Budget Impact Analysis

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CHOIR
Center for Healthcare Organization and Implementation Research

Common Questions

- These new robots for stroke rehab sound promising. What is the budgetary impact?
- Hiring coders would be great, but that sounds expensive. What is the value proposition?
- Is there any return on investment for providing naloxone free of charge?

Value in Economics

- Economics defines value to a consumer as the difference between the benefits received and the price paid.
- Consumers measure the value of a purchase when considering an alternative use of the money, whether that is an investment or an alternative purchase.
- This economic definition of value does not easily translate to health care
  - Poor information on benefits or costs.
  - This definition requires that we measure benefits in dollars

What is value in health care?

- Value= incremental outcomes gained per dollar spent
- Value equation= $\frac{\Delta \text{Outcomes}}{\Delta \text{ Costs}}$
- Alternative value equations

If outcomes are measured in quality adjusted life years (QALYs) then this is the ICER (incremental cost-effectiveness ratio)

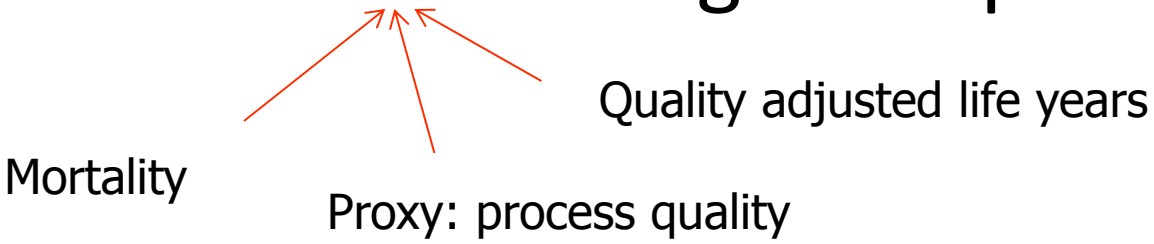
$$\text{Value} = \frac{\Delta \text{Access}}{\Delta \text{ Costs}} \qquad \text{Value} = \frac{\Delta \text{Process Quality}}{\Delta \text{ Costs}}$$

These alternatives are often easier to measure, but they assume that access and quality are good proxies for outcomes

- Low value care has been defined as health care services or products that provide little benefit to patients

Measuring Value in Health

- Value= outcomes gained per dollar spent



- When:

  outcomes =quality adjusted life years, then

  value= cost effectiveness analysis (CEA)

- ACP endorsed CEA as the preferred method for measuring value[1]

1. Owens D, Qaseem A, Chou R, et al. High-value, cost-conscious health care: concepts for clinicians to evaluate the benefits, harms, and costs of medical interventions. Annals of Internal Medicine 2011;154(3):174-80.

What Value Isn't

- Value as we currently define it isn't
  - Referring to an ethical or cultural set of values.
  - Value is not static; value is a dynamic.
    - If you purchase a smartphone, you spend money (which has value) because you have determined that the smartphone has more value than using the money for something else. Over time, the value of that phone changes as new technology is released.
    - When drugs decrease in price (e.g., after a transition from brand-name to generic), their value increases because they can be provided to more people

Value and CEA

- Long standing, robust interest in CEA
  - Weinstein & Stason[1]
  - Gold et al.[2]
  - Theoretically appealing from a decision making perspective (Von Neumann and Morgenstern)
  - Suitable for drug, surgical and behavioral[3] interventions

1. Weinstein MC, Stason WB. Foundations of cost-effectiveness analysis for health and medical practices. N Engl J Med 1977;296(13):716-21.
2. Gold MR, Siegel JE, Russell LB, et al., editors. Cost-Effectiveness in Health and Medicine. Oxford: Oxford University Press, 1996.
3. Wagner TH, Goldstein MK. Behavioral interventions and cost-effectiveness analysis. Prev Med 2004;39(6):1208-14.

Challenges with Measuring Value

- Perspective matters, so perceptions of value may differ
  - Patient
  - Provider / Payer
  - Societal

  Some services may offer tangible value to the organization but not to the patient. Some services may offer value to society but not to the payer (drug treatment's effect on criminal justice)

- Time horizon matters
  - Preventive services may offer minimal value to the patient in the short term. These services may offer substantial value in the long-run.

- Measuring outcomes is challenging
  - Committee noted that scientists often struggle to measure outcomes that are important to patients. Many well regarded measures (e.g., mortality or indirect measures of quality adjusted life years) are not sensitive to changes that patients see as important.

Why the Limited Impact?

- Medicare avoids the dollar discussion
- CEAs are expensive, slow and prone to misinterpretation.[1]
- CEAs are rarely done on existing treatments
- Limited impact on providers
  - Perceptions that results do not apply to "my patients"
  - Incentives depend on the perspective

Important lessons for learning health care systems

1. Houlind K, Kjeldsen BJ, Madsen SN, et al. OPCAB surgery is cost-effective for elderly patients. Scand Cardiovasc J 2013;47(3):185-92.

