

A Guidebook: Economic Evaluation of Population-Based
Prevention Interventions in an ACO Community

NC Public Health Incubator Collaboratives

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“More important than deciding whether dollar benefits exceed dollar costs is the questioning approach inherent in these frameworks. One cannot assume that a program is efficacious without evidence, even though prestigious experts may ‘feel’ that it is. One cannot begin with the notion that resources are plentiful so that one need make only some emotional plea in order to be able to mount a major health program. More attention to defining goals and to evaluating efficacy should be combined with benefit-cost analysis if we are to improve the health of the nation.”

—Lester Lave

Introduction

The worlds of healthcare and public health are currently undergoing rapid and fundamental change. Driven by the Affordable Care Act and, more importantly, by the unsustainable rise in healthcare costs, the healthcare community is moving from fee-for-service reimbursement to pay-for-performance reimbursement. In other words, profitability will increase not by doing more procedures but through using resources more efficiently and effectively. Quality and efficiency are thus becoming drivers, and in a capitated system, the enhanced savings will become the source of greater profitability.

There are a number of forms that this outcomes-based reimbursement model might take. Examples are: Patient Centered Medical Homes (PCMH), Accountable Care Organizations (ACO), bundled payments, and shared savings arrangements. Shared characteristics of these models include: 1) the “healthcare continuum” extends beyond acute clinical care to include prevention, preventive health care, and disease management; 2) care requires a team of partners who collaborate to provide the range of services included in the expanded continuum of healthcare; 3) risks and savings are shared among the partners, 4) data collection and analysis are essential to evaluate performance, and 5) both individual patients and the population of patients are the targets of care.

These developments in the world of outcomes-based reimbursement bring a new and important role for local public health departments (LHDs). LHDs are the experts in prevention and in the

surveillance of and response to communicable diseases. They are also experts in assessing the public health status of a community, and they are experienced in bringing together teams of community partners to address a community's health issues. However, for many LHDs, a major obstacle to playing this new role is the fact that many potential partners, particularly hospitals/health systems, are unaware of LHD expertise. They may also need to be convinced that this expertise brings real value to a partnership with LHDs.

With these issues in mind, this guidebook is designed to assist local health department staff assess the value of their contributions, with a particular focus on population-based prevention interventions. Population-based prevention addresses changes in the social and physical environment, involves intersectoral action and community participation and empowerment, and emphasizes context (Kindig and Stoddart, 2003.) Intersectoral action involves engaging and coordinating actors from a variety of relevant sectors in the planning, implementation, and evaluation of interventions (IOM, 2012.) Adapting population-based interventions to local conditions and context is an important feature of effective interventions that also increases community ownership and buy-in for the intervention (McLaren et al., 2007). Population-based interventions incorporate many of the potential roles that LHDs can bring to a partnership – community collaborations, intervention prioritization, and the selection and implementation of evidence-based strategies. With careful assessment of their potential contributions, LHDs can make the case for their value as a partner who should share in the savings associated with outcomes-based reimbursement.

An effective assessment guide works if it supports an intelligent decision-making process, one that clarifies trade-offs, reminds decision makers of the things that are important, and helps decision makers explore and work through disagreements (IOM, 2012 p. 93). This guide and related evaluations are intended to foster transparent and ongoing communication among stakeholders and to demonstrate to Accountable Care Organization decision-makers the economic value of population-based interventions and the important role that LHDs can play in the selection/design, implementation, and evaluation of these interventions.

This Guidebook provides a description of steps and things to keep in mind when calculating the economic value of population-based prevention interventions with a particular reference to potential Accountable Care Organization (ACO) stakeholders. The steps include: 1) engaging key stakeholders in the process; 2) specifying the intervention, 3) planning the evaluation project, 4) identifying and measuring costs and benefits, 5) calculating the return on investment (ROI), and 6) presenting findings.

To assist the reader in understanding and applying the concepts in this guidebook, we will reference an example ROI case study throughout the guidebook. This example is a study of smoking cessation programs. Its purpose is to determine whether these programs lead to worthwhile healthcare cost savings and a related positive return on investment for third party payers. (Leif Associates, Inc., 2012) We will modify a few of the details to better suit the purposes of this guidebook. Of course, the negative impact of tobacco use has been known for some time. In 1964, the U.S. Department of Health Education and Welfare distributed an initial report on the health impact of smoking. Among its findings, smoking was causally associated with lung cancer for men and women, increased risk of dying from bronchitis and emphysema, and higher death rates for coronary artery disease. (Surgeon General, 1964) Since then many studies have provided overwhelming evidence to support these findings and to demonstrate other negative health consequences associated tobacco use and for those subject to secondhand smoke.

This literature points to the potential health value of tobacco cessation programs, and a number of insurance companies responded by providing coverage. A 2002 study including over 150 health plans noted that 88.8% of these plans covered at least one type of pharmacotherapy. (McPhillips-Tangum C, et al., 2004) Moreover, the Affordable Care Act has expanded coverage. Under the ACA, tobacco cessation is universally covered as one of the A- and B-rated services recommended by the U.S. Preventive Services Task Force. Under this legislation, each payer can design exactly what is covered and how many units of each method are covered. (Leif Associates, Inc., 2012)

1. Engaging the key stakeholders in the evaluation

The first step in the calculation of an ROI for an ACO partnership is to engage key stakeholders in the evaluation. Engaging key stakeholders early on is important for a number of reasons. First, their perspectives are important in the selection and definition of the intervention, potentially adding insights based on their organization's priorities and experience. Also, early engagement promotes transparency, and it recognizes and establishes a venue for the politics and potential conflicts that are inevitable given the dramatically changing healthcare context and related resource allocation questions. Inevitably an ROI calculation will require some general assumptions and judgments, and these judgments will have to be agreed upon by ACO partners if the ROI is to be considered credible and will inform future interventions, partnerships, and the sharing of ACO savings. (Sanders, 1994)

For this Guidebook's ROI application, our community consists of those who are partners/contractors in an Accountable Care Organization, other community partners, and the population an intervention is intended to address. Partners/contractors are those who may share in potential savings associated with a population-based intervention, based on payer requirements. They are the ACO "decision-makers" who determine the value measures for an intervention, the methods used to evaluate an intervention, and the way the evaluation is used to inform decision-making. Community partners participate in the design, implementation, and/or evaluation of an intervention but are not formal ACO partners/contractors; and the population is the people targeted to benefit from the intervention. The particular population depends on the priorities of the ACO partners/contractors and the community partners. Frequently they include patients across ACO providers, community partner members, or people within a designated demographic or location.

In part, this discussion with ACO partners will be a listening exercise, where LHD representatives solicit the specific priority interests of these stakeholders as they pertain to the chosen intervention. In addition, the discussion may provide an opportunity to represent the public health perspective, educating these stakeholders about the potential value of the

intervention to a larger community population. One should be prepared to describe the well-defined and concrete community-based value of the intervention. Finally, the LHD must reflect on its priorities. In many cases these will dovetail with those of other stakeholders. It is also important to remember that one reason for the LHD to calculate the ROI of population-based interventions is to demonstrate the capacity of and the value of the LHD itself to other ACO decision-makers.

The engagement process can be described in two steps: 1) identifying and prioritizing potential stakeholders, and 2) recruiting the priority stakeholders (Preskill, H., et. al., 2009). When identifying stakeholders, cast a wide net, identifying all the potential stakeholders who may provide value during the evaluation. Begin with some of the stakeholders who will be involved in the design/selection of the intervention. You may then supplement these with others who are experts on the intervention or similar interventions, or with evaluation experts. Candidate stakeholders may have perspectives and experiences that differ from those of other key stakeholders. Perhaps they are members of an under-represented target population. Or they may have substantial influence as ongoing or potential funders of interventions. They may prove to be important advocates, building buy-in for both the current and other proposed interventions. The economic value of the intervention will be of material interest for many of these stakeholders. The table below lists different types of stakeholders. You may want to use this table to stimulate your thinking about candidate stakeholders. (Preskill, H., et. al., 2009, p. 16)

Types of Stakeholders

<ul style="list-style-type: none"> • Program / Initiative Staff <i>Staff, Leadership, Others accountable for program/project</i> • Organizational Leadership <i>Executives, Board of Directors, Advisory boards</i> • Grantees • Program / Initiative Beneficiaries <i>Participants, Clients, Patients</i> • Program / Initiative Researchers and Evaluators 	<ul style="list-style-type: none"> • Volunteers • Contributors <i>Founders, Donors, Other funders and co-funders, Collaborating organizations</i> • Community Groups and Leaders <i>Community-based organizations, Community leaders, Religious leaders, Law enforcement, Community service groups, Business leaders</i> 	<ul style="list-style-type: none"> • Experts <i>Expert consultants, Evaluators of similar programs/initiatives, Researchers, Academics</i> • Policy Groups <i>Policy makers (local, state, federal), Advocacy organizations, Government agencies</i> • Other <i>Staff from similar programs/initiatives, Professional associations, Media</i>
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The next step is to prioritize the stakeholders. Too many and/or too divergent stakeholders can lead to an evaluation that is too lengthy or costly or complex to be practical. These are some things to keep in mind as you winnow down the number:

- Which candidate stakeholders will make or influence decisions about the value of this intervention in particular and about prevention in the care continuum more generally?
- Which candidate stakeholders will make or influence decisions about the role of the LHD as a partner in the ACO? What roles will they envisage for the LHD now and in the future?
- Which candidates represent important community perspectives?

- Which candidates have a strong interest in the issues the intervention is intended to address?
- With which candidates would the LHD like to initiate or strengthen relationships in order to develop future population-based interventions or to have these stakeholders serve as advocates for the LHD and for prevention as part of the continuum of care in the community?

The roles of stakeholders in the evaluation will vary; however, it is very important that stakeholders participate in defining and/or agree to the costs and benefits to be included in the evaluation. They should help develop and/or agree to the data collection method, including ways to handle “missing data” and assumptions about such things as weighting of benefits, ways to incorporate “intangible” benefits, and ways to monetize benefits. They should also participate in and/or agree to the analysis of the data and generation of findings, and in the use of these findings to inform decision-making. This participation is essential if the ROI calculation is to be considered credible by the stakeholders who will use the findings to inform important decisions.

Typically, these stakeholders, some of whom will be key staff in your community’s ACO, will be the primary users of the evaluation. They may use the evaluation for instrumental purposes, or they may use the findings to improve the intervention. Some may use it for conceptual purposes as they anticipate future interventions, and others may use the findings to advocate for the intervention, or for future funding, or as a rationale for including prevention as part of the healthcare continuum and the LHD as a provider of prevention services. (Preskill, H., et. al., 2009, p. 9) (It is important to remember that while there will clearly be overlaps between stakeholders who participate in the design and implementation of the intervention and those who participate in the evaluation, the stakeholders of most importance here are those who are involved in the evaluation.)

