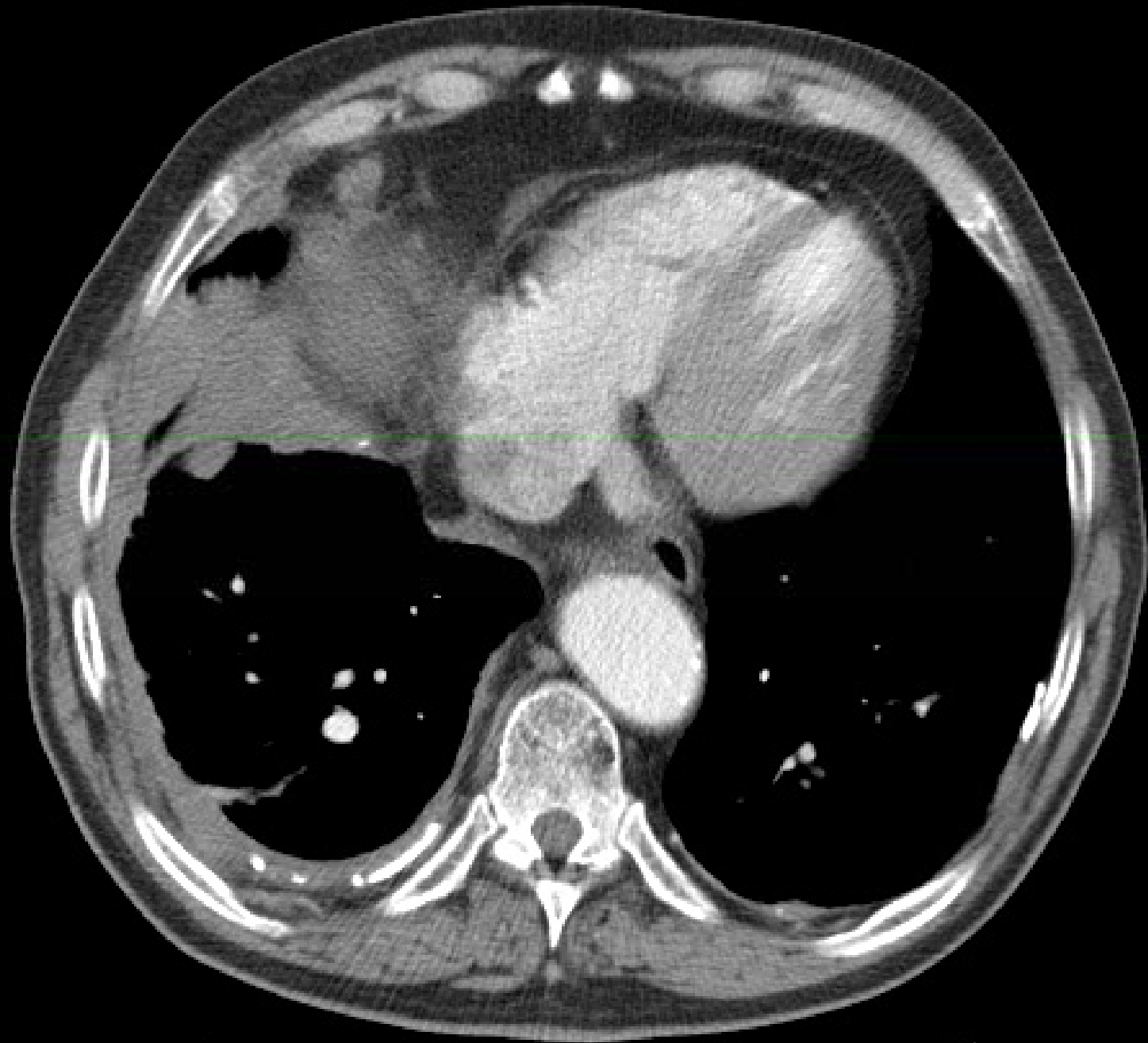


Optimizing the Intensity of Diagnostic Imaging

William C. Black, M.D.