Clash of Perspectives

- Over the past two decades,
  - Increasing evidence that substance use treatment was cost effective.
  - Large contraction in substance use treatment programs.

- Ettner et al[1] found that substance use treatment was cost-effective due to savings in criminal justice.

- We found no evidence that VA investments in substance use treatment paid for itself, with the exception of opiate agonist treatment programs.[2]

1. Ettner SL, Huang D, Evans E, et al. Benefit-cost in the California treatment outcome project: does substance abuse treatment "pay for itself"? Health Serv Res 2006;41(1):192-213.
2. Humphreys K, Wagner TH, Gage M. If substance use disorder treatment more than offsets its costs, why don't more medical centers want to provide it? A budget impact analysis in the Veterans Health Administration. J Subst Abuse Treat 2011;41(3):243-51.

BIA Overview

- Analysis of expenditures for a program or technology over a short period (often 1-3 years), including the effect of any offsetting savings
  - Evaluates a scenario rather than a single action
  - Includes comparison to the *status quo*
  - Includes sensitivity analysis

Perspective

- BIA takes the payer's perspective.
- May have >1 intra-organizational perspectives as different decision makers are relevant
  - VHA
  - Region
  - VA medical center
  - Clinic or specialty
- Patient costs are typically excluded, unless they are reimbursed by provider (travel)

Time Horizon

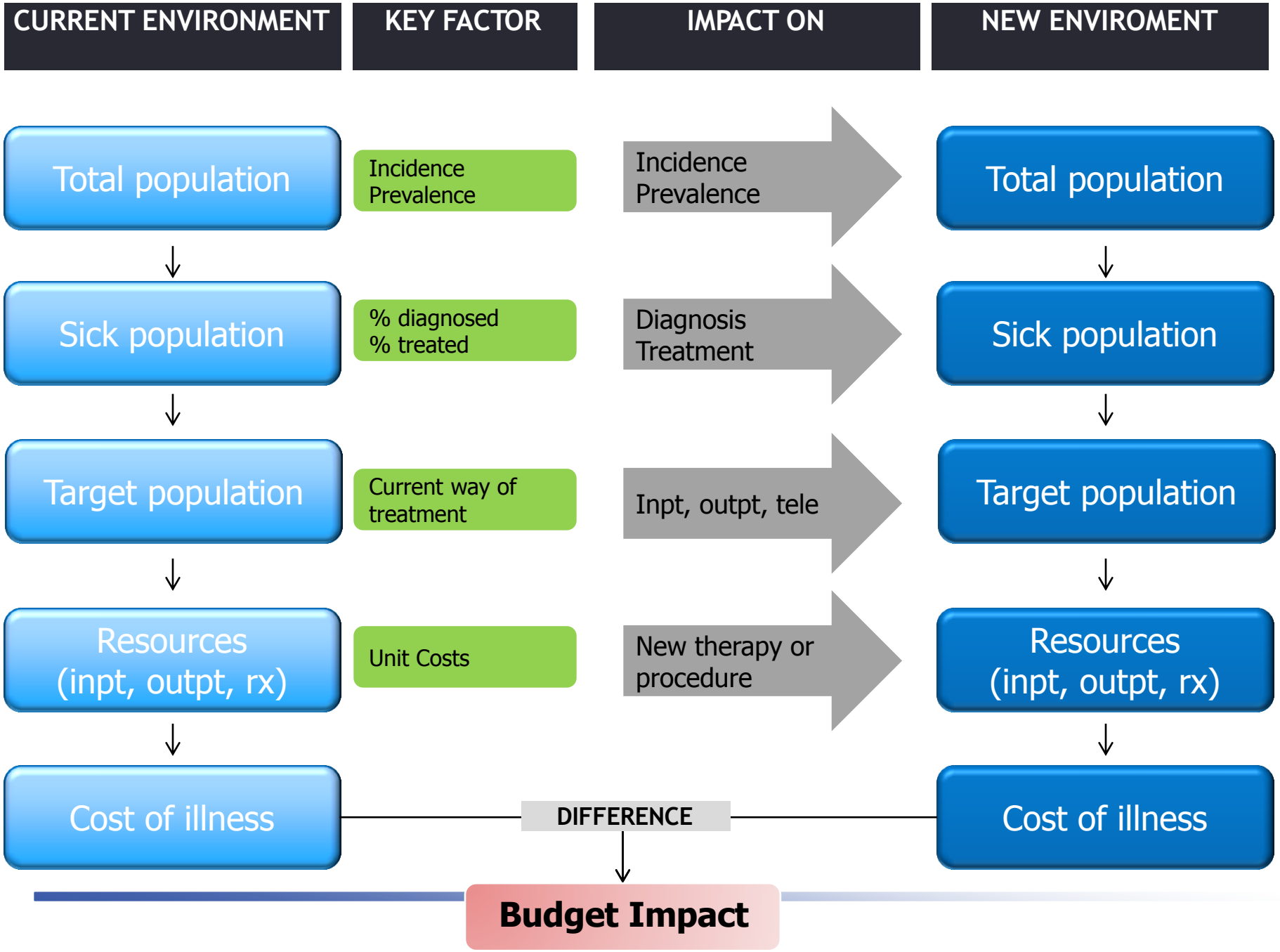
- BIA uses a short horizon – usually a few years at most.
  - Long-term modeling is unnecessary.
  - Costs are not discounted.
  - Savings in far future cannot offset initial/start-up or investment costs.

