

# Budget Impact Analysis

Todd Wagner, PhD

April 8, 2020



# Acknowledgements

- This work has benefitted from Heather Gold, Alex Dopp, Jo Jacobs, David Goodrich, Jean Yoon, Angela So, and Amy Kilbourne
- Previous versions benefitted greatly from Jim Burgess
- No conflicts; errors are my own



# Far from Perfect

- Institute of Medicine (IOM) estimated that 30% of health spending was wasted.<sup>1</sup>



**Table 2. Cost Estimates by Waste Domain**

Domain	Costs, \$US Billion	
	Annual Estimates	Total Range
<b>Failure of Care Delivery</b>		
Hospital-acquired conditions and adverse events <sup>18-22</sup>	5.7-46.6	102.4-165.7
Clinician-related inefficiency (variability in care, inefficient use of high-cost physicians) <sup>27,28</sup>	8.0	
Lack of adoption of preventive care practices (obesity, vaccines, diabetes, hypertension) <sup>23-26</sup>	88.6-111.1	
<b>Failure of Care Coordination</b>		
Unnecessary admissions and avoidable complications <sup>19,29</sup>	5.9-56.3	27.2-78.2
Readmissions <sup>30,31</sup>	21.25-21.93	
<b>Overtreatment or Low-Value Care</b>		
Low-value medication use <sup>12,32-35</sup>	14.4-29.1	75.7-101.2
Low-value screening, testing, or procedures <sup>14,36,37</sup>	17.2-27.9	
Overuse of end-of-life care <sup>38</sup>	44.1	
<b>Pricing Failure</b>		
Medication pricing failure <sup>8</sup>	169.7	230.7-240.5
Payer-based health services pricing failure <sup>39,40</sup>	31.4-41.2	
Laboratory and ambulatory pricing <sup>41</sup>	29.7	
<b>Fraud and Abuse</b>		
Fraud and abuse in Medicare <sup>42-44</sup>	58.5-83.9	58.5-83.9
<b>Administrative Complexity</b>		
Billing and coding waste <sup>45</sup>	248	265.6
Physician time spent reporting on quality measures <sup>10</sup>	17.6	
<b>Total</b>		<b>760-935</b>

**Delivery Failure  
~\$200-340 B**

# Delivery Failures

- Health care systems frequently have to decide whether to implement interventions designed to reduce gaps in the quality of care.
- A lack of information on the cost of these interventions is often cited as a barrier to implementation.

# Value

- Managers could employ cost-effectiveness analysis (CEA) to help make decisions.
- CEA is the most widely accepted and well-known method for assessing the value of a medical intervention.

Garber AM, Phelps CE. Economic foundations of cost-effectiveness analysis. *J Health Econ.* 1997;16(1):1-31.

Gold MR, Siegel JE, Russell LB, Weinstein MC, eds. *Cost-Effectiveness in Health and Medicine.* Oxford University Press; 1996.

Neumann P, Sanders G, Russell L, Siegel J, Ganiats T, eds. *Cost-effectiveness in Health and Medicine.* Oxford University Press; 2016.

# CEA

- Compares two or more options with regard to gains in outcomes, measured in quality adjusted life years (QALYs), relative to costs

$$\frac{\text{Ave Cost}_a - \text{Avg Cost}_b}{\text{Ave QALY}_a - \text{Avg QALY}_b}$$



Incremental cost-effectiveness ratio (ICER)

- Traditionally: long term, societal costs

# Gap

- Health care organizations often resist implementing interventions that are cost-effective, why?
  - Is it a failure of decision making?
  - Is it a failure of CEA?
  - Both?



# Today's Objectives

- Give you insights into why this gap exists and persists
- Describe methods for economic evaluation in implementation science
- Explain budget impact analysis in detail

But first....