Dartmouth-Hitchcock Medical Center



Advances in Imaging

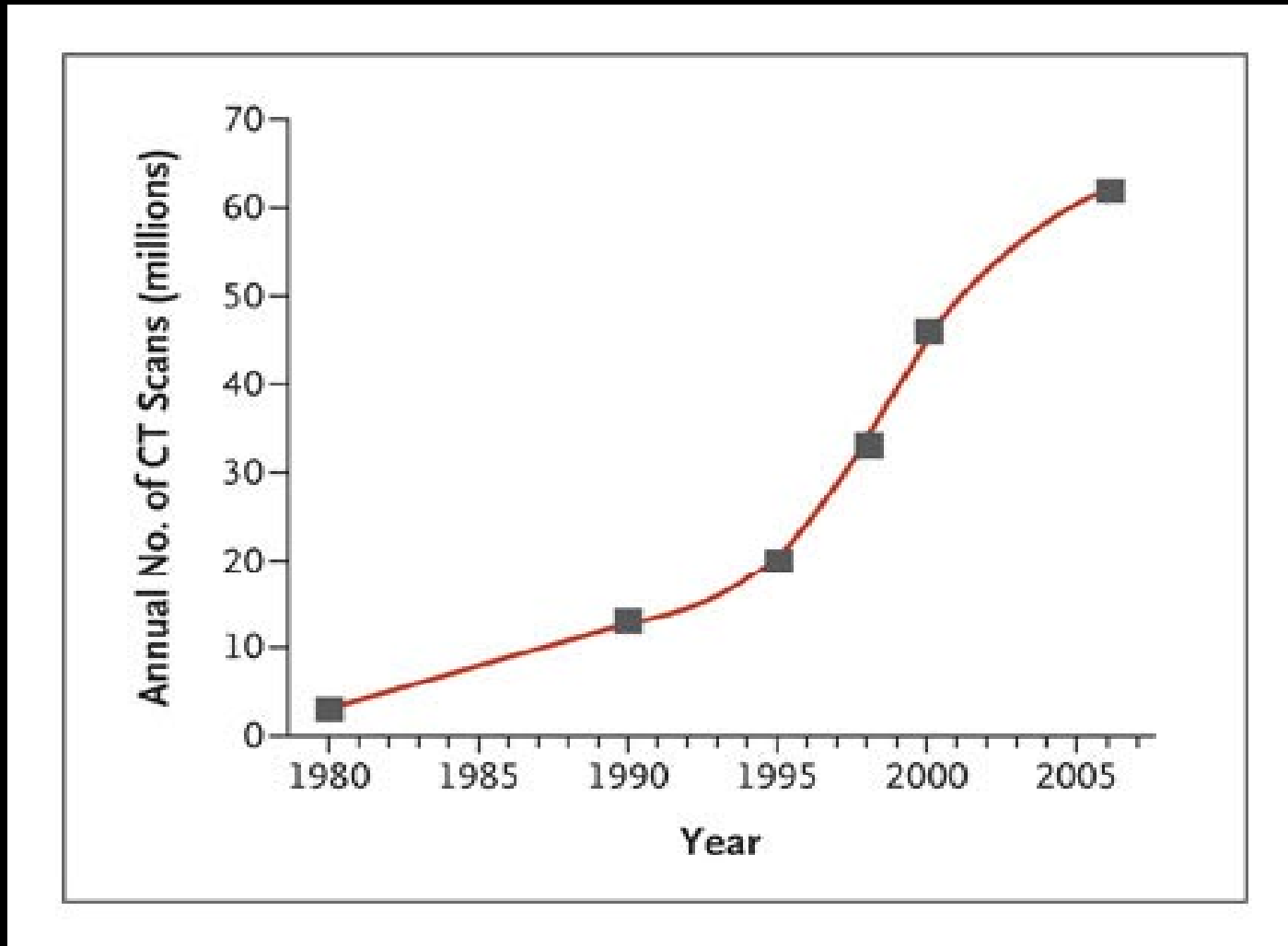
- Overestimation of disease prevalence
- Overestimation effectiveness
- Cycle of increasing intensity

