

# Value of Information: What is it Good For?

## *Just About Everything*

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# Assessing the Evidence for Comparing Two Health Care Interventions: *Treatment vs Standard*

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VOI methods can answer the following questions

1. Is the current evidence sufficient for adopting *Treatment*?

2. If not, what is the optimal design for additional evidence?

3. Does a state of equipoise exist?

4. What is the maximum price acceptable to a “societal” decision maker?

5. How should competing research projects be placed in priority?

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VOI methods can identify

- The value of a research study

- The total cost of a research study, opportunity and financial

If value < cost for all potential studies, current evidence is sufficient

If value > cost for at least one potential study

- state of equipoise exists

- conduct study which maximizes value minus cost

# Simple Model for Incremental Net Benefit

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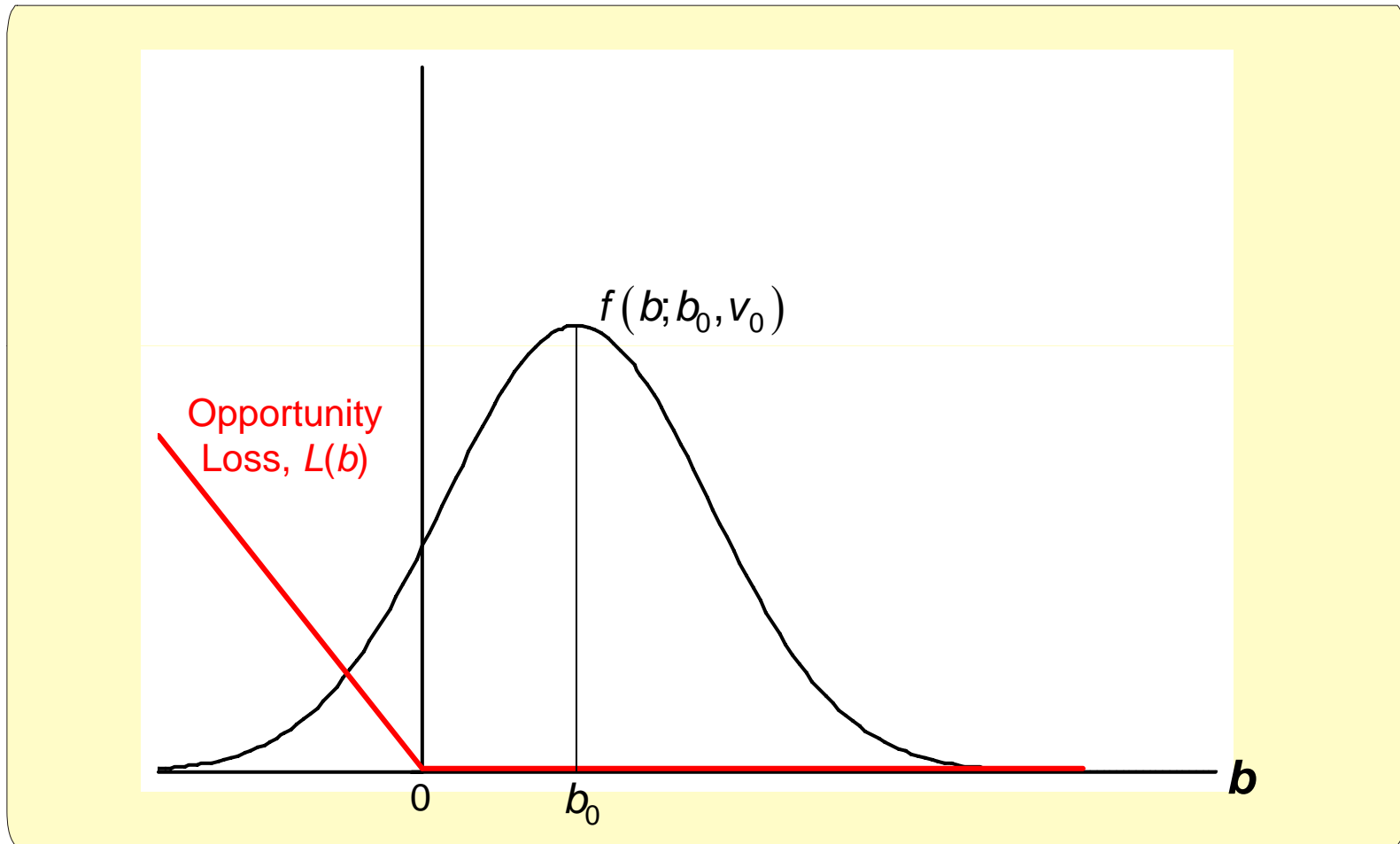
$b \equiv \Delta_e \lambda - \Delta_c$ , where