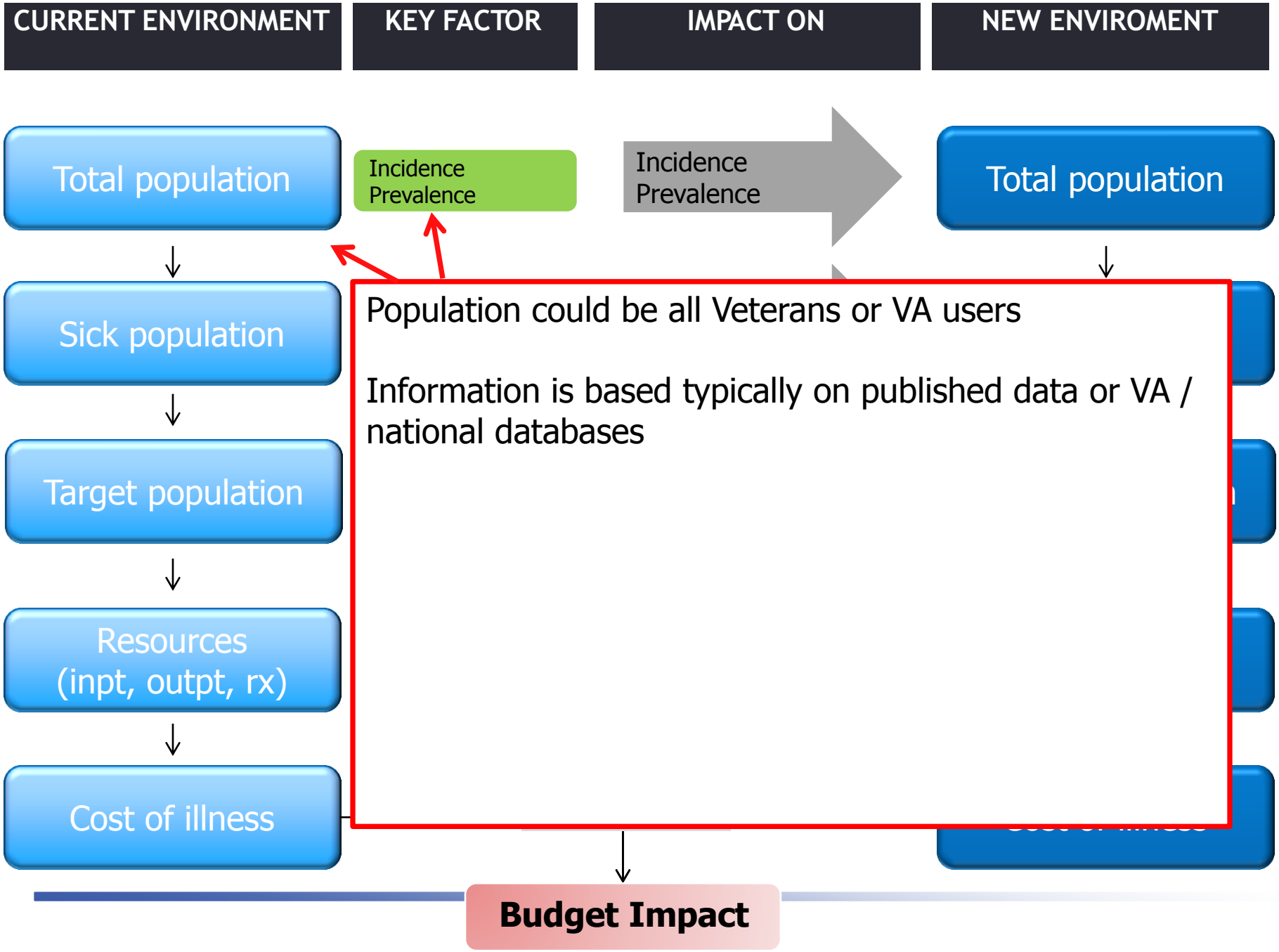
Patient Outcomes

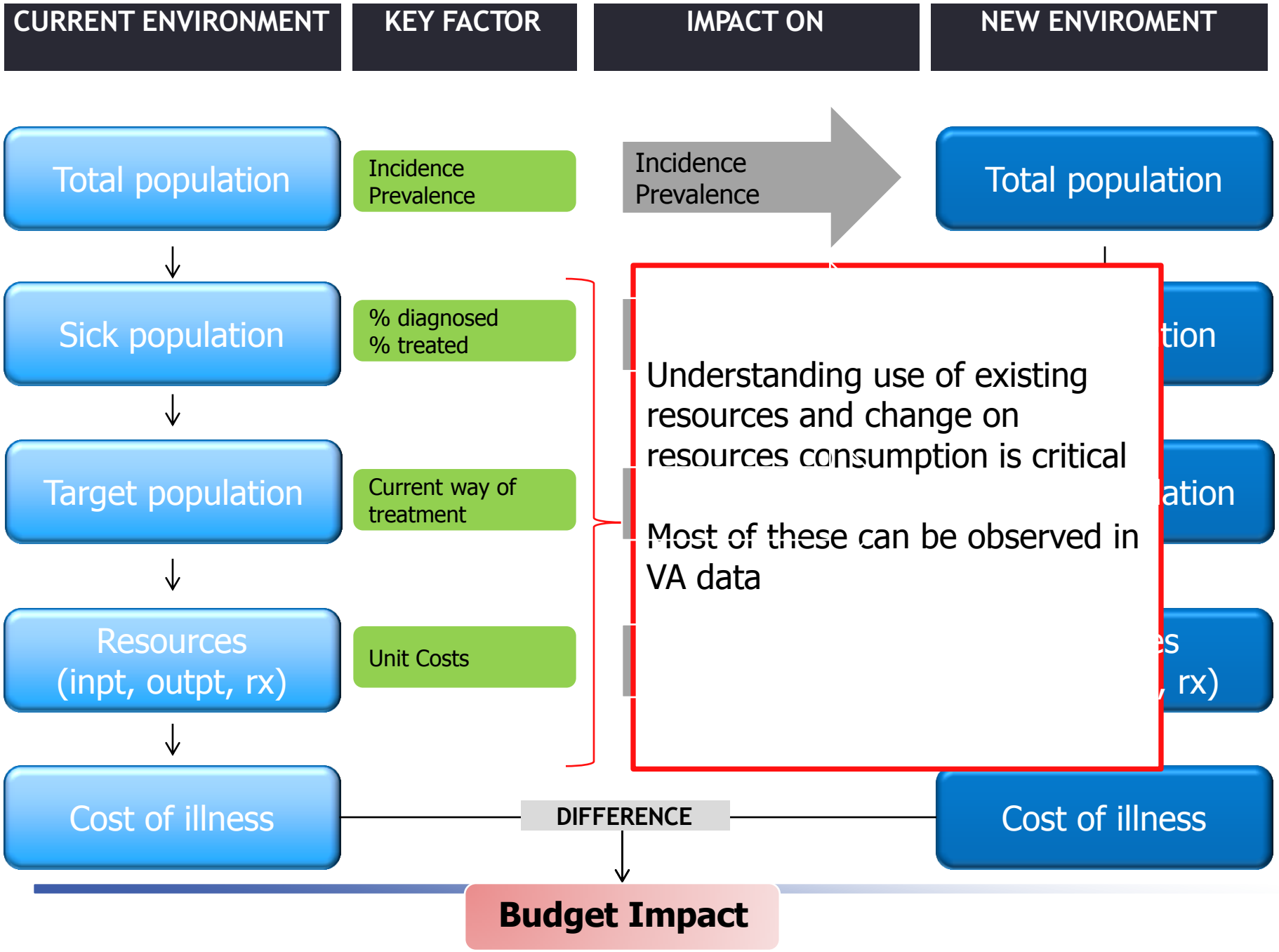
- BIA does not measure non-financial outcomes or utilities.
  - No need to survey patients
  - No calculation of quality adjusted life years (QALYs)
  - Outcomes are assumed to be known or ignorable