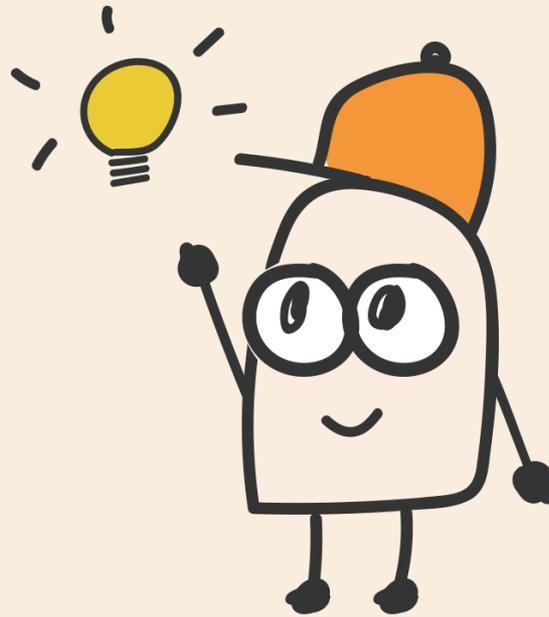


# Implementing Change

- Hospital CEO offers you a job to reduce costs and improve care in the ICU.
- The base pay isn't that great, but there is a huge bonus if the hospital's costs decrease.
- Do you take the job?

# Luckily, you're smart

Search Google  
Scholar



Call your friend who  
is a critical care nurse

# ICU Care

- More than 51,000 ICU beds in the US in 2015
- ICUs usually have three types of patients
  - Those who need life sustaining care
  - Dying patients
  - Lower acuity patients where the clinician wants extra monitoring of vitals
- Many hospitals are adding ICU beds, yet up to 40% of ICU admissions are not for life sustaining care.

# ICU Care is Expensive

- Expensive staff
- Fancy equipment
- Lots of additional care, especially early on
  - Tests
  - Medications
  - Scans
  - Additional monitoring

	Cost Per Added Day (VA 2018)		
Day of Stay	Total Cost	Variable Costs	Fixed Costs
1	9,605	5,210	5,915
2	6,838	3,692	2,712
3	7,250	3,951	2,829
4	7,914	4,303	3,069
5	7,332	4,050	2,889
6	7,826	4,362	2,988
7	6,458	3,541	2,645

# Two Short Term Options

- Option 1: Divert low acuity patients out of the ICU (diversion)
- Option 2: Transfer low acuity patients out of the ICU earlier (expedited transfer)

# Poll– What is your winning bet?

- Option 1: Divert low acuity patients out of the ICU (diversion)
- Option 2: Transfer low acuity patients out of the ICU earlier (expedited ? transfer)





# Option 1: Diversion

- This means that some ICU beds will go unfilled.
  - ↓ in tests, tubes, monitoring, scans, etc.
  - Possible ↓ in labor costs
  - No decrease in space and other fixed costs
- Net effect is unclear
- Bonus seems unlikely; depends on your labor costs and how quickly you can redeploy staff

# Option 2: Expedited Transfer

- Keeps ICU beds occupied
  - Same staff
  - Same space costs
- But, more day 1 admissions
  - With more day 1 admissions, there is an increase in tests, tubes, monitoring, scans, etc.
- Net effect is  $\uparrow$  average cost per patient

- Definitely no bonus



# Economic Reality

- There are a couple important issues at play here. Understanding these are key to how you think about innovation and economics in health care.
- Key issues
  - Production is a process. It yields information on effort. Costs can be computed using accounting rules.
  - Embedded in these accounting rules are:
    - Time horizon: Short vs long term
    - Efficiency
  - Accounting costs do not always match opportunity costs.

# Opportunity Cost

- The costs of using resources for a particular activity are the benefits foregone because the resources were not used in the next best alternative—this is the opportunity cost. (WHO, 2003)
- Opportunity cost is theoretical, but it is what we should be measuring.

# Opportunity Costs are Everywhere

- You consider this in your everyday life
  - Do you go out for dinner?
  - Where do you invest your money?
- Organizations use it all the time.
  - Example: cost of a no show for a medical clinic or an airline

# Traditional CEA

- The CEA Panel (1996) recommended the societal perspective (all costs) over the lifespan of the participants.
- Wow. That's a lot of information.
  - Technically tough
  - Hard to interpret
  - Maybe ideal for federal policy, but what about other decision makers or program managers?
- That also makes assumptions about the decision maker and their opportunity cost
- This can lead to paradoxical findings

# Paradox in Substance Use Tx

- Over the past two decades,
  - Increasing evidence that substance use treatment was cost effective
  - Large contraction in substance use treatment programs
- Ettner et al<sup>1</sup> found that substance use treatment was cost-effective due to savings in criminal justice.
- VA investments in substance use treatment do not save the hospital money.<sup>2</sup>
- Implementation is often a local decision and so identifying the right perspective is important.

