

CAHO Kolkata 6<sup>th</sup> April 2024

# "Making Healthcare Efficient, Effective, Economical & Equitable: *applying the four 'E' s to cancer care in India*"

Dr Mammen Chandy



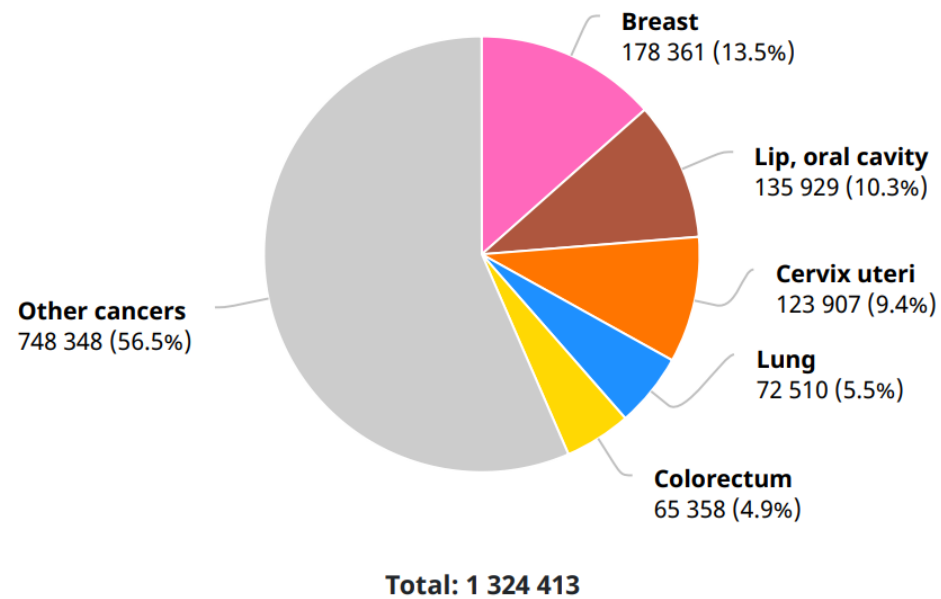
# The problem – Cancer in India

# India

Source: Globocan 2020



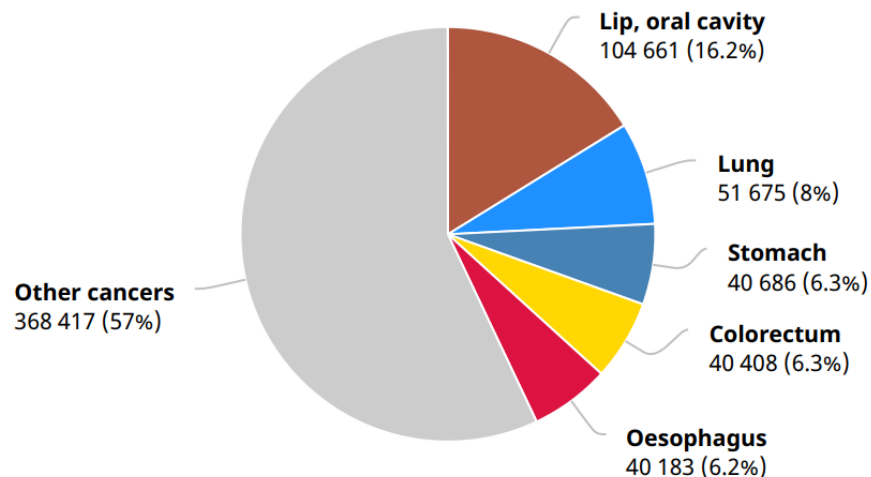
## Number of new cases in 2020, both sexes, all ages