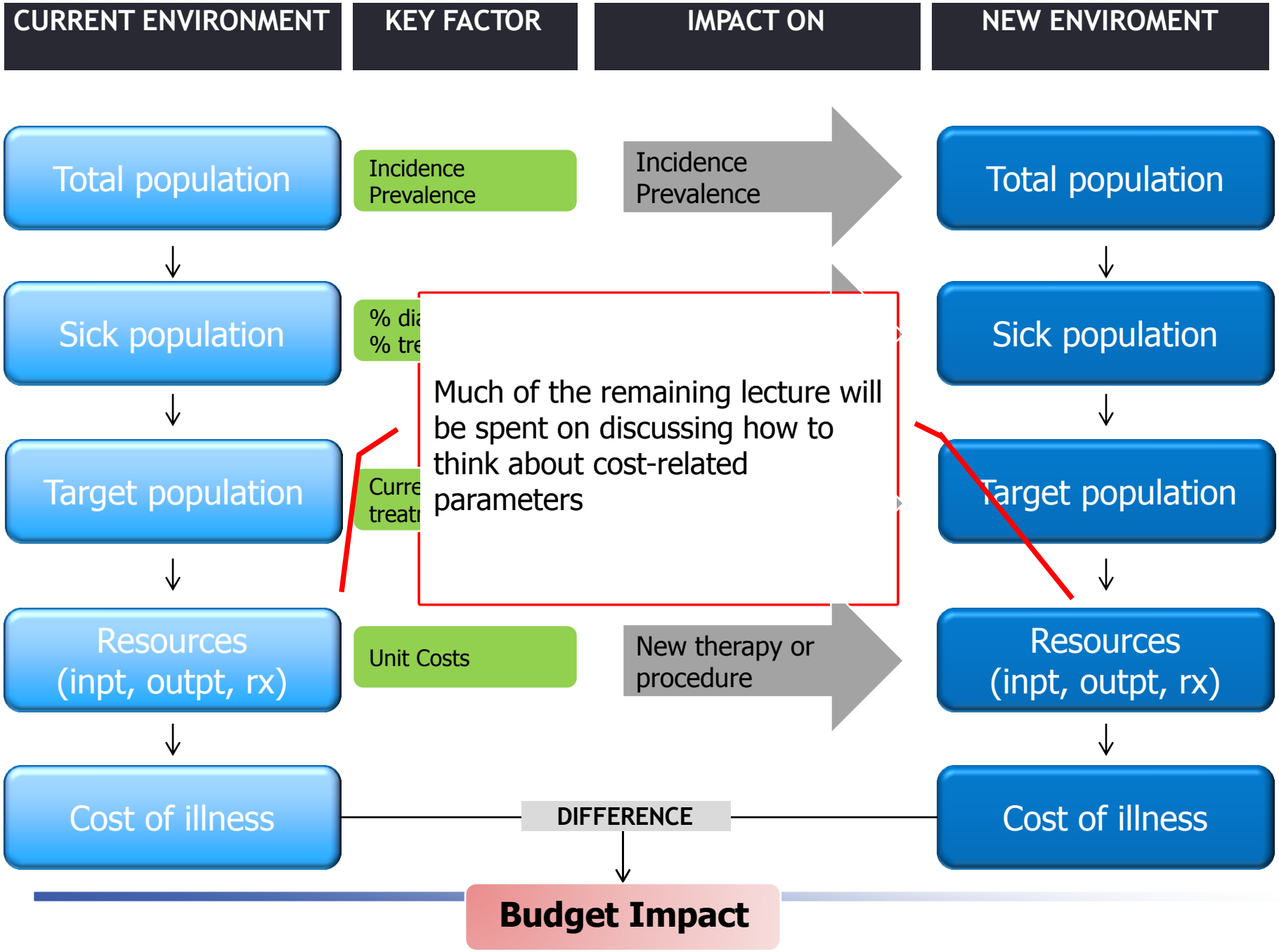
Budget Impact Analysis: Framework

- You need to estimate:
  - The cost of the intervention
  - Changes in staffing, schedules and use of technology
  - Changes in patient access/ throughput/ demand
  - Downstream financial costs


CURRENT ENVIRONMENT
KEY FACTOR
IMPACT ON
NEW ENVIROMENT
Total population
Incidence
Prevalence
Incidence
Prevalence
Total population
Sick population
% diagnosed
% treated
Diagnosis
Treatment
Sick population
Target population
Current way of treatment
Inpt, outpt, tele
Target population
Resources (inpt, outpt, rx)
Unit Costs
New therapy or procedure
Resources (inpt, outpt, rx)
Cost of illness
DIFFERENCE
Cost of illness
Budget Impact


CURRENT ENVIRONMENT
KEY FACTOR
IMPACT ON
NEW ENVIROMENT
Total population
Incidence
Prevalence
Incidence
Prevalence
Total population
Sick population
Target population
Resources
(inpt, outpt, rx)
Cost of illness
Population could be all Veterans or VA users
Information is based typically on published data or VA / national databases
Budget Impact


CURRENT ENVIRONMENT
KEY FACTOR
IMPACT ON
NEW ENVIROMENT
Total population
Incidence
Prevalence
Incidence
Prevalence
Total population
Sick population
% diagnosed
% treated
Target population
Current way of
treatment
Resources
(inpt, outpt, rx)
Unit Costs
Understanding use of existing resources and change on resources consumption is critical
Most of these can be observed in VA data
Cost of illness
DIFFERENCE
Cost of illness
Budget Impact


CURRENT ENVIRONMENT
KEY FACTOR
IMPACT ON
NEW ENVIROMENT
Total population
Incidence
Prevalence
Incidence
Prevalence
Total population
Sick population
% dia
% tre
Sick population
Much of the remaining lecture will be spent on discussing how to think about cost-related parameters
Target population
Curre
treatr
Target population
Resources
(inpt, outpt, rx)
Unit Costs
New therapy or
procedure
Resources
(inpt, outpt, rx)
Cost of illness
DIFFERENCE
Cost of illness
Budget Impact

Costs and Outcomes

$$\text{Value} = \frac{\Delta \text{Outcomes}}{\Delta \text{ Costs}}$$

- It is easy to confuse costs and outcomes, especially when some outcomes can be measured as costs (e.g., reduced hospital stays).

BIA: Rule 1

- Budget impact analysis focuses on the denominator
- You can track outcomes, but the goal of the BIA is the $
- Not all factors that are important have a cost.

