



Agency for Healthcare Research and Quality

Advancing Excellence in Health Care

www.ahrq.gov

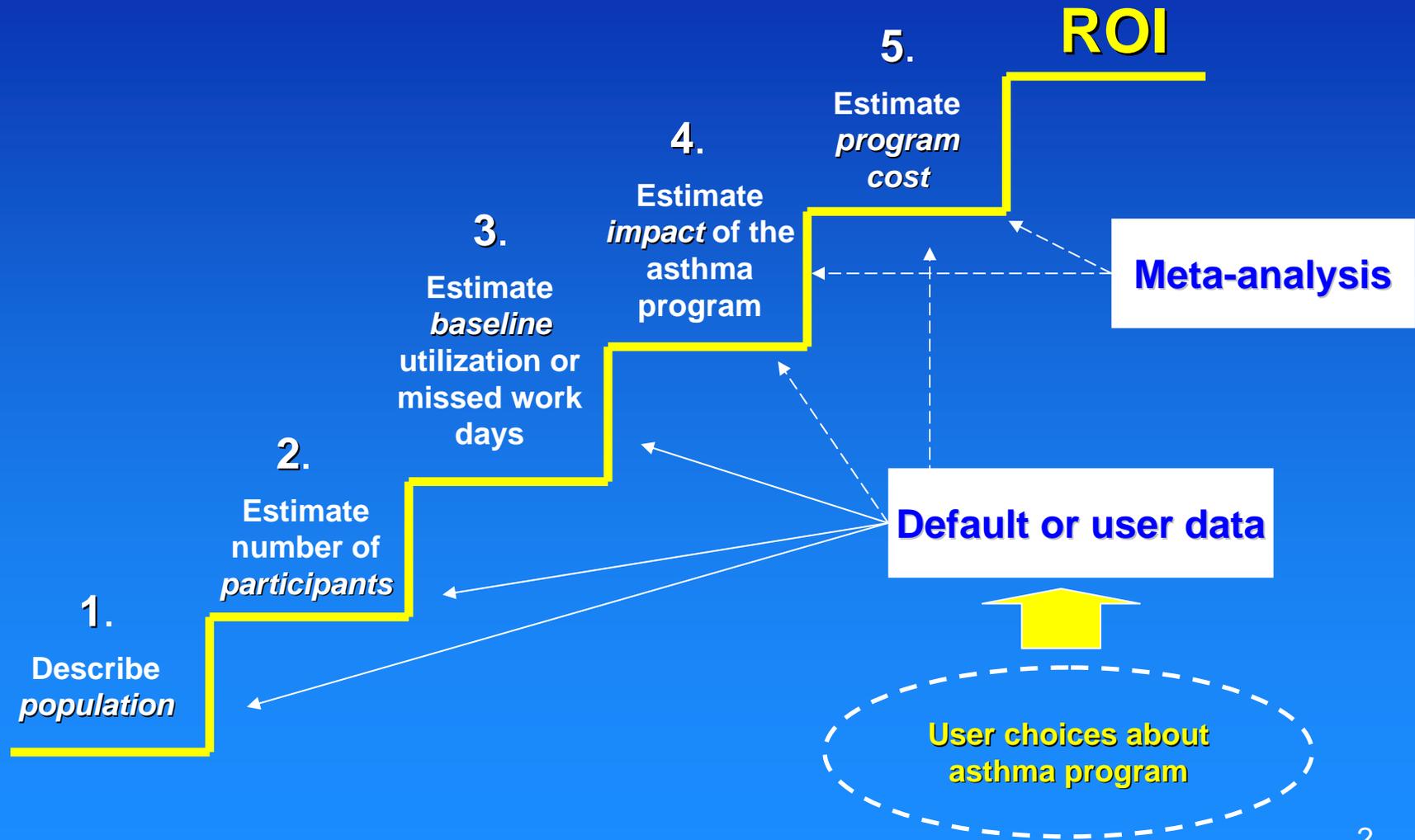
Hands-on-Training: Screen shots of the asthma care return on investment calculator