## Geography

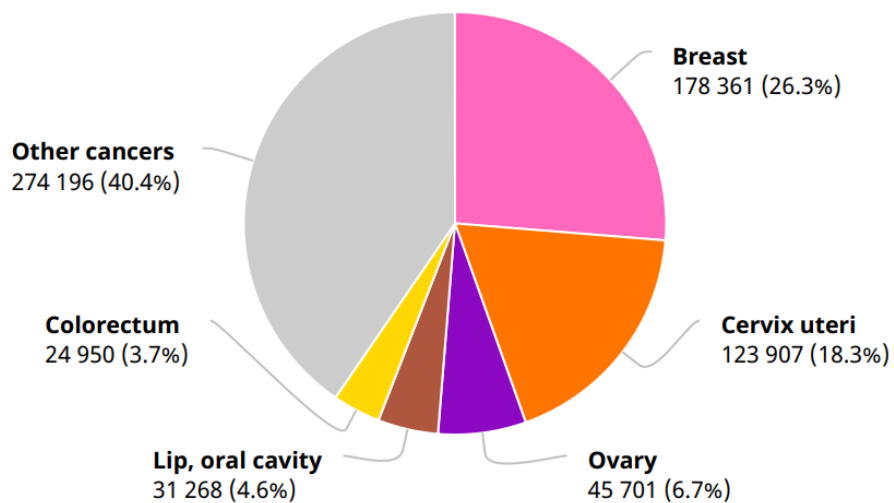


## Number of new cases in 2020, males, all ages



Total: 646 030

## Number of new cases in 2020, females, all ages



Total: 678 383

## Numbers at a glance

Total population

1 380 004 378

Number of new cases

1 324 413

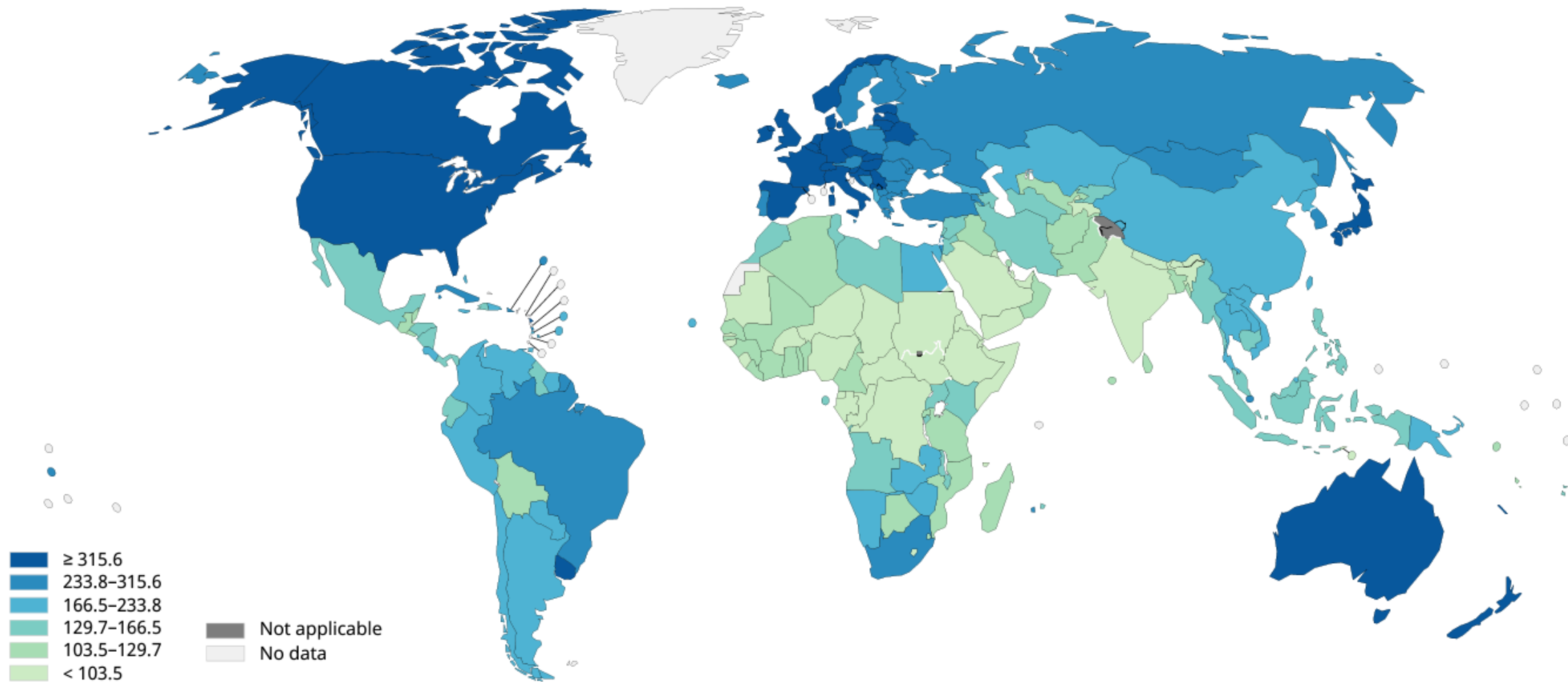
Number of deaths

851 678

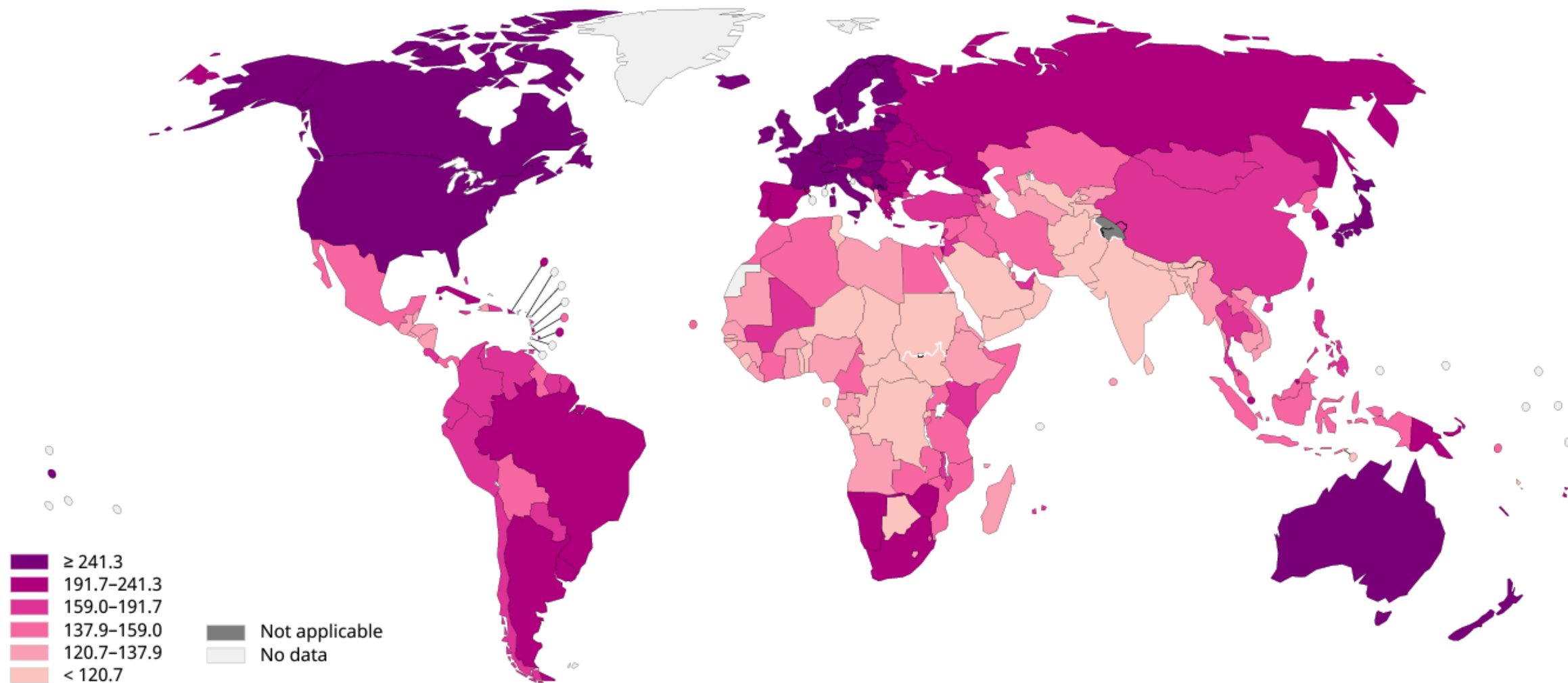
Number of prevalent cases (5-year)

2 720 251

Age standardized (World) incidence rates, all cancers, males, all ages



## Age standardized (World) incidence rates, all cancers, females, all ages



Data source: GLOBOCAN 2020

Graph production: IARC (<https://gco.iarc.fr/today>)

World Health Organization



© International Agency for Research on Cancer 2020

# Leading cancers in men and women, age 30-69 years

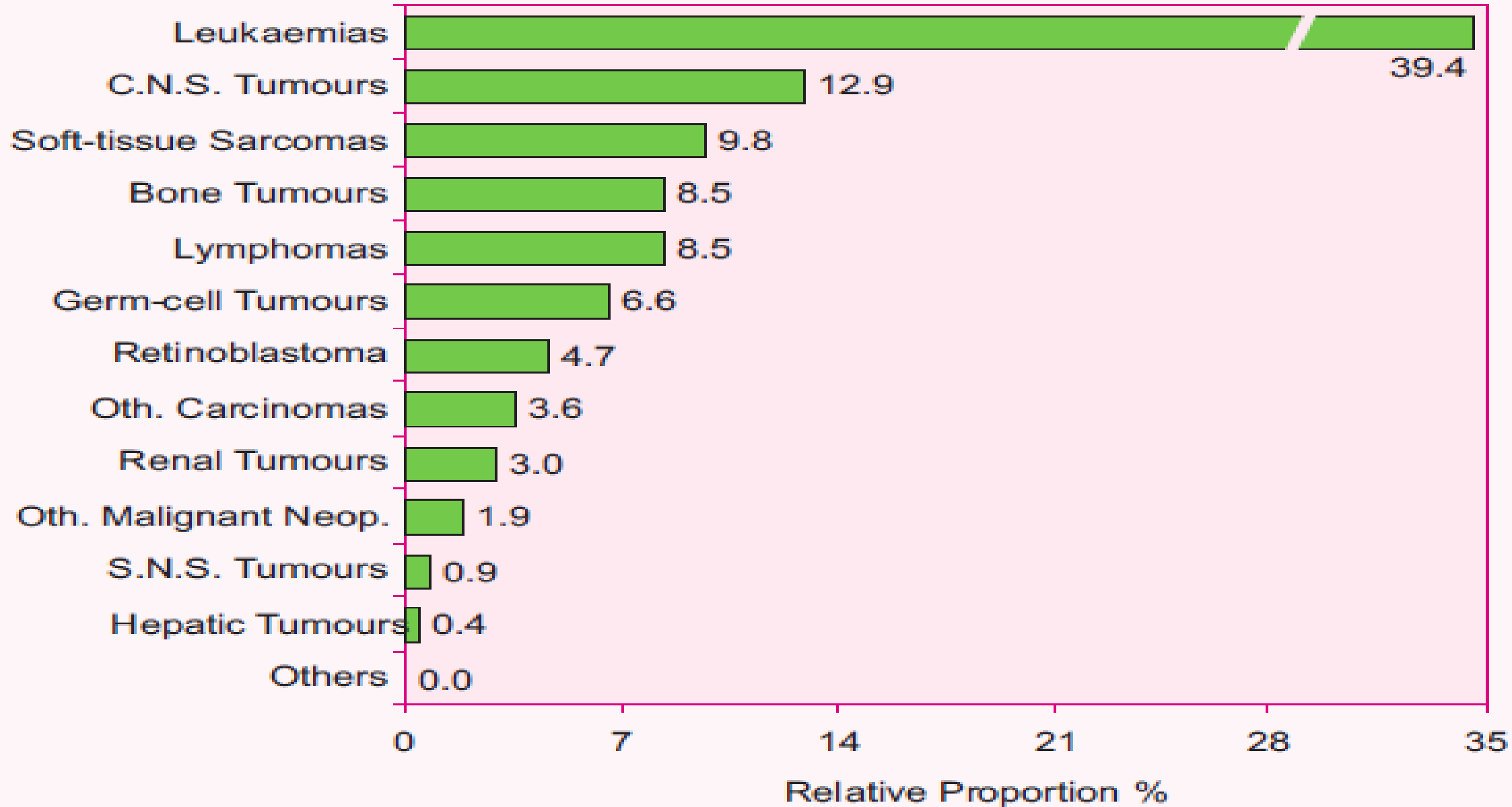
## MEN

- Oral 45,800: 23%
- Stomach 25,200: 13%
- Lung 22,900: 11%
- Liver 14,000: 7%
- Esophagus 11200: 6%

## WOMEN

- Cervical 33,400: 17%
- Stomach 27,500: 14%
- Breast 19,900: 10%
- Oral, 19,100: 10%

# Children : Hospital based data from the Indian national Cancer Registry program





# Future trends in cancer burden in India

- Cancer will become one the leading causes of death in India in a few decades.
  - Early mortality from infection is going down.
  - Life expectancy is increasing and with an increasing proportion of older persons India will see an increase in cancer incidence.
  - Cancer is already more common in affluent Indian states with higher human development Index

# Cancer burden & expenditure in 2025 if all are to receive reasonable care

- India will have 1.5 million new cancer cases,
- India will have 1.0 million deaths in 2025.
- Indians will spend \$1.6 billion out of pocket before their treatment is started\*
- Indians will spend another \$3.2 billion for cancer treatments\*\*

