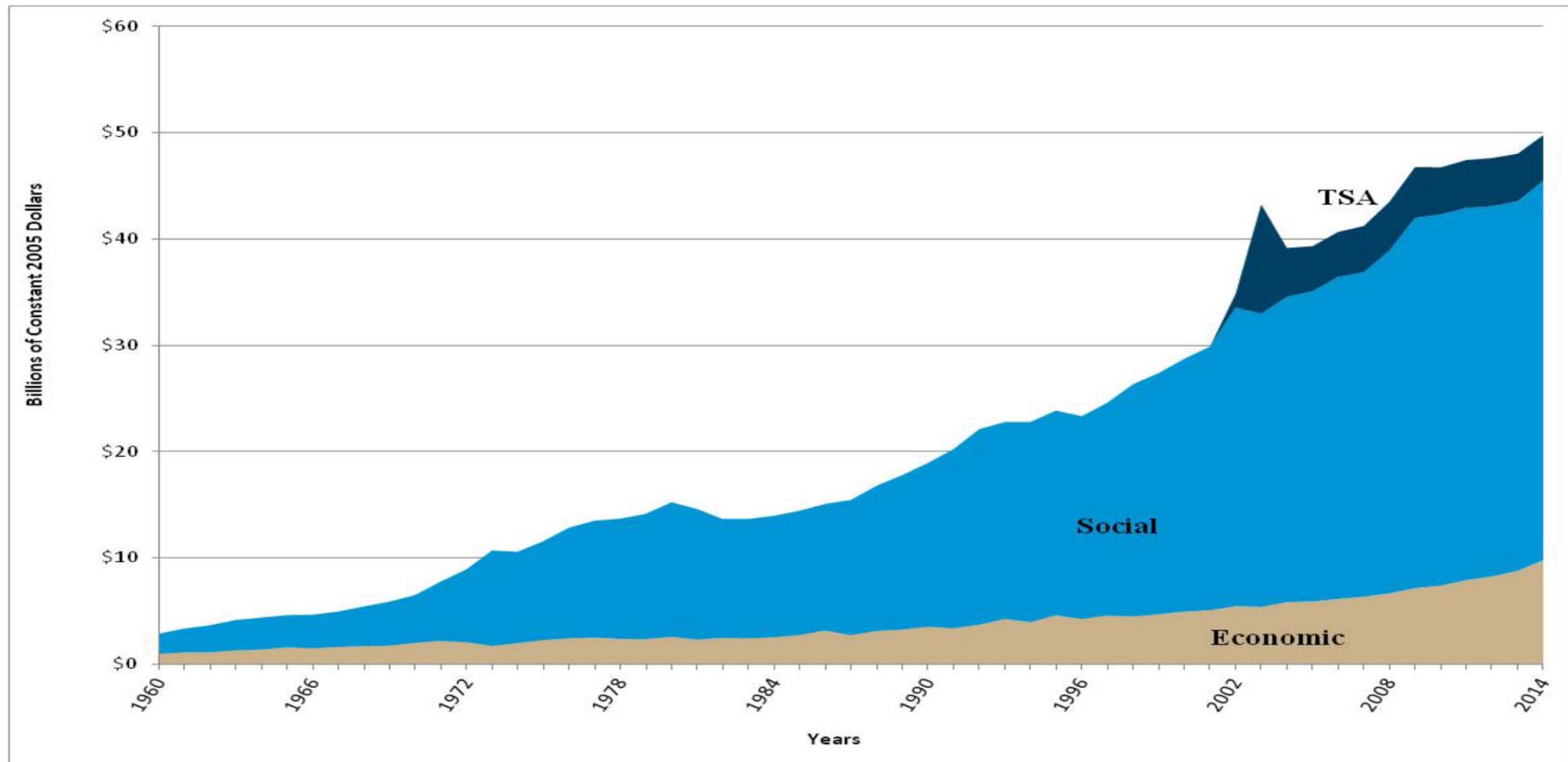


Hormesis and Linear No-Threshold Dose-Response Curves

Ed Calabrese
Richard Williams
Dima Yazji Shamoun
James Broughel

Presentation by Richard Williams
Vice President of Policy Research
Mercatus Center at George Mason University