The LHD should develop a detailed knowledge of stakeholders in preparation for stakeholder recruitment. The following kinds of information may prove useful:

- Recent and projected financial condition of an organization
- The leadership (not just the CEO), key staff, and influential providers
- The organization's strategic priorities and key issues
- The organization's physical locations and the communities it serves
- Past or current community outreach efforts undertaken by the stakeholder and their experience with these efforts
- Organization/resources committed to community outreach
- The organization's culture and history regarding community collaborations
- Relationships with other candidate stakeholders
- The stakeholder's opinion of and preparation for ACO participation
- The stakeholder's history with your LHD and opinion of the LHD's competencies
- The likely evaluation participant(s) from the stakeholder organization and their familiarity with evaluation and ROI calculations in particular, etc.

The organization's website, financial statements, and promotional materials can be a starting point for gathering this information. With this material as background, LHD staff may follow up with formal and informal conversations with informed members of the stakeholder organization, starting with the senior leadership if possible.

In many instances, relationships will already exist between the leadership and staff of the LHD and the leadership and staff of key stakeholders. As noted above, at least some of the stakeholders selected will also have played an important role in the intervention negotiations and/or the design of the intervention. These relationships can be leveraged, and through the associations and prior collaborations, for example, in a Community Health Assessment, the LHD leadership may already know enough about stakeholders and their priorities to engage them in the evaluation generally and in particular facets of the evaluation.

A LHD that has a detailed familiarity with candidate stakeholders will be better able to identify potential barriers to participation as well as issues that might be of particular interest to stakeholders. It can then target its engagement efforts accordingly. The point is to use this

information to encourage stakeholders to participate throughout the evaluation and to play roles that enhance the rigor of the evaluation and increase the credibility of the evaluation's findings.

For example, let's say the LHD has identified the community hospital as a key candidate stakeholder to participate in the evaluation. The LHD knows the hospital is a small (75 beds) county hospital located in the county seat where most of the county's population is also located. The hospital is struggling financially as a result of ongoing reductions in Medicaid reimbursements, and this has led to some layoffs and limited capacity for services beyond acute patient care and some diabetes-related disease management. The Medicaid reductions have been particularly difficult since the county the hospital serves is rural and has a disproportionately large proportion of the poor population. As a non-profit, the hospital has worked with the LHD to develop a community health assessment and it is now developing a community health improvement plan, but it is doing this on its own. Its history of community outreach has been limited to providing indigent care. Its staff and leadership are familiar with healthcare cost increases, and they are aware that outcomes-based reimbursement is a movement that is gathering some steam. They are also aware that prevention is considered to have value for the community's health, but they believe prevention is of marginal benefit. Overall, they are skeptical of the value of prevention, the value and duration of the outcomes-based reimbursement movement, and the practicality of Patient Centered Medical Homes and Accountable Care Organizations. Finally, they have had some conflicts with physicians, who have chosen to refer their patients to other hospitals, and again, given their limited non-acute care staffing, they do not really have anyone who is familiar with or has the time to participate in the development/calculation of a ROI for a proposed community-based prevention intervention.

In all likelihood, the LHD has already worked with the hospital to select and design the community-based prevention intervention and has therefore overcome some of the obvious barriers like the hospital leadership's skepticism about such things as the value of prevention and the likelihood that they will need to form or join an ACO. However, to gain their participation in the evaluation, the LHD must still address issues of limited hospital staffing and the fact that the hospital may have no staff with competence in conducting evaluations. As one approach,

the LHD might point to the value of building ROI competence among some of the hospital staff through their participation in the evaluation, and note that evaluation can point to the “bottom-line” value of the proposed prevention intervention (and to the value of other initiatives internal to the hospital), which is particularly important during this financially challenging time. The LHD might propose that it do the evaluation’s “heavy-lifting”, bringing hospital staff in principally in an advisement role for such things as review and signoff on the logic model, targeted costs and benefits, and the various assumptions made in regard to monetization of benefits; all of these will be initially drafted by the LHD and by other stakeholders.

In the smoking cessation example, the key stakeholders are the third party payers, healthcare provider organizations, and smoking cessation program and evaluation experts. They all play a significant role in the evaluation including: the selection of the interventions, the identification of the evaluation objectives (i.e. ascertaining the “bottom-line” economic value of tobacco cessation programs), designation of the relevant costs and benefits, and a description of assumptions and constraints to be incorporated into the evaluation. In the end, however, the third party payers will find the evaluation most useful (assuming they’ve bought into the evaluation method), using these finding to determine the cessation programs and related coverage they will support.

2. Specifying the intervention(s)

As noted in A Blueprint of the Future for Local Public Health Departments in North Carolina, LHDs are, or should be, the first-to-mind community resource with regard to the identification and selection of evidence-based strategies (EBS.) To be effective leaders in community health promotion and prevention activities, LHDs will need to guide the identification/prioritization of community public health issues, the review and selection of preferred evidence-based strategies, the adaptation and resourcing of a selected EBS (i.e., maintaining fidelity with the core EBS while accommodating community idiosyncrasies), and the assessment of the EBS. Needless to say, these activities require sophisticated competencies. With these competencies, LHDs should position themselves to be key players in the negotiations/selection of community-based interventions and as a partner to the relevant community's ACO. (Describing the steps associated with the actual selection of an intervention is beyond the scope of this guidebook. Some well-regarded resources that can be leveraged to assist in intervention selection are listed in the bibliography.) (NCIOM, 2012, Higgins, 2008, CSAP, 2009)

As it negotiates the selection of an intervention, the LHD should keep in mind that the intervention itself will have a material impact on every aspect of the intervention's evaluation. For example, the intervention will determine the target population and other stakeholders, relevant costs and benefits, outcome measures, data availability, the anticipated timeframe associated with intervention results, and in an iterative fashion, the logic model. In other words, from an ROI or cost effectiveness perspective, the selection of an intervention can make the calculation of these economic outcomes practical or impractical and credible or not.

Thus, the initial step in the calculation of an ROI or cost effectiveness outcome is the selection of the intervention(s) itself. Of course, in a sense, this could be interpreted as "the tail wagging the dog." That is, should we factor in the evaluation requirements of an intervention as an important criterion for selecting an intervention? From a strictly public health perspective, perhaps not, but if the LHD seeks not only to contribute to their community, but also to

demonstrate the value of that contribution as an ACO partner, an intervention's evaluation requirements become a logical selection criterion.

Below are a number of guides to consider as one evaluates and selects interventions with evaluation in mind:

- 1) The potential value of an intervention to decision-makers and other key partners (e.g., what it saves relative to capitation limits) will influence their commitment to effective participation in the evaluation process. Ongoing stakeholder participation from design through to final analysis is very important if the results are to be considered credible and influence decisions about ongoing and future LHD participation.
- 2) The evaluation of an intervention is comparative; that is, the ROI of the intervention is compared to that of others or compared to doing nothing. (From the perspective of the ACO community decision-makers, "doing nothing" typically means pursuing a traditional acute care approach to healthcare.) For example, the costs and benefits associated with an aggressive flu vaccination program would be compared to costs and benefits when immunization has not been promoted. As you select an intervention(s), consider which comparisons will be of most value/most meaningful for your ACO partners (IOM, 2012, p. 76).
- 3) In general, the more inclusive the community of interest, the more complex, costly, and challenging will be the evaluation of cost-effectiveness/ROI. As noted in the Introduction, a community consists of those who are partners/contractors in an Accountable Care Organization, other community partners (i.e. those who collaborate on the intervention and/or evaluation but are not ACO partners), and the population that an intervention is intended to address (e.g. patients). A final important member is the larger community, defined as the residents of a specified geographic location (e.g., county.) Inclusion of this last group frequently will be a source of contention between those with a typical public health perspective and those who are most concerned about the patients for whom they will be held

- accountable. Whether this group or segments of this group will be included should be a topic of discussion early in the intervention selection process.
- 4) The more general and pervasive the intervention (e.g., a policy intervention rather than a programmatic intervention), the more complex, costly, and challenging will be the cost-effectiveness/ROI evaluation. In part, that is because the more general and pervasive an intervention, the more diffuse are its benefits, introducing uncertainty about the causal relationship between the intervention and outcomes. Also, the link between those who bear the cost and those who benefit from the intervention is less clear. The greater these uncertainties, the less valid are the calculations. (Hutton, G. 1997).
 - 5) The longer the time required to achieve observable outcomes, the less likely they are to be of value to “bottom-line” driven partners/decision-makers. A set of outcomes, or outputs and outcomes, may result from some interventions. When this is the case, it may be useful to discuss the relative value of each to key stakeholders as well as the anticipated timelines associated with the optional outcomes. Discussion about workable timelines should be an early topic of discussion among ACO partners when selecting an intervention.
 - 6) This intervention will be one of many potential interventions over time. Therefore, when considering initial ACO-related interventions, bear in mind that you are considering a partnership that may include other interventions over time, with a cumulative impact.
 - 7) When selecting an intervention, keep the related logic model in mind. The model lays out the intervention’s resources and activities and explains what works and why. It also identifies the outputs and outcomes associated with the intervention. In other words, the logic model provides important insights into key evaluation requirements like the evaluation costs and benefits, outcome measures, and data requirements. Thus when negotiating with other key stakeholders about the selection of an intervention, the intervention’s logic model and the proposed outcomes can provide useful talking points.

Looking at the guidelines above, it is apparent that an intervention that is most helpful from a public health perspective, one that helps a large and diverse community of people with expansive programmatic/policy strategies, will often be the most difficult to evaluate from an ROI perspective. Such interventions may take too long; require assumptions that are too broad and unsubstantiated, and cost too much to work for bottom-line driven organizations like ACO partners. Yet from an evaluation point of view, the tradeoffs should be incorporated into any negotiations about intervention selection.

The intervention for our smoking cessation example is based on the U.S. Department of Health and Human Services Public Health Service Clinical Practice Guidelines. (Flore, M., 2008) Key Guidelines are listed below:

- Smoking requires repeated intervention and multiple attempts to quit.
- Clinicians should consistently identify and document tobacco use status and treat every tobacco user seen in a healthcare setting.
- Effective medications are available for tobacco dependence, and clinicians should encourage their use by all patients attempting to quit smoking.
- Counseling and medication are effective when used by themselves for treating tobacco dependence. The combination of counseling and medication, however, is more effective than either alone.

The selected intervention is 12-week program that includes six counseling sessions. It also provides medication and access to a public quitline. (Leif Associates, 2012) From an evaluation perspective, this or similar interventions have been well-studied, and quit rates can be reliably estimated. In addition, the intervention addresses tobacco smoking, a well-known carcinogen and well-understood source of other chronic diseases. As such a clear causal link can be established between quitting and one's physical health (e.g. a year after quitting, a former smoker's elevated risk of coronary heart disease decreases to half that of someone who continues to smoke.) (American Cancer Society, 2011). Finally, from this linkage, reliable estimates can be made about the impact of the improved physical health and the related frequency and cost of care.

The key stakeholder for this analysis is the third party payer. The payer's evaluation objective is to ascertain whether the costs of coverage associated with this intervention are outweighed by the improved health and related reduction in cost of care. In turn, the reduced cost of care could enhance insurer profitability and potentially, reduce consumer premiums. The evaluation findings will inform the coverage the insurer is willing to provide.

