The Buddha is smiling during years of his pilgrimage (1925-2004)
CANCER IN INDIA

ELEVENTH RAJA RAMANNA MEMORIAL LECTURE

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Tata Memorial Centre
Mumbai, India
Indian Scenario in Cancer care

CANCER BURDEN – GAUGING THE PROBLEM

Cancer Incidence (Age Standardised rate)

Ref: GLOBOCAN 2008,
Indian Scenario in Cancer care

CANCER BURDEN – GAUGING THE PROBLEM

Cancer Mortality (Age Standardised rate)

Ref: GLOBOCAN 2008,
Fig. 4.1(a): ALL SITES (ICD-10: C00-C96) - Males
Trends over time (1982-2005) in AAR (Three Year Moving Average)

**TRENDS IN CANCER**

- Rising Lung, Breast, Ovary
- Reducing Cervix, Stomach, Penile
- All Cancers is a straight line (No change)

<table>
<thead>
<tr>
<th></th>
<th>ASR* 1976-80</th>
<th>1996-2000</th>
<th>EACP*+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>14.6</td>
<td>19.3</td>
<td>1.4 (1.2 - 1.7)</td>
</tr>
<tr>
<td>Cervical</td>
<td>15.2</td>
<td>11.4</td>
<td>-1.5 (1.7 - 1.2)</td>
</tr>
<tr>
<td>Ovarian</td>
<td>4.5</td>
<td>4.9</td>
<td>0.8 (0.3 - 1.3)</td>
</tr>
</tbody>
</table>

Source: Bombay cancer Registry  
*Age adjusted incidence rates (30-64 years)  
+ Estimated Annual Percent Change  
The age of maximum incidence of cancer in this country is at least ten years earlier than in Western countries and Japan and in the case of cancer of female generative organs earlier by 15-20 years. In every Province including Burma, the incidence of cancer of cervix falls heaviest on Hindu women. The incidence of buccal cancer falls heavier on the male than the female and on Muslims more than Hindus. This form of cancer has its lowest incidence in Punjab, where Pan chewing is not indulged in to the same extent as in other parts of India. Unhappily this habit is growing rapidly in that Province as well. Penis cancer is peculiarly a disease of the uncircumcised communities and out of total 611 cases recorded in biopsy records and 1,080 cases in clinical records only 17 cases were recorded among Mohammadens in the former series and 29 in the latter.
UNIQUE CANCERS

- Religion (Cervix & Penis)
- Geographic Variation
  - Gall Bladder
  - Nasopharynx
  - Esophagus
INDIAN SCENARIO IN CANCER CARE

PREVENTABLE CANCERS (70%)

- 40% of cancers are Tobacco related
- 15% Urban / Semi-Urban Cancers are due to Obesity (5 types of cancers)
- 15% Infections (Ca Cervix, stomach, penis, Gall Bladder?)
Act of Observation
Changes the Observed
CANCER CONTROL PROGRAM: SCREENING

- Screening increases Incidence
- Unless screening reduces preferably All Cause Mortality (also Cause specific) but under no circumstances it should increase all cause mortality (Swedish overview for Breast Ca)
- Do not adopt any intervention unless robust evidence of mortality reduction emerges lest it is difficult to withdraw public health intervention or disown its benefit or accept its harm (Prostate, Thyroid)
# ACT OF OBSERVATION & CANCER INCIDENCE

<table>
<thead>
<tr>
<th></th>
<th>Symptomatic</th>
<th>Asymptomatic</th>
<th>Autopsy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>5</td>
<td>60</td>
<td>&gt; 15000</td>
</tr>
<tr>
<td>Thyroid</td>
<td>3</td>
<td>10</td>
<td>&gt; 10000</td>
</tr>
<tr>
<td>Lung</td>
<td>10</td>
<td>65</td>
<td>&gt; 10000</td>
</tr>
<tr>
<td>Breast</td>
<td>30</td>
<td>120</td>
<td>&gt; 12000</td>
</tr>
<tr>
<td>Brain (A)</td>
<td>3</td>
<td></td>
<td>&gt; 10000</td>
</tr>
</tbody>
</table>
In women < 50 yr. debatable benefit

In women > 50 yr. 30% RR in cause sp mortality

Overdiagnosis

CBE is equivalent to CBE + Mammo

All cause mortality unchanged or increased

CBE vs Awareness (Mumbai Study)
EFFECT OF VISUAL INSPECTION WITH ACETIC ACID (VIA) SCREENING BY PRIMARY HEALTH WORKERS ON CERVICAL CANCER MORTALITY: A CLUSTER RANDOMIZED CONTROLLED TRIAL IN MUMBAI, INDIA.