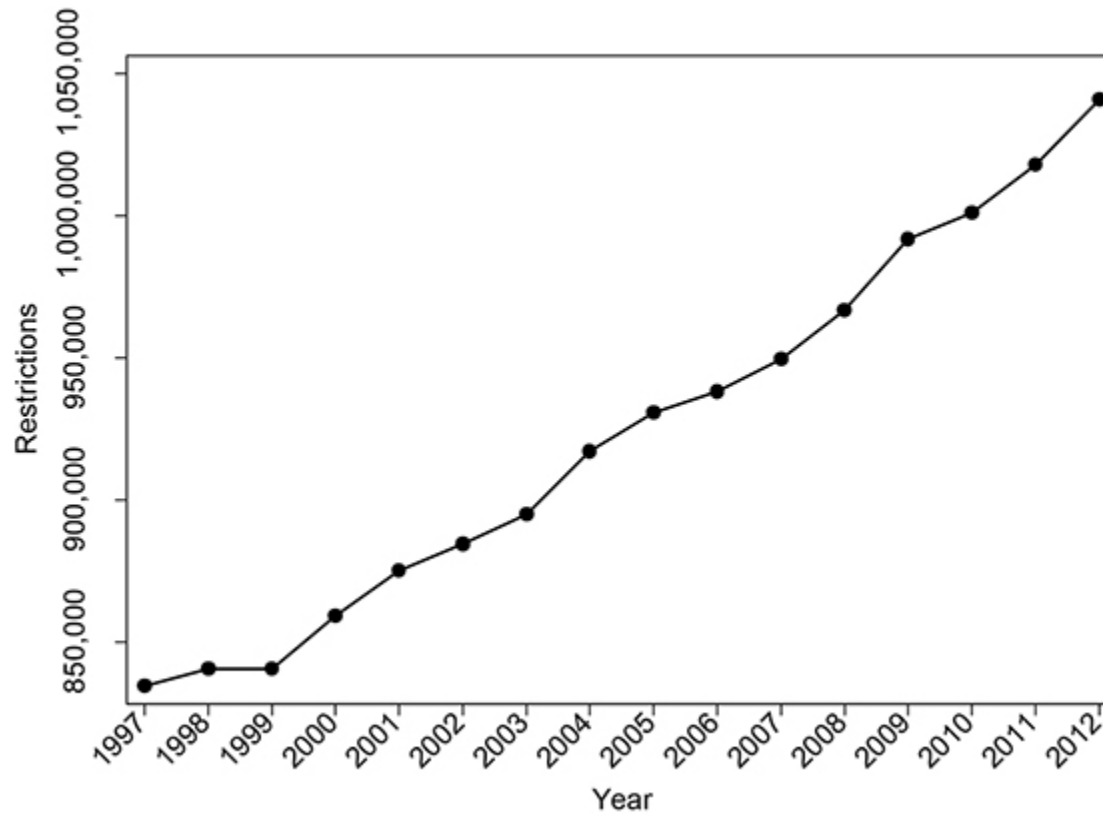
Growth in Regulatory Agencies



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Growth in Regulations

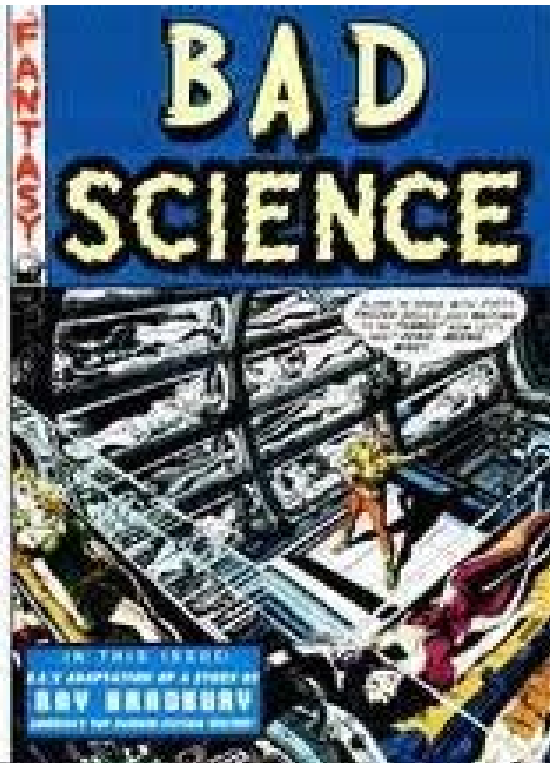
Figure 1. Total Annual Regulatory Restrictions, 1997-2012