Ginger Smith Carls, M.A., Rosanna M. Coffey, Ph.D., Ronald J. Ozminkowski, Ph.D., Karen Ho, M.S., Mika Nagamine, Ph.D., Katheryn Ryan

December 6-7, 2007

State Healthcare Quality Improvement Workshop:
Tools You Can Use to Make a Difference

Steps in the ROI calculator





Data sources

1. Demographics of populations

- Medicaid (CMS 2003)
- Employer sponsored health insurance (CPS 2003-2005)
 - State employees (Employees from BLS 2003-2005)

2. Large, nationwide, medical claims database (MarketScan™)

- Prevalence rates
- Utilization and costs for asthma patients

3. Literature review

- Impact of asthma care programs
- Cost to implement asthma care programs



Example

- Based on default values of the calculator when calculator is opened
- Asthma care program for children and adults with persistent asthma for Medicaid programs (nationwide)



Population

Select the type and geography of the general population (people with and without asthma) that you are considering for asthma care quality improvement. For a general discussion of this page, click on the black question mark. ? For information on a particular item, select a blue question mark.

Population type ? Geographic location ?

Size of population ?

Age & gender of population ?

	Male	Female
1 - 4	6.2%	9.1%
5 - 17	15.0%	21.9%
18 - 34	9.2%	13.7%
35 - 44	4.6%	6.7%
45 - 54	3.7%	5.6%
55 - 64	1.8%	2.5%

Sum = 100.0%

The sum should be 100%.

Race of population ?

White	43.8%
African American	23.1%
Hispanic	22.1%
Asian or Pacific Islander	3.5%
American Indian / Alaskan Native	1.5%
Other / Unknown	6.0%

Sum = 100.0%

The sum should be 100%

Data sources ?



Participants

For a general discussion of this page, click on the black question mark. ?

Do the following on this page:

- 1) Select the age group and asthma severity that you want to target for a quality improvement program. (If you want to target people through emergency departments or hospital inpatient settings, select "persistent asthma with an acute visit".)
- 2) Review the number of people eligible for program and the percent expected to participate in the program. Modify if needed.

Age Group: ?

Select children, adults, or both

Child
 Adult

Asthma Severity/Definition: ?

All asthma (intermittent & persistent asthma)
 Persistent asthma only
 Persistent asthma with an acute visit

Number of patients eligible for the program, by age & gender

	Male	Female
1 - 4	135,966	128,581
5 - 17	285,481	300,304
18 - 34	101,469	172,338
35 - 44	81,146	190,717
45 - 54	100,414	270,990
55 - 64	79,246	149,804

? Asthma patients eligible for program: 1,996,456

(Calculated from population, age group, asthma severity/definition, and prevalence rates.)

? Percent of eligibles who will participate: 25.0%

? Expected patients who will participate: 499,114

View asthma prevalence rates*



Asthma definitions

- All Asthma
 - patient has at least one claim with asthma as a primary or secondary diagnosis during the year (ICD-9-CM code 493.xx)
- Persistent asthma*
 - One or more of the following is true using **one year** of data:
 - a) ED visit or inpatient admission with asthma diagnosis
 - b) 4 outpatient visits and at least 2 asthma medication fills
 - c) 4 asthma medication fills, if all 4 fills for leukotrienes, then must have at least 1 claim with an asthma diagnosis
- Persistent asthma* with acute visit
 - Met criteria **a)** for persistent asthma

• **Similar to HEDIS definition, differs in that only 1 year of data is used.**

Asthma medications include: Antiasthmatic combinations , Bronchodilator combinations , Inhaled anticholinergics , Inhaled corticosteroids , Leukotriene modifiers , Long acting adrenergic bronchodilators , Mast cell stabilizers , Methylxanthines , Short acting adrenergic bronchodilators , Corticosteroid tablets or syrup (oral corticosteroid)



Baseline Data

For a general discussion of this page, click on the black question mark. ?