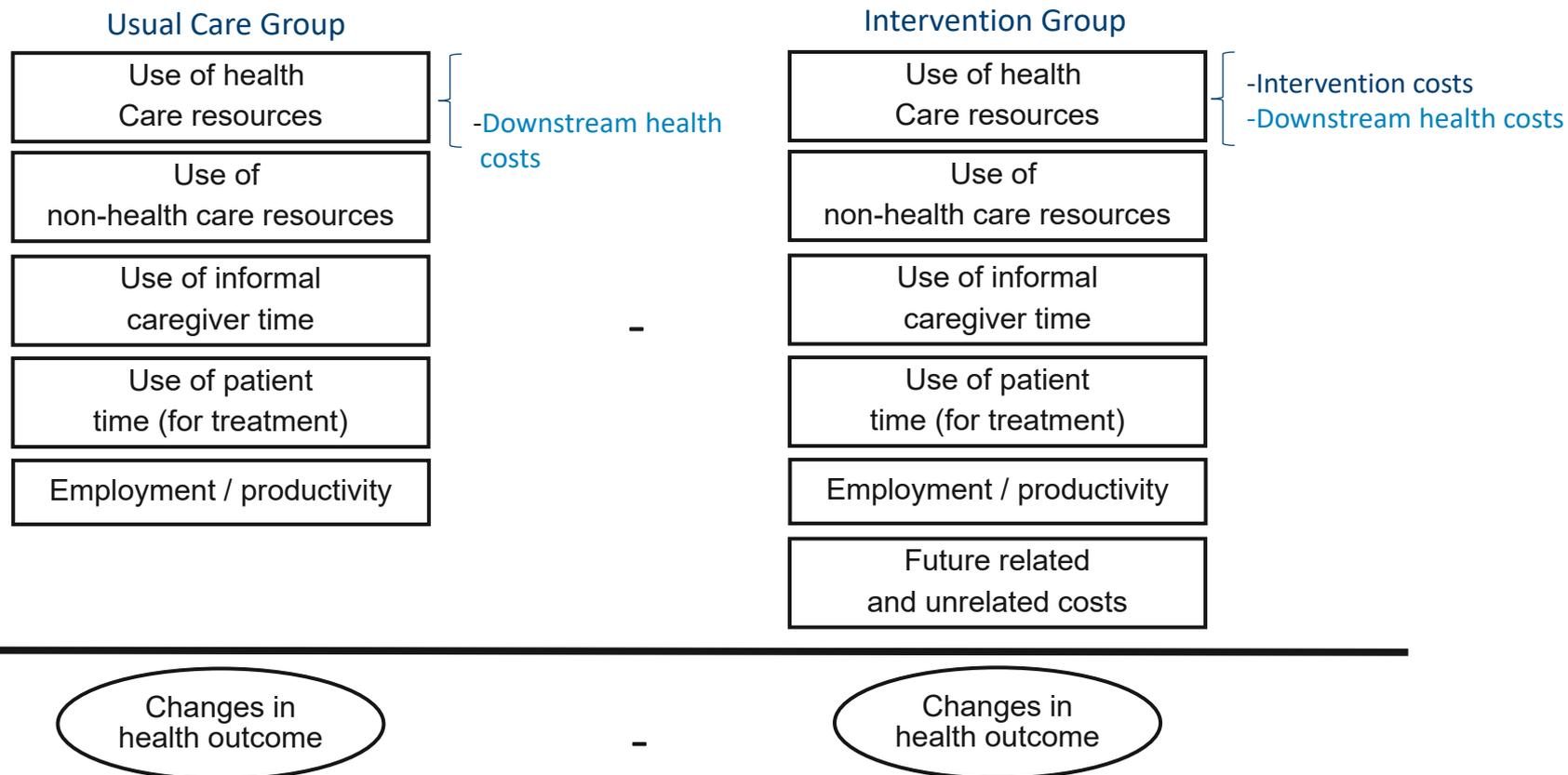
# What do managers want?

- Managers want:
  - Analyses that reflect their perspective
    - Societal is too broad.
    - They have a budget.
  - Analyses that reflect their time horizon
    - Lifetime is too long.
    - Budgets are usually 1-3 years.