$\Delta_e$  is the increase in health outcome (e.g. proportion surviving, mean survival time or mean quality-adjusted survival time)

$\lambda$  is the threshold value of a unit of health outcome (e.g. a life, a year of survival, a quality-adjusted life-year)

$\Delta_c$  is the increase in mean cost

# Current Evidence Regarding Incremental Net Benefit



$$\text{Expected Opportunity Loss(per - person)} = \text{EOL(pp)} = \int_{-\infty}^{\infty} L(b) \cdot f(b; b_0, v_0) db$$

# Per-patient Expected Opportunity Loss

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Expected opportunity loss is a measure of the uncertainty regarding the decision to adopt *Treatment* based on current evidence.

EOL(per-person) increases as  $b_0$  (*i.e.* the mean) decreases

EOL(per-person) decreases as  $v_0$  (*i.e.* the variance) decreases

Consider additional evidence (*e.g.* a new trial, with  $n$  patients per arm)

Expect mean of  $b$  after new trial =  $b_0$

Expect variance of  $b$  after new trial  $< v_0$

# Population Expected Value of Sample Information

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## Value

$$EVSI(n) = N(n) \{ \text{pre-trial EOL}_{pp} - \text{post-trial EOL}_{pp}(n) \}$$

where  $N(n)$  is the number of patient for whom the decision is relevant,  
depends on time horizon, incidence, accrual rate and follow-up time

## Cost

$$ETC(n) = C_f + 2nC_v + D(n)b_0$$

where  $D(n)$  is the number of patient who receive *Standard* during the trial,  
depends on incidence, accrual rate and follow-up time

## Expected Net Gain

$$ENG(n) = EVSI(n) - ETC(n)$$

# CADET-Hp Trial

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Double-blind, placebo-controlled, parallel-group, multi-centre, randomized controlled trial.

Patients with uninvestigated dyspepsia of at least moderate severity were randomized between

T: Omeprazole 20 mg, metronidazole 500 mg and clarithromycin 250 mg

S: Omeprazole 20 mg, placebo metronidazole and placebo clarithromycin.

Treatment success was defined as the presence of no or minimal dyspepsia symptoms at one year. Assume threshold value ( $\lambda$ ) is \$500.

Total costs were determined from the societal perspective and are given in Canadian dollars.