\* Based on our study at TMH on a sample of 100 patients

\*\* Based on approximate expenses of semi private patients

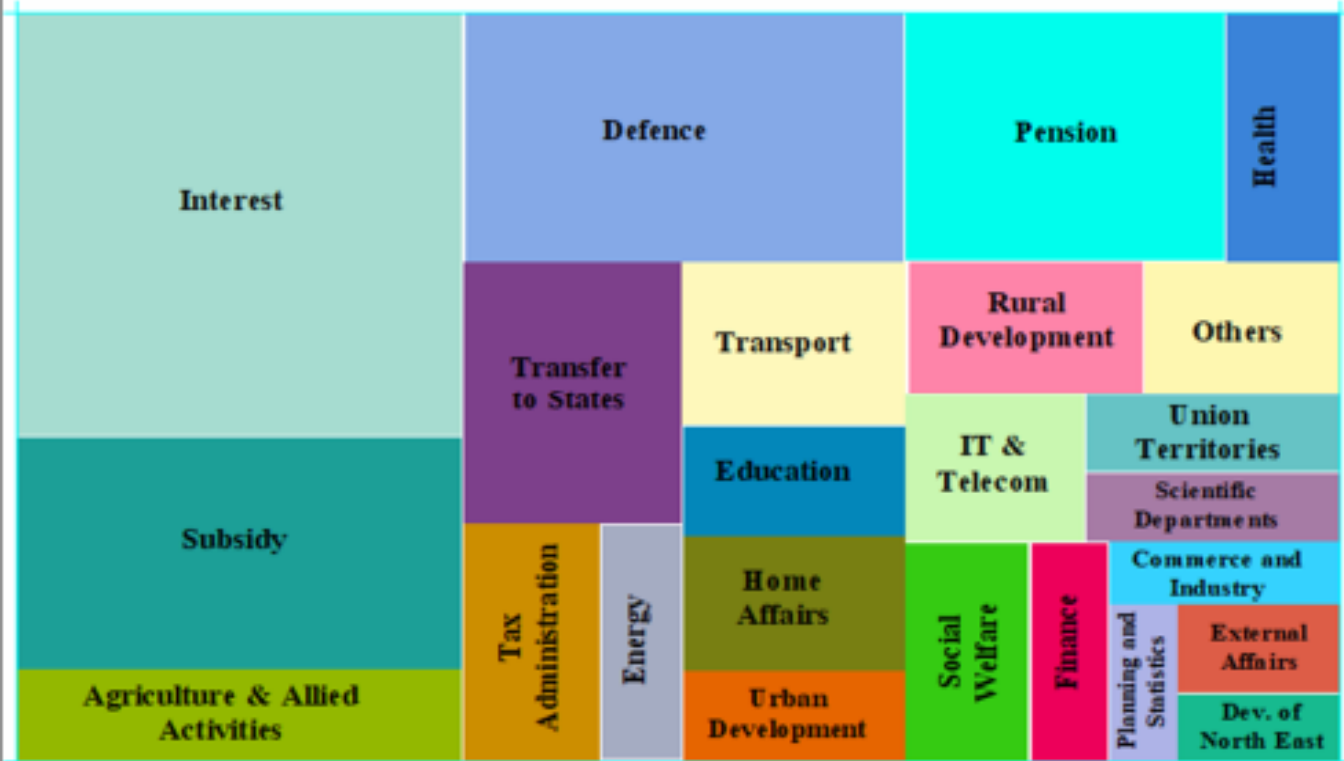
# 1. EQUITY

# Cancer Care Gap

- Is there disparity in Cancer Care?
- What are the reasons for this disparity?
  - Unequal distribution of Resources
  - Education and Social factors
  - Access
  - Gap between infrastructure and Demand
    - Cancer centres: Tertiary/Secondary/Primary
    - Diagnostics
    - Radiation therapy
    - Drugs: chemotherapy, monoclonals, antimicrobials
    - Palliative care and pain relief
    - Prevention

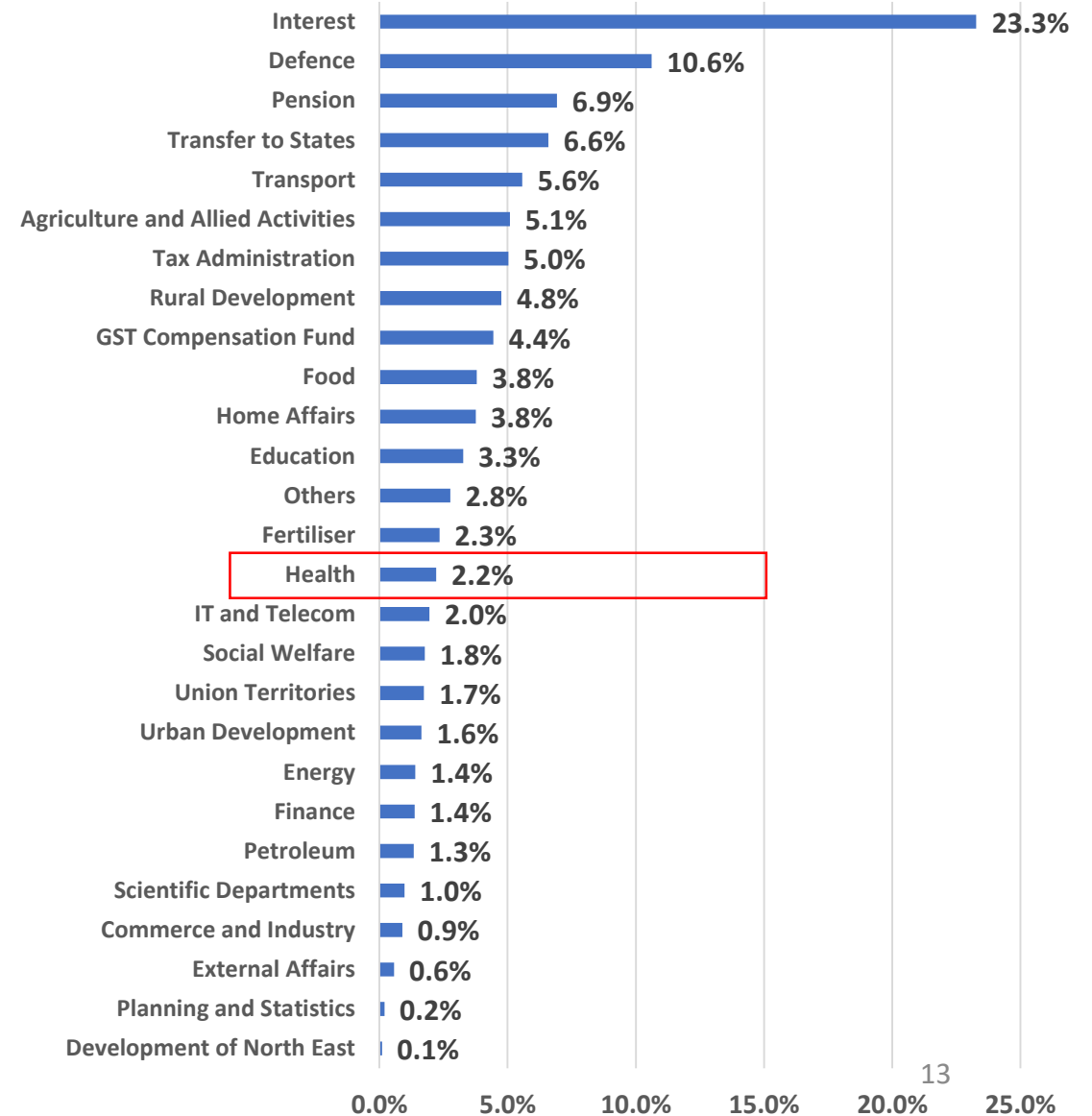
# India - Union Budget 2023 (? Pro-poor)

## COMPOSITION OF EXPENDITURE



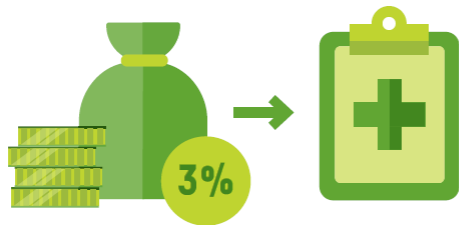
Total GDP – 3 trillion Rupees (\$400 billion)  
 Total revenue – 30 trillion Rupees  
**Health allocation budget – 60000 Crores (\$4.8 billion)**

## Union budget allocation



# We can close the gap only if there is a just sharing of resources

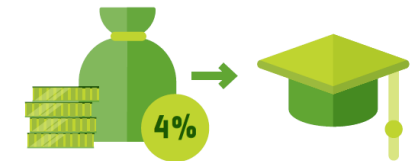
- India: world's highest number of poor at 228.9 million.
- Total number of billionaires in India increased from 102 in 2020 to 166 billionaires in 2022.
- The combined wealth of India's 100 richest has touched INR 54.12 lakh crore.
- The wealth of the top 10 richest stands at INR 27.52 lakh crore – a 32.8 per cent rise from 2021.



THREE PER CENT OF WEALTH TAX ON TOTAL WEALTH OF INDIAN BILLIONAIRES CAN FUND THE NATIONAL HEALTH MISSION, THE LARGEST HEALTHCARE SCHEME IN INDIA, WITH A CURRENT ALLOCATION OF INR 37,800 CRORES,<sup>100</sup> FOR 5 YEARS.<sup>101</sup>