3. Planning the ROI Evaluation Project

As with any project, it's important to plan for an ROI evaluation. To do so, first assess your organization's (and/or your ACO partners') readiness to conduct an ROI evaluation. Next determine the scope of the project. Then identify high-level deliverables with a proposed set of milestones, and finally, assign roles to your organization's staff and to other ACO partners.

Readiness Assessment

As with any project, success requires adequate preparation and resources. A readiness assessment is a first step in such preparation. Below is a list of assessment questions that will assist you in ascertaining your readiness and that of your partners. (Kirkpatrick, 2008, p. 10) How you respond to these questions will help you determine the next steps in your evaluation planning and setup.

- 1) Have you secured the support and commitment of key stakeholders as participants in the ROI evaluation process? These stakeholders should participate in the development of and/or concur with assumptions, methods, and findings as the evaluation process progresses. Where possible their agreement should be documented.

- 2) Have you selected a well-defined, evidence-based intervention that has a specific starting date? The intervention should have clearly defined objectives, deliverables, and related high-level tasks. Importantly, you need to identify the expected outcomes/impacts of the intervention.

- 3) Have you identified the target population for the intervention? As noted above, is this population one that will be of particular interest to your key stakeholders, particularly your ACO decision-makers? Can you track the impact of the intervention for this population?
- 4) Do you have a system/method in place — or can you create one — that can quantify what it costs to develop and carry out the intervention (e.g., staff time, materials development, information technology system redesign, etc.)?
- 5) Do you have a system/method in place — or can you create one — to measure benefits that are expected to result from the intervention (e.g., changes in the cost of care, utilization, revenue, lines of business, disease prevalence)? Determining these changes will require that you establish a baseline against which to compare outcomes of the intervention.
- 6) Do you have a system/method in place — or can you create one — to capture indirect benefits from the intervention (e.g., organizational sustainability, patient goodwill, employee satisfaction)?
- 7) Do you have the time and resources to conduct an ROI evaluation?
- 8) Do you and/or your partners have the skills required to conduct the ROI evaluation? That is, can you identify/select an evidence-based intervention, target/recruit the intervention population, select/design economic measures, collect and analyze data, and build and sustain partner collaboration around the evaluation?

Evaluation scope and assumptions

The next question is, how extensive should the ROI evaluation effort be? As with any project, an ROI evaluation requires careful delineation of the evaluation's purpose and scope. A project's scope statement documents the boundaries of the project. Clearly articulating the scope is essential to maintain project focus, avoid scope creep, and to make sure the objectives

of the project will be understood and approved by key stakeholders. Typically a scope statement will include such things as project objectives, deliverables, tasks, timelines, location, organizational roles, and estimated project costs.

To do this for an ROI project, the evaluation objectives, the community of interest, the desired economic measures, the evaluation method/design, including the duration of the evaluation, and contextual constraints and related assumptions should be described. In addition, the roles of the intervention/ROI stakeholders and a project budget should be agreed upon. (OJJDP, 1989) Keep in mind that it can require considerable resources (time, skill, and money) to do an ROI well.

To begin scoping the ROI evaluation project, it is important to solicit and document key stakeholder evaluation priorities, and based on those priorities, define the ROI evaluation objectives. These priorities should align closely with the proposed/anticipated intervention outcomes. As noted above, the intervention itself will play a key role in determining the scope of the evaluation. For example, larger interventions with more diffuse outcomes and a limited evidence base can lead to an extensive design and data collection effort and can accrue large costs. Thus, selection of the intervention itself will be a key initial decision in determining the scope of the ROI evaluation.

Exactly which stakeholders should be approached and in what order will depend on your particular circumstances (e.g., stakeholder relationships, priorities, relative influence) and on your judgment. It is important to recognize that the priorities/issues faced by one stakeholder may conflict with those of another, and to undertake your review with this in mind. For example, if you are interested in calculating an ROI for prevention interventions intended to complement traditional acute healthcare for an Accountable Care Organization, a key perspective is that of the community's largest healthcare providers, and they will focus on their economic bottom line. In other words, it is likely that their evaluation priority will be related to cost savings derived over the next year or two. On the other hand, minority churches may be partners in the intervention, and they may particularly value the impact of the intervention on their parishioners and more broadly, on health equities in their community. Therefore, they may advocate for weighing

heavily the intervention's benefits for the health of minority community members. This approach may run contrary to one that focuses strictly on healthcare cost savings. Wherever possible, it is important to try and anticipate the priorities of key stakeholders, and undertake discussions and documentation of evaluation objectives accordingly. Of course, as noted earlier in the "Engaging the key stakeholders in the evaluation" section, the initial selection of stakeholders should keep these potential conflicts in mind.

Views of relevant costs and benefits will often surface during a discussion with stakeholders about their evaluation objectives. This discussion can be a starting point for the next step in scoping an ROI evaluation project: determining whose costs and benefits should be included in the calculation – that is, the costs and benefits for which stakeholders, what population, which interventions, and within what jurisdiction. Typically, an ROI analysis does not include the interests of all stakeholders. To do so is often too expensive or complicated for the relatively minor effects an intervention may have on some of the stakeholders. (Zerbe, R. and S. Tyler, 2012)

For an ACO partner, the population of interest will often be designated by the Centers for Medicare and Medicaid Services (CMS) or other payers. In other words, the population that will be the primary beneficiary of the intervention and the target of the ROI evaluation will be the patients and potential patients for whom the ACO will be held accountable and for whom their per member per month (PMPM) allocation will be calculated. ACO partners may want to specify the population of interest even more narrowly. For example, ACO providers may have a relatively large population of asthma patients, who are expensive, with a large number of emergency department visits and hospital stays. This group might be the specific population of interest to an ACO partner. In this case, the target population might be identified first, and the intervention then selected, perhaps an environmental health intervention that reduces asthma triggers. One of the competencies that LHDs might bring to the table is the ability to assist ACO partners in targeting high-priority populations.

Of course, this population may be a relatively restricted one from a public health perspective. Public health education experts generally agree that evaluations of population-based interventions should be comprehensive. These evaluations should incorporate a full set of benefits, harms, and resources for all members of the community, as well as for other

stakeholders who may be outside the community of interest. The experts also suggest that benefits and harms include those in the domains of health, community well-being, and community process (IOM, 2012, p. 121).

However, from a practical perspective, when the community includes many stakeholders with a large collective population, such an evaluation can be expected to be relatively expensive and time-consuming. The resources and time required to do the evaluation would necessarily be incorporated into the costs associated with the intervention and as such, could negatively affect the evaluation results. The LHD will have to determine/negotiate whether a larger population should be included in the evaluation, keeping in mind the fact that the larger and more diverse the community, the more complex, lengthy, and costly will be the ROI evaluation project.

Once key stakeholders have agreed upon their evaluation objectives and the target population, the economic measures should be selected. While the focus in this guide is on ROI, there are also other economic measures, and depending on the interests of the key stakeholders and outcomes from the intervention, these may be better suited for the analysis. We will include the various options below in the event that one or more of them proves preferable for a particular analysis. It should be noted, however, that many of these measures are also component parts of the ROI measure.

Cost Analysis: Cost analysis studies calculate the monetary value of the personnel and resources necessary to implement an intervention. These studies document the start-up and implementation costs of a program but do not comment on the effectiveness of the intervention.

Cost-Benefit Analysis (CBA) or Return on Investment (ROI): CBA or ROI translates the outcomes of prevention programs into dollar values. It provides a summary measure of a selected set of costs and benefits. This type of analysis is particularly valuable for interventions that have multiple beneficial outcomes or significant non-health benefits, and, of course, it is commonly used to evaluate the “bottom-line” impact of an intervention. The ROI measures the financial return per dollar invested in the

intervention. Typically, the annual cash flow estimated by the ROI will be discounted if the outcomes are expected to continue for a number of years.

Cost-Effectiveness Analysis (CEA): Cost-effectiveness analysis (CEA) incorporates many of the ROI constituents. (IOM, 2012) However, it assesses only medical and health interventions focusing on non-monetary health-related benefits or outcomes. (Donaldson, 1998; Gold et al., 1996). For example, CEA include such measures as disease prevalence and health-adjusted life expectancy. The CEA asks how much does an additional unit of health cost, calculating the dollars spent for an additional unit of health. (Bleichrodt and Quiggin, 1999) This measure is best used with outcomes that cannot be monetized in some straightforward fashion.

Cost Offset Analysis: Cost Offset Analysis is a type of CBA that compares the cost of prevention to the reduced costs of health care that result from preventive efforts.

Net Present Value (NPV): NPV measures the discounted flow of dollar costs and benefits over the duration of an evaluation timeline. The cash flows are discounted at the current borrowing rate and summed to arrive at a measure of the financial impact of the intervention. It is not uncommon to consider both the NPV and ROI when assessing findings because ROI alone may rank the projects incorrectly. For example, the net present value of two interventions may be \$5,000 and \$100,000, while the ROI may be 1.5 and 1.25. The ROI would suggest that the first intervention is preferable though in fact the second intervention yields the greatest dollar amount of net benefits. When selecting measures, it is important to keep this potential issue in mind. (Kirkpatrick, K., and C. Brownson. 2008, p. 8)

As with any evaluation, a research design needs to be specified. An ROI measure compares intervention outcomes to the status quo (baseline) or to other interventions' outcomes. In other words, the method used to collect evaluation data and analyze the data is a comparative one. To illustrate, longitudinal studies might be conducted when members of a selected group are either tested (e.g., cholesterol levels), or surveyed (e.g., on blood sugar screening rates) to assess the status of an intervention's population pre-intervention and post-intervention. In some cases, an evaluation may use secondary or existing data on baseline and intervention outcomes

for an entire population in order to calculate the impact of an intervention on a subset of that population. For long-standing interventions, outcomes for the group participating in the intervention may be compared to outcomes of another, similar group who do not participate in the intervention (e.g., a group with the same socio-economic characteristics). This evaluation method is commonly used to conduct an ROI evaluation. (Giffin, 1999) (Duigan, 2009)

The duration of the evaluation is also an important consideration when selecting an evaluation method. Keep a number of things in mind as you select the timeline. First, the intervention and the related time horizon associated with its outcomes will play a central role in the time horizon selected for the ROI evaluation. An intervention's outcomes may not fully mature until several years out, and to cut the evaluation timeline too short will exclude important benefits.

Referencing other, similar interventions and their outcomes' timelines can help in estimating a timeline that captures the majority of the benefits expected from your intervention. Second, how far we look into the future affects the validity of the benefit numbers we use. As we project out into the future, our estimates inevitably become less certain, regardless of our forecasting technique. Inflation rates may change, populations may change, our projections of proposed benefits may become more variable, etc. Further, evaluation objectives and related, preferred timelines will often differ for different stakeholders. For example, organizations with a focus on the bottom line will want to see one-year, perhaps two-year evaluation timelines, while community-based policy-makers are often interested in longer timelines to assure that a full set of benefits is captured. (ROI evaluation timelines are typically referenced in years.)