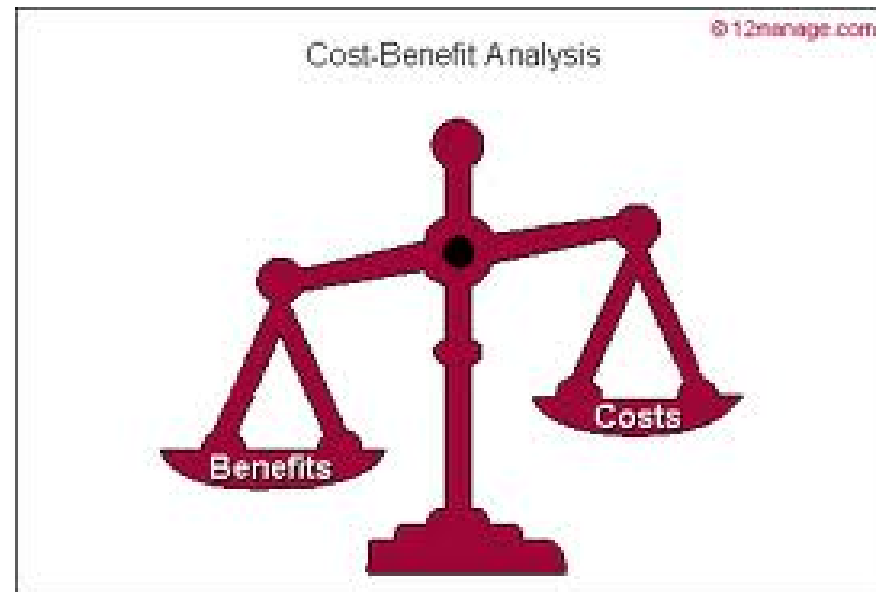


Analysis for Regulation

Risk Assessment



Benefit-Cost Analysis



Cost-Benefit Analysis and Risk Assessment

