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Estimating Downstream Budget Impacts in Implementation Research

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Health care decision makers often request information showing how a new treatment or intervention will affect their budget (i.e., a budget impact analysis; BIA). In this article, we present key topics for considering how to measure downstream health care costs, a key component of the BIA, when implementing an evidence-based program designed to reduce a quality gap. Tracking health care utilization can be done with administrative or self-reported data, but estimating costs for these utilization data raises 2 issues that are often overlooked in implementation science. The first issue has to do with applicability: are the cost estimates applicable to the health care system that is implementing the quality improvement program? We often use national cost estimates or average payments, without considering whether these cost estimates are appropriate. Second, we need to determine the decision maker's time horizon to identify the costs that vary in that time horizon. If the BIA takes a short-term time horizon, then we should focus on costs that vary in the short run and exclude costs that are fixed over this time. BIA is an increasingly popular tool for health care decision makers interested in understanding the financial effect of implementing an evidence-based program. Without careful consideration of some key conceptual issues, we run the risk of misleading decision makers when presenting results from implementation studies.

Keywords
budget impact analysis, cost, cost analysis, financial management, implementation science

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Waste in the United States health care system accounts for $760 billion to $935 billion per year.[1] Some of this waste is attributed to administrative inefficiencies and fraud, but failures in how the system delivers care accounts for between $200 billion and $340 billion. This includes failures of care coordination, failures in providing the right services, and overtreating patients with low-value services. Implementation scientists are focused on trying to reduce these failures through greater use of evidence-based care.[2,3]

It is often assumed that health care systems can afford to implement these improvement efforts—or that the program will pay for itself through savings from avoided waste—but budgetary pressures and uncertainty surrounding implementation costs can create a challenge for decision makers.[4] Some interventions may be supported by evidence indicating their cost-effectiveness.[5,6] But this may not address the "wrong pockets" syndrome, whereby the benefits from a program accrue to an agency that did not pay for it.[7–9]

An increasing number of decision makers in health care organizations are requesting a budget impact analysis (BIA). This narrowly focused analysis requires estimating the costs required to implement the intervention and then comparing those input costs to changes in the downstream health care costs for that organization. This comparison informs the question of whether the intervention is feasible within budgetary realities and whether

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the intervention will pay for itself. The methods by which we estimate these downstream costs for implementation research are rarely discussed. Although many BIAs use simulations, this article focuses on methods for estimating downstream costs in which different implementation strategies are compared using a randomized trial or stepped-wedge designs. A separate article discusses the methods for estimating the cost of the implementation intervention.[10] In this article, we focus specifically on patient-related, downstream costs. Some implementation strategies may affect other outcomes, such as provider burnout (which could potentially affect patients). It would be possible to design similar studies focused on the costs of provider outcomes, but that is outside the scope of this article.

Measuring Downstream Utilization

Measuring changes in participant utilization and costs depends on a program implementation date, whether that is achieved through an experimental design or a natural experiment. At that date, some participants are exposed to the intervention (directly or indirectly through provider exposure) and others are exposed to the control condition. Cases and controls can be tracked over time using administrative data or via self-report.

Administrative Data

Claims or administrative data can simplify the tracking of patients, especially for larger studies. Administrative data are organized by encounters, such as an outpatient visit or an inpatient stay. These data must be extracted and transformed for analysis. In the extraction and transformation, a few important decisions must be made. First, one must decide on the periodicity, which may depend on length of study follow-up and potential downstream health care encounters for the patient. Data can be summarized by day, month, or year starting on day 1, which is often the randomization date or the date the program was initiated. Transformed data can always be summed to a higher level (e.g., 30 day to 90 day), but the reverse is not possible. In one study, we computed daily cost for patients diagnosed with stage 4 lung cancer.[11] In this case, costs were very high in first few days after diagnosis and then very high near the end of life. Having daily cost estimates provided flexibility in the statistical analysis that would not be possible had costs been summed into 30-day periods. For most studies, however, daily cost estimates lead to unstable estimates that are harder to interpret. Thus summarizing costs to longer periods (e.g., 30 days, 90 days, or 1 year) provides stability and aids interpretation.