Finally, the evaluation starting point or reference may be one of three types:

- A retrospective analysis can be conducted when the intervention is already in place or has been carried out previously. When the analysis starts, the intervention costs have already been incurred
- With a prospective analysis, costs have not yet been incurred when the study starts. We must therefore track the costs as they occur.
- In a model analysis, costs are based on estimated values from other studies. (Owusu-Edusei, p.7)

Articulating the assumptions and constraints on your ROI evaluation is a final task when scoping one’s evaluation project. Assumptions typically address some uncertainty, and describe conditions that must be in place to enable or clarify the meaning and enhance the credibility of an ROI evaluation. As an example, if a landfill is being considered as a possible solution for a waste disposal problem, an associated ROI evaluation might be based on the assumption that “sufficient land for the landfill is available within a 20-mile radius of the waste generation site.” Projections of costs and benefits often require assumptions as well. (Office of the Deputy Assistant Secretary of the Army, 2013) Constraints describe restrictions on the evaluation. Constraints frequently include data source limitations, inadequate participation by key stakeholders, a relatively short evaluation timeline, and insufficient evaluation staff and resources.

Project deliverables and roles

As with most projects, a high-level ROI evaluation project plan should lay out the evaluation objectives, deliverables/milestones, and project roles. Below is a Gantt Chart that lays out high-level deliverables for a generic ROI evaluation project.

Task Name	Duration
Key stakeholders enrolled	30 days
Population health intervention selected	30 days
ROI evaluation project planned and setup	25 days
Costs identified & measured	300 days
Benefits identified & measured	300 days
Economic measure (e.g. ROI) calculated	5 days
Findings presented	31 days

Possible roles will depend on the staffing and skills of the various stakeholders. Some may continue throughout the evaluation (e.g., providing intervention oversight), and others will

change as the intervention progresses. In general, one would expect the LHD to play a lead or important role in all facets of the evaluation - bringing partners together, identifying/negotiating intervention selection, designing the evaluation method and scope, including the population of interest, coordinating data collection and analysis, and developing and presenting the final presentation.

For our smoking cessation example, we will focus on the evaluation priorities of our key stakeholder, the insurance company. The company's evaluation objective is to ascertain whether the costs of coverage associated with the medication plus repeated counseling tobacco cessation intervention are outweighed by the improved health and related reduction in cost of care. The related economic measure will be a cost/benefit – ROI calculation. Their population of interest is the 10,000 member insured community across selected providers which will participate in the tobacco cessation intervention. We will calculate our estimates based on the assumption that the target community mirrors a typical insured population. Given the substantial literature available for tobacco cessation programs, we will use study data and findings to estimate baseline and intervention outcomes for our intervention on our target population. We will rely on these data to step through the following calculations in anticipation of our final ROI calculations:

- Estimate the smoking prevalence in a typical insured population.
- Estimate the average monthly medical cost for population categories of smokers and non-smokers.
- Estimate the expected cost of smoking cessation approaches and the likely participation and success rates of each.
- Estimate the improvement in health when smoking ceases.
- Estimate the cost savings that will be realized.

4. Identifying and Measuring Costs and Benefits

The IOM recommends using an evaluation framework for population-health interventions when identifying and measuring costs and benefits. “The committee concluded that a framework for valuing community-based prevention programs and policies should meet at least three criteria. First, the framework should account for benefits and harms in the three domains of health, community well-being, and community process. Second, the framework should consider the resources used and compare benefits and harms with those resources. Finally, the framework needs to be sensitive to differences among communities and to take them into account in valuing community-based prevention. In part, this reflects the reality that, because communities vary so much in their characteristics, the causal links between interventions and valued outcomes may be different for different communities” (IOM, 2012, p. 92). In other words, the committee suggests that the evaluation should account for a relatively comprehensive set of costs and benefits. These costs and benefits accrue to the larger community, and they include a wide range of measures. Conceptually, this recommendation makes sense from a public health perspective; however, some practical considerations may also need to be taken into account. A comprehensive approach will complicate the selection of measures and the collection of relevant data, and may potentially reduce the overall validity of the results. In addition, such an approach may substantially increase the costs and time associated with the evaluation. The LHD will need to judge the degree to which such a comprehensive approach is doable as it identifies and measures costs and benefits.

Measuring the Costs

The costs included in an ROI calculation should include any costs required to implement and pursue/manage the intervention. These are costs that would not have existed if the intervention had not been undertaken. Begin by listing in words the costs that you intend to include in the analysis. Once you have put together a relatively comprehensive list, determine whether these costs can be measured and whether data to measure the costs can be collected. Often this will require literature review and some leg work.

Identifying Costs

Possible costs include: 1) direct costs, 2) indirect costs, and 3) intangible costs.

- Direct costs are those incurred to implement the intervention. These costs may be borne by any of the intervention stakeholders. Stakeholders might include the local health department, other ACO partners, and community partners. Of course, population-based interventions frequently require a coalition of community partners, and it is common for these partners to rely on volunteer time to assist with an intervention. Intervention participants may bear costs (e.g., travel costs) as well. Conceptually, estimated in-kind costs associated with these volunteers and participants should be included among the evaluation costs; however, this is a matter of judgment, and a choice to make in collaboration with your key evaluation stakeholders (IOM, 2012, p. 74, 75).

Typical direct costs include personnel, facilities, computing, consulting services, and materials. Usually, overhead costs are also prorated to the intervention, and if in-kind support is provided (e.g., volunteers); the value of this support is estimated and also attributed to the project. Enumerating these costs can become complicated, particularly when allocating overhead costs to the intervention. Seek help from your financial staff as you undertake these more complex allocations of cost (Mays, 2013)

- Indirect costs often are byproducts of the intervention. For example, tobacco cessation campaigns may reduce the profitability of tobacco-related businesses, which may lead to job losses. To measure these costs, you can rely on secondary data (e.g., average tobacconist profitability and staffing), and/or surveys of selected stakeholder representatives. These costs can be challenging to identify and to monetize, requiring additional time and resources. Thus, care should be taken to include only those that will be of real interest and/or have a material impact on key stakeholders and the community of interest.
- Intangible costs are subjective costs that are difficult and sometimes impossible to measure monetarily. For example, a smoking cessation intervention may reduce the goodwill or morale of some smokers who, nonetheless, are community stakeholders. Other examples might be the pain, suffering, fear, and anxiety experienced by

intervention participants. Should these costs be incorporated into an ROI, and if so, how would these costs be valued monetarily? As with some of the other costs, these may require agreement among your ACO decision-makers. Otherwise, their inclusion or exclusion may reduce the credibility of the final calculation.

For some items, the entire reported cost will be attributed to the intervention. For others, only some fraction of the reported costs will be attributed to it. As a general principle, the allocation of the costs should follow the actual flow of money to the intervention. (Giffin, 1999) A common approach is to allocate direct and overhead costs based on the percentage of staff time dedicated to the intervention. In some cases, the allocation of staff time is available in regular reports. In others, the staff members will need to be surveyed. Also, for some costs the initial allocation may be adjusted based on the staff's knowledge of actual costs. For example, technology support costs dedicated to this intervention may be higher than the estimated allocation given the extensive tablet setup required to initiate the intervention. Finally, you may want to seek stakeholder agreement on whether to include "non-avoidable costs", i.e., costs that would not disappear if the intervention went away. As an example, administrative costs allocated to the intervention are usually not avoidable (they remain after the intervention finishes) and therefore might not be included in intervention costs.

Collecting Cost Related-Data

Once cost components have been identified, the next step is to collect data on these costs. Again, the ROI is a comparative measure. If you are evaluating the intervention's costs and benefits relative to the status quo, then data need to be collected on the baseline state and the post-intervention state. If you are comparing one intervention to other interventions, then of course cost data will need to be collected for all the interventions.

Data collection will be the most time-consuming and potentially complicated task in the overall ROI evaluation project. Therefore, it is important to take the time necessary to develop a systematic data collection strategy. As with any strategy, you will need to identify tasks, roles, timeline, and deliverables. For a data collection strategy, you will need to address the following questions: What data need to be collected? What are the data sources? Who will collect the data? How will the data be collected? How will the data be collated and tabulated?

The data will be the “minimum data set” required to capture the designated costs, (e.g., personnel costs required by the intervention, including salaries, benefits and contract services.) Data sources will vary depending on the costs selected for inclusion in the ROI evaluation. However, in general, data sources might include financial documents (e.g., related budgets, periodic financial reports, direct observations, time studies, activity logs, and analysis of administrative records.) Other sources may include literature reviews, internet searches, and surveys of program staff and volunteers. When surveys are being used, it is usually a good practice to test the survey instruments to make sure respondents understand the questions and that the data to be collected will be meaningful.

The tasks associated with the actual data collection process will depend on the available sources and the staff assigned to collect the data. As a general rule of thumb, when collecting data from financial documents, those closest to the data should be assigned the data collection task. They understand the data in detail and are familiar with the methods used to access and extract the data. For collecting data using surveys, the staff should ideally have research methods skills. If they do not, training or contract support may be required to assure that the data collected are in fact valid data.

Below is a data collection plan template that you may reference in laying out your data collection strategy. (Six Sigma, 2013)

Performance Measure	Operational Definition	Data Source & Location	Sample Size	Who Will Collect The Data	When Will Data Be Collected	How Will Data Be Collected	Other Data that Should be Collected at the Same Time
Course is developed within 10% of industry standard hrs.	1 hour e-Learning developed in no more than 220 hrs 3 hour Workshop developed in no more than 132 hrs	Project Plans	17 (100%) of courses with data	Kaliym Islam	6/8 – 6/24	Development hrs will be identified from project plan data	Less than 10% of development time is associated with rework
Less than 10% of development time is associated with rework	No more than 20 rework hours for 1 hour e-learning No more than 12 hours rework for a 3 hour workshop	Project Plans	17 (100%) of courses with data	Kaliym Islam	6/6 – 6/24	Rework data will be identified from project plan	N/A

Our tobacco cessation ROI evaluation is a prospective analysis. As such, the costs will be estimates based on the Clinical Guidelines and on other similar projects that have already been undertaken. We're proposing a 12-week treatment period. During that time, participants will ideally participate in six counseling sessions. They will also be provided with medication. The treatment costs will vary for each participant depending on the number of actual counseling sessions and the required amount of medication. To come up with a reliable cost we refer to the medication costs cited in the Clinical Guideline. We also expect a counseling session to cost between \$60 and \$70. For this example, we do not include overhead costs. Based on these estimates we expect the cost of a participant's cessation treatment to be \$600. (Leif Associates, 2012)

Identifying and Measuring Benefits

For an ROI study with our focus, benefits are the monetary values associated with positive outcomes of a population-based prevention intervention. They reflect changes in individual, institutional, and community social welfare, with a particular focus on population health.