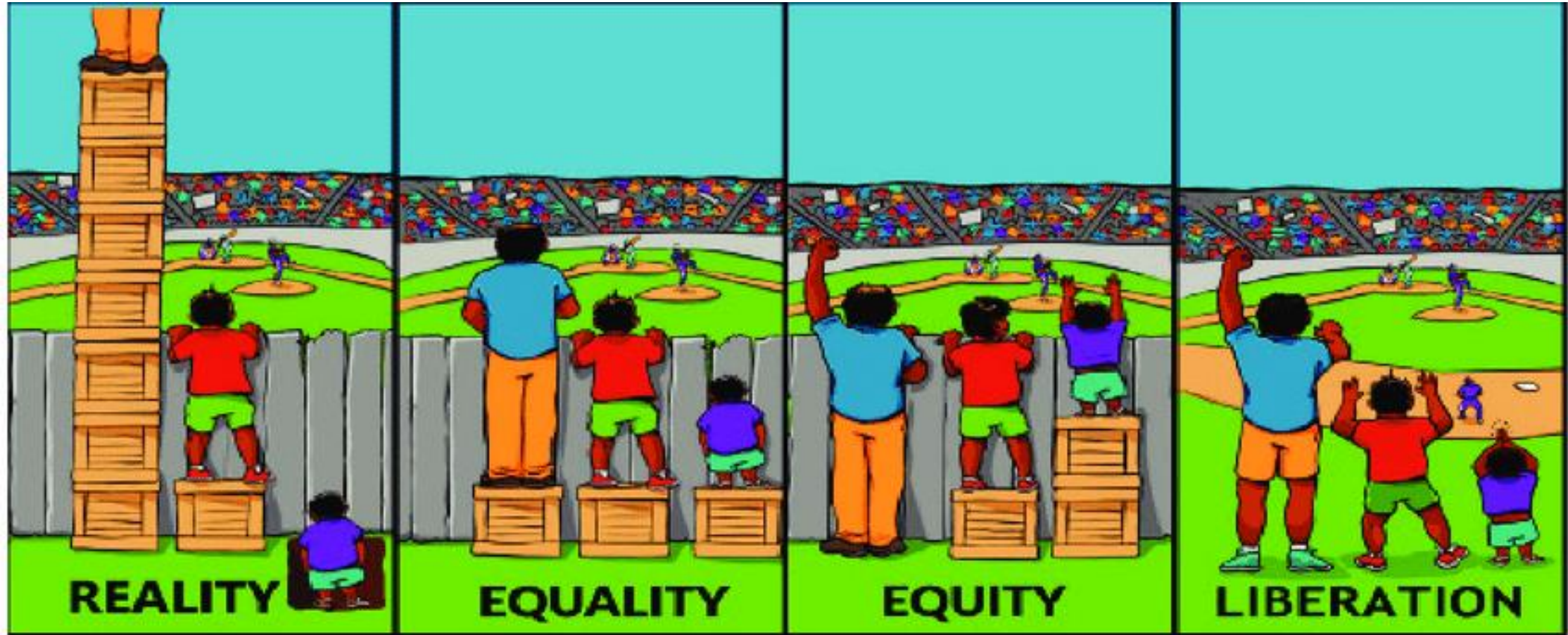


TAXING ALL OF INDIA'S BILLIONAIRES AT 2 PER CENT WOULD SUPPORT THE REQUIREMENT OF INR 42,033 CRORES FOR THE NUTRITION OF MALNOURISHED IN THE COUNTRY FOR 3 YEARS.<sup>109</sup>



FUNDS FOR SAMAGRA SHIKSHA IN 2022-23 WERE MUCH LOWER (BE-INR 37,383 CRORES) THAN WHAT WAS ASKED FOR (INR 58,585) BY THE EDUCATION MINISTRY IN 2021-22.<sup>123</sup> TAXING THE WEALTHIEST 10 BILLIONAIRES AT 1 PER CENT WOULD BE ENOUGH TO COVER THIS SHORTFALL FOR 1.3 YEARS.<sup>124</sup> TAXING THE SAME 10 RICHEST BILLIONAIRES AT 4 PER CENT WOULD COVER THE ENTIRE AMOUNT OF FUNDS REQUESTED FOR TWO YEARS.<sup>125</sup>

# What we need is EQUITY



*For the healing of the nations, Lord, we pray with one accord; for a just and equal sharing of the things that earth affords. Fred Kaan*

# Pediatric Blood & Cancer

Article

## **Childhood acute lymphoblastic leukemia in India: An approach to management in a three tier society**

Mammen Chandy MD

First published: September 1995 | <https://doi.org/10.1002/mpo.2950250307> | Citations: 26



[Volume 25, Issue 3](#)

September 1995

Pages 197-203



# Population profiles

- Profile I

AGE : 2 Years

FATHER: LABORER

MOTHER: LABORER

EDUCATIONAL

STATUS: ILLITERATE

SIBLINGS: SIX

MONTHLY INCOME :  
US \$ 200



**70%**

- Profile II

AGE : 5 YEARS

FATHER: BAKER

MOTHER: HOUSEWIFE

EDUCATIONAL STATUS :  
LITERATE

SIBLINGS : TWO

MONTHLY INCOME  
: US \$ 1500



**28%**

## Profile III

AGE : 10 YEARS

FATHER : BUSINESS

MOTHER : HOUSEWIFE

EDUCATIONAL STATUS

BOTH GRDUATES

SIBLINGS : ONE

MONTHLY INCOME

> US \$ 300,000



**2%**

# Management of Hodgkin's lymphoma Stage IV

- **Government Hospital/Regional Cancer Center**
  - Accurate Histopathological Diagnosis and Staging (CXR/USG Abdomen: \$ 300 )
  - Primary treatment ABVD x 6 cycles (\$500)
  - Relapse
    - MOPP
    - Metronomic therapy
    - Radiation if localized
- **Private Hospital**
  - Accurate Histopathological Diagnosis and Staging (PET Scan : \$600)
  - Primary Treatment
    - ABVD x 6 cycles (\$600)
    - Escalation to BEACOP
    - Brentuximab/Nivolumab (\$10,000/cycle)
  - Relapse
    - Reinduction with Brentuximab + Bendamustine
    - Reinduction with Brentuximab + Nivolumab
    - Autologous HSCT
    - Consolidation with Brentuximab + Nivo
    - Maintenance Brentuximab.

*Is this cafeteria approach based on resources ethical?*

*YES: So long as we have a gold standard which we continue to aim for, applicable to all.*



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# Some steps to increase Equity in Cancer Care in India

- Tackling social structures and the economy to increase purchasing power of the poor.
- Health care schemes
- Increasing cancer treatment infrastructure within a three tier system
- Differential pricing of services
- Providing low cost boarding and lodging for patients from rural areas near tertiary cancer facilities.
- Charge 10% above hospital price (not MRP) for all cancer drugs.



# Tata Medical Center Equity



6<sup>th</sup> May 2024

# Tata Medical Center - Kolkata



# TMC- Pharmacy Operations & Equity



	FY 2011-12	FY 2012-13	FY 2013-14	FY 2014-15	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21
TOTAL TRANSACTIONS	2,62,442	7,28,461	8,59,724	10,25,242	11,67,081	12,94,132	13,64,934	15,20,429	18,79,626	17,65,228
NET PURCHASE VALUE	5,62,90,760	13,85,77,402	17,18,64,942	26,64,57,067	30,47,88,721	36,04,47,013	39,93,87,469	49,76,38,966	62,12,66,224	63,95,34,367
NET SALES VALUE	8,82,62,056	21,81,78,602	26,52,26,852	38,20,00,247	44,29,15,153	52,33,25,458	57,37,46,923	71,04,47,253	90,98,37,787	93,99,27,602
NET MRP VALUE	8,82,62,056	21,81,78,602	26,52,26,852	43,30,83,720	53,20,87,045	64,28,21,198	72,56,62,947	92,69,43,642	1,12,09,61,874	1,17,39,60,663
NET DISCOUNT GIVEN	0	0	0	5,10,83,473	8,91,71,891	11,94,95,740	15,19,16,024	21,64,96,389	21,11,24,087	23,40,33,061
DISCOUNT PERCENTAGE OVER MRP				11.80%	16.76%	18.59%	20.93%	23.36%	18.83%	19.94%
REVENUE APOLLO	56,29,076	1,38,57,740	1,71,86,494	2,66,45,707	2,68,62,987	2,88,35,761	3,19,50,998	3,98,11,117	4,97,01,298	5,11,62,749
REVENUE TMC	1,95,59,168	5,35,13,724	6,62,64,957	7,78,67,508	9,52,99,572	11,39,56,030	11,04,19,005	13,04,67,802	17,97,10,048	18,80,03,872
FREE MEDICINES VALUE GIVEN TO PATIENTS	0	2,12,18,304	2,81,23,500	4,14,74,558	5,18,35,394	4,43,59,918	4,94,39,506	7,34,28,672	8,71,36,204	7,35,20,210

# TMC Operations- Differential Pricing for Services 1



MAJOR_DESC	MINOR_DESC	SERVICE_DESC	GENERAL_RATE	PRIVATE_RATE
DAYCARE CHARGES	CHEMOTHERAPY	1-2 DRUG BOLUS	630	1060
DAYCARE CHARGES	CHEMOTHERAPY	INFUSION LESS THAN 4 HOURS	850	1600
DAYCARE CHARGES	CHEMOTHERAPY	INFUSION GREATER THAN 4 AND LESS THAN 12 HOURS	1800	2580
DENTAL	DENTAL PROCEDURES	ORAL PROPHYLAXIS - SCALING - COMPLETE	900	1700
DIAGNOSTICS	BACTERIOLOGY	BLOOD CULTURE SENSITIVITY	1280	2120
DIAGNOSTICS	BIOCHEMISTRY	ELEC/RENAL PANEL	660	1060
DIAGNOSTICS	BIOCHEMISTRY	LFT	960	1650
DIAGNOSTICS	CYTO GENETICS	FISH FOR HER-2-NEU	5830	11130
DIAGNOSTICS	HAEMATO PATHOLOGY LABORATORY	CBC PROFILE	570	830
DIAGNOSTICS	HISTOPATHOLOGY	SMALL SPECIMEN	4300	5390
DIAGNOSTICS	HISTOPATHOLOGY	BIG SPECIMEN	7350	10530
DIAGNOSTICS	MYCOBACTERIOLOGY	MYCOBACTERIA- MICROSCOPY FOR AFB- ZIEHL NEELSEN STAIN	220	320
DIAGNOSTICS	SEROLOGY	HEPATITIS B SURFACE ANTIBODY- ANTI HBS TITRE	750	960



