we do Act. Including exploring alternative technology.
- We understand that to recruit and retain people to work in challenging environments they need to build programs with world-class capability and connectivity.
- New paradigm…..

New paradigm: *Treatment, not Terror*

(Pomper et al.)

- Cobalt-60 is a mainstay of cancer care in LMICs. To remove it without alternative technology is detrimental to the people with cancer.
- The IAEA does both peaceful uses, including cancer care in Division of Human Health and radiological and nuclear security.
- The alternative technology issue now includes, at a broader scale, the issue of capacity and capability for sustainable cancer care programs.
- ICEC defines this as an Expertise Challenge as it involves not just the machine but how it is used for human health.



https://www.nonproliferation.org/treatment-not-terror/

10. Please provide any additional information or advice that you think is relevant to this committee's work – defining the problem as a common humanitarian goal for which "helicopter (hit & run) solutions" may be more expensive than a truly long-term sustainable approach.

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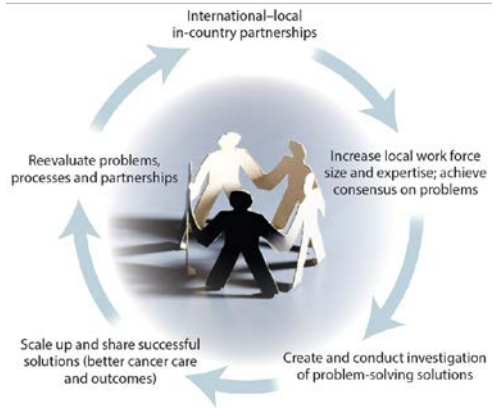
Innovative technology- CERN

Early Career Leaders Washington DC

Innovative technology- Botswana

Think globally, mentor locally



The solution needs a very big tent

Broad spectrum of expertise for complex systems solution

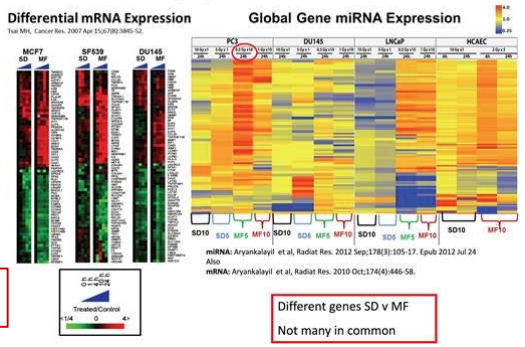
Medical	Science, non-MD	Support
Radiation, medical & Pediatric oncologists	Prevention and screening	Educational tools
Palliative care	Epidemiologists	Finance
Surgeons including subspecialists	Medical physicists	Hospital/medical administration
Nurses	Technologists	International policy
Pathologists	Basic & translational scientists	Patient advocacy
Radiologists	Medical education	Economists
General internists	Treatment guidelines	Sociologists
Primary care	Statisticians	Social workers
Infectious diseases	Social scientists	Cultural experts
Gerontologists	Political scientists	Diplomats
Pharmacologists	Regulatory Affairs specialists	Communications
Psychologists	Pharmacists	Cancer survivors
Public health	Data-management and big-data science	Information tech (IT)
Emergency medicine		Legal
		Development

Bringing together generations,...

CERN

...technology and biology

Some highlights: Fractionation Matters



The solution for Global Cancer Care and Global Health is expertise and capacity- with people and with enabling technologies