A second decision is whether to sum across all utilization categories or across utilization that is plausibly related to the implementation efforts. Emphasizing related costs is appealing because it focuses attention on plausible effects and may yield smaller standard errors as opposed to total costs.[5,6] The downside of this approach is that "relatedness" often eludes definition, and decisions to exclude categories are criticized as arbitrary. Consequently, many researchers measure the total utilization, based on all care, as well as a subtotal, based on related care. Other subtotals, such as inpatient, outpatient, or emergent, also provide value. Category subtotals permit the analysis and reporting of different subtotals that can aid decision makers' different perspectives and sensitivity analyses, discussed in more detail later.

Self-Reported Data

An alternative to administrative data is to track health care utilization using patient or proxy self-report. Patients may recall their co-payments or their deductible, but patients cannot be expected to accurately estimate the cost of care they receive, so one needs to ask about health care utilization and then estimate costs for the utilization data. This method is less precise but not necessarily less accurate than administrative data.[12,13] The lack of precision and the potential for bias depends on the frequency and length of recall. The recall process can be problematic if the utilization is not salient or happened a long time ago.[14] Many questionnaires and diaries have been developed to ascertain self-reported health care

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utilization (see, for example, www.dirum.org). Strategies have been used to enhance recall, such as asking about outpatient care in reference to landmark events (e.g., birthdays) or by asking first about a longer recall period followed by a narrow period (i.e., 2 time frames).[12]

Cost Estimates

The next step involves estimating costs for the utilization data. In some cases, the utilization data have accompanying information on payments or charges, but even in these situations, it is wise to question what that information represents. In theory, the costs should reflect the opportunity costs—the value of using the resources for the next-best alternative.[15] However, no databases list the opportunity costs, so most people turn to cost estimates from activity-based cost (ABC) accounting systems, payments, or charges.

Activity-Based Costs

ABC systems track inputs, such as labor, supplies, and space, and link those inputs to local prices for each service that a patient receives. ABC systems use accounting rules designed to estimate the local health care system's cost of producing care. There are subtotals for variable costs, which include labor and supplies that vary across patients. There are also fixed costs, which reflect the health care system's capital investments, such as buildings and equipment, which are considered fixed over the life of the investment. These fixed and variable costs are then assigned to patients getting care. The US Department of Veterans Affairs (VA) implemented an ABC costing system in 1998, and the cost data are highly precise. VA cost data have been used to compare close substitutes, such as the costs for different types of coronary artery bypass surgery.[16] Comparing the cost of these close substitutes would not have been possible using payment data because both procedures incur the same payment amount. One downside is that linking activities to costs is a complex process that in rare cases can result in multiplication errors (i.e., a unit is multiplied by the wrong unit cost).[14] Further, ABC systems represent local costs, a strength for many implementation science studies, but also a challenge when generalizing to other health care systems.

Payments

Payments are the amount paid by an insurer and/or the patient to a provider for rendering care. In the case of federal insurers, such as Medicare, the payments are designed to reimburse a hospital for its long-term average costs. Inpatient and outpatient payments reflect a national base amount, to which local adjustments can be made through geographic indices. Payments are limited in their precision, and they only reflect benefits that are covered by the insurer.[17] One advantage of payments is being able to estimate what the payments would be for a different provider using payment formulas (e.g., Medicare), thereby removing variation due to wages or other local factors. One disadvantage of payments is that they reflect preestablished agreements, and the payment may not reflect the resources used to care for a patient.[18]

Charges

Charges are the listed prices on the bill, yet because health care is not a well-functioning market, in the economic sense, charges are substantially higher than what insurers pay.[19] Researchers who work exclusively with billing data usually adjust the charges with a facility cost-to-charge ratio. The Health Care Utilization Project database, for example, reports cost-adjusted charges.[20]

Does the Source of Cost Estimates Matter in Implementation Science?

ABC systems are slowly becoming the gold standard for examining health care costs.[17] Unfortunately, not many health care systems employ ABC costing. Thus, the choice between using ABC costs or payments is often based on data availability. Although there is a general understanding that costs, charges, and payments are not synonymous,[21] rarely is there a discussion about whether the choice matters in implementation science. The choice of cost data depends on 2 issues: 1) applicability and 2) time horizon. Applicability refers to whether the costs are an accurate reflection the health care system that is being studied. The issue of time horizon refers to the distinction between variable and fixed costs and whether the fixed costs should be included in the analysis.