# TMC Operations- Differential Pricing for Services 2



MAJOR_DESC	MINOR_DESC	SERVICE_DESC	GENERAL_RATE	PRIVATE_RATE
IMAGING	CT SCAN	CT THORAX	4700	5900
IMAGING	CT SCAN	CT WHOLE ABDOMEN	8800	9900
IMAGING	MAMMOGRAPHY	MAMMOGRAPHY BILATERAL	2500	3700
IMAGING	MAMMOGRAPHY	MAMMOGRAPHY UNILATERAL	1700	2200
IMAGING	MRI	MRI UPPER ABDOMEN	6500	8300
IMAGING	PET-CT	WHOLE BODY PET - CT	20000	24070
IMAGING	SPECT-CT	BONE SCAN	4150	5750
IMAGING	ULTRASONOGRAPHY	USG BREAST	1220	1700
IMAGING	ULTRASONOGRAPHY	ECHOCARDIOGRAPHY	1800	3000
RADIATION ONCOLOGY	TELEETHERAPHY	CURATIVE 3DCRT (4 FIELDS OR LESS)/HIGH DOSE PALLIATIVE CONVENTIONAL	60110	89040
RADIATION ONCOLOGY	TELEETHERAPHY	RESPIRATORY GATING - ADDITIONAL CHARGE	21070	58440
SURGERY	SURGERY CHARGES	CATEGORY F	21470	40230
SURGERY	SURGERY CHARGES	CATEGORY K	60110	139390



A CSR INITIATIVE OF  
COAL INDIA LIMITED

*Patient & family stay facility  
Inaugurated on 3<sup>rd</sup> July 2015*



## 2. Economical

# Making Cancer Care Economical (affordable)

- Differential pricing
- Subsidy on chemotherapy
- Choosing the most appropriate protocols based on the available resources
- Reducing non hospital costs for the patient
- Reducing HR costs by a new paradigm of salaries for CEO's and doctors.

# Health care as Industry

- **MARKET SIZE**

- ❑ The Indian healthcare sector: US\$ 372 billion in 2022
- ❑ India's public expenditure on healthcare stood at 2.1% of GDP in 2021-22
- ❑ Premiums for health insurance: Rs. 73,582.13 crore (US\$ 9.21 billion).
- ❑ The Indian medical tourism market was valued at US\$ 2.89 billion in 2020 and is expected to reach US\$ 13.42 billion by 2026.
- ❑ 697,300 foreign tourists came for medical treatment in India in FY19.
- ❑ The e-health market size is estimated to reach US\$ 10.6 billion by 2025.



## **CEO pay has skyrocketed 1,460% since 1978**

CEOs were paid 399 times as much as a typical worker in 2021

**Report** • By [Josh Bivens](#) and [Jori Kandra](#) • October 4, 2022



**BMW M6 G-Power Hurricane CS - \$760,000**

Justice and Parity in remuneration in Healthcare

Low cost cancer care is difficult when income is the primary reason for existence

Gross disparity is not conducive to a contented workforce

Litigation is more likely when the outcome is bad and the patient perceives that his bill is the reason for the doctor's wealth!

# How India is making Cancer Care economical

Molecular Diagnostics

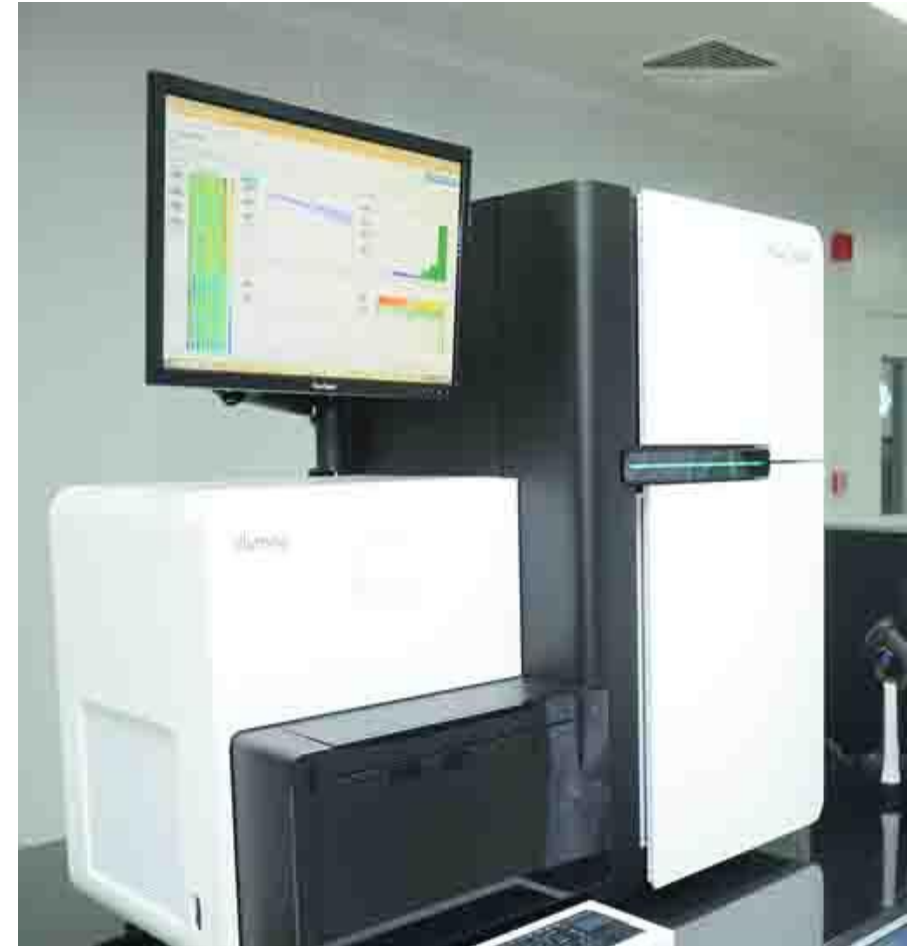
Drugs

Making scientific advances available in India





With 5 Illumina HiSeq Next-Generation sequencing machines, MedGenome is the highest throughput NGS lab in South-East Asia





# Test

**India**



**US**

\$300	BRCA1/2 germline test	\$2000
\$1200	Homologous Recombination Deficiency (HRD) test with BRCA1/2 gene analysis	\$3000
\$800	Comprehensive Genomic Profiling by NGS - Solid tumors (~500 genes)	\$5800
\$1000	Liquid Biopsy genomic profiling by NGS - Solid tumors (~200 genes)	\$5800
\$300	Comprehensive genomic profiling for hematological malignancies (SNVs & InDels, CNVs and Fusions)	\$7200
\$60	BCR-ABL1 qualitative test by RT-PCR	\$350
\$80	EGFR hotspot analysis RT-PCR	\$400
\$200	Myeloproliferative Neoplasms genomic profiling (JAK2, MPL, CALR) by NGS	\$1000

