

DIRAC : Value and impact on decision making

Mohamed S. Zaghloul, MD

Children's Cancer Hospital, Egypt

&

***National Cancer Institute, Cairo
University, EGYPT***

19–20 September 2017

IAEA Scientific Forum

**Nuclear Techniques
in Human Health**

Prevention, Diagnosis, Treatment



مؤسسة مستشفى سرطان
الأطفال - مصر
Children's Cancer Hospital
Foundation - Egypt

TY

- Home
- Methodology
- Description of equipment
- Directory-
 - DIRAC data
 - Data export
 - Data entry
- Data Collection-
 - Availability of Radiation Therapy**
 - Comparison Tool
 - Status of Radiation Therapy Equipment
 - Equipment Age
- Maps-
 - Contact Us

<

Availability of Radiation Therapy

Comparison Tool

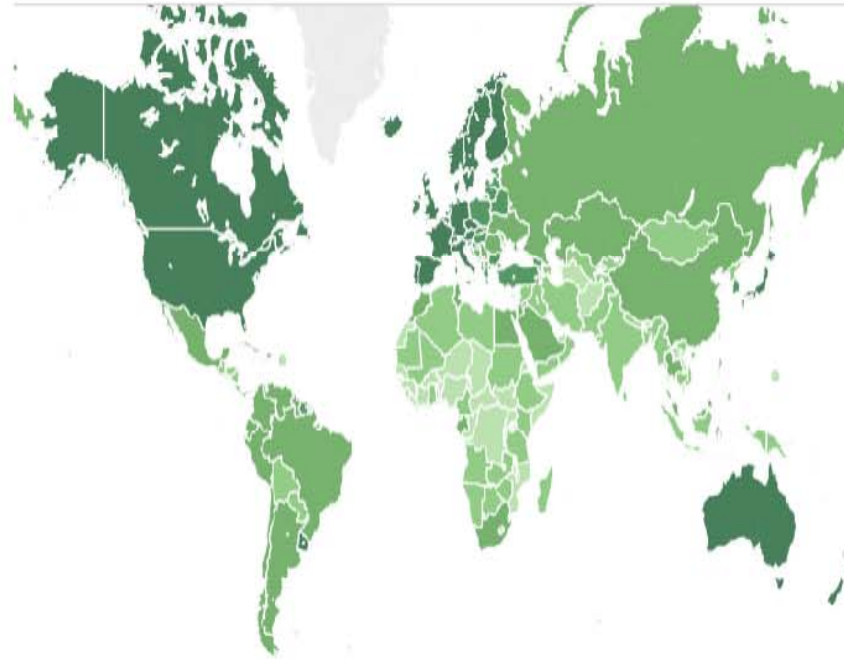
>

Number of Radiotherapy Machines Per Million People

(Updated on : 6/1/2017 7:17:12 AM)

+
-

▶



© OpenStreetMap contributors

■ no reported machi...
 ■ less than 1
 ■ between 1 and 3
 ■ between 3 and 5
 ■ 5 and more

RegionName	Countries	Countries with RT	RT centers	Machines per million pop.	RT machines	Million population	Linac	Radio-nuclide teletherapy	Circular accelerator	Particle accelerator
Grand Total	196	139	7041	2.165	13755	7,318.21	11440	2186	14	115



Countries with no RTh facilities

Continent	countries	With RTh	No Rth	Deficient %	Machine/million
Globe	196	139	57	29.1 %	2.165
North America	2	2	0	00.0 %	9.601
Europe	49	48	1	02.0 %	5.244
Latin America	36	30	6	16.7 %	1.920
Asia Pacific	55	38	17	30.9 %	1.186
Africa	54	22	32	59.3 %	0.243