Inputs and Outputs

- When investing in a new technology, it is often easy to confuse inputs and outputs.
- Input is the unit of “purchase”:
  - New robot
  - Naloxone
  - Coders
- Output is the downstream effects
  - Reduced inappropriate care costs
  - Reduced costs due to fewer overdoses

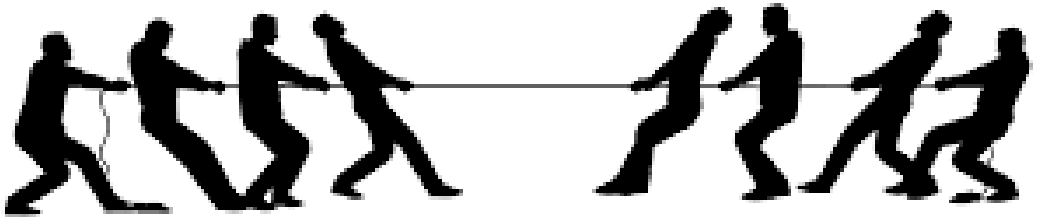
BIA: Rule 2

- Track the costs of inputs and outputs separately
- Don’t just track the average, but track the distribution of inputs and outputs.
  - Inputs often have less uncertainty than outputs
  - E.g., purchasing a $1000 chance to win $1m dollars– inputs are known, outputs are uncertain
- Note: Averages are preferred over medians for cost data

Costs Reflect the Environment

- You need to understand the current environment to understand the cost data generation process
- Costs differ in observable ways: wages and cost of living
- Costs also differ in less observable ways: efficiency and quality

Environment and Context



Context is noise

- Generalizability
- Causality

Context is meaningful

- Implementation
- Quality improvement

In both cases, you need to understand the production process, which underlies the data

An example outside of health

What is the process of producing a meal?

Get ingredients

Use equipment

Cook the meal

Clean up

A natural sequence of events in the production process

Cost of Cooking

Buy ingredients

Buy/rent equipment and space

Cost of Cooking

Cost of clean up

The Production Process

- Efficiency
  - Use fewer resources to produce more outputs, or
  - Use the same resources to produce more outputs
- Quality
  - Services that increase the likelihood of desired health outcomes and are consistent with current professional knowledge

Efficiency and Quality in Cooking

Buy ingredients

Buy/rent equipment and space

Cost of Cooking

Cost of clean up

Good equipment (knives, stoves)
Skilled labor
Learning by doing (volume)
Specialization (skills and foods)
Proper preparation
Understanding client flow

These issues transfer to medicine

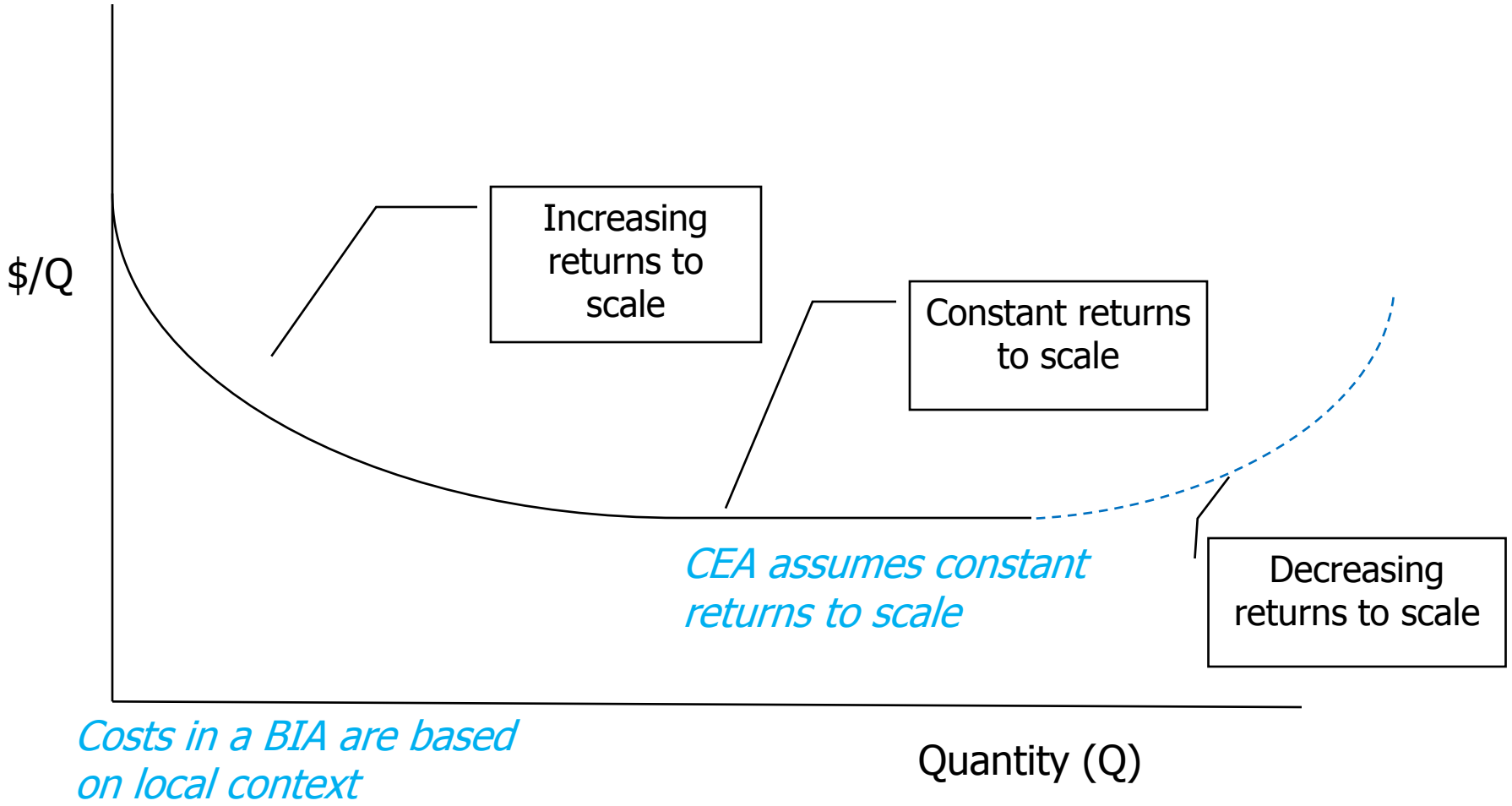
What is unique to health care is risk and uncertainty.