As with costs, benefits are generally classified as direct, indirect, and intangible:

- Direct benefits are the positive health and non-health outcomes directly related to the implementation of a particular intervention. Preferably they are estimated by using market-based data (i.e. they are valued by prices that arise from market place supply and demand).
- Indirect benefits are the costs that have been prevented and the savings resulting from the intervention but not related directly to the intervention.
- Intangible benefits include positive outcomes such as reductions in pain and suffering which are more subjective and are difficult to value economically. (Owusu-Edusei, K., 2010)

As an example, a vaccination intervention protects patients from catching the disease. It also provides additional "herd immunity" for others who have not received the vaccination. The benefits of the program would be:

- The savings associated with prevented illness cases among those actually vaccinated would be classified as a direct benefit.
- The savings resulting from lower morbidity among unvaccinated persons due to herd immunity would be an indirect benefit.
- The reduced risk of catching the infection for those vaccinated and the peace of mind resulting from that risk reduction would be intangible benefits. (Owusu-Edusei, K., 2010)

The identification/selection of benefits should draw on the intervention's logic model and the purpose statement of the ROI evaluation, which in turn are based on the interests of key stakeholders. (See item 7 in the "Specifying the intervention" section above.) What do these stakeholders value and what do they want to learn from this evaluation? As noted earlier, this guidebook focuses on the calculation of an ROI for interventions that are of particular interest to your community's ACO partners and decision-makers. Typically they include providers (e.g., physicians, hospitals, nursing homes, health systems, behavioral health providers), various government agencies (e.g., local and state health departments, social services departments), and third-party payers (e.g., private insurers, Medicare or Medicaid, or government.) They will be interested in outcomes that are related to the ACO reimbursement model, their immediate and long-term bottom-line savings (e.g., savings associated with ER and hospital visits and hospital days), and the quality of their care as measured by such things as Healthcare Effectiveness Data and Information Set (HEDIS) and Agency for Healthcare Research and Quality (AHRQ) indicators. For example, an AHRQ measure that corresponds to a tobacco cessation intervention and might be included as a benefits measure is "percentage of patients age 18 years and older who have tobacco status checked at each clinician visit."

The LHD may also want to include benefits suggested by others with a material interest in the intervention outcomes. These could be self-payers (e.g., businesses, households), patients (e.g., patients of ACO partners, patients external to those partners but in the community of interest), and the population of the target community. Measures that have been widely vetted and are in common use to evaluate the health benefits of broad community-based interventions

are the: 1) Years of Potential Life Lost (YPLL) (CDC, 1986), 2) Physically and Mentally Unhealthy Days, 3) Limitation of Activity, and 4) Chronic Disease Prevalence. (IOM, 2009)

As noted earlier, the IOM has recommended that three sets of measures be considered when evaluating population-health interventions – health, community welfare, and community process measures. Health refers to physical and mental well-being. Community welfare includes the physical as well as the social and economic environments that affect the health of individuals and populations; and community process includes local leadership development, skill building, civic engagement or participation, community representation, and community history, among others. The table below lists possible high-level measures that pertain to each category (IOM, 2012).

Health Measures	Community Welfare Measures	Community Process Measures
<i>Physical Health:</i> Mortality, Morbidity, & functional capability	<i>Community well-being:</i> Urban Hardship Index, Community Well-being Indices, County Health Rankings	<i>Community Health Literacy:</i> Knowledge of health-related resources in the community
<i>Mental Health:</i> Cognition, individual resilience and emotional reserves, mortality due to mental illness	<i>Economic status:</i> wealth and income, employment	<i>Participation:</i> Representation of stakeholders in design/selection of population health interventions
<i>Socio-emotional health-related quality of life:</i> stress behaviors, injuries, perceptions of health	<i>Education:</i> educational attainment, graduation rates	<i>Leadership engagement:</i> Time commitment of community leadership in community-based interventions.
<i>Healthcare access:</i> uninsured, # of primary care	<i>Social Support:</i> rates of crime, rates of transportation access, percentages of affordable	

providers	housing, prevalence of “food deserts”	
<i>Healthcare utilization:</i> number of emergency room visits, number of hospital days		

(AHRQ, 2012; APHA, IOM, 2003). Measures of community well-being (e.g., the Urban Hardship)

These are some examples that you might use for brain-storming to identify more specific measures. It is important to note that a number of these examples are best suited to cost-effectiveness evaluations. Like Years of Potential Life Lost (YPLL) and other health benefits, the examples do not indicate an economic value.

For many of the more common types of prevention interventions (e.g., tobacco cessation, diabetes prevention) considerable research will already have been done about related benefits, and evaluation data that can strengthen your analysis will also be available. As a result, a literature review is a practical first step in identifying specific benefits measures and collecting related data. Useful places to look for data also include funders that you know are interested in the outcomes of your intervention. For example, foundations like the American Heart Association, the Centers for Disease Control and Prevention (CDC), the Robert Wood Johnson Foundation, and the American Lung Society are likely sources for tobacco cessation related-data, In addition, organizations that develop and promote standard healthcare quality measures like the Agency for Healthcare Research and Quality (AHRQ), the National Committee for Quality Assurance, and the Center for Medicare and Medicaid Services will often be a good starting place for identifying benefits measures and related data; another important public health measures resource is Healthy People 2020 which targets objectives across many diseases and behaviors, including foundational measures for life expectancy, quality of life and well-being, determinants of health, and disparities. (ODPHP, 2013)

Finally, when identifying measures of public health benefit, it is important to attend to the characteristics of the outcome measure itself. Obviously, the measure should be sensitive to and actually demonstrate either absolute or relative change in health status as a result of your intervention. And it should measure what it is supposed to measure. In other words, it should be a valid measure and it should be reliable or stable over time and in different settings. For example, self-reports have sometimes been found to be of questionable validity. Or physical health may be rated highly in a supportive environment and poorly in an environment that is non-supportive. (Thacker, 2006)

Of course, to calculate an ROI, it will be necessary to monetize (measure in dollars) the outcomes of the intervention. This is an essential consideration when selecting measures. For the purposes of this guidebook, measures that reflect medical savings are the most likely candidates. An ACO is essentially a capitated model in which providers are paid a set amount for each person assigned to them. This is a per member per month (PMPM) model, and it lends itself well to monetization of benefits based on direct medical cost savings.

One way to arrive at these savings is to compare savings directly, that is, compare the cost of medical services before the intervention and after the intervention has been implemented. An intervention in which the LHD clinical sites provide primary care services with extended hours is an example of an intervention that could be evaluated using direct medical savings. The intention is to reduce expensive emergency room visits and the progress of diseases to more serious stages by improving access to care. To assess the value of this intervention, the LHD would review and analyze claims data before and after the intervention to compare direct medical costs. This would be a retrospective evaluation for an ongoing or completed intervention.

Of course, there are many potential health outcomes/benefits that are important but do not necessarily lend themselves to monetization. Enhanced capacity for collaboration is an example of such benefits from a population-based intervention. For these outcomes, it may be preferable to incorporate a description of their value in the evaluation narrative, and for some outcomes, it may be best to undertake a cost-effectiveness evaluation instead of an ROI. In many instances, the non-monetary benefits will play an important role in decisions, and while they cannot be monetized, they should nonetheless be included in the overall analysis.

As noted above for our smoking cessation example, our benefits measure will be a cumulative ROI and net present value associated with healthcare cost savings for new non-smokers. This number will be calculated by: 1) estimating the number of smokers in the insured population, 2) estimating the number of smokers trying to quit and the number who succeed, 3) estimating the reduction in healthcare costs associated with a new non-smoker, 4) calculating healthcare cost savings across all new nonsmokers, 5) calculating the intervention costs for all smokers trying to quit, and 6) calculating the ROI and net present value.

5. Calculating the Return On Investment

Before we begin with the calculation steps, it is important to keep a few principles in mind. First, when analyzing data, use only the most credible sources and select the most conservative alternative for your calculation. Second, if no improvement data are available for a population or from a specific source, the assumption is that little or no improvement has occurred. Third, extreme data items and unsupported claims should not be used in ROI calculations. Fourth, the costs of a solution, project, or program should be fully loaded for an ROI analysis. And finally, in most cases intangible measures are considered measures that are purposely not converted to monetary values. Over all, these guidelines point to a conservative approach to ROI calculation with an eye to the credibility of the findings. (ROI Institute, 2010)

Once the costs and benefit measures have been identified/defined and the data collected, the ROI can be calculated. These are the steps associated with this calculation:

- 1) Tabulate costs and monetized benefits across the evaluation timeline.
- 2) Calculate the real value of these net benefits.
- 3) Discount the net benefits accounting for the “value of money.”
- 4) Calculate the return on investment.

Tabulating Costs and Benefits

To tabulate costs and benefits, construct and populate an Excel workbook that incorporates the costs and monetized benefits. While the specific form (e.g., the number of worksheets, and the data that each worksheet includes) will depend on your particular evaluation, generically your workbook would include worksheets that:

- Describe the intervention, including the project timeline
- Compile “investment” and operating cost data for the baseline (or comparative intervention[s]) by year (e.g., personnel, contracted services, office operations, facilities/maintenance, equipment, other direct costs, overhead and other indirect costs)
- Compile “investment” and operating cost data for the intervention by year (e.g. personnel, contracted services, office operations, facilities/maintenance, equipment, other direct costs, overhead and other indirect costs).
- Compile monetized benefits associated with the intervention (these may be savings associated with baseline costs) by year.

For example workbooks see Mays, G., 2013. Public Health Return-on-Investment Template – Demonstration Version, University of Kentucky, Lexington, KY.

http://works.bepress.com/glen_mays/64/

Calculating the real value of net benefits

Before undertaking the final ROI calculation, particularly for interventions with long evaluation timelines, it is important to accommodate the “value of money” and to adjust prices such that the costs and benefits are valued consistently in “real” terms. The money value of net benefits (i.e. benefits – costs) changes as the time horizon moves into the future. Future costs and benefits are discounted relative to those in hand today, using a discount rate that takes account of the changing (declining) value of money over time. This rate recognizes that \$1 collected in a future year will be worth less than the same \$1 collected today due to opportunity cost (the \$1 could have been invested) and risk. (WERF, 2013) Similarly, an anticipated inflation rate can be applied to future costs and benefits to assure that the prices of these future costs and benefits remain “constant”. In other words, the future costs and benefits are valued in today’s dollars.