Evidence-based Background



Radiotherapy is essential for most cancer patients

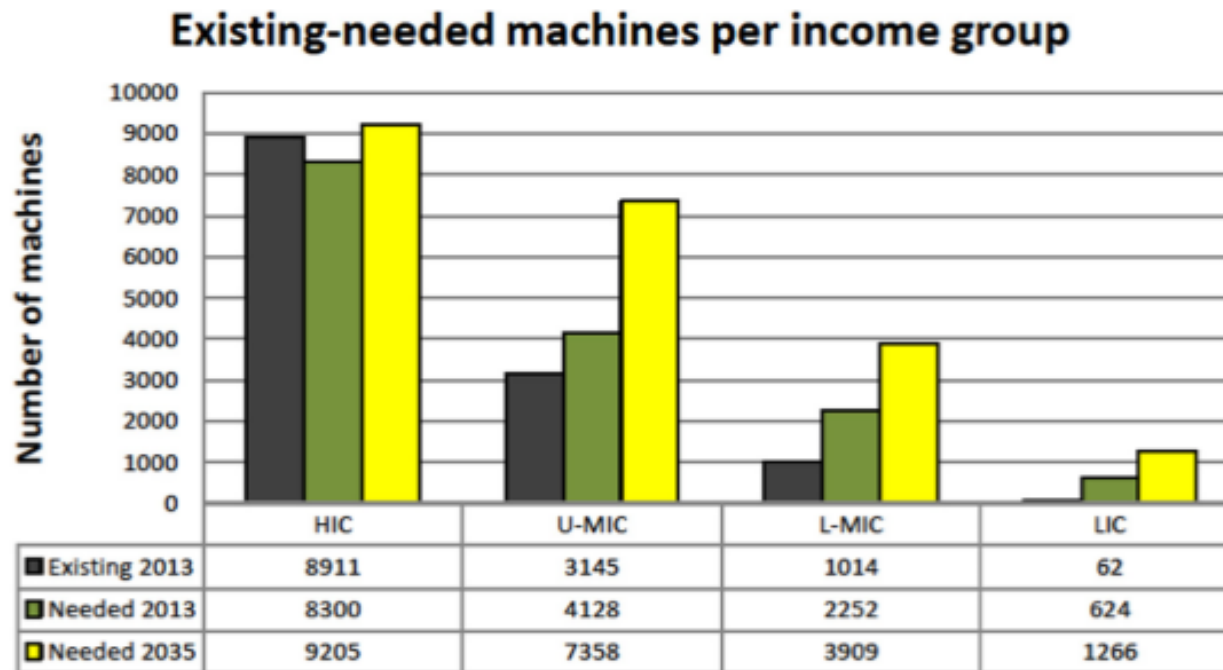
50-60 % of cancer patients received RTh at one stage of their disease

57 countries out of 196 (29 %) have no RTh facilities

Rth is a complex process that needs not only equipment but also knowledge, different sub-specialties, staff training, high capital money, running costs, efficient management.....

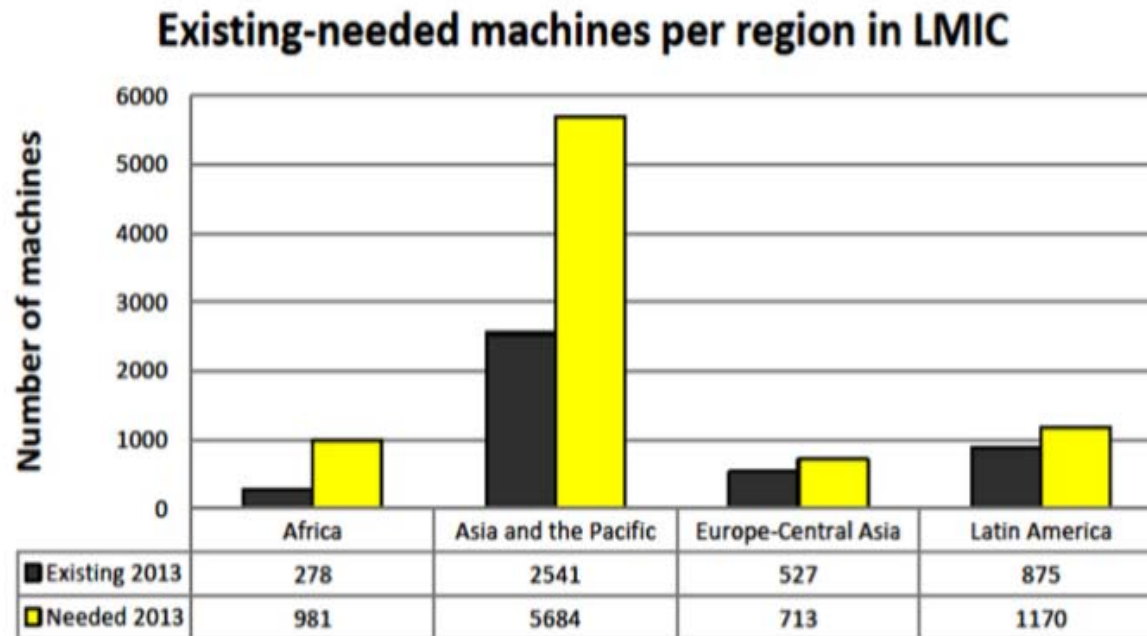
Though of the high capital cost it is considered the cheapest tool for cancer treatment

RTh facilities affected by income status



Existing and needed machines in different income groups in 2013 and 2035. (Adapted with permission from Atun et al.³) (Color version of figure is available online.)