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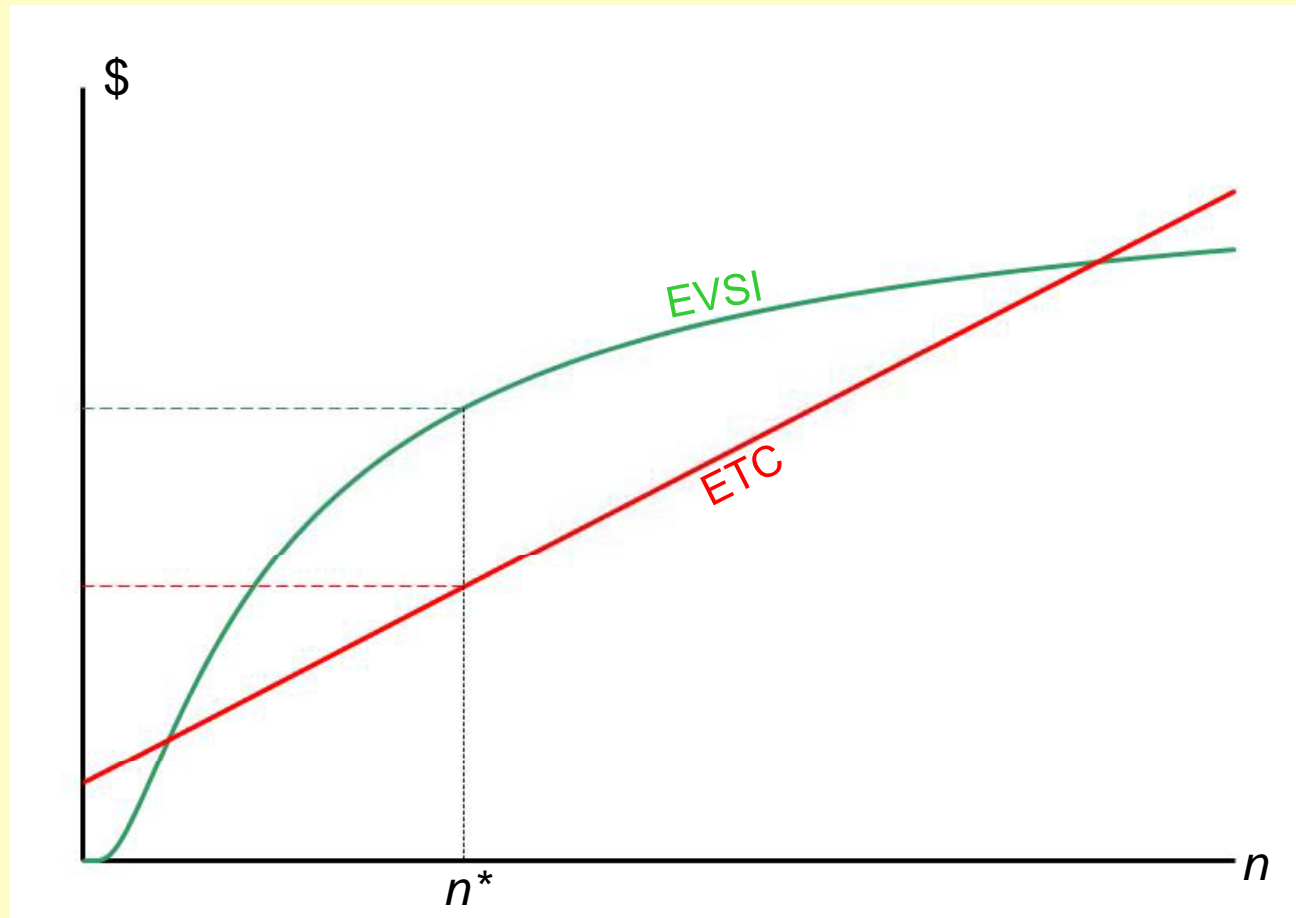
# CADET-Hp Trial

	<i>Treatment</i> ( $n_T=142$ )	<i>Standard</i> ( $n_S=146$ )	
Mean Effectiveness	0.5070	0.3699	difference = $\hat{\Delta}_e = 0.1371$
Mean Cost	$455.47 + P$	529.98	difference = $\hat{\Delta}_c = -74.51 + P$

$P$	55	25	38
$\hat{\Delta}_c$	-19.51	-49.51	-36.51
$b_0$	88.06	118.06	105.06
$v_0$	5846	5846	5846
$b_0/\sqrt{v_0}$	1.152	1.544	1.374