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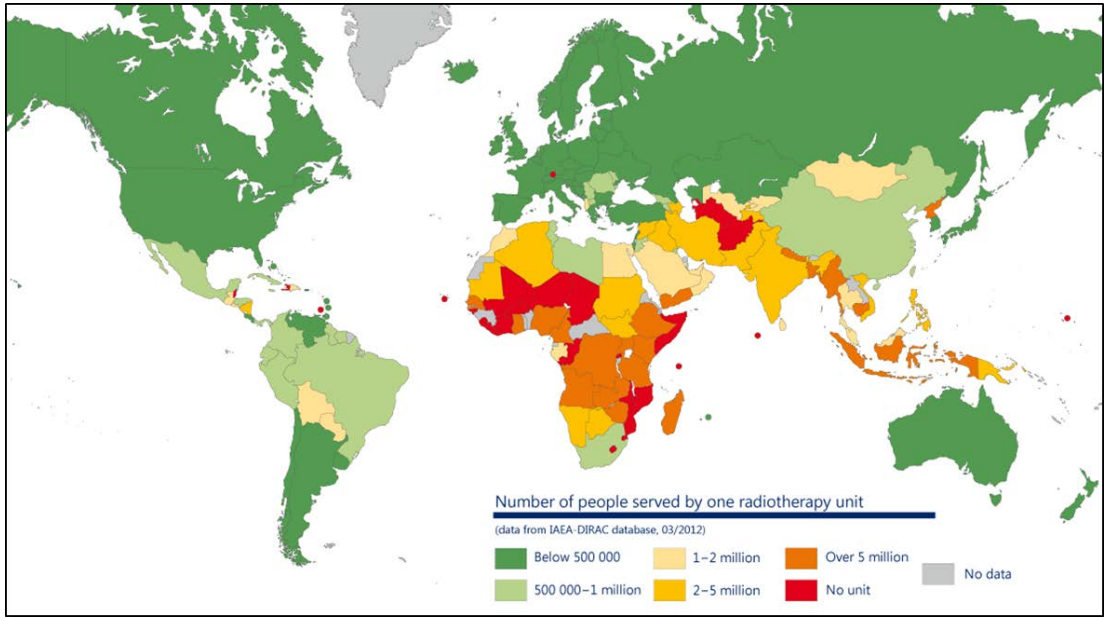

Shortfall of over 5000 linear accelerators (essential for total cancer care) in developing world and many thousands of needed experts.

Commissioning 1/week with appropriate expertise available = a century to meet current shortfall.

Large scale problems require disruptive, catalytic and, for global health, reverse innovation…..

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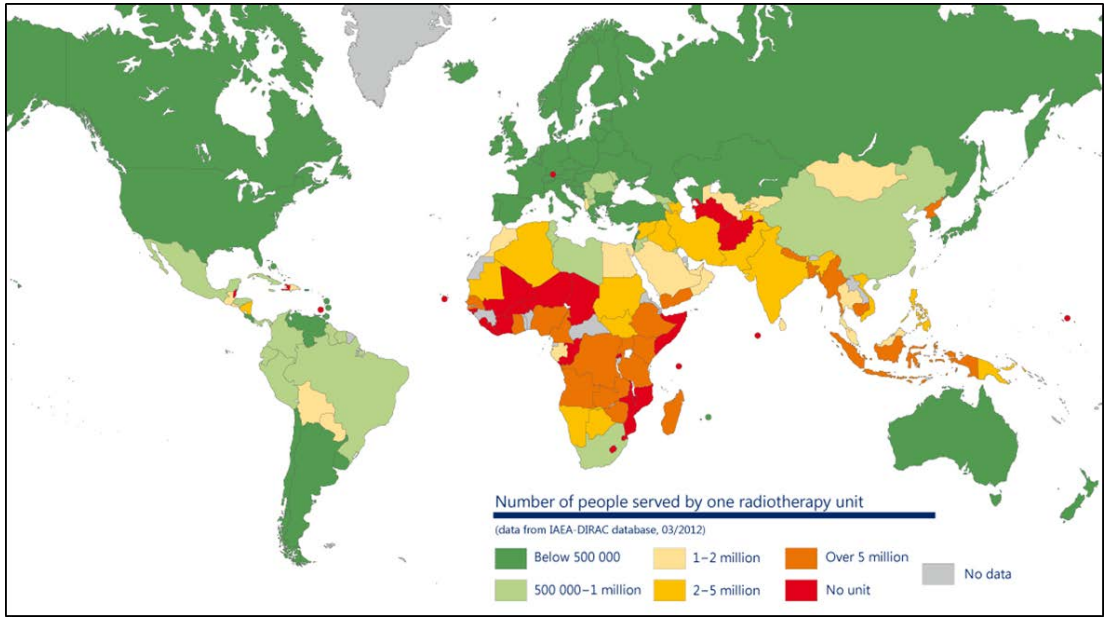

There is *nothing* in our systems solution approach that cannot be accomplished.