Make two decisions on this page:

- 1) Select a treatment definition and cost perspective for calculating results.
- 2) Review the baseline utilization and cost estimates. Modify them if you have pre-program estimates for your population

Please select a type of treatment definition: ?

Asthma Treatment
 Any Treatment

Please select a cost perspective: ?

Program / plan
 Pgm / plan & patient

Annual emergency department visits per patient ?

Cost of an emergency department visit ?

Annual hospital stays per patient ?

Cost of a hospital stay ?

Annual outpatient visits per patient ?

Cost of an outpatient visit ?

Annual cost of asthma medications per patient ?

Annual cost of asthma-related ancillary services per patient ?

Annual missed work days per adult from asthma ?

Cost of a missed work day ?

Annual missed school days per child from asthma ?

Cost of a missed school day ?



Program Impact

For a general discussion of this page, click on the black question mark. ?

This page shows the impact estimates from a meta-analysis of the research literature on asthma quality improvement and disease management. You have one decision to make and one option on this page.

- 1) Select the type of study you want to use for results.
- 2) Freeze the impact values if you want to compare different scenarios when the impact stays the same.

Select a study design: Randomized controlled studies

Check to keep impact at current values: Freeze impact values

Healthcare Measures:

Productivity Measures:

Program impact on emergency department visits? -25%

Program impact on missed work days per adult? -86%

Program impact on hospital stays? -37%

Program impact on missed school days per child? -57%

Program impact on outpatient visits? -21%

Program impact on the cost of ancillary services? -66%

Program impact on the cost of asthma medications? 16%

* Negative percents are a decrease and positive percents are an increase in health care use or cost or missed days.

Microsoft Excel - Asthma_ROI_model_20070601.xls

Overview | Contents | Population | Participants | Baseline Data | Program Impact | **Program Cost** | Results | Appendix | Save and Exit | Exit

File | Edit | View | Insert | Format | Tools | Data | Window | Help | Adobe PDF

A1 | Program Cost

 **Program Cost** 

For a general discussion of this page, click on the black question mark. ?

Review four decisions that will affect calculations of the cost of the program to be implemented. Modify if appropriate.

- 1) Length of operation planned for the program.
- 2) Time until the full-impact of program is expected.
- 3) Cost of the program per person per year (consider changing based on costs estimates for specific programs from vendors).
- 4) Discount rate for valuing savings and costs that occur in different years.
(If immediacy of results is essential in your program, you may want to raise the discount rate.)

How long will the program operate (1 to 10 years)?	<input type="text" value="5"/>	What is the annual program cost per participant?	<input type="text" value="\$395"/>
How many years until the program achieves full impact?	<input type="text" value="2"/>	What is the discount rate for ROI calculation?	<input type="text" value="3%"/>



Results

[Go To Detailed Results](#)

For a general discussion of this page, click on the black question mark. ?

This page shows the impact of the asthma program and summarizes the assumptions you made in the calculator. Make two decisions on this page: 1) Whether to include health care savings, productivity gains, or both. 2) Whether to report results per participant or per program.

Choose whether to display averages or totals: Show averages per participant Show totals for all participants

Current Model Settings

Population type	Medicaid
Geographic location	Nation
Asthma definition	Persistent only
Adults and/or children	Adults and Children
Estimated persons with asthma	1,996,456
Percent who will participate	25%
Estimated program participants	499,114
Annual program cost per participant	\$395
Years the program operates	5
Program phase-in period (years)	2
Discount rate for NPV and ROI	3%

Health Care Savings per Participant	\$257
Emergency department visits	8.2%
Hospital confinements	227.8%
Outpatient visits	14.8%
Asthma-specific ancillary services	36.9%
Asthma medications	-187.6%
	100.0%

Productivity Gain per Participant	\$1,714
Productivity for adults	76.9%
Productivity for children	23.1%
	100.0%