# CADET-Hp Trial

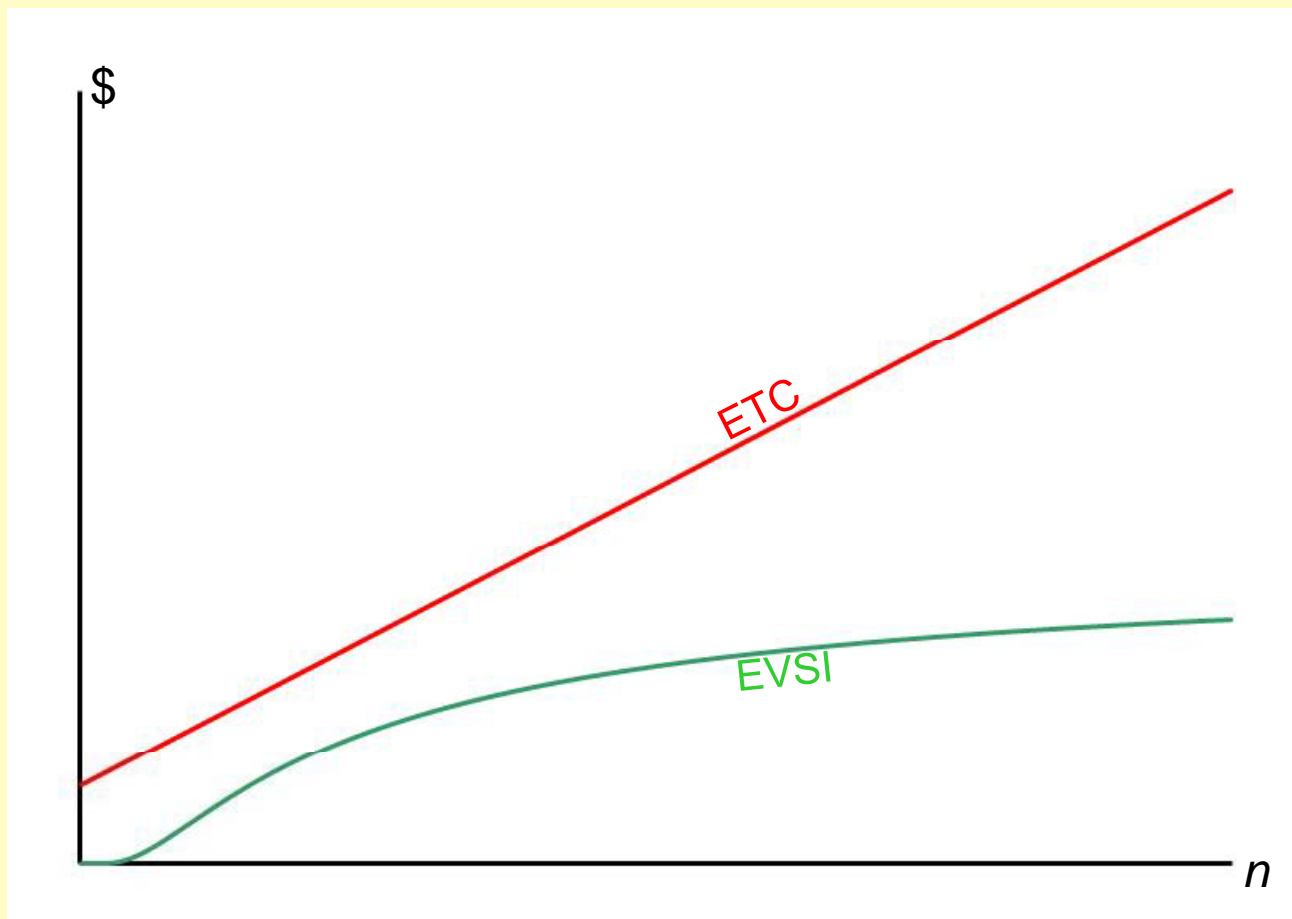
$$P = 55; \hat{\Delta}_c = -19.51; b_0 = 88.06$$