Applicability

Imagine that a rural hospital implemented an intervention to improve the quality of care. Further assume that we can see the utilization data from this hospital, but they lack patient-level cost data to complete the BIA. Thus, analysts would need to impute cost from another source. It would be unwise to impute costs using cost estimates from a large, urban hospital. Intuitively, this makes sense; we understand that rural hospitals have

Table 1 Variable Costs and Total Costs from Activities-Based Cost (ABC) Accounting in the US Department of Veterans Affairs (2018 Dollars)[a]

Variable Cost ($)	Fixed Cost ($)	Total Cost ($)	% Variable	
Inpatient				Diagnostic-Related Group (MS DRG)
20,199	9013	29,212	69	Major joint/limb reattachment procedure of upper extremities (483)
25,825	20,333	46,158	56	Other vascular procedures with complications (253)
21,437	18,028	39,465	54	Septicemia or severe sepsis (871)
38,864	32,938	71,802	54	Coronary bypass without cardiac catheter, no complications (236)
15,369	16,280	31,649	49	Alcohol/drug abuse or dependence with rehabilitation (895)
Outpatient				VA clinic
75	18	93	81	Pharmacy
286	75	361	79	Prosthetics
62	37	99	63	Laboratory
450	315	765	59	Emergency care
208	147	355	59	Primary care

[a]Variable costs include labor and supplies that vary across patients within a fiscal period (month). Fixed costs include equipment and buildings, although these may have different life spans.

very different operating structures than urban hospitals, and this pairing would result in cost estimates that would not accurately reflect the rural hospital. It may be easy to identify the obvious cases in which cost data are not applicable, but there are likely many more situations in which it is unclear, in part because we do not observe some of the key parameters on which we can judge applicability.

One way to think about applicability is to consider that each health care system uses labor, such as physician and nurse time, and capital investments, such as space and equipment to provide care, while simultaneously trying to maximize profits or minimize costs.[22] Systems differ in their use of inputs and in how they combine these inputs. Researchers who study hospitals can observe the quantity of inputs used, input prices, and the quantity of services produced. Unfortunately, the quality and efficiency by which these health care systems convert the inputs into outputs are never fully observed. An efficient health care system will be able to produce more care, or be less expensive, all else being equal, than an inefficient system. Quality and efficiency are 2 parameters by which we should judge applicability because they are correlated with costs,[23,24] and our inability to measure them poses a major problem when estimating costs in implementation science. In the ideal scenario, the cost data would come from an ABC accounting system from the health care system under investigation, thereby focusing on costs that are affected by the intervention over the relevant time period. Without ABC cost data, however, researchers need to carefully consider whether the cost estimates are applicable.

Time Horizon: Fixed and Variable Costs

When a health care system produces care, it must make decisions over different time horizons. There is the short-term time horizon, which includes staff and supplies that can be reallocated relatively quickly. Many health care systems will minimize their variable labor costs by adjusting nursing staff to meet patient needs. In the short run, some costs cannot be reallocated and are fixed. This includes capital investments, such as equipment and buildings, which may have life spans of many years. Over the long run, all of these decisions, even buildings, can be varied. Historically, many health economic evaluations have used a long-run perspective, explicitly or implicitly, by using total payments, ABC total costs, or cost-adjusted charges. With the increased attention on economic evaluations with shorter time horizons, this raises the question about whether we should be focused on the total cost, or just the variable costs, thereby excluding some or all of the fixed costs. The primary economic argument for using variable cost is that we should include costs only for which there is an opportunity cost—capital investments cannot be varied in the short term and thus should be excluded from the calculus.[15]

Fixed and variable costs can be observed in ABC systems. Table 1 shows ABC data from the VA, including summary statistics from 5 inpatient procedures and 5 outpatient clinic visits. Among the Medicare Severity-Diagnostic Related Groups, the percentage of variable-to-fixed costs range from 69% for major joint reattachment to 49% for alcohol/drug dependence with rehabilitation. On the outpatient side, the percentage of

variable-to-fixed costs range from 81% in pharmacy to 59% in primary care. Variable costs, which include labor and supplies, are higher on outpatient visits than inpatient stays, which reflects the influence of hospital space and equipment (fixed costs) on inpatient care. Coronary bypass has on average approximately $33,000 in fixed costs, which reflects all the fixed costs associated with staying in the hospital 8.2 days, on average. But even within inpatient and outpatient care, there remains considerable variation in variable and fixed costs. ABC systems use accounting rules to differentiate fixed and variable costs; the VA data report labor and supplies as variable costs, while capital purchases that are constant over a fiscal period are considered fixed, even though a building is fixed over a longer period than equipment.