Science

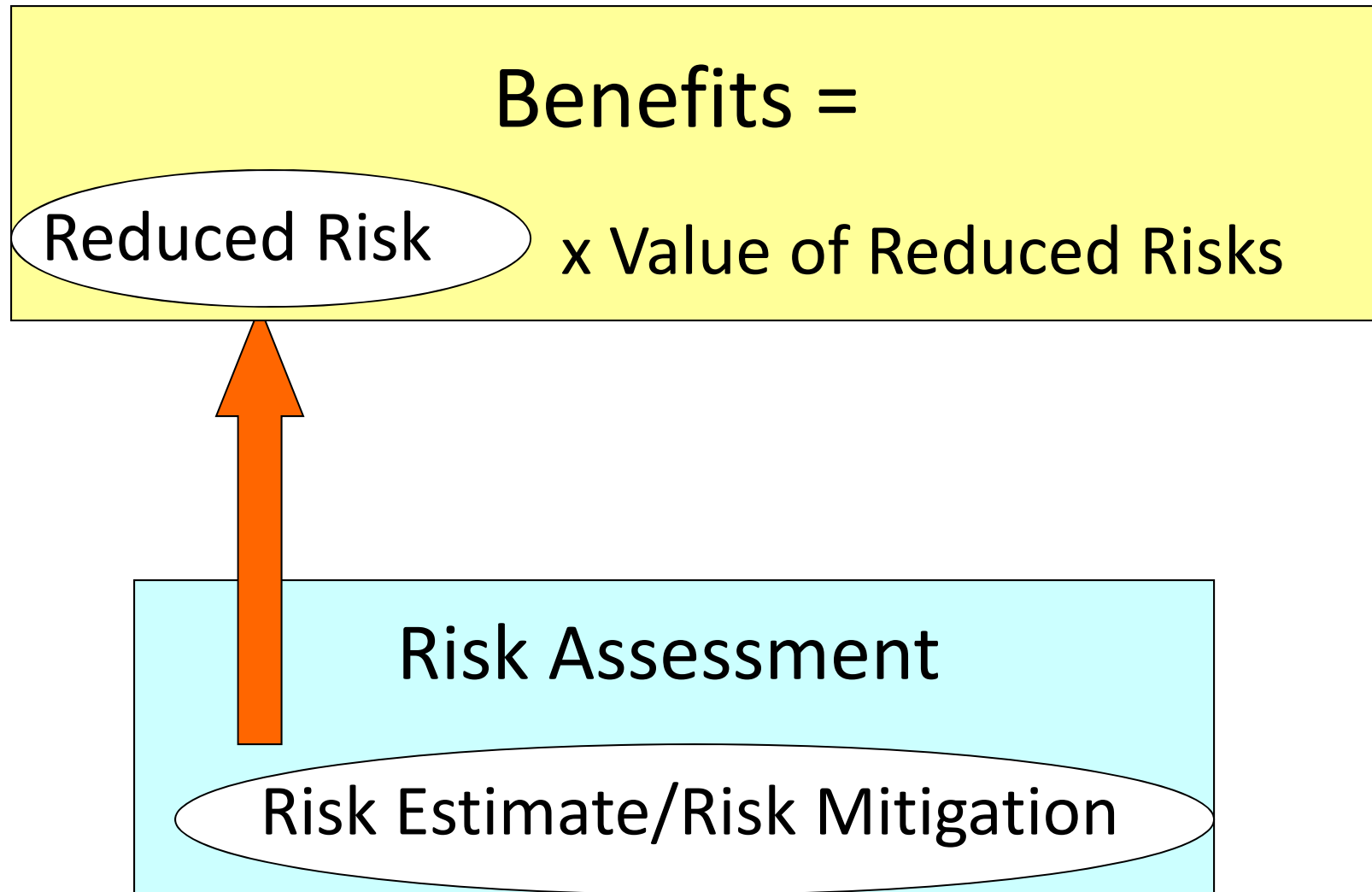


Risk Assessment

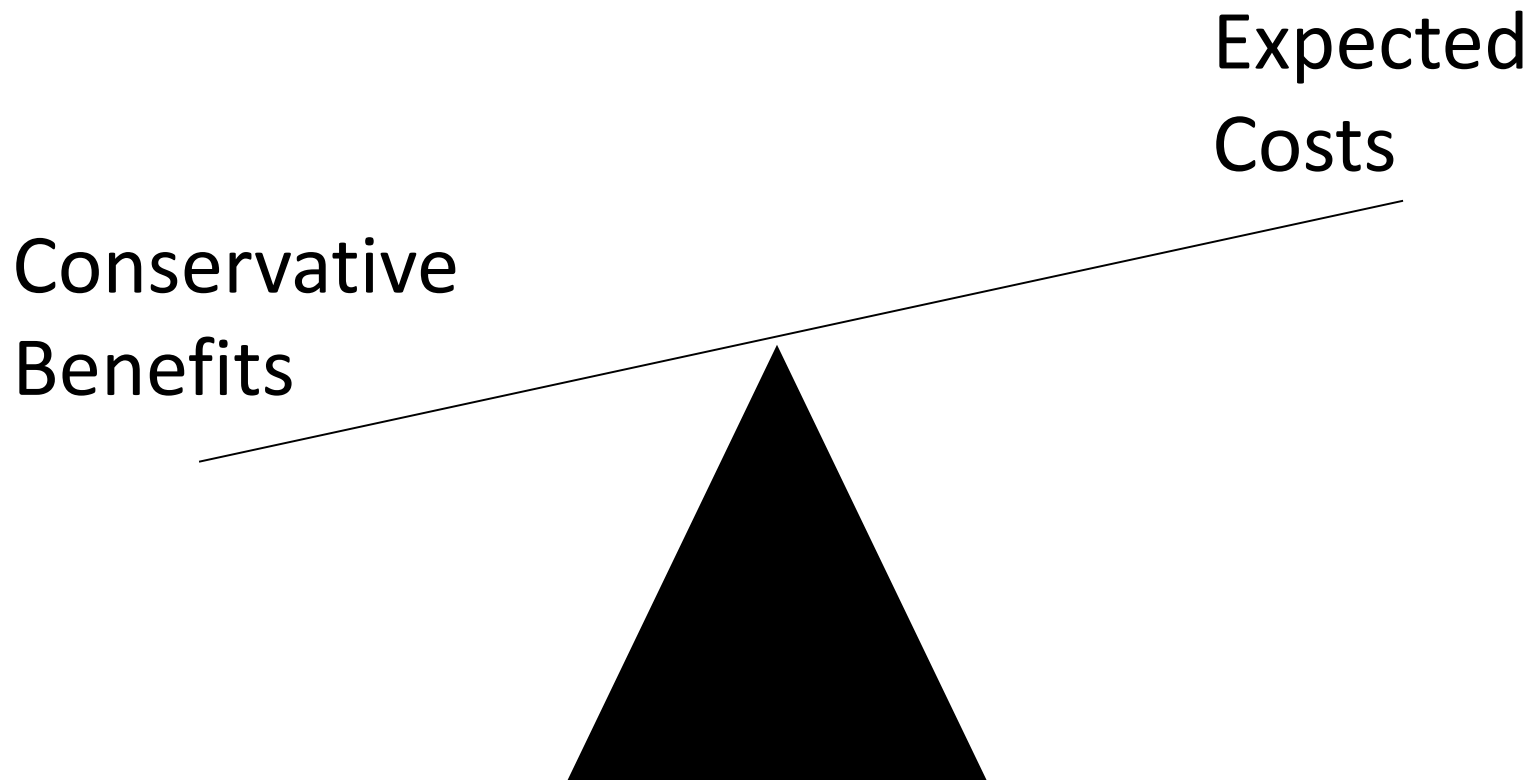


Benefit Analysis