Arrow, Kenneth J. "Uncertainty and the welfare economics of medical care." *The American Economic Review* (1963): 941-973.

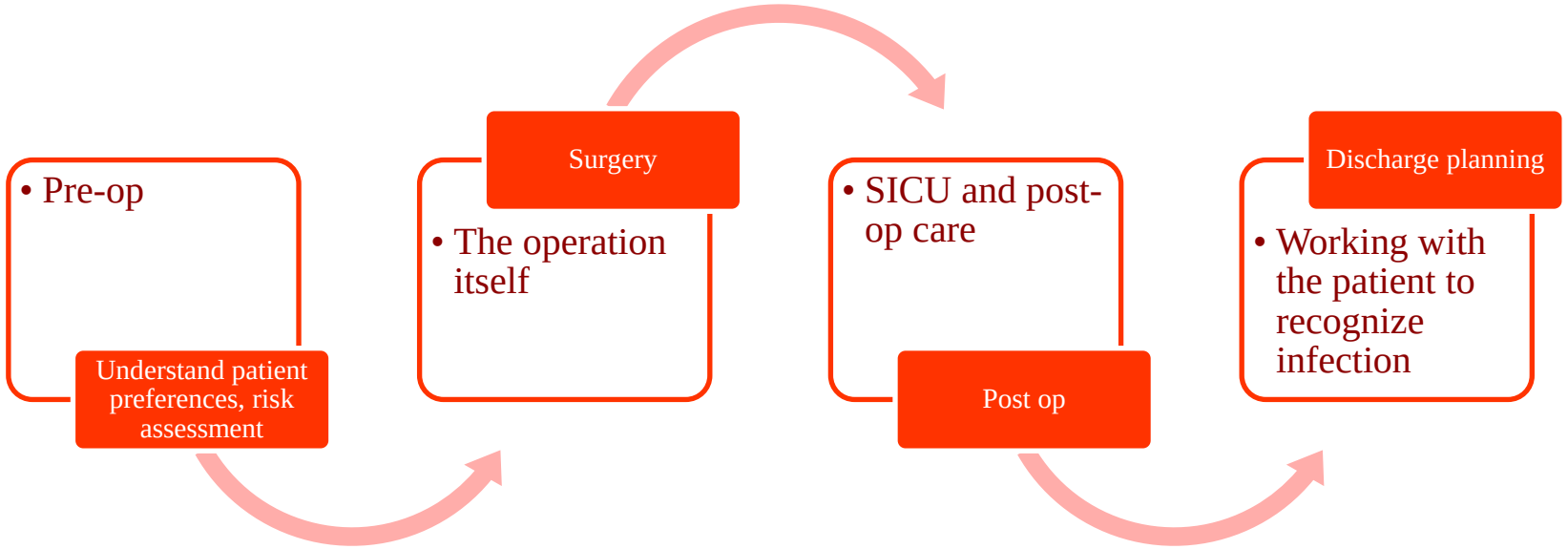
Returning to Health Care…

- Efficiency and quality are important in health care.
- They are often unobserved in health care production and yet they are correlated with costs!
- They can have a big impact on the BIA

Economies of Scale



The Cost of Producing Surgical Care



- Costs
  - Labor
  - Space
  - Supplies
  - Training
  - Contracts
- Costs
  - Labor
  - Space
  - Supplies
  - Training
  - Contracts
- Costs
  - Labor
  - Space
  - Supplies
  - Training
  - Contracts
- Costs
  - Labor
  - Space
  - Supplies
  - Training
  - Contracts