Total Program Cost per Participant over Years the Program Operates	\$1,809
---	----------------

Choose health care savings, productivity gains, or both:

Include Health Care savings in the NPV and ROI

Include Productivity gain in the NPV and ROI

Overall Impact of Program

Net Present Value (NPV)	-\$1,552
Return On Investment (ROI)	\$0.14
Update>> Break-Even Program Impact	-13%
Update>> Break-Even Program Cost	\$56.04

Microsoft Excel - Asthma_ROI_model_20071128.xls

Overview Contents Population Participants Baseline Data Program Impact Program Cost Results Appendix Save and Exit Exit

File Edit View Insert Format Tools Data Window Help Adobe PDF Type a question for help

A1 fx



Undiscounted Results per Person for the User-Specified Program Tabulated by Outcome Measure and Year

[Return](#)

The earliest year represents the baseline period before the program is implemented. Savings are estimated by comparing the results on this page to a scenario with no program, for which the baseline values hold steady over time.

Annual utilization & cost per patient	2007	2008	2009	2010	2011	2012
Emergency department visits	0.24	0.21	0.18	0.18	0.18	0.18
Hospital confinements	0.06	0.05	0.04	0.04	0.04	0.04
Outpatient visits	1.16	1.04	0.92	0.92	0.92	0.92
Emergency department cost	\$20.64	\$18.06	\$15.48	\$15.48	\$15.48	\$15.48
Hospital confinement cost	\$386	\$314	\$243	\$243	\$243	\$243
Outpatient cost	\$44.08	\$39.45	\$34.82	\$34.82	\$34.82	\$34.82
Asthma-specific ancillary cost	\$35.00	\$23.45	\$11.90	\$11.90	\$11.90	\$11.90
Asthma medication cost	\$735.00	\$793.80	\$852.60	\$852.60	\$852.60	\$852.60
Missed work days for adults	5.82	3.32	0.81	0.81	0.81	0.81
Missed school days for children	4.84	3.46	2.08	2.08	2.08	2.08
Productivity cost for adults	\$374.58	\$213.51	\$52.44	\$52.44	\$52.44	\$52.44
Productivity cost for caregivers	\$169.40	\$121.12	\$72.84	\$72.84	\$72.84	\$72.84



Literature review methods

- Inclusion criteria
- Characteristics of included studies
- Calculation of outcome (impact of the program)
- Analysis



Study Inclusion criteria

- **Studies searched (76 studies met criteria):**
 - Asthma care quality improvement: Physician & patient training—written asthma action plan, etc. (not drug efficacy)
 - U.S. studies: 1995 thru 2006
 - Populations: Children and adults under 65
 - Studies: Individual interventions (not meta-analyses or editorials)
 - Impact period: 6+ months
 - Impact: Use or cost of medical care services and productivity (not asthma knowledge or quality of life)
 - Insurance: All types



Abstracting literature

- **Details recorded**
 - Characteristics of studies and patients (e.g., asthma severity)
 - Baseline utilization and cost by patients in the studies
 - Impact of program on percent change in visits or days (for default values)



Included studies

- **The 52 studies report 261 pieces of information**
 - Related to service utilization and productivity
 - For children, adults or both
 - With multiple items (e.g., on ED visits, if the study reported results separately for children and adults)
- **Outcomes (number of related study results)**
 - Emergency department visits (90)
 - Hospital stays (75)
 - Outpatient visits (57)
 - Medication costs (12)
 - Cost of ancillary services (3)
 - Missed work or school days due to asthma (24)



Study characteristics

- Useable means study had to report average visit rates, missed days, or cost (not just percent with event)
- **Most useable studies:**
 - Had a control group (56%); many had randomized controls (38%)
 - Involved patient self-management (85%) and regular medical management (58%); many had a written asthma action plan (40%)
 - Focused on children only (46%)
 - Focused on populations with persistent asthma (55%)
 - Persistent asthma = subjects met HEDIS criteria OR had 2 or more hospital or ED visits at baseline
 - Had mixed insurance coverage (79%)