The decision about whether to include the fixed costs has implications not only for the magnitude of the cost estimate but also for statistical power. Including fixed costs inflates the variance, which reduces the power to detect effects. Therefore, if the decision maker is focused on understanding the short-term effects, including fixed costs that do not vary in the short term could lead to biased estimates of both the magnitude of costs and the standard errors.

Including the fixed costs also has implications for how decision makers interpret the results. If a hospital implements a program and that results in fewer repeat procedures, the health care system in the short run will save only the variable costs from these averted procedures. The savings in fixed costs will occur when the space and capital equipment can be reallocated to productive capacity; converting these resources often takes time and money. In the short run, the savings in fixed costs is illusory; these funds cannot be spent elsewhere, although the space and capital equipment may be used by other patients, if there is excess demand.[25]

Statistical Analysis

Downstream costs can be summarized into time periods. The ISPOR BIA Task Force recommended against inflation adjustment and discounting and instead recommended presenting costs by year rather than combining costs across multiple years into one number.[26,27] This matches the annual budgets faced by many decision makers, although the ISPOR Task Force noted that future costs could be discounted to present value, if so desired by the decision maker.

If inflation adjustment is desired, the US Bureau of Economic Analysis has detailed information on its website explaining the theory and measurement behind different price indices.[28] Some price indices are more appropriate than others depending on the cost component of interest. Implementation researchers focused on variable labor costs might be particularly interested in the US Bureau of Labor Statistics Employment Cost Index. Ultimately, the results may not be sensitive to which index is used, but choosing the most appropriate index can help improve precision of the analysis and aid in interpretation. Similarly, if discounting is desired, future research may wish to reevaluate alternative discount rates, such as declining and hyperbolic rates,[29] especially given insights from behavioral economics regarding decision makers' time preferences.

Analyzing downstream costs should start with descriptive statistics, means, medians, and standard deviations, to explore the data and its variation by intervention and control group. Costs can also be analyzed using regression models in which the dependent variable is the downstream costs and the treatment group is the key right-hand-side covariate.[30] In many studies, the downstream cost data can be summarized over time periods (e.g., by month) such that there are multiple observations per person. In these situations, the regression analysis should use methods that correct the standard errors for repeated observations (i.e., panel data) and that address the distribution of the cost data.[31–33] It may also be important to adjust the standard errors for clustering, especially if organizations were the unit of randomization, as is often done in implementation science.[34] Panel models can model costs explicitly as a function of time as one might expect if there is a learning curve, where health systems or providers become more efficient over time with the targeted activity. One could also explicitly control for other covariates, such as fidelity, if they can be measured and if they vary across the sites or over time. This approach is amenable to subgroup analyses, keeping in mind sample size limitations and concerns about multiple comparisons.

If the study has also collected information on the cost of the interventions, then the intervention costs and downstream costs can be summed to a net cost. Analyzing the net cost compares the total costs (i.e., input costs + downstream costs) for the cases and controls. A net cost that is significantly less than zero suggests that the implementation efforts will save money, on average. A net cost that is significantly greater than zero implies that the implementation efforts will increase average costs, all else being equal. However, sometimes the confidence interval for the net costs spans zero,[35] indicating that the net cost is not significantly different from zero. In this situation, it might be tempting to

conclude that the intervention does not cost additional money. However, this may be inaccurate. Often, the implementation efforts require a known investment, but the variation in the downstream costs are large, creating imprecision in the net cost estimate. In this situation, the decision maker should recognize that the implementation intervention has a known added cost, with an unknown downstream effect. Caution is warranted when interpreting such results because cost data often have substantial variation. Decision makers would be wise to consider the size of the effect and not focus exclusively on whether the results are statistically significant.[36]

Conducting sensitivity analysis, by varying model parameters across a plausible range of values, is key to ensuring a robust analysis. Providing results for alternative possible scenarios, even perhaps best/worst, and most likely cases, can help decision makers understand whether the intervention is worth implementing under a variety of possible, plausible conditions. Further, disaggregated cost categories can aid different decision makers if they have their own cost data to apply or perspective that might not include every cost category. In addition, ensuring a nationally representative cost, or a simplified way for transforming local costs into a generalized estimate, will help decision makers use published BIAs for their own health systems in locales other than the original implementation site.