Black & Welch. N Eng J Med 1993; 328:1237-1243

Biases of Early Diagnosis

- Lead time bias
- Length bias
- Overdiagnosis bias

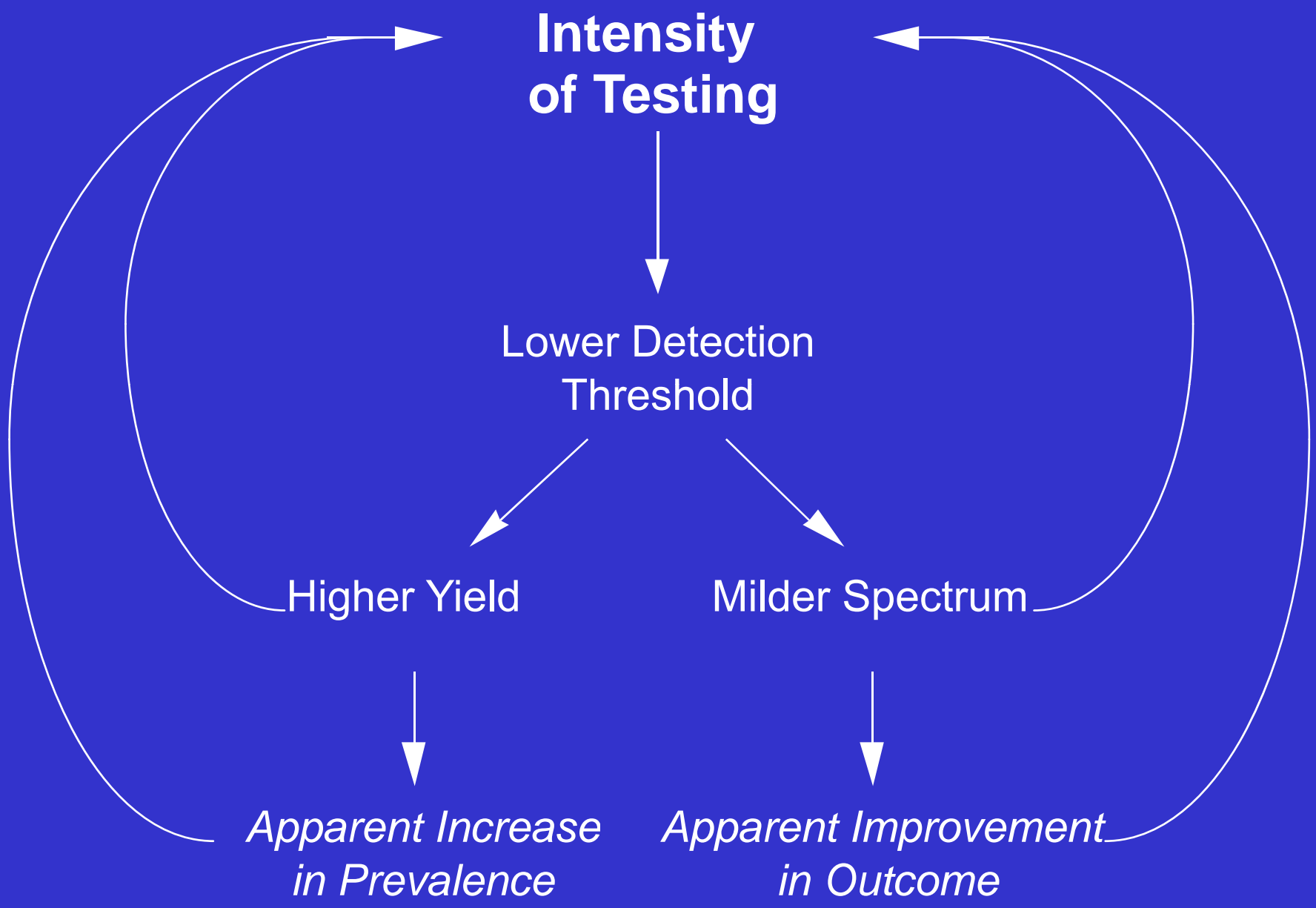
Estimated Number of CT Scans Performed Annually in the United States