Included studies and patients*

Cost Components	Children only		Adults Only		Both		TOTAL	
	Patients	Studies	Patients	Studies	Patients	Studies	Patients	Studies
ED visits	13,213	21	714	11	8,812	9	22,739	40
Hospitalizations	17,575	19	7,161	9	2,526	7	27,262	33
Outpatient visits	20,229	18	6,986	4	1,888	5	29,103	25
Missed work/ school days	4,172	11	521	5	443	3	5,136	17
Medication Cost	486	2	301	3	13,580	5	14,367	10
Ancillary service cost	61	1	148	2	0	0	209	3
Total direct cost	2,729	8	649	4	10,131	8	13,509	20
Total indirect cost	0	0	143	2	524	2	667	4

* Includes patients in treatment and control groups



Study designs

- **Randomized controlled trial (RCT) studies**
 - Standard for clinical efficacy
 - More likely to be accepted by clinicians—main target of QI programs
- **Statistically controlled studies**
 - Much larger samples with greater precision
 - Can control for more patient and setting attributes than RCTs
- **Studies without a control group**
 - Included for showing importance of the study design in measuring outcomes accurately
 - For a preliminary benchmark that can guide a program in its early days about its success or failure

NOTE: Results are available for each design type



Program impact calculations

- All studies
 - Pre-post treatment comparison
- Controlled
 - Post treatment-to-control comparison
 - Net change pre-post, treatment-to-control comparison
- Example calculation

Data	ED visits per person per year	
	Before intervention	After intervention
Treatment Group	4	2
Control Group	4	3
Calculations		
Pre-post treatment: $(2-4) / 4*100 = -50\%$		
Post treatment-to-control: $(2-3) / 3*100 = -33\%$		
Net change: $[(2-4) / 4*100] - [(3-4) / 4*100] = -50\% - (-25\%) = -25\%$		



Analysis of results

- **Regressions:** study-result outcomes regressed on study population and design features
 - **Ys:** ED visits, hospitalizations, outpatient visits, missed work/school days, and medication costs
 - **Xs:** Study population, study design, sample size, length of study, and contact with the physician or patient
 - **Bs:** Average impact of each study feature on Ys, controlling for other Xs
- **Other issues:**
 - Standard errors adjusted for multiple results per study
 - Studies weighted equally, by using inverse of number of results per study as weight on each study-result observation
 - Ancillary services not analyzed in regression context, due to the small number of studies



Selected literature reviews

- Bernard-Bonin, A.-C., S. Stachenko, D. Bonin, C. Charette, and E. Rousseau. 1995. "Self-management teaching programs and morbidity of pediatric asthma: A meta-analysis." *J Allergy Clin Immunol* 95(1):34.
- Krause, D. D. 2005. "Economic Effectiveness of Disease Management Programs: A Meta-Analysis." *Disease Management* 8(2):114-34.
- Lee, T. A. and K. B. Weiss. 2002. "An update on the health economics of asthma and allergy." *Current Opinion in Allergy and Clinical Immunology* 2(3):195-200.
- Sullivan, S. D. and K. Weiss. 2001. "Health economics of asthma and rhinitis. II. Assessing the value of interventions." *Current reviews of allergy and clinical immunology* 107(2):203-10.
- **Shojania KG, McDonald KM, Wachter RM, Owens DK, eds. 2007. "Closing the Quality Gap: A Critical Analysis of Quality Improvement Strategies/ Vol 5: Asthma Care." *Technical Review 9 (AHRQ 04(07)-0051-5).***
- Smith, J. R., M. Mugford, R. Holland, B. Candy, M. J. Noble, B. D. W. Harrison, M. Koutantji, C. Upton, and J. Smith. 2005. "A systematic review to examine the impact of psycho-educational interventions on health outcomes and costs in 22 adults and children with difficult asthma." *Health Technology Assessment* 9(23):1