Cost analysis can obscure mechanisms of action. Analyzing resource use, such as the number of admissions to a hospital, days in the hospital, or admissions to the emergency department, can provide information on potential mechanisms. This can also provide insights into whether there were offsetting effects, such as an increase in appropriate primary care and a decrease in emergency department visits that might not have been noted when analyzing costs. Analyzing the utilization data can be an important step toward informing future replications, which is discussed next.

Informing Replications

A cornerstone of implementation science is to understand the effectiveness of using different implementation strategies to reduce quality gaps. This creates an inherent tension in trying to figure out what factors are idiosyncratic to the current situation and what factors generalize. That same tension exists in health economic evaluations in implementation science. Some economic parameters, such as staff wages, are observed and can be changed to inform replications. Medicare reimburses providers differently by geographic area, and the US Bureau of Labor Statistics shows the variation in labor costs by job, location, and year (see https://www.bls.gov/bls/blswage.htm). The US Centers for Medicare and Medicaid Services also creates a data file known as the Medicare Wage Index that identifies the relative cost of labor by geographic area (see https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Wage-Index-Files.html).

Unfortunately, we do not observe all the local contextual factors in a study, and this complicates our ability to compute replication costs. Most importantly, we do not observe the efficiency and quality of the health care system's provision of care. We might observe in the downstream utilization that one of the participants received a series of inpatient and outpatient procedures. We can speculate about what these procedures may have cost elsewhere, but we do not really know if the patient would have received these same services at a different site. In health economics, it is common to include a facility-level fixed effect—a set of dummy or indicator (0/1) variables for each organization—in the regression model. This method is popular because it controls for facility-level effects that may not otherwise be observed, but these dummy variables may inadvertently control for local issues that are the focus of the implementation efforts.

Qualitative work may be particularly informative in identifying and understanding the underlying differences in how the health care system provides care across all its services,[37] which could then be measured and modeled quantitatively. For example, downstream costs may not shift following implementation if providers continue to engage in previous patterns of referral and service delivery.[38] Qualitative observations or interviews could reveal important insights into the behaviors, attitudes, and thinking that may help understand differences in provider behavior among individuals, roles, facilities, or other contextual factors.

Revenues

Downstream costs can be examined without any discussion about revenues. However, many health care systems will want to know how the costs relate to revenues, which predominantly come through insurance payments. Fee-for-service payments are based on services rendered and create a number of problematic incentives, such as providing inappropriate care.[39] Capitation payments are based on a per-member per-month amount but also create harmful incentives, such as the denial of appropriate services. The past 2 decades has seen an effort to blend payment systems to optimize incentivization of appropriate care.[40] Thus, many implementation scientists will need to consider the budget impact within the provider's

revenue structures and how the budgetary impact might change with the evolution of health care financing.

Case Study: Cardiac Rehabilitation

Cardiac rehabilitation programs have been shown to be effective at both improving cardiac performance and reducing the odds of a subsequent cardiovascular event[41]; these programs also reduce mortality at a reasonable cost, as shown in a cost-effectiveness analysis.[42] A hospital can use implementation strategies, such as audit and feedback, centralized technical assistance, developing educational materials, and promoting insurance coverage, to increase the uptake of cardiac rehabilitation.[43,44] Schopfer and colleagues[45] documented the low use of cardiac rehabilitation in 2010 in the VA and developed strategies to promote home-based cardiac rehabilitation (HBCR). VA managers have expressed interest in HBCR in the hopes that it would improve participation and possibly reduce patients' downstream health care utilization and costs.

Examining the downstream budgetary impact requires comparing usual care (in-person cardiac rehabilitation) to the intervention (usual care plus HBCR). VA has administrative data that can be used to inform this question. Eligibility for cardiac rehabilitation is based on surviving a cardiac event (myocardial infarction or heart bypass or percutaneous intervention), which can be identified in VA administrative data. The VA also uses an ABC accounting system known as the Managerial Cost Accounting system from which one can extract patient-level cost data starting with the date of the event. The length of follow-up is specific to each study, but decision makers typically ask for a follow-up period of 12 months or longer. These data include the costs for treating the cardiac event, which should be excluded, the cost of cardiac rehabilitation, and any other downstream health care costs. Cardiac rehabilitation costs and downstream costs can be separated based on Current Procedure Terminology (CPT) codes.