# Three Keys to Economic Evaluation

1. Perspective
2. Time horizon
3. Use cost estimates that best reflect the opportunity cost for the perspective and the time horizon

# Cost Categories vary by Perspective



# Is it Just a Problem of Perspective?



*"Poor things!"*

# Time Horizon

- Changing the time horizon is more complicated than changing the perspective.
- Embedded in the time horizon are different opportunity costs.
  - Variable costs: supplies, labor
  - Fixed costs: capital equipment, buildings

# Fixed Costs in the Short-Term

- Analyses that take a short-term perspective should exclude costs that are fixed in that time period.
- This method is rarely adopted in practice, but it can be particularly important for implementation research, where “success” is often gauged in the next 1 to 3 years.

# Variable and Fixed Costs

Total Cost (\$)	Var Cost (\$)	Fixed Cost (\$)	% variable	
<u>Inpatient</u>				<u>Diagnostic Related Group (MSDRG)</u>
29,212	20,199	9,013	67%	major joint/limb reattachment procedure of upper extremities (483)
46,158	25,825	20,333	56%	other vascular procedures with complications (253)
39,465	21,437	18,028	54%	septicemia or severe sepsis (871)
71,802	38,864	32,938	54%	coronary bypass w/o cardiac cath, no complications (236)
31,649	15,369	16,280	49%	alcohol/drug abuse or dependence with rehabilitation (895)
<u>Outpatient</u>				<u>VA Clinic</u>
93	75	18	81%	Pharmacy
361	286	75	79%	Prosthetics
99	62	37	63%	Laboratory
765	450	315	59%	Emergency Care
355	208	147	59%	Primary care

# ICU example re-examined

- CEO asked you to save money in short run
- Only way to do that is by focusing on short-term variable costs
  - Diverting low acuity patients away from the ICU saves variable costs and is the winning strategy.
  - Conversely, cycling patients through the ICU faster would increase variable costs.

# ICUs in the Long Run

- Diverting low-acuity patients away from the ICU may work in the short-run.
- BUT, this strategy does not work in the long-run.
- In the long-run, vacant beds must be converted into productive resources.

# Budget Impact Analysis (BIA)

# BIA

- The budget impact analysis (BIA) emerged from the International Society of Pharmacoeconomics and Outcomes Research (ISPOR).<sup>1,2</sup>
- It is increasingly popular with implementation science.