A customary approach to adjusting future costs and benefits is to discount future monetary returns back to the evaluation's base-year, using current interest rates net of inflation. (Harrison, M., 2010) It is necessary to select an appropriate rate to reflect the cost of capital and the risk inherent in the intervention. It is also important to incorporate the effects of inflation, either by adjusting future costs and benefits to today's dollars and using an unadjusted discount rate, or by expressing future figures in nominal dollars and using a discount rate adjusted for inflation (e.g., 8% unadjusted discount rate modified by a 3% inflation rate.) One final wrinkle - some costs and benefits may exhibit inflation rates that differ from the overall rate of inflation. If these are prominent costs or benefits relative to the ROI calculation, adjustments should be made to their future prices to reflect the differences in price changes. (Harrison, 2010)

To select a discount rate and inflation rate, it is important to remember that the ROI calculation will only be credible if the calculation process is as transparent as possible to all key stakeholders. With this in mind, and given the lack of forecasting competencies in many LHDs, a simple but often satisfactory approach to forecasting discount and inflation rates is to solicit the opinions of key stakeholder representatives whose financial expertise is well regarded. The request may be informal or may rely on structured approaches like the Delphi Technique. (Rowe, G. 1999)

To begin the selection of a discount rate, you may want to adopt widely used proxy measures. Short and medium term investment rates of return and Treasury bond rates are frequently used. In addition, though there is no common agreement on discount rates, some governmental and nongovernmental groups recommend—or require—specific discount rates. (Jawad and Ozbay, 2006). For example, the Office of Management and Budget recommends a real (adjusted for inflation) discount rate of 7% per year, with 3% as an alternative to test the sensitivity of an evaluation's results to the discount rate. (IOM, 2012)

It is also important to account for risk and uncertainty, including financial, commercial, industrial, technological, and legislative risks. (WERF, 2013) ROI implicitly assumes a risk-neutral decision-maker. In other words, the generic ROI ignores probabilities that outcomes will be more or less successful, and ignores the fact that costs and benefits may fall unevenly on different populations. The generally recommended approach to addressing risks is sensitivity

analysis, in which rate and weight are varied to ascertain how the changes impact the ROI calculation. (WERF, 2013)

With this background in mind, a final “analysis” worksheet should be added to the tabulation workbook. This worksheet should summarize the costs and benefits of the other ROI workbook worksheets, and it should include “sensitivity” provisions as necessary. You may want to vary the discount rate, the inflation rates for selected cost/benefit categories (when certain costs are expected to differ from the general rate of inflation), the weights used to acknowledge the relative values of benefits to different populations, and the evaluation timeline (i.e., the number of years for which benefits will be collected). Varying these parameters can help to show the impact of differences in the parameters on the ROI calculated. However, this requires that you establish a clear set of weights or values in anticipation of this sensitivity analysis. (IOM, 2012) Of course, this final worksheet should also include the ROI calculator. The calculator sums the monetized benefits and costs by year, discounts the net benefits (i.e. benefits – costs) for interventions with long evaluation periods, adjusts costs and benefits to represent their “real” value, and completes the ROI calculation. The formula used to calculate the ROI is:

$$\text{ROI (\%)} = ((B - C)/C) * 100$$

Where B is the total discounted/adjusted benefits and C is the total discounted/adjusted costs.

Below is a generic “analysis” worksheet:

Intervention:

I. Analysis Excluding Output, Production Time and Outcome Factors

Adjusted Discount Rate 3%

	Baseline	Implementation Year			Total (All Years)
	Pre-implementation	1	2	3	
Investment in Public Health Intervention					
Amortized Pre-implementation Costs	\$ -	\$ -	\$ -	\$ -	-
Ongoing Implementation Costs	\$ -	\$ -	\$ -	\$ -	-
Total Annual Investment Costs	\$ -	\$ -	\$ -	\$ -	-
x Present Value Factors	1.00	0.97	0.94	0.92	
Total Discounted Annual Investment Costs	\$ -	\$ -	\$ -	\$ -	\$ -
Financial Gain/Loss Attributable to Public Health Intervention					
Estimated Changes in Operating Costs	\$ -	\$ -	\$ -	\$ -	-
Estimated Changes in Revenue	\$ -	\$ -	\$ -	\$ -	-
Total Net Financial Gain/Loss	\$ -	\$ -	\$ -	\$ -	-
x Present Value Factors		0.97	0.94	0.92	
Total Discounted Annual Net Gain/Loss	\$ -	\$ -	\$ -	\$ -	\$ -
Return on Investment Summary					
Undiscounted Annual Net Cash Flows	\$ (0)	\$ -	\$ -	\$ -	\$ (0)
Cumulative ROI		0.00	0.00	0.00	0.00

*Present value factors are calculated using the adjusted discount rate.

Glen Mays, Public Health Return-on-Investment Template - Demonstration Version, University of Kentucky http://works.bepress.com/glen_mays/64/

Note the “Adjusted Discount Rate” that enables the modification of this parameter to determine overall impact of different discount rates on the ROI. Summary line items represent the high-level costs of the intervention, financial gains/losses (benefits) associated with the intervention, and a “present value” factor. Based on the Adjusted Discount Rate, this factor reduces the future anticipated benefits to accommodate the opportunity cost of money and risk.

Presenting Findings

The presentation of the findings from the analysis should be made with the interests of key stakeholders in mind (see the earlier discussion of these interests). For example, if your

presentation is to “bottom-line” driven providers, your focus should be on the ROI itself. If the stakeholder of interest is a government payer, the ROI and quality-related outcomes measures might be the focus of the presentation. With regard to a capitated ACO model, the calculations may be represented as “savings” or “savings per member per month (PMPM).” The presentation of findings will also be an opportunity to present the public health value of the intervention and perhaps engage in a little consciousness-raising for those who are primarily focused on healthcare, not prevention. Outcome measures that track the welfare of the larger community and show the logical links between these and the economic measures (the ROI) might be included in your presentation.

Typically, the findings are presented in the form of a “value proposition.” A value proposition is a short statement that describes the tangible results/value a decision maker can expect from implementing the intervention (either prospectively for an anticipated intervention or retrospectively for an implemented intervention.) A value proposition should tell key stakeholder decision-makers exactly what the net-benefits of the intervention can be or are. Here is an example of a strong value proposition: “By adopting the diabetes self-management intervention, the hospital will reduce complications by 10%, reduce emergency room visits by 5%, and reduce hospital visits by 5%. This will result in a saving of 8% and an increase in profitability by 7%.” (ODASA, 2013) This statement is specific, and it reports tangible, attractive results. To supplement the value proposition, the presentation will in all likelihood include discussion of important intangible, qualitative impacts of the intervention.

Of course, the key purpose of the ROI evaluation is to demonstrate the value of the intervention to key stakeholders. However, another reason to calculate the ROI is to demonstrate to these stakeholders the competencies and value of your LHD. This work demonstrates that your LHD understands and accepts the fact that it must be accountable as a partner, it is capable of sophisticated outcomes and financial analyses, and you can effectively communicate the findings from these analyses.

Below is an ROI calculation for the smoking cessation example. To begin we have collected the following information and made several assumptions:

- 16.6% of a typical insured commercial population smokes (Leif, 2012)
- We assume our insured target population mirrors the typical insured population
- Evidence suggests that overtime the health risks for a smoker who quits returns to the non-smoker level of risk over time. In other words, any differences in health care costs associated with smoking diminish over time, ultimately falling to zero.
- We assume that this improvement occurs at the same rate until a smoker's risks returns to that of a non-smoker.
- We assume that all smokers participating in intervention will do so at the beginning of year one of the three year payback period.
- The discount rate is an adjusted rate that uses the S&P 500 Index fund ten-year rate of return as the unadjusted rate (7.55%), and adjusts this rate for inflation (2.56%) over the last decade.
- Given our key stakeholder, an insurance company, we will select a payback period of three years. This is the average period of time a patient remains with an insurance company.

- Below is the estimated cost of healthcare for smoker subgroups of the target population: (Leif, 2012)

	Average Monthly Cost Per Person	Number of Persons	Monthly Cost	Annual
Male Smokers	402	830	333,809	4,005,713
Female Smokers	585	650	380,361	4,564,326
Pregnant Smokers	744	30	22,333	267,998
Child Smokers	291	150	43,677	524,124
Annual Healthcare Cost Per Smoker				<u>5,640</u>

- The healthcare costs associated with smokers is estimated to be 34% higher than those of non-smokers (Menzin et. al., 2009), (ALF, 2002), (Leif, 2012)
- The percentage of smokers attempting to quit is .07 (Leif, 2012)
- A combined smoking cessation intervention like the one chosen in this example is shown to have a successful quit rate of 27.6% (Fiore, 2008)
- Combined smoking cessation programs like the one chosen for this example can range in cost up to \$1000 per person; however, for this particular intervention (i.e. 6 sessions and medication) we will budget \$600 per patient. \$50 per patient of this total is associated with setup costs (pre-implementation costs) for such things as counselor and provider recruitment and training and materials.

Using the ROI template our calculation includes sensitivity parameters. These can be varied to evaluate changes to these parameters on the ROI and Net Present Value. We represent the setup and ongoing costs associated with the smoking cessation intervention. We calculate the benefits associated with the intervention, reduced health care costs associated with a reduction in the number of smokers, and we then calculate net cash flows, the cumulative ROI, and the net present value resulting from the intervention. Given the selected parameters (based on study findings), the cumulative, 3-year ROI is 3.03, suggesting that the intervention is effective and would, in the end, be a cost saver for the insurance company.

ROI for Public Health Strategies

Return on Investment Analysis

Project: Smoking Cessation Intervention ROI Analysis

Organization: NCIPH

I. Sensitivity Analysis Parameters		2. Calculations			
Discount Rate	4.99%	Number of Smokers	1,660		
Target population	10,000	Number of Smokers Attempting to Quit	116		
Percent of smokers in target population	16.60%	New Non-smokers	32		
Healthcare cost premium for smokers	34.00%				
Percent of smokers attempting to quit	0.07				
Successful smoking quit rate	27.60%				
Setup costs	\$50.00				
Counseling and medication costs	\$550.00				
A smoker's estimated annual healthcare costs	\$5,640.00				
	Baseline	Implementation Year			Total
	Pre-implementation	1	2	3	(All Years)
Investment in Public Health Strategy					
Setup Costs	\$ 5,810.00	\$ -	\$ -	\$ -	
Ongoing Implementation Costs		\$ 63,910.00	\$ -	\$ -	
Total Annual Investment Costs	\$ 5,810.00	\$ 63,910.00	\$ -	\$ -	
x Present Value Factors	1.00	0.95	0.91	0.86	
Total Discounted Annual Investment Costs	\$ 5,810.00	\$ 60,872.46	\$ -	\$ -	\$ 66,682.46
Financial Gain/Loss Attributable to Public Health Strategy					
Estimated Changes in Smoker's Healthcare Costs		\$ 74,275.04	\$ 74,275.04	\$ 74,275.04	
Estimated Changes in Revenue		\$ -	\$ -	\$ -	
Total Net Financial Gain/Loss		\$ 74,275.04	\$ 74,275.04	\$ 74,275.04	
x Present Value Factors	1.00	0.95	0.91	0.86	
Total Discounted Annual Net Gain/Loss		\$ 70,744.87	\$ 67,382.48	\$ 64,179.91	\$ 202,307.26
Return on Investment Summary					
Undiscounted Annual Net Cash Flows	\$ (5,810)	\$ 10,365	\$ 74,275	\$ 74,275	\$ 153,105
Cumulative ROI		1.06	2.07	3.03	3.03
Net Present Value					135,624.80

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Appendix A: ROI Studies in Public Health

This review of ROI Studies was originally compiled in Giffin, R. and M. Giffin, 1999. *Cost-Benefit Analysis: A Primer for Community Health Workers*, University of Arizona Rural Health Office and College of Public Health, Health Care Strategy Associates, Inc. Washington, DC.

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It is not intended as a comprehensive listing of economic evaluation studies and findings.

Low Birthrate

The following literature review describes various CBA studies in maternal and child health. Health Resources and Services Administration, Maternal and Child Health Bureau. Economics in MCH. 1998. (1) *Vol. 1: An Introduction to Economic Analysis for MCH Practitioners*. (2) *Vol. 2: A Review of Descriptive Cost studies and Economic Evaluations of Maternal and Child Health Interventions*. (3) *Vol. 3: Costs of Family Health Services: Evaluation of Three Programs in New Jersey*. US Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau. 1998. Washington, DC.

