Lung Cancer Prevention

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Lung Cancer Prevention

- What the Future Holds
- Tobacco Control
- Screening
What the Future Holds
Cancer Mortality Trends

- **Low-income**
- **Middle-income**
- **High-income**

<table>
<thead>
<tr>
<th>Year</th>
<th>Low-income</th>
<th>Middle-income</th>
<th>High-income</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>2010</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>2020</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>2030</td>
<td>5</td>
<td>6</td>
<td>5</td>
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</tbody>
</table>
Components of Cancer Death Trends 2002-2030

- **Lung**
- **Stomach, colon, and rectum**
- **Breast, cervix, uterus, and ovary**
- **Prostate**

Legend:
- Black: Total change
- White: Population growth
- Light gray: Population ageing
- Dark gray: Epidemiological change

Deaths (millions)
Trends in Tobacco Caused Deaths
A model describing stages of the tobacco epidemic based on data from developed countries
Age-standardized Incidence Rates for Lung Cancer

![Bar chart showing age-standardized incidence rates per 100,000 for different regions.](image)
Tobacco Interventions

- Public policy initiatives
- Preventing initiation
- Cessation programs
Tobacco Interventions: Policy

- Policy interventions are most cost-effective.
  
  Taxation to raise prices
  
  Warning labels and advertising bans
  
  Prohibition of sales to minors
  
  Banning smoking in public places
Tobacco Control Milestones in the USA

A change in policy from promoting tobacco to discouraging its use.
Cigarette consumption in the USA
Tobacco Interventions: Initiation

• Initiation usually occurs in teenage years.

• Smoking by celebrities encourages initiation among children.

• School-based educational programs often ineffective.

• Parental role important.
Tobacco Interventions: Cessation

• Adult smokers are usually strongly addicted.

• Brief interventions by doctors can be effective.

• Intervention requires screening to identify smokers and counseling.

• Prescription drugs may help smokers quit.

• Assessed cost effectiveness of tobacco-use screening and brief intervention.

• In USA, 2.47 million QALYs could be saved at a cost savings of $500 per smoker who receives the service.
LUNG CANCER SCREENING

An unproven strategy.
Lung Cancer Screening

Chest Xray and cytology

RCTs have shown no benefit.

PLCO study (USA) due to report in 2013.
Lung Cancer Screening

• Helical CT more sensitive than chest Xray.

• NLST (USA) in progress, RCT due 2010.

• European RCTs will complete soon after.

• ELCAP results from single-arm study 2006.
ELCAP INVESTIGATORS 2006


• Conclusions: “Annual spiral CT screening can detect lung cancer that is curable.”
ELCAP Study

- Screened 31,567 asymptomatic persons at risk for lung cancer using low-dose CT.
- Diagnosed lung cancer in 484 participants.
- 412 (85%) had clinical stage I lung cancer.
- Estimated 10-year survival rate was 88%.
Kaplan-Meier Survival Curves for 484 Participants with Lung Cancer and 302 Participants with Clinical Stage I Cancer Resected within 1 Month after Diagnosis

Resected clinical stage I cancer, 92% (95% CI, 88–95)

All lung cancers, 80% (95% CI, 74–85)

No. at Risk
All participants 484 433 356 280 183 90 50 28 16 9 2
Participants undergoing resection 302 280 242 191 120 59 34 18 12 7 1

• Longitudinal analysis of 3246 smokers in 3 study centers

• Screened for lung cancer with CT

• Follow-up for a median of 3.9 years
A. Lung Cancer Diagnoses

B. Lung Cancer Surgical Resections

C. Advanced Lung Cancer Diagnoses

D. Lung Cancer Deaths

\[ P < .001 \]

\[ P = .14 \]

\[ P = .90 \]
Bach, et al. Conclusions

“Screening for lung cancer with low-dose CT may increase the rate of lung cancer diagnosis and treatment, but may not meaningfully reduce the risk of advanced lung cancer or death from lung cancer.”
Need for RCTs of screening.

• Lead time bias causes spurious increase in survival.

• Length bias sampling causes preferential detection of more favorable tumors.
Natural history of disease

PRECLINICAL

CLINICAL

DPCP

LEAD TIME

Onset of Disease
Detectable by Test
Signs or Symptoms
Death from Disease or Other causes
Lead time bias

**NO SCREENING**

<table>
<thead>
<tr>
<th>Signs or symptoms</th>
<th>Death from Disease</th>
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</table>

**SCREENING**

- Positive test
- **SURVIVAL**

**LEAD TIME**
Survival is always prolonged by early detection.

(Unless the treatment kills you first.)
Length bias sampling
Screening preferentially detects slower growing (less aggressive) tumors.
Conclusions

• Tobacco control most cost-effective approach to preventing lung cancer.

• Policy approach to tobacco is essential strategy for low and middle income countries.

• “Favorable” results of ELCAP uninterpretable.

• CT screening evaluation will require an RCT.