1. Mauskopf J. Principles of Good Practice for Budget Impact Analysis.... *Value in Health*. 2007;10:336-347.

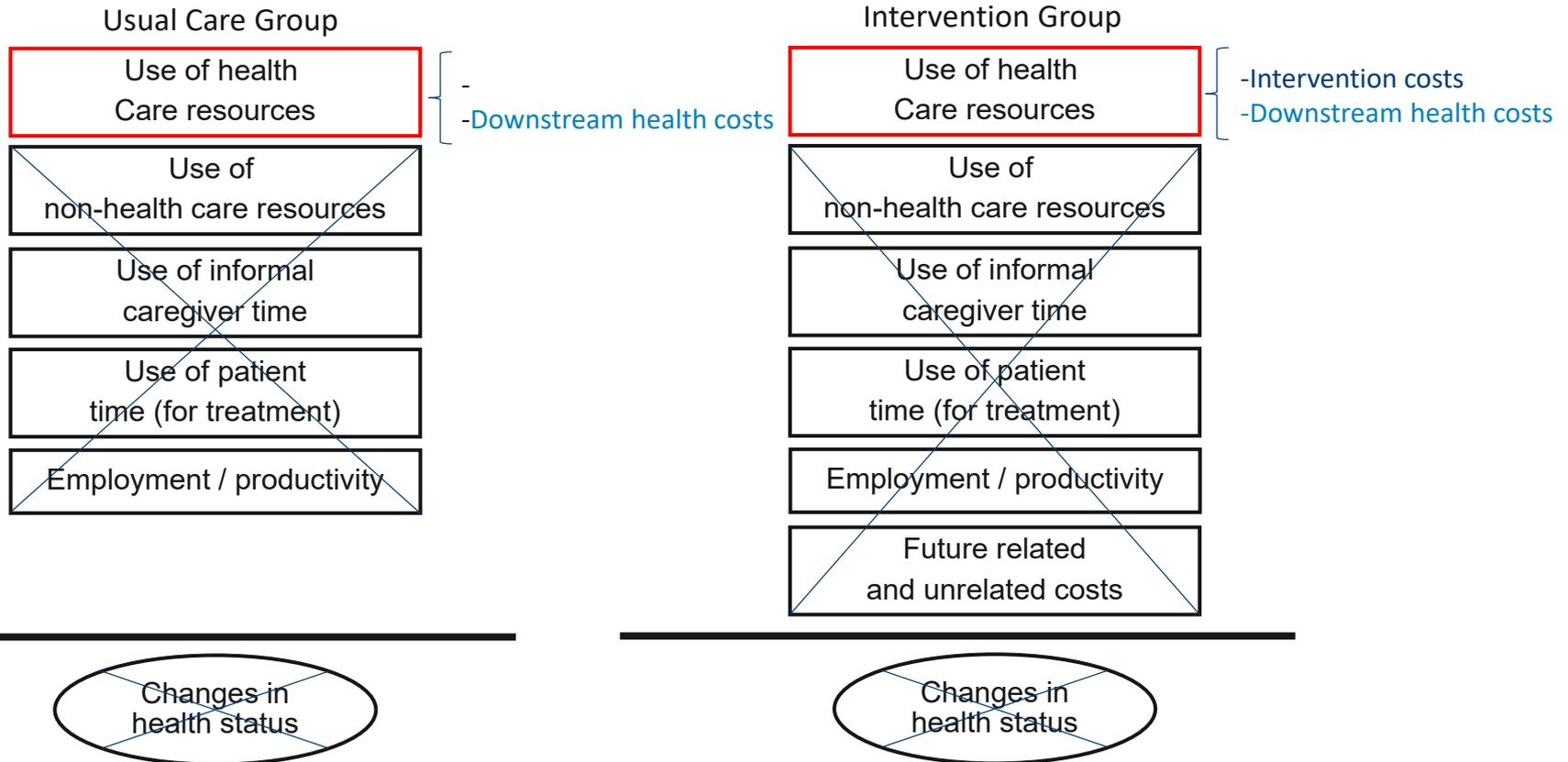
2. Sullivan SD, et al. Budget impact analysis-principles of good practice...*Value in Health*. 2014;17(1):5-14.

# 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.



# BIA



# BIA: Rule 2

- Track the input costs and downstream costs separately
- Input costs has two components
  - Treatment
  - Implementation strategies

# Implementation Costs

- Sometimes you can separate implementation costs from treatment costs
- But often the implementation and treatment costs are intertwined, so the costs cannot be separated
- Differentiate these costs whenever possible

# Example 1: TPA for Stroke

- Tissue plasminogen activator (TPA) is a highly effective clot-busting treatment for ischemic stroke.
- For TPA to be effective, organizations must coordinate care processes quickly.
- Known: purchase price for TPA
- Unknown is the cost of using different strategies to increase coordination

# Example 2: Depression Treatment

- Team-based collaborative care is more effective than traditional approaches for depression tx.
- Health care providers can use strategies to increase the number of patients receiving collaborative care.
- Unknown:
  - the cost of the collaborative care
  - the costs of the implementation strategies

# Factors that Can Influence Input Costs

- Learning curves and efficiency
  - Unit costs may decrease with learning
  - This may be an outcome or a confounder
- Distribution cost is not zero at the margin
  - Changing drugs does not affect distribution costs. But implementation studies often affect other parts of the delivery system, which may be important.
- Variation in Fidelity
  - Unit costs may be a function of fidelity
- Exclusions
  - Exclude one-time development cost (sunk costs)
  - Exclude research-related costs

# 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

# BIA: Rule 3

- Estimated savings are not revenue
- Organizations often prefer strategies that increase revenues, versus those that cut costs
  - ICU example: diverting patients does not save money without considerable effort

# Unresolved...

- How do you do a short-term health economic evaluation?
  - How do you identify variable or fixed costs?
  - Most researchers do not have access to activity-based cost data (ABC) data, like we do in the VA.
- Short-term evaluations can be myopic and socially suboptimal in the long run.
  - Do you need to do each analysis both ways?

# 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
- Is this really ignorable?

Example:

Poor follow-up after an  
abnormal Pap smear

# Outreach workers

- A local county hospital identified a quality gap: Low rates of follow-up among abnormal Pap smears (~30% follow-up)
- Question: what is the cost of using an outreach worker to improve follow-up?

