

Economic analysis of invasive species

Cost-Effectiveness Analysis



Cost-Effectiveness Analysis

- Often used when cannot derive monetary benefits from an intervention
- Monetary costs of option typically compared with physical changes (benefits)
- Will not determine if option produces a net monetary benefit
- Can use to rank options in terms of cost per physical unit of benefit



CEA Examples

- Health
 - Cost per lives saved from hazard mitigation (e.g., flood control)
- Environmental
 - Cost per unit reduction in pollution (e.g., GHG emissions)
- Biodiversity protection
 - Cost per species protected (e.g., native birds)

Cost Effectiveness

- Cost effectiveness (CE) – Cost per physical unit change in desired outcome (\$/unit)

$$CE = \frac{\sum_{t=1}^T \left(\frac{C_t}{(1+r)^t} \right)}{TB}$$

TB = total benefit over
lifetime of project
C = value of cost at time t
T = final year of project
r = real interest rate

- Allows several options to be evaluated for a single physical objective (benefit)



CEA v CBA

- CEA is different from CBA in several ways:
 1. benefits are expressed in physical units not monetary
 2. need to divide by a physical unit, so options being assessed must be similar.
 3. there is only one benefit in the estimate.
 4. discounting is only applied to the monetary cost component of the estimate.
 5. each option must be estimated using the same project length



Example: Forest conservation

- A specific area in two forests is being considered for forest conservation and species protection.
- Protecting the forest would remove the timber from production and hence be considered a cost.
- Forest #1
 - Net present value of timber production for 30 years: \$2,000
 - Total area: 17 hectares
- Forest #2
 - Net present value of timber production for 30 years: \$3,000
 - Total area: 10 hectares.



Example: Forest conservation

- Despite the impact to the local economy, the government still sees a benefit from protecting the forest and is willing to compensate landowners for their loss in production.
- However, their budget of \$3,000 is only large enough to implement one of the projects.

Which one is most cost effective?

Activity	NPV Cost	Area Protected
Option 1	\$2,000	10 ha
Option 2	\$3,000	17 ha

Based purely on cost-effectiveness, option 2 is preferred

Jumbee Example

- Recall that Jumbees can impact psychological health
- One metric we can use may be visits to a psychologist

Option	Psychologist Visits Prevented	PV Cost	Cost Effectiveness (\$/visit)
Diversion channels	10,000	\$5,722,606	\$572
Shoes outside door	5,000	\$3,316,324	\$663
Heaps of rice	500	\$1,377,222	\$2,754

- Based on the cost-effectiveness criteria, diversion channels are the most cost effective, at a value of \$572/visit prevented



Group Exercise

- List some specific cases where cost-effectiveness analysis may be preferred over cost-benefit analysis
- Keep in mind that a typical CEA requires:
 - Physical and monetary values of costs
 - Physical value of benefit
 - Same type of benefit for all options