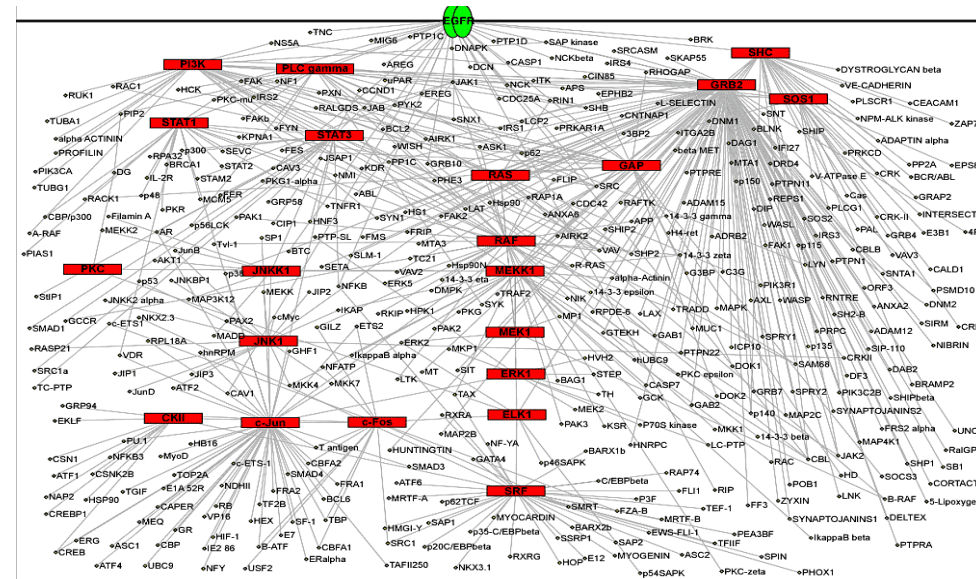
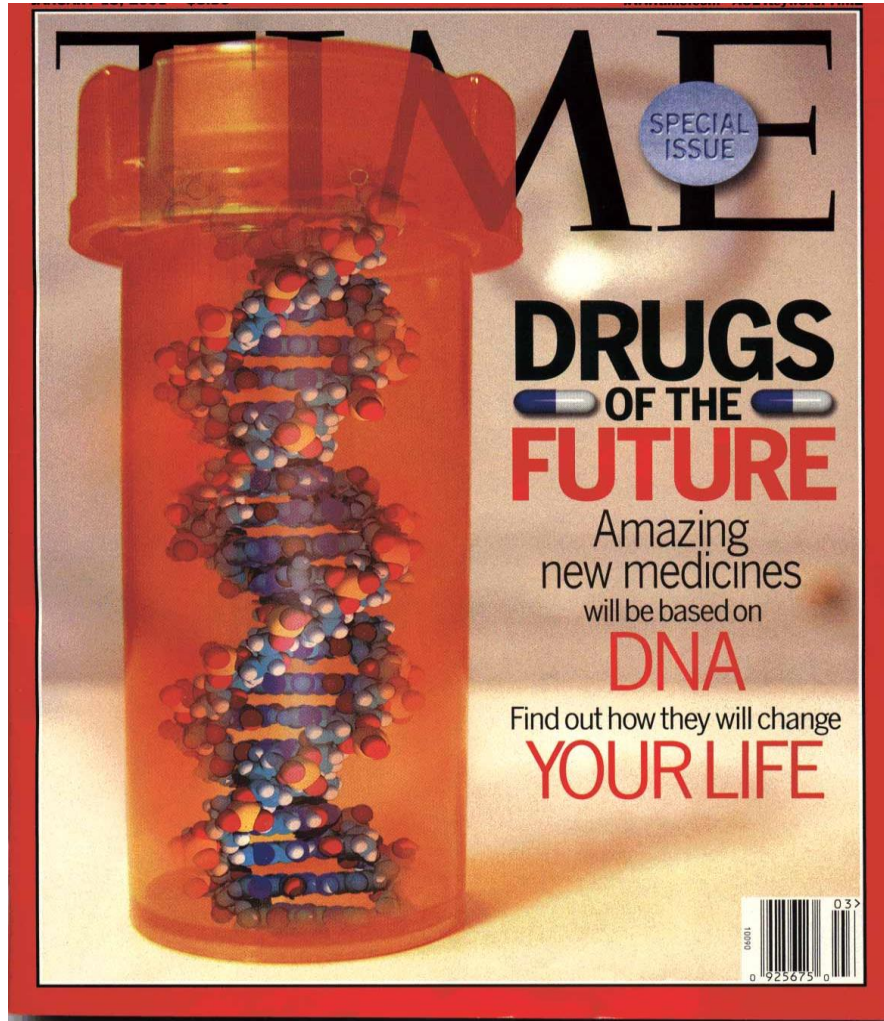
\*Covered by Insurance



# India- Cancer therapeutics

Sr. NO.	Molecule	Unit		
			Unit Price in India (USD)	Unit Price in US (USD)
1	Paclitaxel 100 mg	1 vial	7	38
2	Docetaxel 80 mg	1 vial	139	2413
3	Doxorubicin 50 mg	1 vial	12	260
4	Oxaliplatin 100 mg	1 vial	52	214
5	Bortezomib 2.5 mg	1 vial	41	212
6	Bendamustine 100 mg	1 vial	14	1642
7	Cyclophosphamide 500 mg	1 vial	1	120
8	Methotrexate 50 mg	1 vial	11	60
9	Letrozole 2.5 mg	30 tablets	5	822
10	Imatinib 400mg	30 tablets	16	250
11	Fludarabine 50 mg	1 vial	78	120
12	Gefitinib 250 mg	30 tablets	45	8211
13	Pegylated L - Asparaginase 3750 IU	1 vial	651	25621
14	Trastuzumab 150 mg	1 vial	76	1651
15	Rituximab 500 mg	1 vial	177	4956

# Drug discovery will now be based on targeting the altered signaling pathway -the era of precision medicine



Small molecules to interrupt oncogenic signalling  
Monoclonal antibodies targeting tumour antigens: plain, conjugated, T cell engagers (bites)

# Cost of targeted therapy – Is Justice more important than IPR?

- Blinatumomab: New Leukemia Drug Tops the Charts With a \$178,000 Price Tag (2014)  
Current price \$3000 per dose of 35 mcg
- Myelotarg 4.5 mg \$9926.50

JOURNAL ARTICLE

**Intellectual Property and the Pharmaceutical Industry:  
A Moral Crossroads between Health and Property**

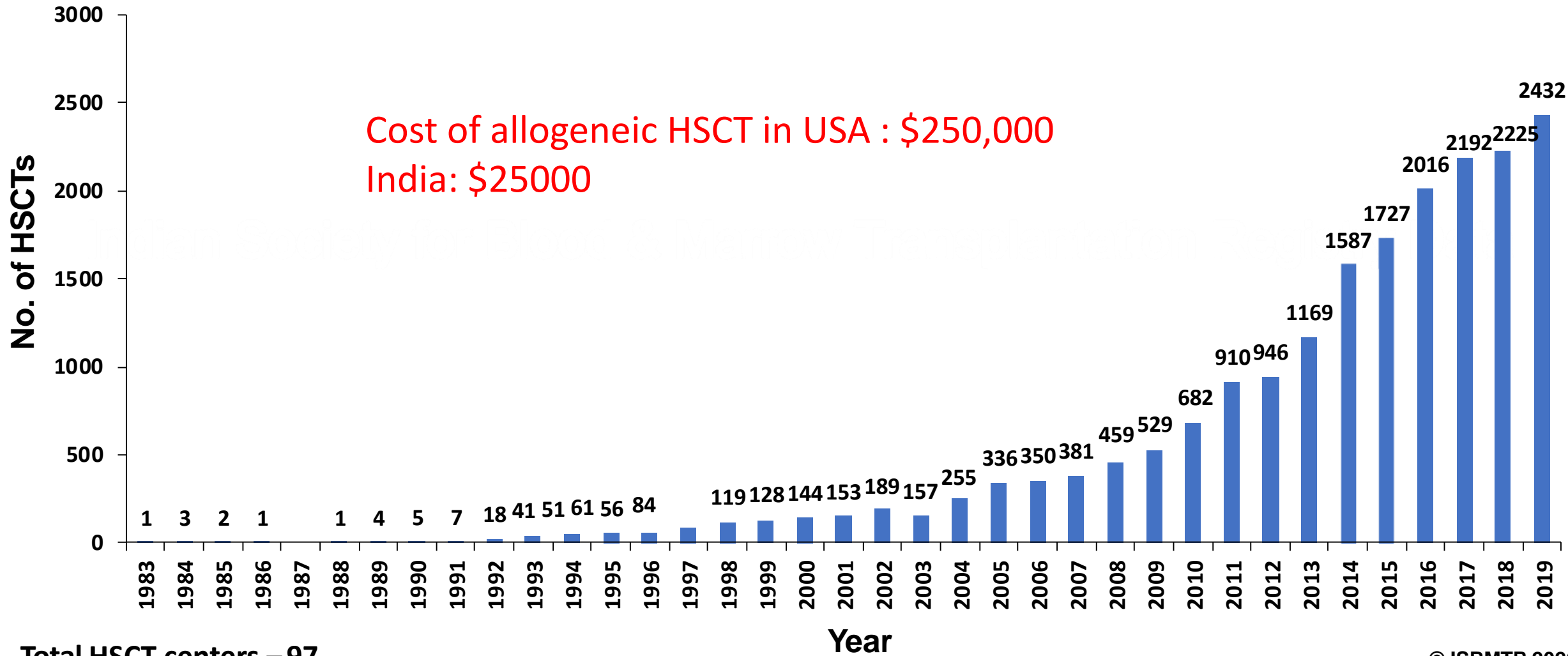
Nevin M. Gewertz and Rivka Amado

Journal of Business Ethics

[Vol. 55, No. 3 \(Dec., 2004\)](#), pp. 295-308 (14 pages)