State of equipoise since current evidence is insufficient

# CADET-Hp Trial

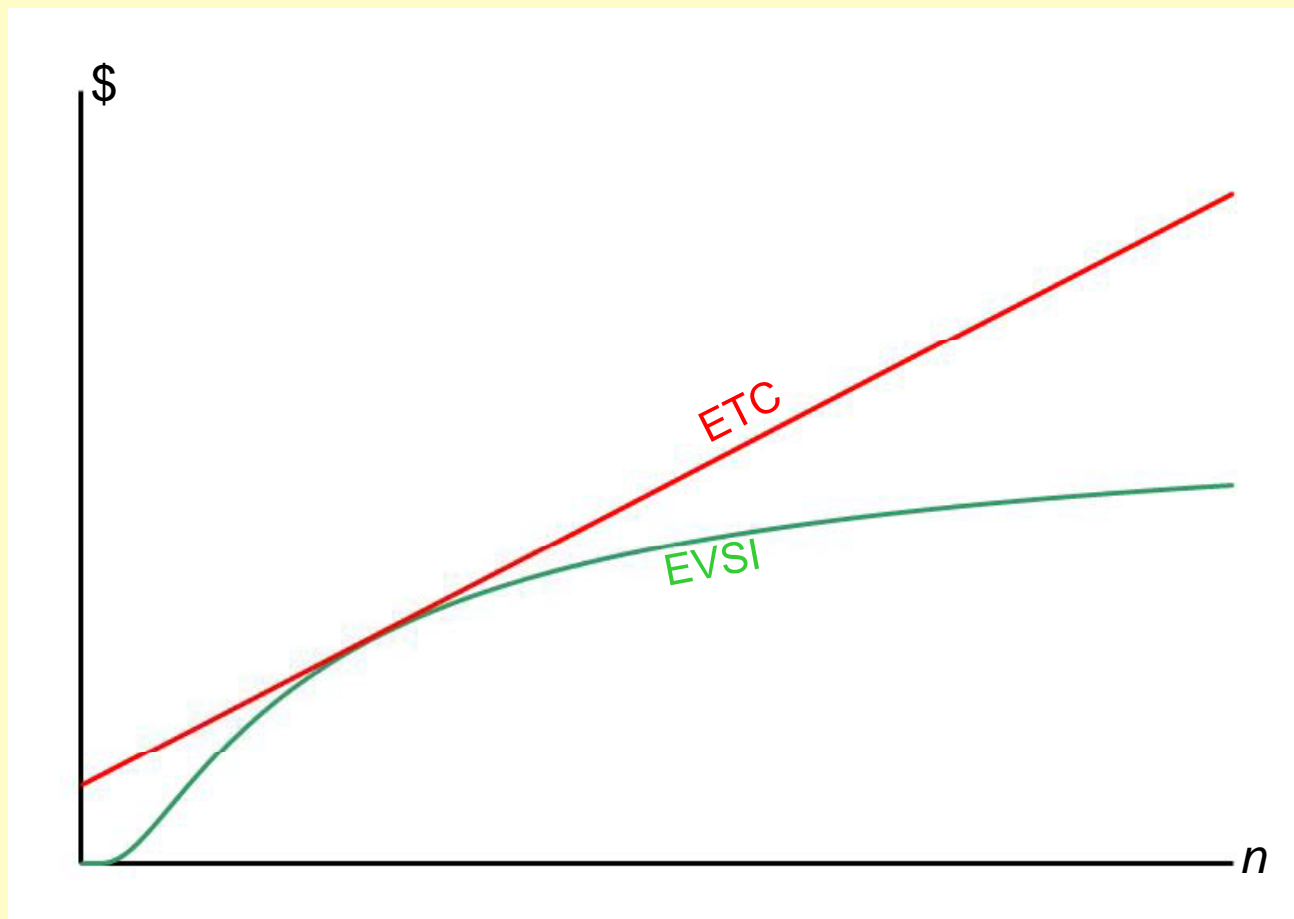
$$P = 25; \hat{\Delta}_c = -49.51; b_0 = 118.06$$



Current evidence sufficient for decision making

# CADET-Hp Trial

$$P = 38; \hat{\Delta}_c = -36.51; b_0 = 105.06$$



Maximum acceptable price with current evidence is \$38

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# VOI and Assessing Evidence for New Health Care Interventions

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## Issues Remain

1. Need to put a value on health outcomes.

2. Need to specify a time horizon for the new intervention, *i.e.* shelf-life.

3. Strong assumption regarding evidence and adoption.

4. Investigator inertia.

## References—Value of Information

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