Cost savings of:

\$14,000 to \$30,000 per LBW birth prevented as a result of the expansion of Medicaid prenatal care benefits to all women in poverty. **Source:** Office of Technology Assessment. *Healthy Children: Investing in the Future*. OTA-H-345. 1988. Washington DC: US GPO.

\$15,000 in direct medical costs in the first year of life for LBW infants. **Source:** Lewit EM, Baker, LS, Corman H. Shiono PH. *The Direct Cost of Low Birth Weight*, Future Child 1995;5:35-56.

\$26,000 + \$2,950 for each year through age 15 for very low birthweight (VLBW) babies. **Source:** Boyle M, Torrence G, Sinclair J. Horwood, S. *Economic evaluation of neonatal intensive care of very low birthweight infants*, New England Journal of Medicine 1983;308:1330-37.

\$6,200 + \$5,560 for each year of survival through age 15 for all LBW (including VLBW) births. **Source:** Office of Technology Assessment. Healthy Children: Investing in the Future. OTA-A-345. Washington, DC: US Government Printing Office, February 1988.

\$60,000 per VLBW cost in the first year, versus \$3,600 for all births (US\$1989). **Source:** Rogowski J. *Cost effectiveness of care for VLBW infants*, Pediatrics. 1977.

\$1000 in additional hospital costs if there is no prenatal care. **Source:** Henderson JW. *The cost-effectiveness of prenatal care*” Health Care Financing Review. 1994;15:21-32.

Benefit-cost ratios of:

1.49:1 for the provision of “adequate” prenatal care to Medicaid enrollees in Missouri in 1988. **Source:** Schramm WF. *Weighing costs and benefits of adequate prenatal care for 12,023 births in Missouri’s Medicaid program, 1988*’ Public Health Reports. 1992;107:647-52.

7:1 for the provision of prenatal care, in terms of neonatal intensive care costs saved. **Source:** Morales WJ. *The cost of no prenatal care*, Journal of the Florida Medical Association. 1985;72:852-55.

3.39:1 for the prevention of low birthweight births. **Source:** Institute of Medicine, Division of Health Promotion and Disease Prevention, Committee to Study the Prevention of Low Birthweight. *Preventing Low Birthweight*. Washington, DC: National Academy Press. 1985.

4.70:1 for a comprehensive perinatal care program in San Diego (savings of \$2,821 versus program costs of \$600 per patient for 100 patients). **Source:** Moore TR, Origel W, Key TC, Resnik R. *The perinatal and economic impact of prenatal care in a low-socioeconomic population*, American Journal of Obstetrics and Gynecology. 1986;154:29-33.

2.92:1 for a program to increase participation in the WIC program (Department of Agriculture, Supplemental Nutrition program for Women Infants and Children) in terms of newborn medical costs. **Source:** Buescher PA, Larson, LC, Nelson MD, Lenihan AJ. *Prenatal WIC participation can reduce low birthweight and newborn medical costs: a cost-benefit analysis of WIC participation in North Carolina*, Journal of the American Dietetic Association. 1993;93:163-6.

Birth Defects

Cost savings of:

\$408,000 over the patient's lifetime for the prevention of spina bifida, in terms of medical care costs, resulting from insufficient folic acid fortification of food (\$US1993). **Source:** Kelly AE, Haddix AC, Scanlon KS, Helmick CG, Mulinare J. *Worked example: cost-effectiveness of strategies to prevent neural tube defects*, In Gold MR, Siegel JE, Russell LB, et al., eds. Cost effectiveness in health and medicine. New York: Oxford Univ. press, 1996:313-48.

Fetal Alcohol Syndrome

Cost savings of:

\$600,000 in lifetime medical costs associated with a fetal alcohol syndrome birth. **Source:** Bloss G. "The economic cost of FAS." *Alcohol World: Health and Research*. 1994;84:53-61.

Hepatitis B screening and vaccination

Benefit-cost ratios of:

3.32:1 for screening of mothers and infants of infected mothers. Includes both medical and work loss costs. **Source:** Margolis HS, Coleman PJ, Brown RE, Mast EE, Sheingold SH, Arevalo JA. *Prevention of hepatitis B virus transmission by immunization: an economic analysis of current recommendations*, JAMA 1995; 274:1201-8.

Childhood Immunization

Benefit-cost ratios of:

Measles-mumps-rubella vaccine 16.3:1 for use of the MMR vaccination. **Source:** Hatziandreu EJ, Brown RE, Halpern MT. *A Cost benefit analysis of the measles-mumps-rubella (MMR) vaccine*, Arlington, VA,; Batelle, 1994.

Diphtheria and tetanus and pertussis 6.21:1 for use of the DPT vaccine. **Source:** Hatziandreu EJ, Palmer CS, Brown RE, Halpern MT. *A Cost benefit analysis of the diphtheria and tetanus and pertussis vaccine*, Arlington, VA: Batelle, 1994.

Diabetes

Cost savings of:

\$2,700 per client in reduced ER, inpatient and other medical services through a program which helps diabetics keep appointments and understand health needs (the ENABLE project at the University of Maryland School of Pharmacy). **Source:** The University of Arizona, The Final Report of the National Community Health Advisor Study. Tucson, AZ: University of Arizona, 1998.

Cancer

Cost savings of:

Cervical Cancer **\$9,000** from early diagnosis (early diagnosis \$4,359 versus late \$13,359, US\$1988). **Source:** Muller C, Mandelblatt J, Schechter CC, et al. *Costs and effectiveness of cervical cancer screening in elderly women*, Washington, DC: Office of Technology Assessment, US Congress, 1990.

Colorectal cancer **\$20,000 to \$30,000**, average direct costs of treating colorectal cancer (US\$1989). **Source:** US Preventive Services Task Force, Guide to Clinical preventive services, 2nd Ed. Baltimore: Williams & Wilkins, 1996.

Nutrition

Benefit-cost ratios of:

10:1 for the Oxford Health Plan's nutritional program for at-risk elderly: **Source:** *Focus on Nutrition to Improve Disease Outcomes*, Healthcare Demand and Disease Management Dec. 1997 3(12):177-182.

2:1 from use of Medical Nutrition Therapy (MNT) in the US military's TRICARE program, in terms of the reduction in inpatient and outpatient care. **Source:** Shiels J, Hogan P, Haught R. *The Cost of Covering Medical Nutrition Therapy Services under TRICARE: Benefit Costs, Cost Avoidance and Savings*, Washington, DC: DOD Health Affairs, 1998.

HIV/AIDS

Cost savings of:

\$71,000 - \$119,000, the lifetime medical costs of treating HIV and AIDS (US\$1996). **Source:** Pinkerton SD, Holtgrave DR, DiFranceisco WJ, Stevenson LY, Kelly JA. "Cost-effectiveness of a community-level HIV risk reduction intervention." American Journal of Public Health. 1998;88:1239-1242.

\$280,000, the lifetime direct medical costs for children born with HIV (estimated lifespan of 8 years). (US\$1994) **Source:** Bonifield SL. "A cost savings analysis of prenatal interventions." Journal of Healthcare Management. 1998;43:443-451.

Benefit-cost ratios of:

2.4:1 for a program of HIV risk assessment, counseling, peer education and referrals.

Source: Tao G, Christianson J, Finch M, Remafedi G. *The cost/effectiveness of an HIV intervention program for gay and bisexual adolescents in Minnesota*, AHSR FHSR Annual Meeting. Abstracts Book. 1996;13-102.

20:1 for a program of counseling, testing, referral and partner notification. **Source:** Holtgrave DR, Valdiserri RO, Gerber AR, Hinman AR. *Human immunodeficiency virus counseling, testing, referral and partner notification services: a cost-benefit analysis*, Archives of Internal Medicine 1993; 153:1225-30.

Tuberculosis

Cost savings of:

\$20,000 per patient per year, the average direct cost of treating a TB patient (US\$1992) **Source:** Shulkin DJ, Brennan PJ. *The cost of caring for patients with*

tuberculosis: planning for a disease on the rise, American Journal of Infection Control. 1995;23:1-4.

Benefit-cost ratio of:

1.20:1 from screening kids for TB at both kindergarten and grade 12, and treatment with isoniazid. **Source:** Mohle-Boetani JC, Halpern M, et al. *School-based screening for tuberculosis infection: a cost-benefit analysis*, JAMA 1995;274:613-9.

Substance Abuse

Cost savings of:

\$9000 to \$10,000 incremental lifetime medical costs for smokers versus non-smokers (US\$1990). **Source:** Hodgson TA. *Cigarette smoking and lifetime medical expenditures*, Milbank Quarterly. 1992;70:81-125.

Benefit-cost ratio of:

2.16:1 resulting from a six year, school-based smoking prevention programming high schools. **Source:** Pentz MA. *Costs, benefits and cost-effectiveness of comprehensive drug abuse prevention*, In Bukoski WJ, Evans RI., eds. Cost-Benefit/Cost-Effectiveness Research of Drug Abuse Prevention Implications for Programming and Policy. NIDA Research Monograph 176. US Department of Health and Human Services, National Institutes of Health, National Institute on Drug Abuse. 1998.

Lead poisoning

Cost savings of:

\$1,000 cost of short-term medical treatment per patient receiving chelation therapy;

\$417,000 lifetime costs for non-treatment at an early stage (\$129,000 medical; \$288,000 special education; US\$1995). Based on the 16th Street Community Health Center project in Milwaukee. **Source:** Center for Policy Alternatives. *Community Health Workers: A Leadership Brief on Preventive Health Programs*, Washington, DC, 1998.

Elderly

Benefit-cost ratio of:

30:1 to 60:1 for influenza vaccination among the elderly, in terms of hospital costs.

Source: Nichol KL, Margolis KL, Wuorenma J, Von Sternberg T. *The efficacy and cost-effectiveness of a vaccination against influenza among elderly persons living in the Community*, New England Journal of Medicine. 1994;331:778-84

Appendix B: Glossary

Benefits: The dollar denominated amount of benefit that stems from an intervention.

Community Participation: Engagement of community organizations in public health interventions.

Costs: The dollar denominated expenses directly attributed to an intervention.

Cost Allocation: The assignment of common or shared costs to individual interventions. For example, rental costs associated with building rental may be assigned, in part, to space being used by intervention staff.

Cost Analysis: Cost analysis studies calculate the monetary value of the personnel and resources necessary to implement an intervention. These studies document the start-up and implementation costs of a program but do not comment on the effectiveness of an intervention.

Cost-Effectiveness Analysis (CEA): CEA compares the costs and effectiveness of two or more interventions so that program managers are able to determine whether a program is cost-effective or which of several programs is the most cost-effective. Effectiveness is measured in terms of health outcomes such as the number of children vaccinated or the number of pounds lost. In selecting appropriate health outcomes, evaluators must consider the validity, reliability, and sensitivity of the indicators. While any health outcome can be used, the use of common health indicators, such as quality-adjusted life years (QALYs), can help stakeholders compare cost-effectiveness of various preventions.