Cost of the Intervention

- When cost data already exist
  - Cost regression
  - Pseudo-bill
- When data on costs do not exist
  - Direct measurement

Cost of the Intervention: Labor

- Labor mix has a big effect on costs
  http://www.herc.research.va.gov/include/page.asp?id=labor
  http://vaww.herc.research.va.gov/include/page.asp?id=labor
  - More info on VA labor cost on the intranet
- Pay can affect quantity and quality; attracts different types of people
- Need to include benefits (when appropriate)
- Need to include direct/productive and indirect/non-productive costs (e.g., meeting times)

Cost of the Intervention: Supplies

- National Prosthetics Patient Database (NPPD)
- Your local A&MMS purchasing officer
- Market prices

Cost of the Intervention: Space

- Hospital space is expensive and the costs of it are not well known (poorly observed market)

- Retail and office space is easy to track online, however the cost per square ft. may not be relevant

Sensitivity Analyses

- Purpose: to test the robustness of your results
- Method: change assumptions in your model and see how the final outcome changes
- Change one at a time
  - Easy, but possibly misleading
  - Not considered state-of-the-art
- Change multiple assumptions at once
  - Probably will require software and/or a formal model
  - High credibility
  - Allows useful graphing

BIA: Rule 3

- Estimated savings are not revenue.
- Organizations often prefer strategies that increase revenues, versus those that cut costs.

BIA Example on Medical Care Management with Seriously Mentally Ill

Druss, Benjamin G., A. Silke, Michael T. Compton, Liping Zhao, and Douglas L. Leslie. "Budget impact and sustainability of medical care management for persons with serious mental illnesses." *American Journal of Psychiatry* (2011).

Outline and Conclusions of Study

- 407 Randomized Seriously Mentally Ill Psychiatric Outpatients to Usual Care or Care Coordinating Medical Care Manager
- Primary Care/Mental Health/Cardiometabolic Quality Clearly Increased
- 95% CI on Total Costs from Health System Perspective (-$1973, +$102), average -$932
- But BIA Breakeven is at 58% of Clients having Medicaid or other Insurance, yet Medicaid rate is only 40.5%, so the program was NOT sustainable

Budget Impact Analysis Assessment and Assumptions

- BIA Requires Careful Assessment of Costs of Implementing an Intervention with a Managerial Perspective and Shorter-Term Time Horizon
- In this case at an urban Community Mental Health Center (CMHC) ONLY the services provided at the CMHC are considered for the BIA
- Visit Reimbursements are Considered at Medicaid rates BUT only some of the seriously mentally ill patients are Medicaid eligible, crucial to the BIA
- Careful Measurement of the Care Management Implementation Costs are Essential Since these are the Costs that must be balanced in the BIA

Implications for BIA Work

- The Budget Structure of the System that Determines Intervention Sustainability Varies by Setting with which Managers Consider which Costs for BIA and this is Essential to Understand
- Interventions have Value/Quality Outcomes that can be very Impressive, but we often have no idea of the BIA of Sustaining them
- Variations in Cost and Quality Outcomes Complicate the Challenges in doing Understandable and Effective Research

International Interest in BIA

	Perspective	Time Horizon	Inclusion other costs	Discounting
Australia	Government	5 years	No	No
Canada	Drug plan	3 years	No	Yes
Ireland	Health and Social System	5 years	Yes	Yes
Poland	Public purchaser	Until changes are minimal	Yes	Yes
ISPOR	Payer	Until changes are minimal	Yes	No
Annemans	Payer	3-5 years	Yes	No

Resources

- HERC web site
  - Guidebooks
  - Technical reports
  - FAQ responses
  - Slides from training courses (cyber-seminars)
- VIREC web site
  - Research user guides (RUGs) on DSS, PTF, OPC
  - Technical reports (pharmacy)
- HERC and VIREC maintain intranet sites that have more VA-centric information and data

Resources

- Decision models and economic evaluations frequently appear in these journals:
  - Medical Decision Making
  - Health Economics
  - Value in Health
- BIA papers sometimes struggle to find a home because they are so context specific

Resources

- ISPOR recommendations on BIA:

  Mauskopf J, Sullivan SD, Annemans L, et al.
  Principles of Good Practice for Budget Impact Analysis: Report of the ISPOR Task Force on Good Research Practices – Budget Impact Analysis.
  Value in Health 2007;10(5):336-347.

  Sullivan SD, Mauskopf JA, Augustovski F, et al. Principles of good practice for budget impact analysis II: Report of the ISPOR Task Force on Good Research Practices – Budget Impact Analysis. *Value Health* 2014:17:5-14
  http://www.ispor.org/budget-impact-health-study-guideline.pdf

- VA-funded literature review on budget impact analysis:

  Luck J, Parkerton P, Hagigi F.
  What is the business case for improving care for patients with complex conditions?
  Journal of General Internal Medicine 2007;22(Suppl 3):396-402