Brenner D, Hall E. N Engl J Med 2007;357:2277-2284



The NEW ENGLAND
JOURNAL of MEDICINE



Adapted from Black & Welch. AJR 1997; 168: 3-11

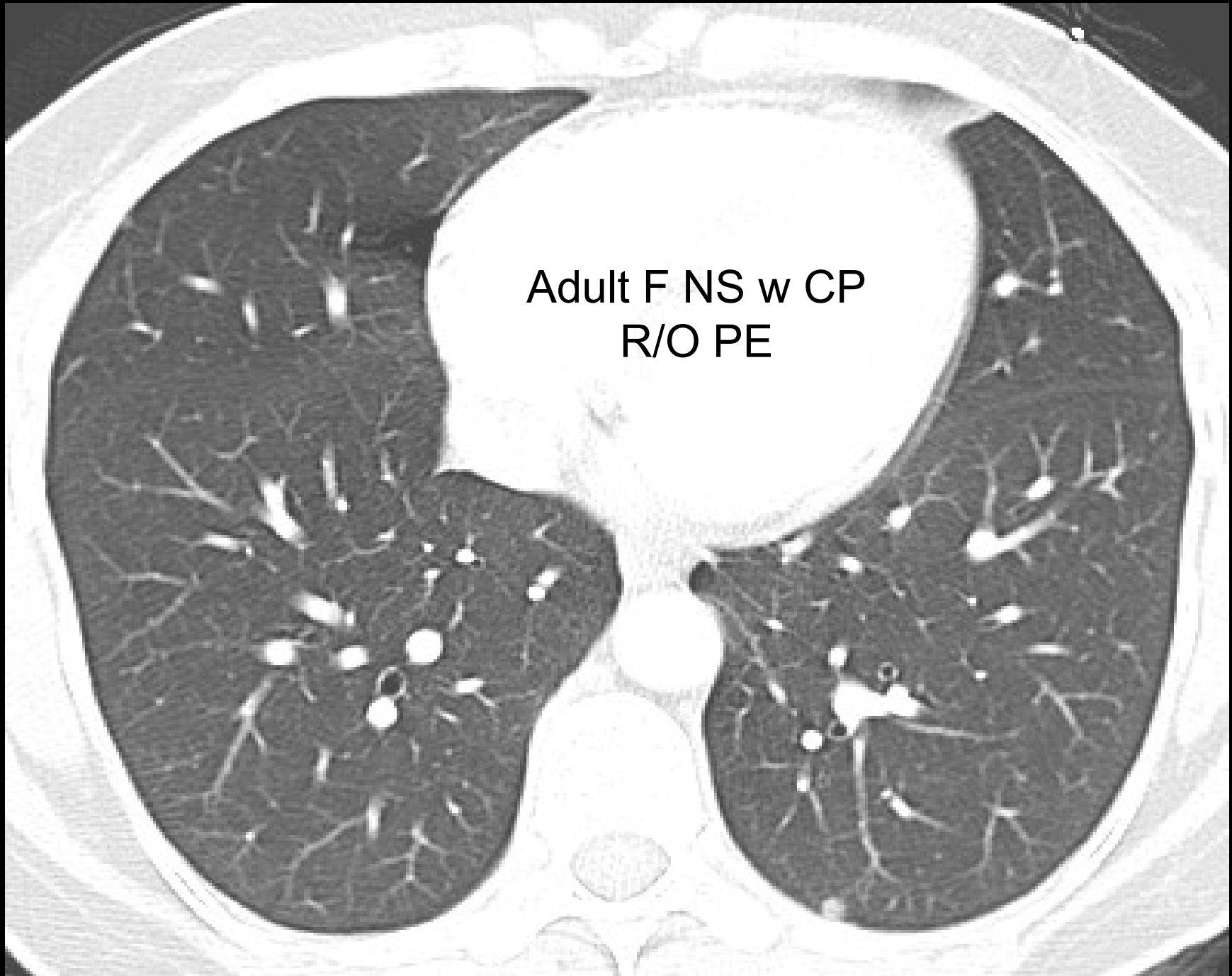
Cycle of Increasing Intensity

- Screening for disease
- Staging disease
- New treatments
- Incidental findings

Most Common Incidental Findings

- Pulmonary nodule
- Thyroid nodule
- Liver lesion
- Adrenal lesion
- Renal lesion
- AAAs