- Four rounds of biennial VIA screening by PHWs led to 31% cervical cancer mortality reduction
- No overdiagnosis
- Widely implementable
- Can prevent over 22,000 cervical cancer deaths in India and 72,000 deaths in the developing world annually
Schrodinger's famous thought experiment involves a (macroscopic) cat whose quantum state becomes entangled with that of a (microscopic) decaying nucleus. The creation of such micro-macro entanglement is being pursued in several fields, including atomic ensembles, superconducting circuits, electro-mechanical and opto-mechanical systems. Here we experimentally demonstrate the micro-macro entanglement of light. The macro system involves over a hundred million photons, whereas the micro system is at the single-photon level. We show that microscopic quantum fluctuations (in field quadrature measurements) on one side are correlated with macroscopic fluctuations (in the photon number statistics) on the other side. Further, we demonstrate entanglement by bringing the macroscopic state back to the single-photon level and performing full quantum state tomography of the final state. Although Schrodinger's thought experiment was originally intended to convey the absurdity of applying quantum mechanics to macroscopic objects, this experiment and related ones suggest that it may apply on all scales.
Quantum theory is often presented as the theory describing the microscopic world, and admittedly, it has done this extremely well for decades. Nonetheless, the question of whether it applies to macroscopic scales remains open, despite many efforts 1-3. Here, we report on entanglement exhibiting strong analogies with the Schrödinger cat state as it involves two macroscopically distinct states—two states that can be efficiently distinguished using detectors with no microscopic resolution". Specifically, we start by generating entanglement between two spatial optical modes at the single-photon level and subsequently displace one of these modes up to almost a thousand photons". To reliably check whether entanglement is preserved, the state is redispaced back to the single-photon level and a well-established entanglement measure", based on single-photon detection, is applied. Our results provide a tool to address fundamental questions about quantum theory and hold potential for more applied problems, for instance in quantum sensing.
Impact of Removal of Primary Tumour on Metastasis

Fisher & Gunduz 1989


**DISTANT PROGRESSION-FREE SURVIVAL**

HR = 1.42, 95% CI = 1.08 - 1.85, p=0.01

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**At Risk**

<table>
<thead>
<tr>
<th>No LR Rx</th>
<th>177</th>
<th>74</th>
<th>38</th>
<th>17</th>
<th>8</th>
<th>6</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR Rx</td>
<td>173</td>
<td>66</td>
<td>26</td>
<td>12</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

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**Cum Survival**

No LR Rx (N = 177)

LR Rx (N = 173)

47.5%

28.3%
NATURAL HISTORY OF UNTREATED BREAST CANCER


[Diagram showing survival rates over time without treatment]
Natural history of clinically manifest tumors shows < 5% survival at 10 yrs.

Increased precision of diagnosis increases incidence of cancer

Early surgery is superior to late surgery

Segregation between those who metastasize and those who don’t, is determined at the time of surgery and not by events prior to surgery

Can we tweak events at the time surgery to prevent onset/autonomy of metastases?
Primary Progesterone for Operable Breast Cancer

Trial Schema

- OBC
- R
- Control

Stratification

Menopausal Status (Pre, Post)

Tumor Size (<=2, 2-5, >5)

Inj. Hydroxy-Progesterone 500 mg IM (day -4 to -14)

Sx

Adj Rx
Single-Injection Depot Progesterone Before Surgery and Survival in Women With Operable Breast Cancer: A Randomized Controlled Trial

Rajendra Badwe, Rohini Hawaldar, Vani Parmar, Mandar Nadkarni, Tanuja Shet, Sangeeta Desai, Sudeep Gupta, Rakesh Jalali, Vaibhav Vanmali, Rajesh Dikshit, and Indraneel Mittra

See accompanying editorial on page 2839

In recent years I have been interested in the philosophy of science. This approach to knowledge has been neglected and is only now becoming an essential part of science. The fact that the various components of science like Physics, Chemistry, Biology have merged into one, makes a philosophical approach inescapable, as it used to be in the past, and in fact the old name for science is Natural Philosophy. It is indeed an anomaly that many of the Doctors of Philosophy as fabricated in our Universities each year, know little of philosophy as an integrated approach to knowledge.
Thank You