RTh Status in different Continents



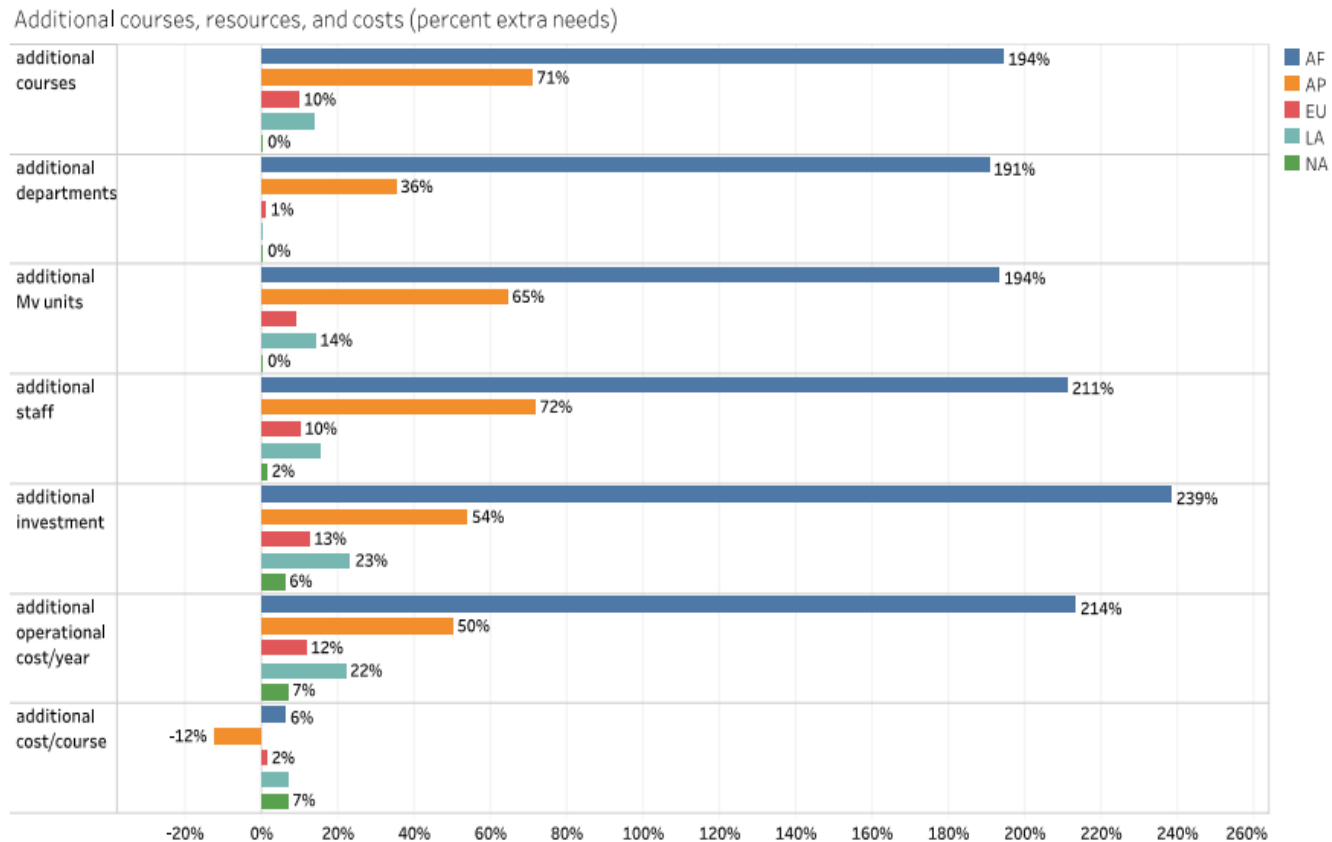
Existing and needed machines in LMIC in different regions in 2013. (Adapted with permission from Zubizarreta et al.⁸).

Actual Status of RTh worldwide (2013)

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

The proportion of need in RTh



Additional courses, resources and costs (percentage extra needs). AF, Africa; AP, Asia Pacific; EU, Europe; LA, Latin America; NA, North America.

Slightly Better situation in 4 years

(2013-2017)

Continent	Year	Population	Centers	Needs	MV (real)	MV (Need)	% real
AFRICA	2013	1070	140	407	277	813	25.4 %
	2017	1184	195	397	342	842	28.9 %
Asia Pacific	2013	4108	2585	3503	3894	6406	37.8 %
	2017	4422	2890	3743	4488	6567	40.6 %
Latin America	2013	601	620	624	968	1106	46.7 %
	2017	623	653	636	1048	1102	48.7 %
Europe	2013	893	1431	1449	3751	4098	91.5 %
	2017	747	1518	891	3909	4127	94.7 %
North America	2013	350	2787	1200	4243	2175	195 %
	2017	359	2553	1536	4032	2551	158 %

Situation in AFRICA 2017

(EG + SA / Africa)



	Centers	MV	Cobalt %	CT	Sim	TPS
AFRICA	195	342	25.1 %	126	101	240
EGYPT	66	114	21.0 %	49	51	70
SOUTH AFRICA	44	85	08.2 %	34	15	54
%	56.4 %	58.2 %	15.6 %	65.9 %	65.3 %	51.7 %

Conclusions



Great efforts performed depending on evidence based data of the real situation and needs calculating according to the standard of each region

DIRAC and the whole IAEA helps, advice, audit and provide technical support whenever needed

The increase rates of the population consume most of the achieved improvement

The increased life-expectancy & better control of communicable diseases increased the risk of cancer incidence