Cost-Benefit Analysis (CBA) or Return on Investment (ROI): CBA or ROI translates the outcomes of prevention programs into dollar values. This type of analysis is particularly valuable for interventions that have multiple beneficial outcomes or significant nonhealth benefits. For

example, a new bike path may improve the health of community members but it may also increase the value of property in the area, and decrease traffic congestion and pollution. CBA is controversial because the process of assigning dollar values to health outcomes and even lives is complex.

Health Promotion: Enhance people's capacity and control over their health.

Indirect Benefits: These benefits derive from the intervention but unlike the direct benefits, they are secondary results. For example, an intervention that enhances access to care with longer clinic hours may enhance employee satisfaction for those that do not have to negotiate rush hour traffic.

Indirect Costs: These are secondary costs associated with an intervention. As an example, day care expenses for mothers participating in a weight loss program might be indirect costs.

Intangible Benefits: Subjective benefits that can not be easily or reliably quantified.

Intervention: A programmatic or policy-related set of activities intended address health-related set of issues.

Per Member Per Month (PMPM): The dollar compensation paid to a healthcare provider each month for each patient for whom the provider is responsible for providing services.

Population Health: The health of a group of people such as those who live in a geographic region, belong to a worksite, or are members of minorities.

Secondary Data: Data collected and compiled by others, rather than data associated with original research.

Appendix C: ROI Calculators

ROI Forecasting Calculator

- <http://www.chcsroi.org>
- User's guide:
http://www.chcs.org/publications3960/publications_show.htm?doc_id=872816
- ROI Template for tracking financial investment and retrospectively measuring ROI of a program: http://www.chcs.org/publications3960/publications_show.htm?doc_id=702936
- Supported by RWJF grant funding
- The ROI Forecasting Calculator was created by the Center for Health Care Strategies (CHCS) to aid health care organizations assess and demonstrate the ROI from proposed initiatives to improve the quality of care. This calculator is a web-based, front-end planning tool that includes four primary components: Target Population, program costs, utilization changes and sensitivity analyses
- Users must provide information on the clinical focus, intervention strategies, timeframe of initiative, targeted population subgroups, disease prevalence among target groups, expected enrollment rate, risk stratification, average 12 month baseline costs for intervention group members, expected growth in claims cost, anticipated utilization changes resulting from initiative, estimated costs of launching and operating the initiative, organizational cost of capital. (** All detailed assumptions **)
- First, identify baseline utilization costs for the target population and trend these costs forward using historical growth rates. Then indicate changes to trended utilization patterns that are expected to result.
- ROI Forecaster can calculate the internally captured ROI for the stakeholder of interest and the broader ROI for the quality initiative as a whole.

- For identifying disease prevalence, users should use the same method that will be actually used for identifying and targeting program participants.
- For any parameter, it is possible to run multiple parameters to see how different assumptions will effect ROI.
- Users may need external actuarial support to determine usage and cost trends.
- To make assumptions about changes in utilization, consider prior experience if the program has already been running, or effects documented in published literature. If neither are available, it might be necessary to hypothesize.
- ROI forecaster includes an evidence-base of studies on high priority issues for the Medicaid population.

Public Health Return-on-Investment Template (Demonstration Version)

- works.bepress.com/glen_mays/64/
- Developed through NPHII for ASTHO.
- Designed to help organizations estimate the economic returns from investments made in strategies that enhance public health service delivery, including QI. Pathways for economic returns include reductions in routine operating costs, increases in revenue streams, increases in the outputs produced through agency services/functions, reductions in the time required to produce outputs, increases in the reach and/or health impact of agency services/functions.
- Requires data on operating costs before and after implementation of strategy, revenues before and after implementation, measures of outputs/services before and after, measures of health and economic outcomes (if available) before and after.

- Excel file includes sheets for project information, investment costs, routine operating costs, output and outcome measures, and ROI analysis. Each sheet includes notes, definitions, and data entry instructions.
- For questions, comments and feedback to project staff, contact Karl Ensign:
kensign@astho.org

RWJF Diabetes Self-Management ROI Calculator:

- <http://www.diabetesinitiative.org/support/businessCase.html>
- Download the ROI template—this might be a helpful example for the Incubator project.
- Users must input data on personnel and non-personnel costs in the planning and development and ongoing operations of the intervention, revenues for the intervention group at baseline and post-intervention, expressed on a per-patient, per-month basis, number of patient months per year for the intervention group, and number of months per year that the intervention was operational.
- Webinar on The Business Case Handbook:
http://www.diabetesinitiative.org/support/BuildingaBusinessCaseforDiabetesSelfManagement_000.swf

AHRQ Asthma ROI Calculator:

- <http://statesnapshots.ahrq.gov/asthma/Required.jsp>
- Synthesizes information from 52 studies on improving asthma care and implications for costs.
- The tool guides users through six main steps:
 - Users select the population for which the intervention is being designed.
 - The calculator helps estimate the number and demographic characteristics of participants in the asthma program.

- The calculator estimates the baseline utilization of medical services and missed work days for participating patients at baseline.
- Using impact estimate from the review and analysis of the literature, the calculator estimates the asthma program impact in terms of reduction or increase in hospital visits, ED visits, etc.
- The calculator provides program cost estimates from the literature or allows the user to enter estimates from program vendors.
- Results of savings, costs, and overall ROI are estimated.

RTI Obesity Cost Calculator

- <http://www.rti.org/page.cfm?objectid=9AC94365-24EA-4EAE-AF16C0A4F7D7B958>
- Estimates costs based on the organization's demographics, industry and state-level defaults. Estimates vary by severity of obesity.
- Users define the interventions used. The tool provides separate reductions in medical costs and productivity costs as well as varying time horizons.
- Side-by-side comparisons of interventions are available.
- For more information, contact Justin Trogdon at 919-541-6893.

HIMSS Electronic Health Record ROI:

- <http://www.himss.org/ResourceLibrary/ResourceDetail.aspx?ItemNumber=7229>
- Computes estimated costs and benefits of implementing an ambulatory EMR based on parameters that the user enters.
- The user enters information on the number of FTE providers, % of patients on capitated contracts, current levels of technology, coding style, and transcription use, and probable level of integration with laboratory, radiology, and/or pharmacy.

- Calculations are based on published data from Health Affairs, the Center for Information Technology Leadership, and Health Affairs Market Watch.
- Benefits include increased coding due to elimination of lost charges, personnel savings from automated results documentation, paper supplies saving, increased capacity for patients, and improved resource utilization (avoidance of redundant testing, etc.)
- Costs include software and hardware, training, installation, transition costs, maintenance, staffing, and other costs.
- Contact jgaddis@himformatics.com or mgriskewicz@himss.org

AHIP (America's Health Insurance Plans) Making the Business Case for Smoking Cessation

- <http://www.businesscaseroi.org/roi/apps/calculator/calcintro.aspx>
- AHIP partnered with the Center for Health Research, Kaiser Permanente Northwest.
- Calculates the ROI for the '5A's' program either independently or in conjunction with medication and/or telephone counseling.
- Targets employers and health insurance companies.
- Estimates the number of participants, new quitters, and program costs. Then compares the annual costs for each intervention with usual care. Productivity savings are also calculated. Uses a longitudinal cohort approach.
- Users enter in the percent of population covered by different health plans, state, number of males and females by age group and percent of smokers for each group, percent of adults by age who leave the plan each year, cost per participant of prescription medication and telephone counseling, other program costs such as provider training, and the time period.
- Uses published data on reach, efficacy, and costs. Uses estimates for a smoking-related disease diagnosis, spontaneous quitting and relapse, and disenrollment.

- Medical expenditures and productivity losses are estimated for each distinct SRD, quitting and relapse, and plan disenrollment group, controlling for age, sex, and smoking intensity.
- Dollars are adjusted to 2002 dollars so data may be out of date.
- Detailed methodology available at <http://www.businesscaseroi.org/roi/apps/methods.aspx>
- For more info, contact roi-team@kpchr.org

Cost Calculators (Not ROI)

CDC Chronic Disease Cost Calculator:

- <http://www.cdc.gov/chronicdisease/resources/calculator/download.htm>
- For methodology, including how the tool calculates prevalence and per person costs, see the Technical Appendix.
- For a detailed explanation of how to use the tool, see the User Guide.
- Helps estimate state Medicaid expenditures for six chronic diseases: CHF, heart disease, stroke, hypertension, cancer, and diabetes. It generates estimates of the costs to Medicaid of selected chronic diseases using customized inputs on prevalence rates and treatment costs. This does NOT calculate ROI.
- States do not have to enter their own Medicaid data. The tool uses claims data from selected states and nationally representative data to produce sound estimates. However, users can input their own data if they wish.

CDC Smoking-Attributable Mortality, Morbidity, and Economic Costs (SAMMEC):

- <http://apps.nccd.cdc.gov/sammec>

- Provides data on smoking attributable mortalities and years of potential life lost by state for the years 1997-2001 or 2000-2004.
- The tool allows users to compute economic outcomes such as smoking-attributable productivity losses and smoking-attributable expenditures based on their data or by your own expenditure data. To compute, users enter in data on ambulatory, hospital, prescription drugs, nursing home, and other expenditures.
- MCH SAMMEC allows users to estimate adverse health outcomes from specific diseases where maternal cigarette smoking is a significant risk factor.
- Username: jbrick414; Password: ecgmj

CDC LeanWorks Obesity Cost Calculator:

- <http://www.cdc.gov/leanworks/costcalculator/index.html>
- Designed for HR or benefits personnel to input data and estimate the costs to an organization that are obesity related. Estimates are based on the characteristics of the company such as costs for medical expenditures and the dollar value of increased absenteeism resulting from obesity.
- The obesity cost calculator worksheet helps users collect information to approximate costs. Users need to know the BMI and age of employees at the company, as well as information on average hourly wages and benefits. If users do not have this information, the calculator can provide default values from nationally representative samples.

Alere Wellbeing Obesity Cost Calculator:

- [Alere Wellbeing](#)
- Alere Wellbeing runs evidence-based tobacco cessation programs and weight loss programs for employers.
- Calculator was developed by RTI International with support from CDC.

- Employers enter the number of eligible employees for the weight loss program. They also enter the number of eligible adult dependents and the prevalence of overweight at various levels of BMI. They can enter these parameters in themselves or use national averages.
- Excess costs in terms of medical costs and productivity costs are calculated.
- No methodological information is readily available.

RTI Substance Abuse Services Cost Analysis Program:

- <http://www.rti.org/page.cfm?objectid=7E6095C8-AE6E-4568-874839C81FAD414B>
- Provides questionnaires that help organizations collect information on the resource uses and costs of a treatment program.
- The cost questionnaire includes questions on facility characteristics, patient information, personnel, contracted services, buildings and facilities, depreciation, other resources, and overhead. An additional questionnaire helps calculate labor costs for an average month.
- Does not calculate ROI but provides an example of the type of information that is needed to determine the full cost of program operations.
- For more information, contact Laura J. Dunlap at 1-866-309-4558