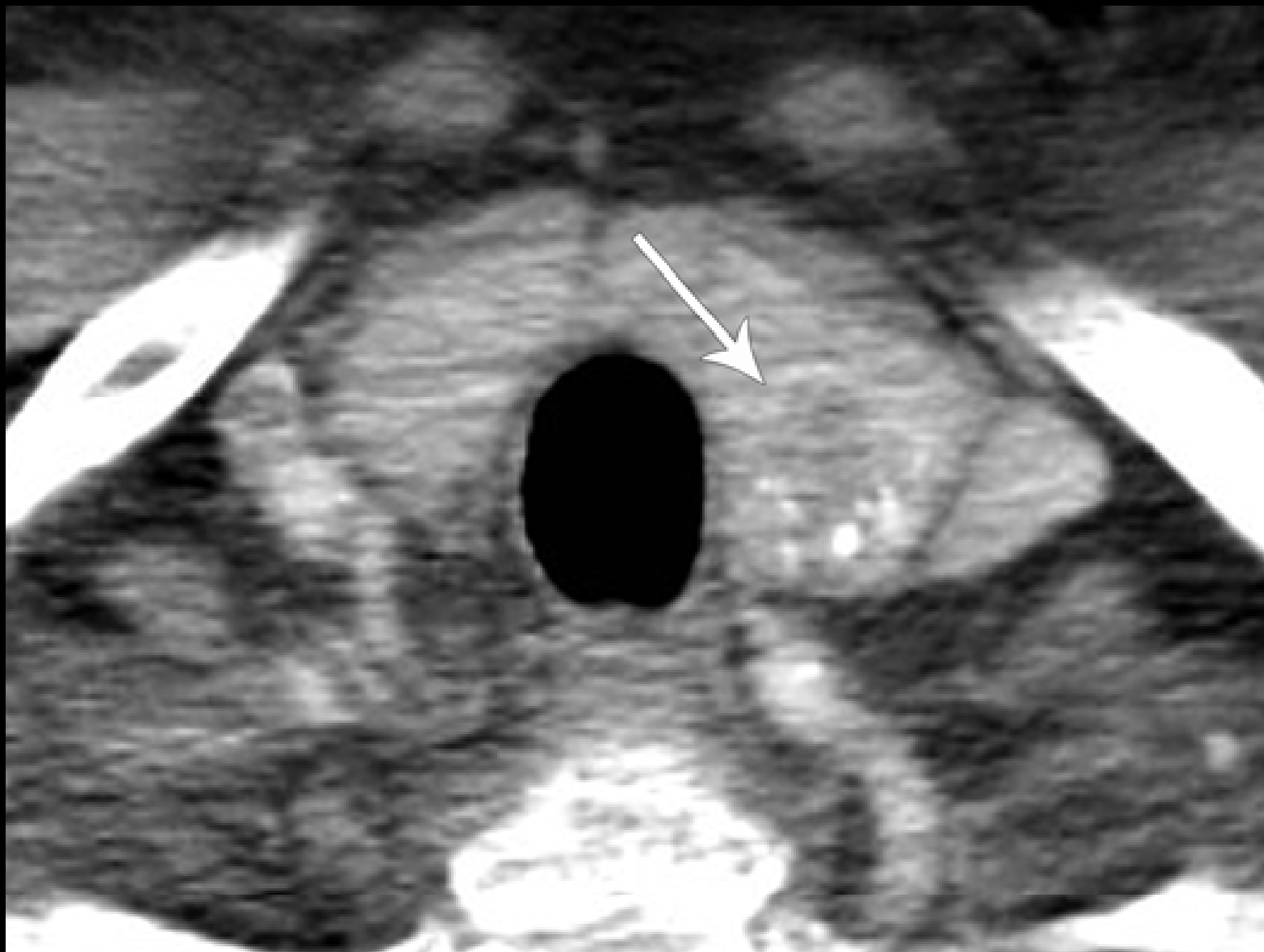
Jacobs et al. *J Comput Assist Tomogr.* 2008;32(2):214-21



Adult F NS w CP
R/O PE

Significant Incidental Findings

- Prev in CT scr for lung ca $\approx 14\%$
- Prev in CTC scr for colon ca $\approx 10\%$
- In CTC, $\$Rx > \Dx & $\$SIF > \scr