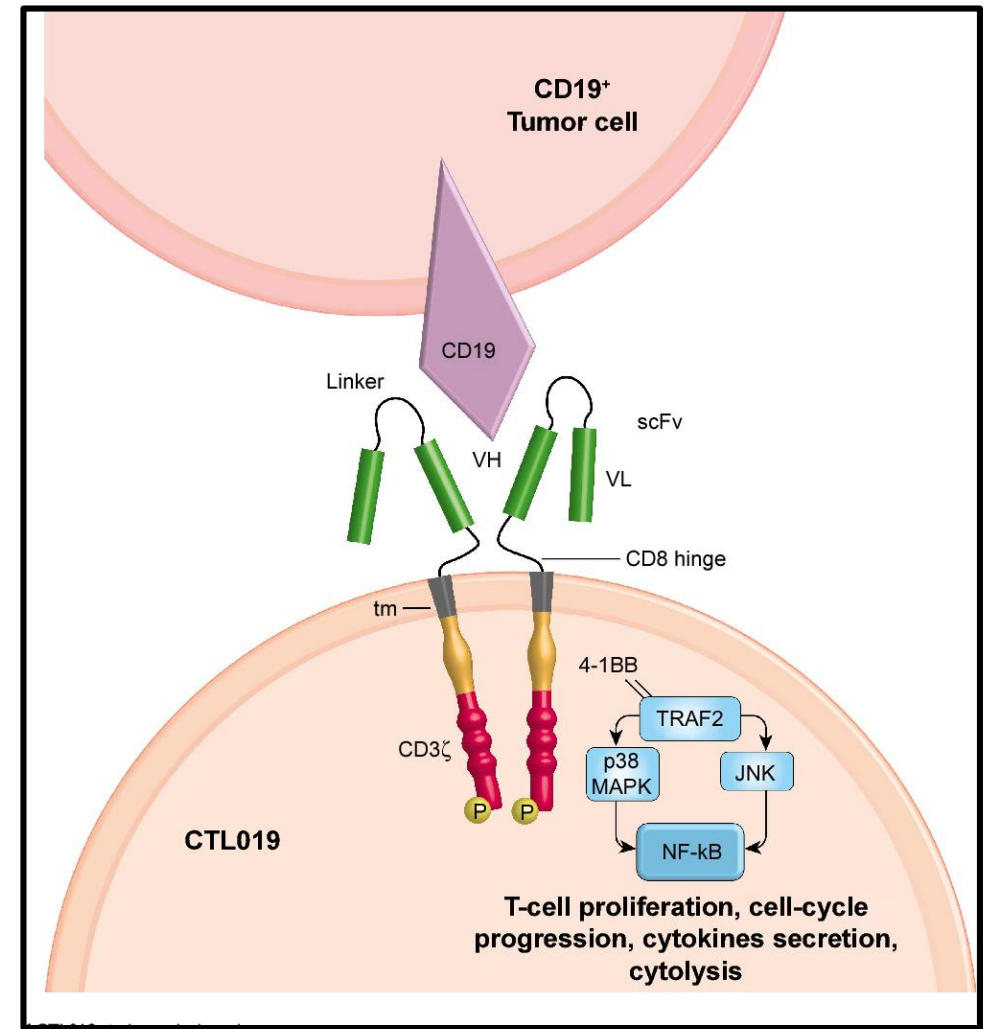
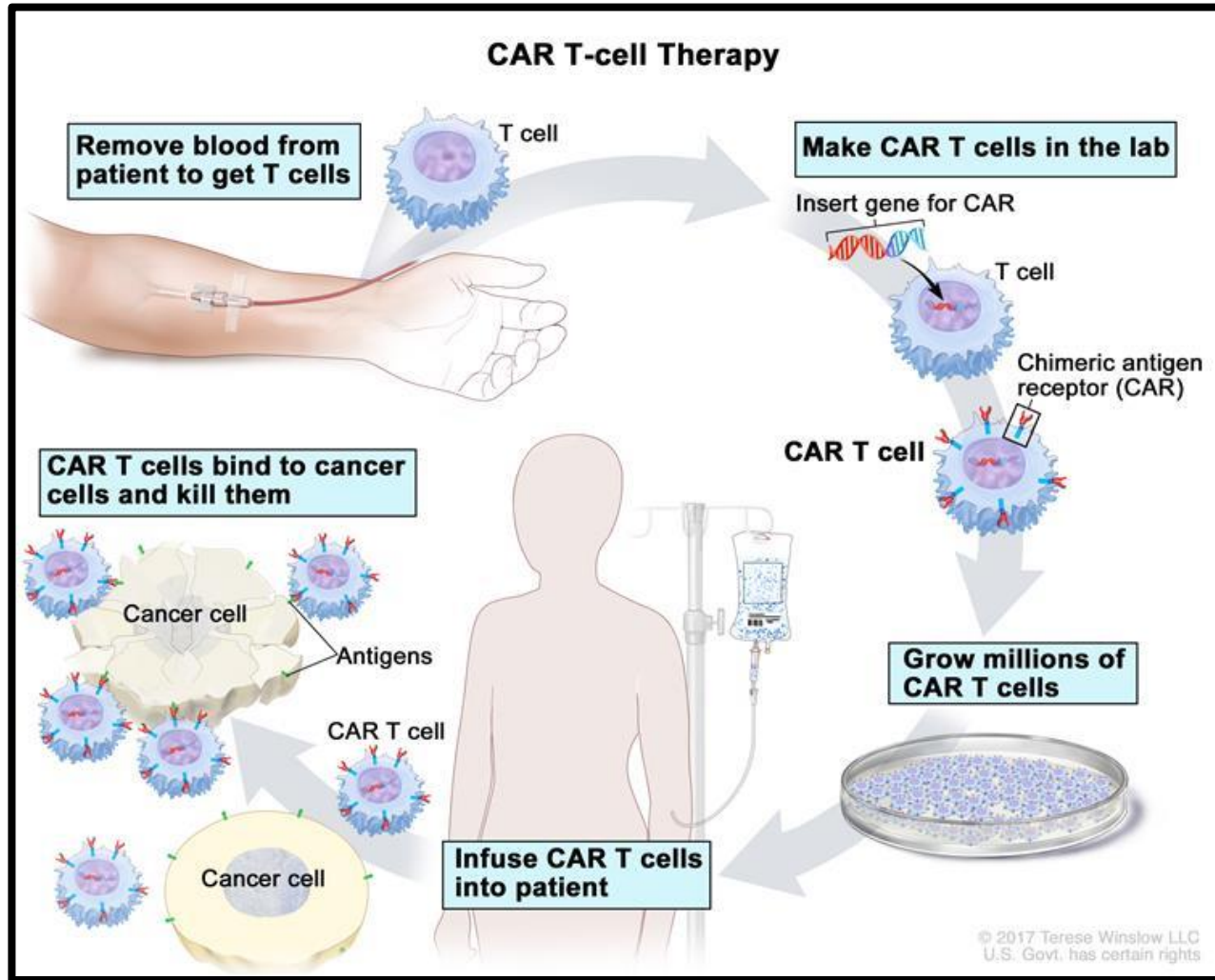
# INDIAN SOCIETY FOR BLOOD AND MARROW TRANSPLANTATION REGISTRY 1983 – 2019

## Total number of HSCTs by Year (N= 19421)



Total HSCT centers – 97

# CAR T – cells the Living Drug







**Manufacturing room**

**US Costs \$1million  
Can be done in India  
at 25-50 lakhs**



**QC Lab**

# 3. Efficient

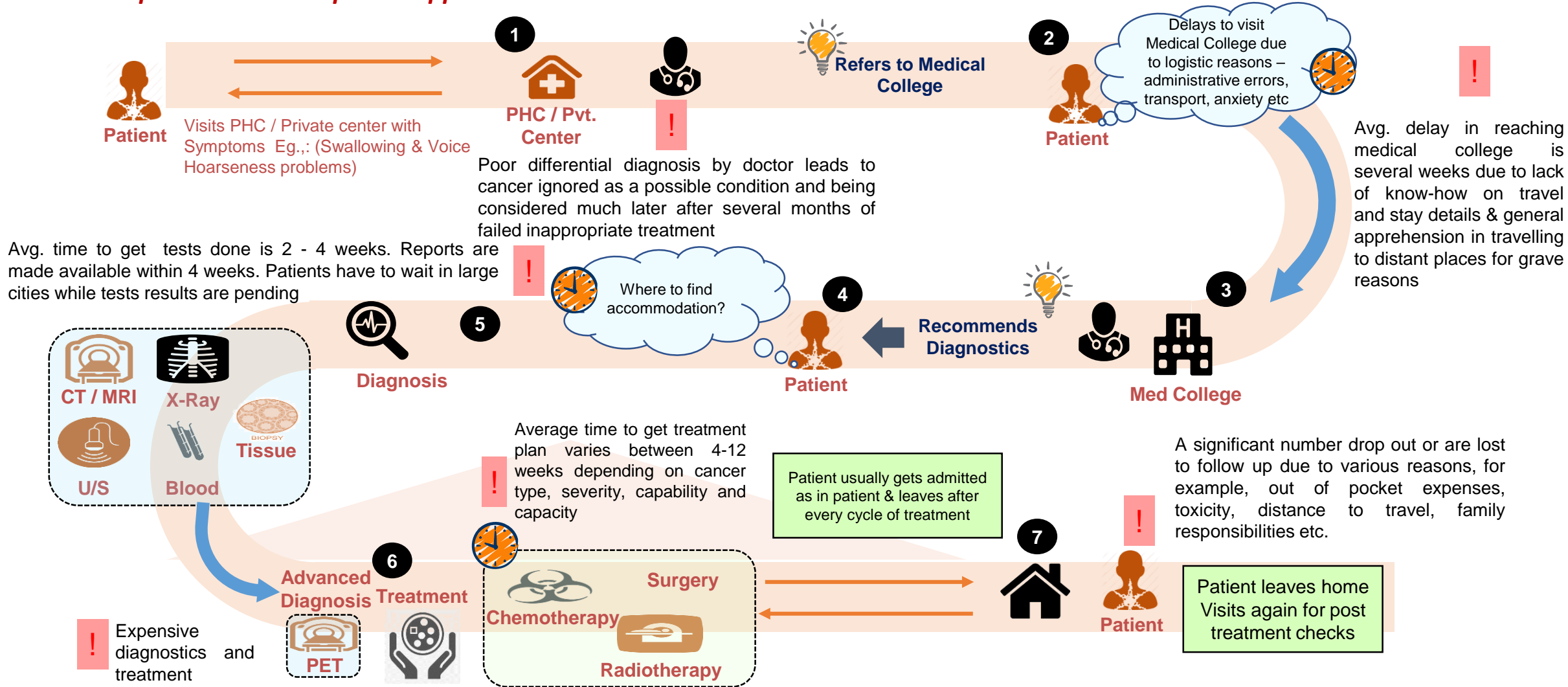
# CANCER MANAGEMENT HIERARCHY



# PATIENT PATHWAY – OBSTACLES

Current time to a confirmed cancer diagnosis:  
6 -12 months from first presentation with symptoms to a health care practitioner