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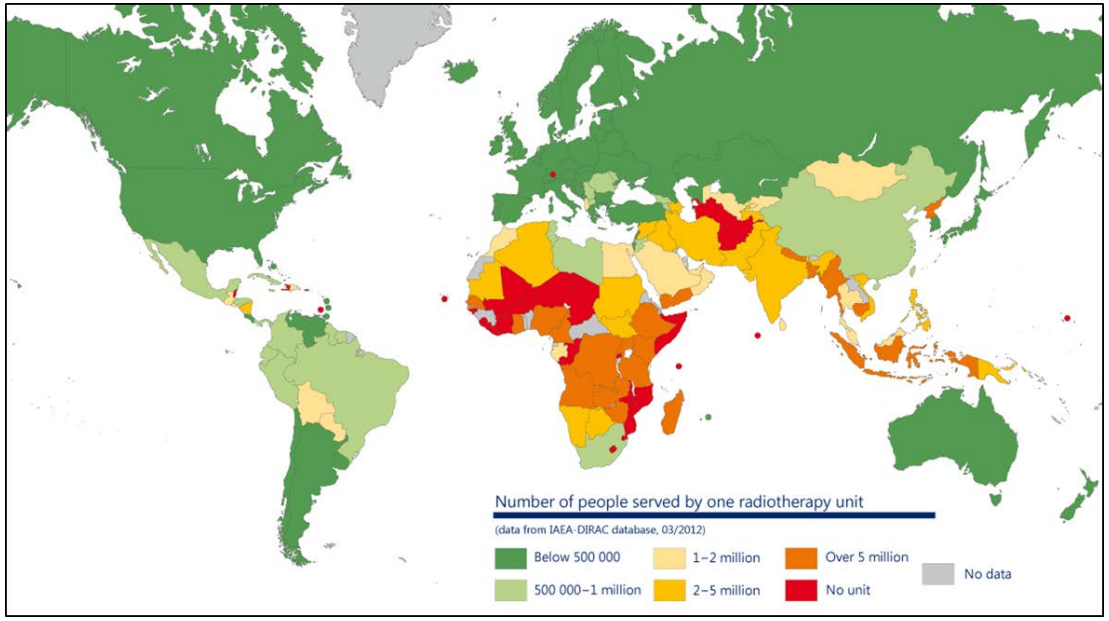

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African Proverb: “If You Want To Go Fast, Go Alone. If You Want To Go Far, Go Together”

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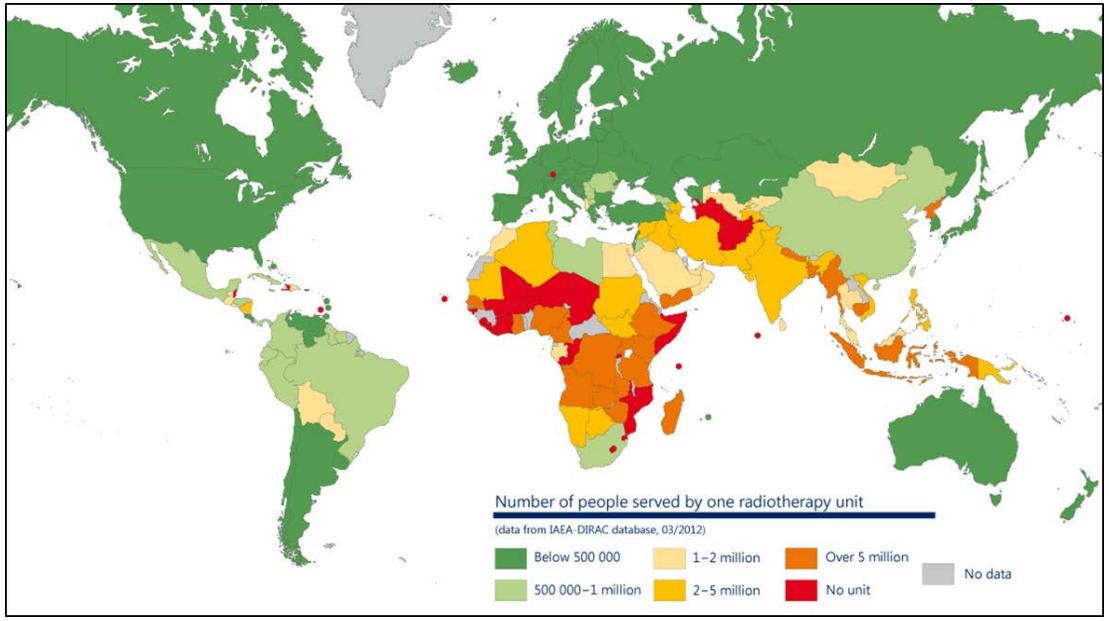

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Global health version: Individual programs are essential and pioneering BUT….

If you go alone you'll go slowly. If you go with **true partners you may be able to make the *necessary transformational system changes and exponential growth in capacity*.**

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“It always seems impossible until it's done.”

Nelson Mandela