# Objective

- We measured the cost of usual care (a mailed postal reminder) with a tailored outreach intervention compared to usual care alone.
- Do costs vary by disease risk?

# Study Overview

- Randomized, controlled trial
- Usual care: notified by telephone or mail, depending on the degree of abnormality. Provided intervention after 6 months
- Intervention: Usual care plus outreach and tailored individual counseling
- Estimated costs using direct measurement

# Data Collection

## Client Contact Form

Your Name: _____ Today's Date: _____ Time: _____					
Client's Name: _____		ID#: _____			
Type of Contact:	<input type="checkbox"/> Phone	<b>Contact to</b> (CHA, client, other): _____			
	<input type="checkbox"/> In person	<b>Contact from</b> (CHA, client, other): _____			
	Where: _____				
<b>Total Time with Client:</b>		<b>Travel Time:</b>		<b>Expenses:</b>	
Hours	Minutes	Hours	Minutes	Mileage	Parking
				<input type="checkbox"/> County vehicle	
				<input type="checkbox"/> Own vehicle	

Reason for call/visit	Outcome
<input type="checkbox"/> Administer pre-survey	<input type="checkbox"/> Next appt date: _____
<input type="checkbox"/> Administer survey	Date to give reminder call: _____
<input type="checkbox"/> Provide information	Date to check if appointment kept: _____
<input type="checkbox"/> Check to see if she scheduled appointment	Appointment kept?
<input type="checkbox"/> Schedule an appointment for her	<input type="checkbox"/> Yes <span style="margin-left: 100px;"><input type="checkbox"/> Cancelled</span>
<input type="checkbox"/> Remind her of appointment	<input type="checkbox"/> No, why? _____
<input type="checkbox"/> Check if she kept appointment	Resched - New appt date/time _____
<input type="checkbox"/> Other: _____	

Consultation/Intervention	Referrals
<input type="checkbox"/> <b>A.</b> Consumer skills (blue/green/pink/yellow)	<input type="checkbox"/> <b>B.</b> Transportation
<input type="checkbox"/> <b>D.</b> Calendar	<input type="checkbox"/> AC Transit Voucher
Coping:	<input type="checkbox"/> <b>C.</b> Child care
<input type="checkbox"/> <b>E.</b> Distancing	<input type="checkbox"/> <b>I.</b> Mental Health
<input type="checkbox"/> <b>F.</b> Seeking Social Support	<input type="checkbox"/> <b>J.</b> Alcohol abuse
<input type="checkbox"/> <b>G.</b> Escape Avoidance	<input type="checkbox"/> <b>K.</b> Substance abuse
<input type="checkbox"/> <b>H.</b> Planful Problem Solving	<input type="checkbox"/> <b>L.</b> Domestic violence
<input type="checkbox"/> Education about abnormal Paps	<input type="checkbox"/> <b>M.</b> Sexual abuse
<input type="checkbox"/> Other (specify): _____	<input type="checkbox"/> <b>V.</b> HIV/AIDS

Attempts to contact:	
1 <input type="checkbox"/> Date and time of day: _____	10 <input type="checkbox"/> Date and time of day: _____
2 <input type="checkbox"/> Date and time of day: _____	11 <input type="checkbox"/> Date and time of day: _____