The 12-month downstream cost data then can be summarized per-person per-month. Summarizing costs to the monthly level frequently provides sufficient precision and makes it easy to aggregate to a higher level (quarterly or yearly), if there are lot of zeros. The bottom-line calculation is total cost per person per month regressed on a treatment indicator (i.e., usual care or the intervention). This framework can handle adaptations. Inpatient, outpatient, and pharmacy cost subtotals can provide precision about the effect of the intervention and should be built into the analysis plan. In addition, these analyses can control for contextual factors, such wage rate differentials. Sensitivity analyses, such as subgroup analyses by age or comorbidity burden, can also be conducted.

Analyzing downstream costs with ABC accounting data provide a number of benefits compared with tracking downstream costs through self-report and imputation. One advantage is that ABC data enable further analysis of the variable and fixed costs, which can be particularly informative for understanding the relative costs or savings in variable costs, which may be helpful for managers considering replications. A second advantage is that the ABC data emanate from the hospital under investigation. Without such data, the analyst needs to be particularly thoughtful when estimating costs to ensure that the cost data are applicable to their own setting, as discussed above. Finally, the added precision of the ABC data provide more statistical power than cost data that are estimated through self-report. Researchers should consider these issues when planning their study.

Discussion

We described methods for estimating the downstream costs resulting from an implementation study. Two main points arose in these methods. The first is the need to understand the health care system that is implementing the intervention. Health care systems with known quality problems may yield unit costs that are not accurately approximated by national data. The best solution would be to use ABC data emanating from the organizations being studied. Frequently, however, the health care systems do not have any ABC data, and there is little information on how well they are functioning. Consequently, researchers often use cost estimates from other sources, such as average Medicare payments, even though there is no guarantee that these costs are appropriate for the analysis. If there were concerns that national payment data were not applicable, one option would be to develop a local micro-cost model to estimate unit costs based on the organization's operating characteristics and financial data.[15] This is challenging and beyond the scope of most studies. Another option is to match the facility being studied to similar facilities that have cost data. Qualitative data may offer insights into the organization and which cost data might be a good match.

Second, there is the need to consider costs in the short term, as has been discussed by Adang and Wensing.[46] In the short term, defined as time horizons of fewer than 5 years, decision makers should only consider those inputs that can be varied. The ability to separate variable and fixed costs is possible in most ABC accounting systems.

When costs are estimated from self-report, charges, or payments, we only observe the total cost, not the fixed and variable cost components. Future research is needed to determine if it is possible to develop ratios from ABC data for estimates of the variable- and fixed-cost components. While this may be mathematically feasible, it may require many assumptions that could be unpalatable or possibly unrealistic.

Focusing on variable costs in a short-term time horizon may be appealing for managers in health care systems, but it can lead to myopia. The right decision in the short run may be different than the optimal decision in the long run, when all inputs can be varied. This is especially true if substantial costs (or benefit) accrue in the long run. A downside of the short-term focus is that decision makers will need BIA information to implement quality improvement programs now, but they also need the long-run results so that they can make appropriate strategic plans. Researchers may need to convince the decision makers that this is worthwhile and then plan and budget accordingly to provide analyses from both perspectives.

We have presented methods and analytical techniques that dovetail prospective studies testing implementation strategies in a randomized trial or stepped wedged design. It is possible to extend these analytical approaches to natural experiments in which costs can be compared before and after implementation for intervention and control sites (i.e., difference-in-differences models).[47] The approaches discussed in this article generalize to a difference-in-differences approach, although it can be challenging to measure intervention costs using in a natural experiment. Measuring intervention costs is discussed in detail in a separate article.[10] There is a growing list of completed and planned studies in this area for interested readers.[48–57]

Cost-effectiveness analyses have common approaches for presenting results.[58] There is growing literature on how to best present information on the budget impact for implementation science.[59–61] First, we need to communicate levels of uncertainty; there may be more certainty with the implementation efforts although considerable uncertainty in the downstream costs. Therefore, analysts should report these costs separately, rather than only reporting the net cost. Second, presenting information on costs assumes that the audience is foremost interested in costs; however, they may be more concerned with effort, especially if effort is required primarily by specific staff (e.g., primary care providers) who may have very limited time or are already overbooked. Therefore, analysts should present detailed information about resource use, such as the time required of particular staff, because this may be as important as the cost information.

In conclusion, the relatively simple mechanics of conducting a BIA belie some more complicated issues that are rarely discussed. These issues are likely to be important for implementation scientists who are focused on reorganizing health care systems to improve the safety, efficiency, and effective delivery of care.

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