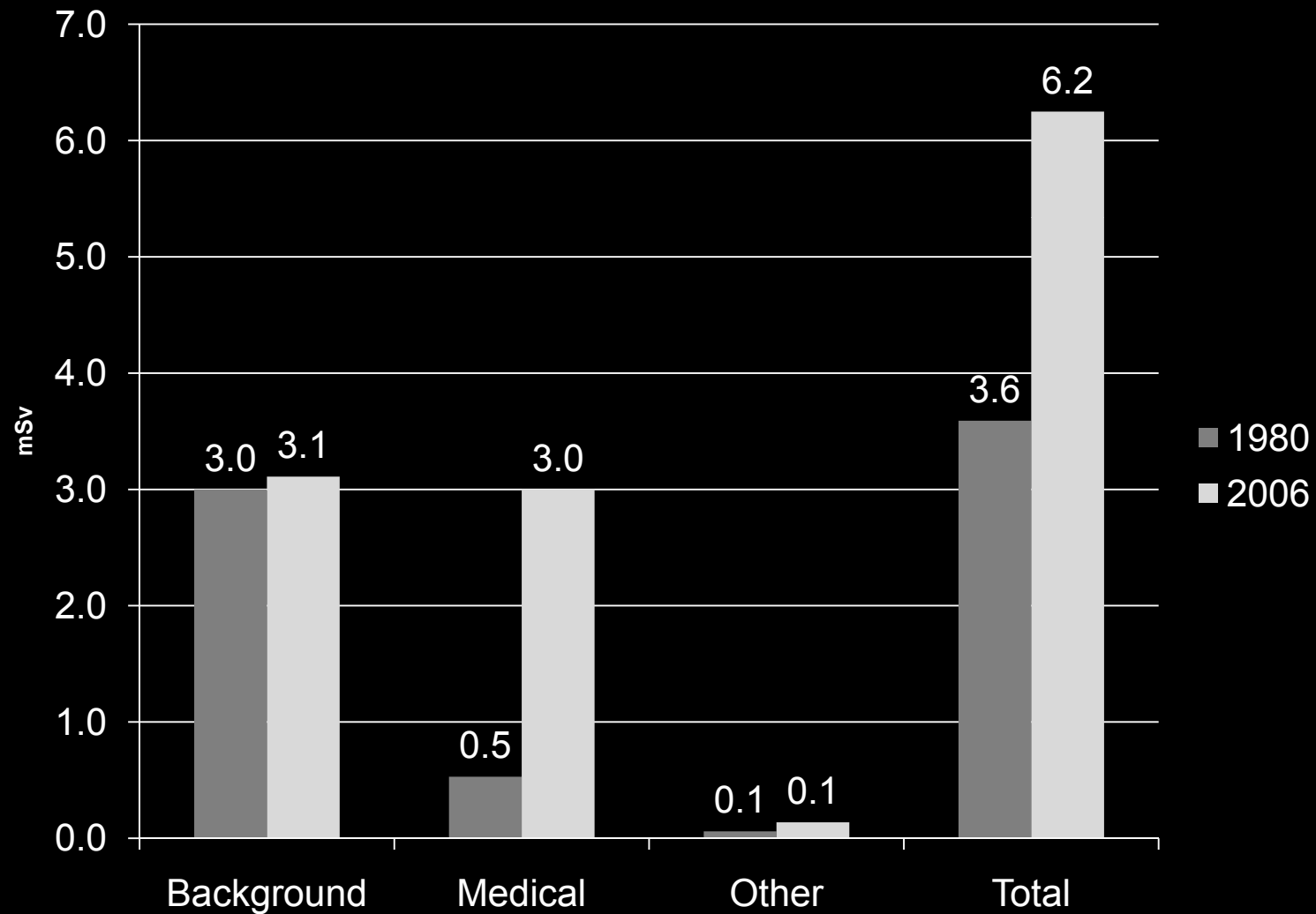
Shetty et al AJR 2006;187:1349-56.

Costs of Increasing Intensity

- Radiation exposure
- False positive results
- Overdiagnosis
- Incidental detection
- Dollar costs

Effective dose per individual in the US (mSv)

Adapted from Table 8.3 NCRP Report No. 160



Breaking the Cycle

- RCTs
- Observational studies
- Modeling
- Education
- Financial incentives
- Malpractice reform

Randomized Clinical Trials

- Gold standard
- Costly
- Practical and ethical concerns
- Insufficient sample size

Observational studies

- Less costly to perform
- More difficult to interpret
- Opportunities in clinical practice
- Patient registries

Modeling

- Integral to CER, esp imaging
 - Interpretation of data
 - Formulation for data collection
- Assumptions problematic
- Black box

Standardization of Testing

- Patient characteristics
- Technology
- Imaging protocol
- Positivity threshold
- Recommendations

Summary

- Advances in imaging
- Benefits and harms
- Cycle of increasing intensity
- Modeling integral to CER of DI