# Unit Costs

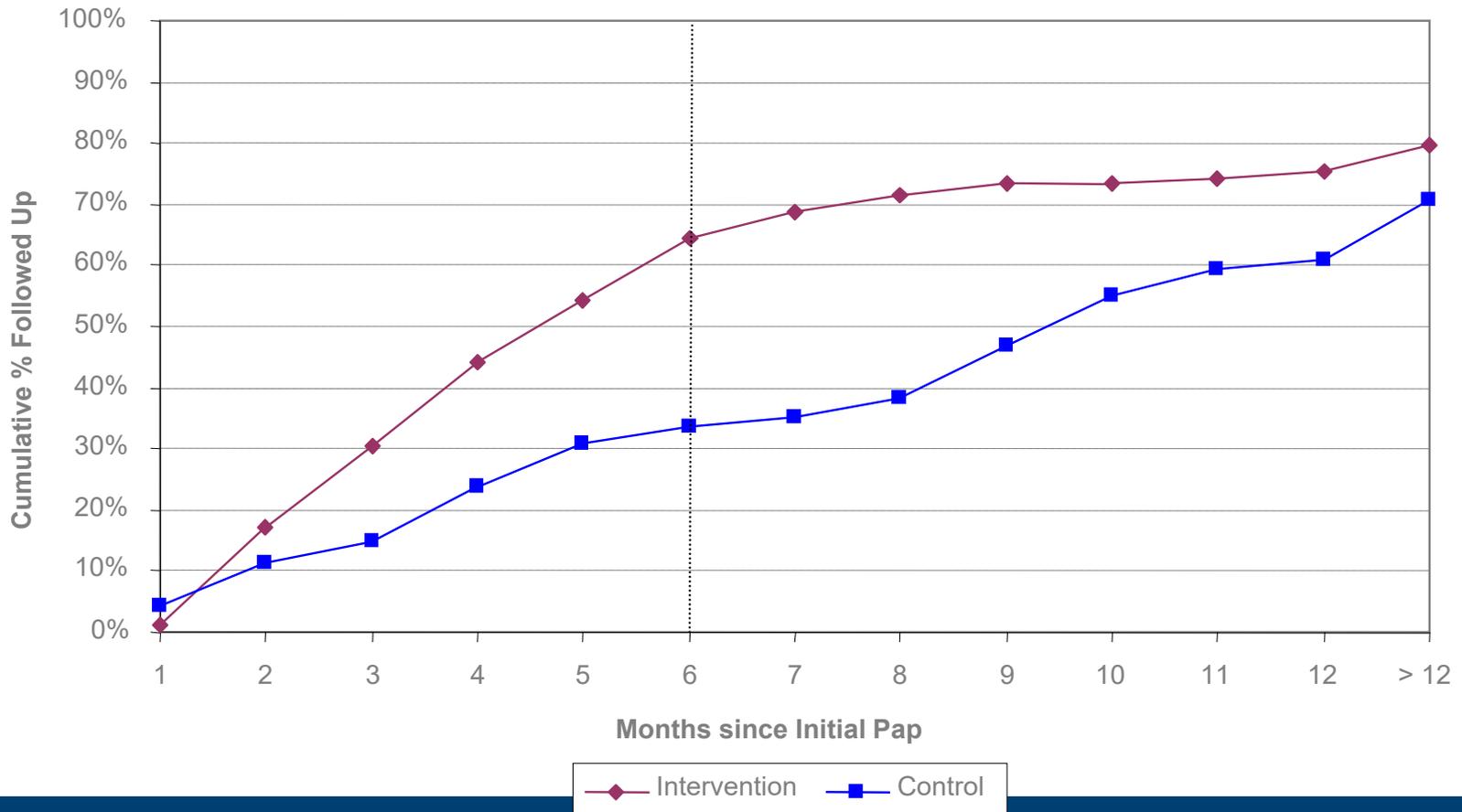
---

	Intervention (n=178)	Usual care (n=170)
Outreach worker costs	\$142	\$0
Travel costs at \$.365 per mile	\$4	\$0
Office space and supplies	\$28	\$0
Outreach worker quality assurance	\$19	\$0
Usual care	\$1	\$1.00
Subtotal	\$47	\$0
Patient Travel Costs for Follow-up	\$19	\$9.9
<b>Total unit cost</b>	<b>\$214</b>	<b>\$10.9</b>
<b>Cost to add intervention from provider perspective</b>	<b>\$194</b>	<b>\$0</b>

---

# Effectiveness

Abnormal Pap Follow-up at Highland Hospital  
non-OB Patients



# Cost per follow-up

	Cost	Incremental cost	Probability of follow-up	Incremental follow-up	Incremental cost per follow-up
<b>Overall</b>					
Control	\$77		0.32		
Intervention	\$355	\$278	0.61	0.29	\$959
Bootstrapped 95% CI					(787-1367)
<b>By severity</b>					
ASCUS/AGUS	\$75		0.32		
	\$347	\$272	0.57	0.25	\$1,090
LGSIL	\$74		0.30		(813-1658)
	\$374	\$300	0.64	0.34	\$882
HGSIL	\$105		0.43		(579-4584)
	\$405	\$300	0.87	0.44	\$681
					(486-1989)

# Questions?

For more information visit  
the HERC website at  
[www.herc.research.va.gov](http://www.herc.research.va.gov)

Email us at [HERC@va.gov](mailto:HERC@va.gov)

Call us at (650) 617-2630