Cost-Benefit Analysis and Risk Assessment



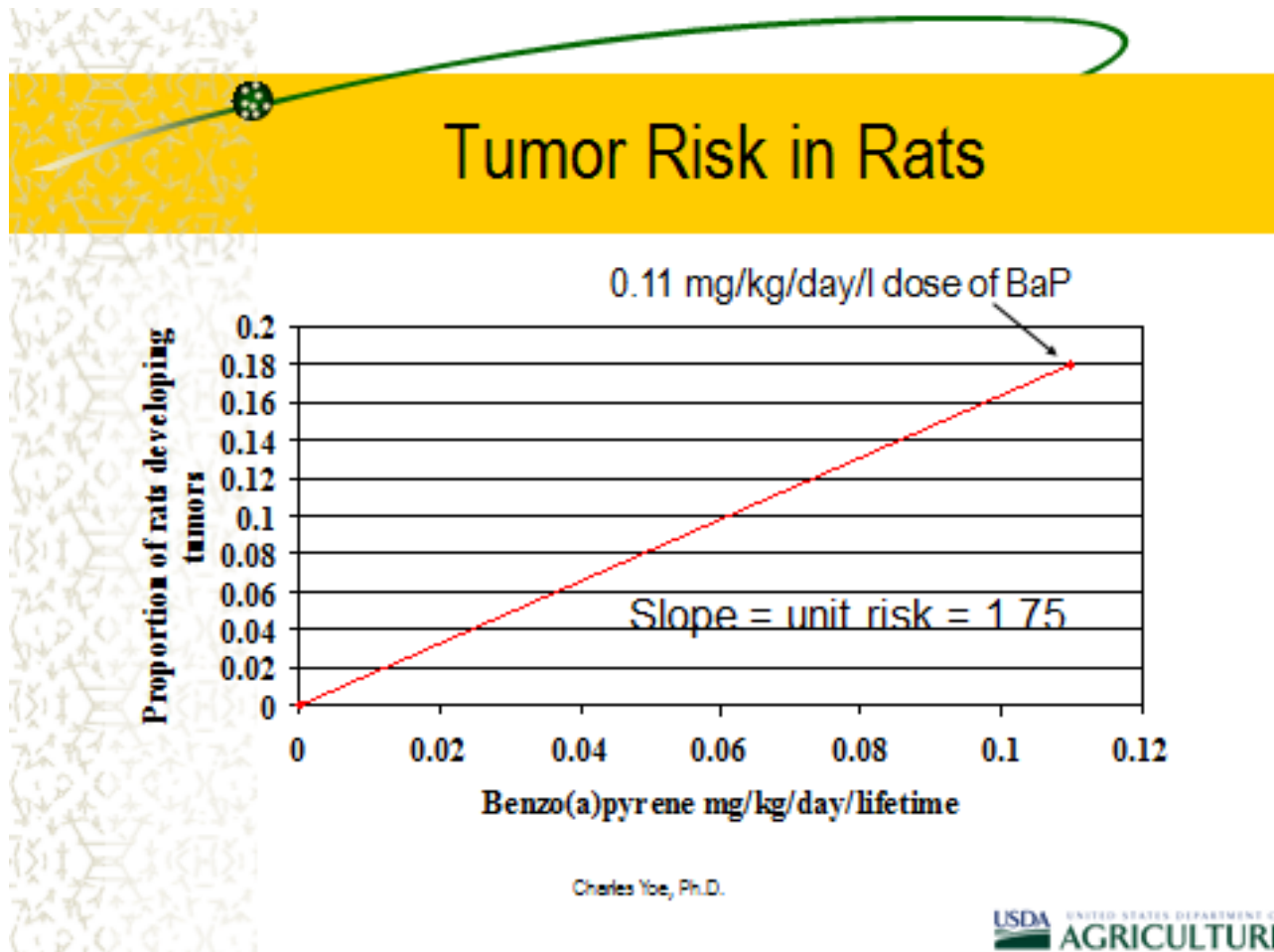
Cost-Benefit Analysis and Risk Assessment



Overestimating Risks and Benefits: So What?