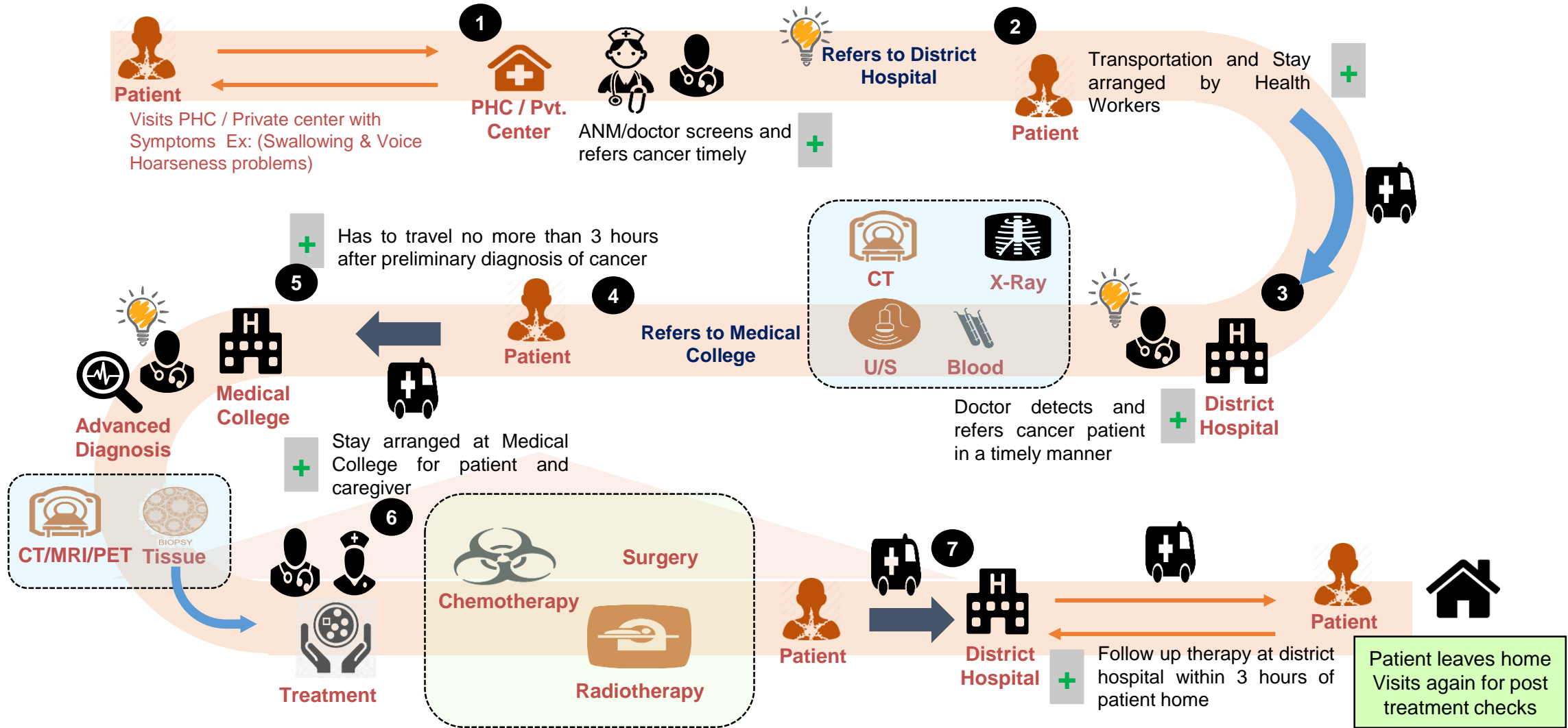
- **Current points where drop out happens**



# PATIENT PATHWAY – PAVING THE WAY

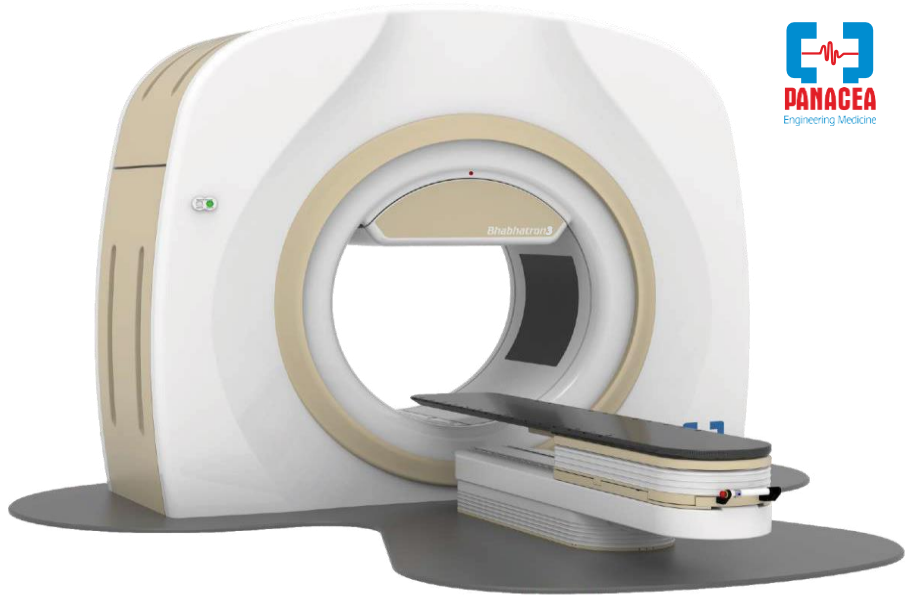
## • Easing Patient Navigation & Referral

Proposed time to a confirmed cancer diagnosis: 2 - 4 weeks from first presentation to a doctor



# To make Cancer Care efficient in India

- Infrastructure
  - Hospitals
  - HR
- Systems which are implemented
  - chemotherapy
- Defined TAT
- Reduce waiting times
- Patient centric
- Proper distribution of services



# Radiotherapy facilities in India

Directory of Radiotherapy Centers:

India has less than one radiotherapy machine per million individuals. 2021 data

- 427 centers with 669 megavoltage units and 317
- brachytherapy and few advanced therapy units.

The estimated shortfall in India for teletherapy machines is around 1,200 as per the WHO estimate

*Munshi A, Ganesh T, Mohanti BK.*

*Radiotherapy in India: History, current scenario and proposed solutions. Indian J Cancer 2019;56:359-63.*

*Pictures show the Bhabhatron Cobalt 60 and the Siddharth II Linear Accelerator made in India.*

*Brachytherapy with Treatment planning system developed in India with irridium*



# 4. Effective

1. Emphasis on Prevention
2. Evidence based treatment: standard protocols
3. Constant evaluation of Quality and Outcome
4. Palliative care



# Effective Cancer Care in India

- All cancer treatment must be evidence based and protocol driven
- Outcomes must be analysed and compared with international best practice
- Emphasis on quality at all levels
- Availability of resources for the individual must be factored into the choice

# Cancer screening and prevention in India

- **CERVICAL CANCER**
  - 59.7 million girls and 272.8 million women in India in the eligible age group for cervical cancer vaccination and screening
  - cytology, co-testing (HPV + cytology), primary HPV testing, and visual inspection with acetic acid.
  - HPV vaccination was introduced in India in 2008, it is yet to be included in the universal immunization program in India
- NATIONAL PROGRAMME FOR PREVENTION & CONTROL OF CANCER, DIABETES, CARDIOVASCULAR DISEASES & STROKE (NPCDCS) 2016
- **TOBACCO**
  - 267 million adults (15 years and above) in India (29% of all adults) are users of tobacco, according to the Global Adult Tobacco Survey India, 2016-17
  - Global Adult Tobacco Survey (2009–10) to 2016-17: 4.5% decline in smokeless tobacco use from 25.9% to 21.4% and a 3.3% decline in smoking, from 14.0% to 10.7% *PLoS ONE*2021 16(2): e0247226

# Palliative Care in India

- KERALA: “Neighbourhood Network in Palliative Care,” has more than 60 units covering a population of more than 12 million, and is probably the largest community-owned PC network in the world.

*J Pain Symptom Manage 2007;33:623e627.*

- 1985 Narcotic Drugs and Psychotropic Substances Act (NDPS) and 1988's Prevention of Illicit Trafficking in Narcotic Drugs and Psychotropic Substances Act.
- 2014: amendment making opioids available for appropriate use
- 70% of the population still does not have adequate access to oral morphine.
- 19,482 deaths in 2012 in Kerala: Morphine use: 2,041 mg/cancer death. Compared to: Canada, 284,653 mg/cancer death; and Italy, 24,287 mg/cancer death. *JGO 2017 720:3, 6,*

# Yes we are implementing the four E's in Cancer Care: but not fast enough

- How?

- Unequal distribution of Resources: eg Swastha Sathy in WB
- Education and Social factors: internet
- Access
- Gap between infrastructure and Demand
  - Cancer centres: Tertiary/Secondary/Primary: new cancer centres
  - Diagnostics: lower cost centralized molecular diagnostics
  - Radiation therapy: radical change in thinking required
  - Drugs: chemotherapy, monoclonals, antimicrobials – Proud of Indian Pharma industry
  - Palliative care and pain relief: availability of opioids
  - Prevention: need of the hour



Thank you