- Should have spent resources elsewhere.
- Risk/risk trade-offs.
- Extent of bias unknown

Linear No Threshold Dose-Response Model

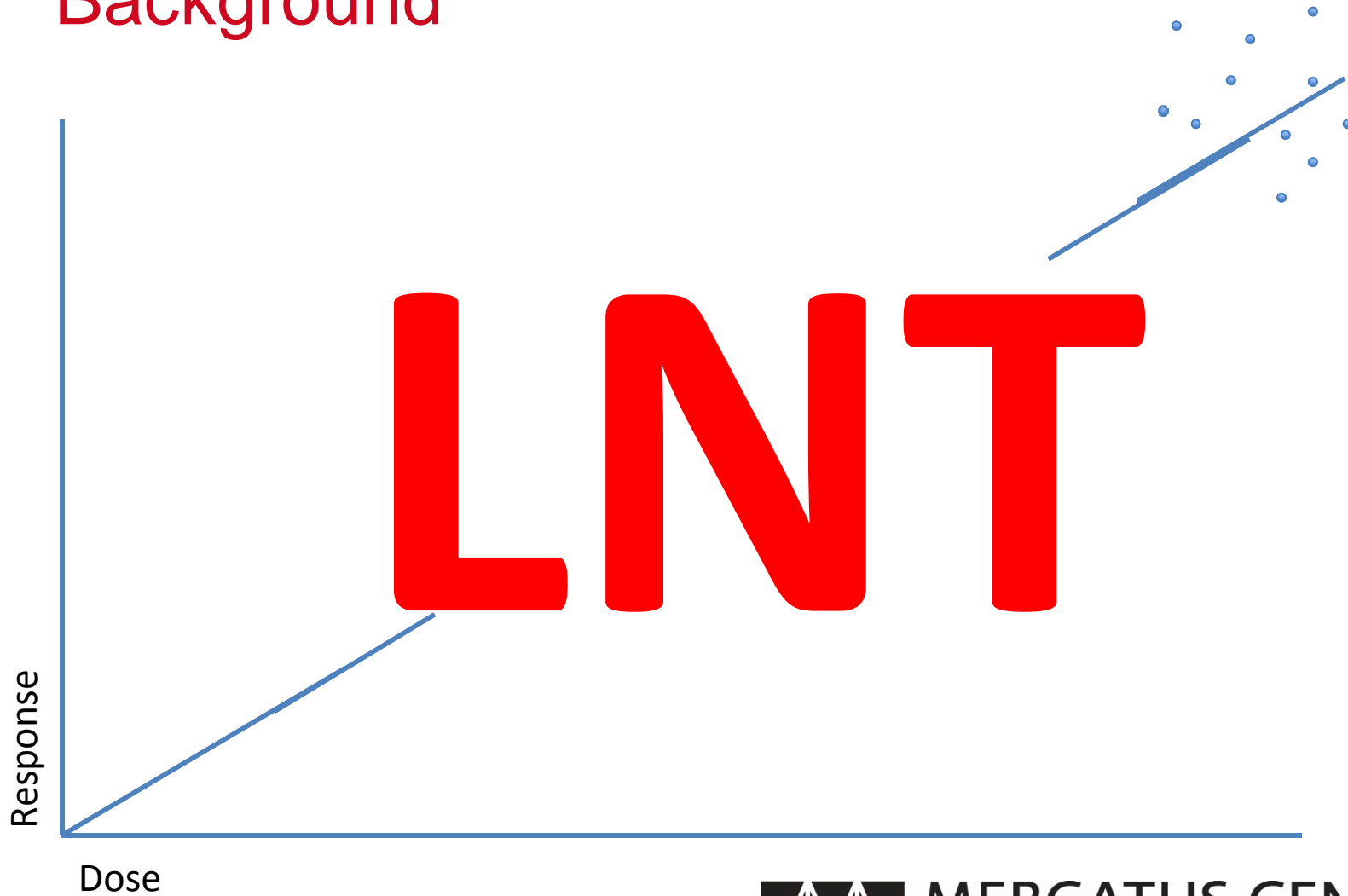


USDA UNITED STATES DEPARTMENT OF AGRICULTURE

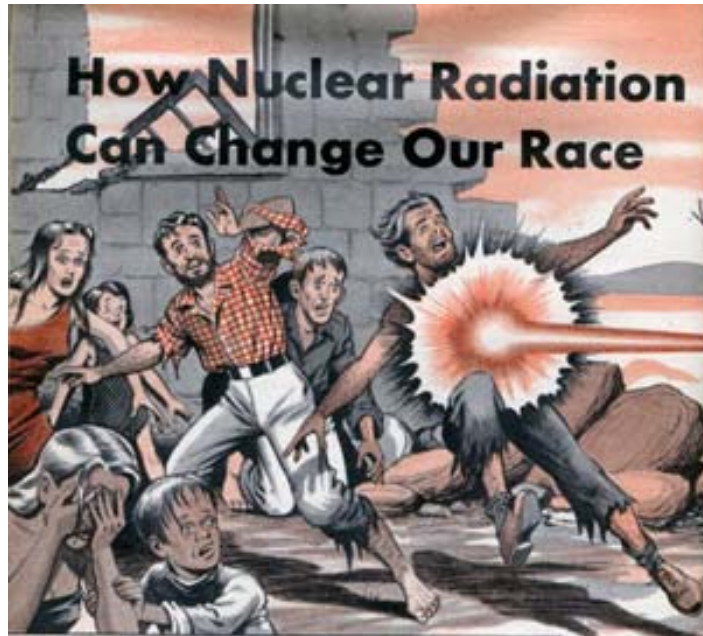


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Background



How Did We Get Here?



Hormetic Response

Low levels of stress or damage resulting in improved fitness for some physiological systems for a finite period

- Disruption of homeostatis
- Modest overcompensation
- Reestablishment of homeostatis
- Adaptive nature of the process



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Pre-Conditioning

- Radiation
- Exercise
- Fasting
- Heavy metals
- Chemicals
- Light
- Blood or oxygen restriction
- Cold or Heat
- Interrupted sleep
- Inflammation
- Brain Functioning (Alzheimers)
- Glaucoma
- Depression
- Recovery from Surgery
- Stroke
- CVD
- Multiple other diseases
- Longevity



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Challenges to LNT

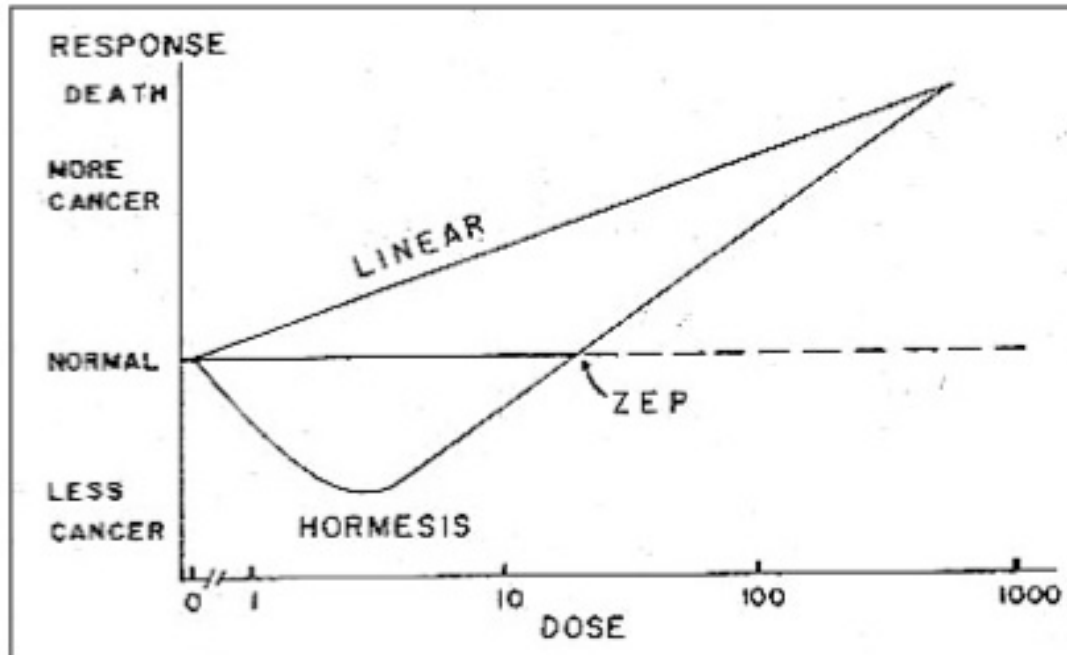


Figure 1: 'Linear-No Threshold' model (linear) vs. 'Hormesis' model. ZEP refers to 'zero-equivalent point' or the level of radiation that neither does harm nor good. (Adapted from Luckey, 1991.)

Risk/Risk Trade-offs

Risk is Ubiquitous

Locations

Cities
Highways
Golf courses
Buildings

Activities

Sleep
Eat
Work
Play

Chemical – Pesticides, Air pollutants

Physical – Guns, Earthquakes, Accidents

Microbiological – E. coli, Influenza

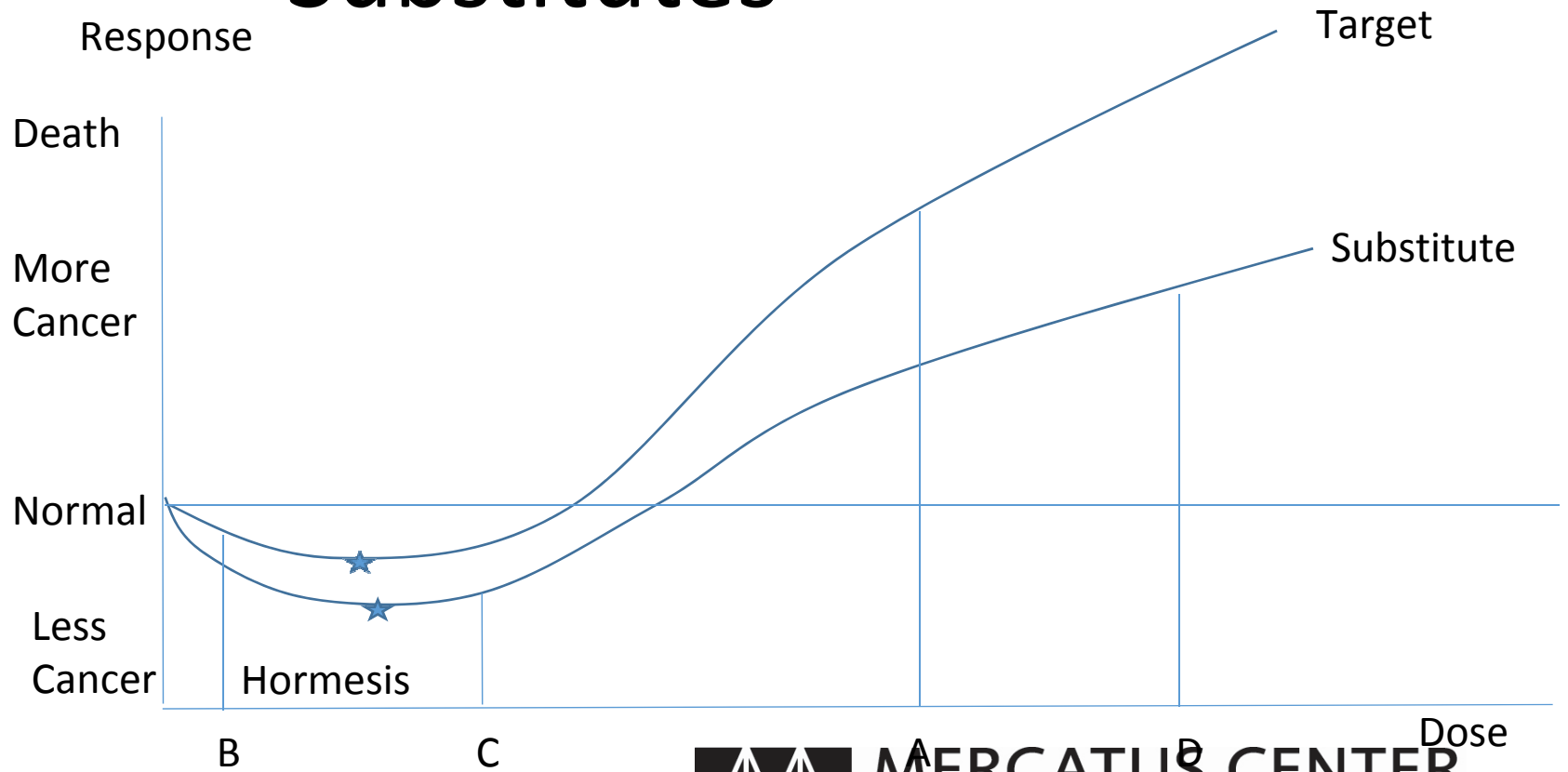
Radiological - Radon

Countervailing Risks

Risk/Risk Analysis - An analysis that compares the intended reduction in risk with the unintended increase in risk that results by substituting different technologies.

Health/Health Analysis - Health/health analysis analyzes the portion of every private dollar that goes to reducing risk by regulation and determines the amount of private risk reduction that would not be purchased.

Hormetic Dose-Response - Substitutes



Health/Health Analysis Private Risk Reduction



LNT \neq Conservative

- Hormetic functions
- Risk/risk trade-offs
- Private risk reduction