Interventions to reduce unnecessary emergency department visits: Asthma self-management education for children

Health Care: Health Care System Efficiency

Benefit-cost estimates updated December 2019. Literature review updated December 2014.

Current estimates replace old estimates. Numbers will change over time as a result of model inputs and monetization methods.

The WSIPP benefit-cost analysis examines, on an apples-to-apples basis, the monetary value of programs or policies to determine whether the benefits from the program exceed its costs. WSIPP's research approach to identifying evidence-based programs and policies has three main steps. First, we determine "what works" (and what does not work) to improve outcomes using a statistical technique called meta-analysis. Second, we calculate whether the benefits of a program exceed its costs. Third, we estimate the risk of investing in a program by testing the sensitivity of our results. For more detail on our methods, see our Technical Documentation.

Program Description: Asthma self-management education aims to manage asthma symptoms and avoid emergency department visits by teaching children to identify and avoid asthma triggers, recognize symptoms, and take appropriate action to manage symptoms. In the studies included in this analysis, asthma self-management education was typically delivered by a social worker, nurse, or computer program. We included interventions delivered to children or children and their families in an individuals or group setting. This analysis focuses on interventions initiated in the healthcare system.

Benefit-Cost Summary Statistics Per Participant

Benefits to:

Taxpayers	$11
Participants	$4
Others	$18
Indirect	($36)
Total benefits	($3)
Net program cost	($82)
Benefits minus cost	($85)

Benefit to cost ratio	($0.03)
Benefits minus costs	($85)
Chance the program will produce benefits greater than the costs	46 %

The estimates shown are present value, life cycle benefits and costs. All dollars are expressed in the base year chosen for this analysis (2018). The chance the benefits exceed the costs are derived from a Monte Carlo risk analysis. The details on this, as well as the economic discount rates and other relevant parameters are described in our Technical Documentation.

Meta-Analysis of Program Effects

Outcomes measured	Treatment age	No. of effect sizes	Treatment N	Adjusted effect sizes and standard errors used in the benefit-cost analysis						Unadjusted effect size (random effects model)	
				First time ES is estimated			Second time ES is estimated				
				ES	SE	Age	ES	SE	Age	ES	p-value
Hospitalization	7	10	1342	0.015	0.101	8	0.000	0.086	10	0.153	0.475
Emergency department visits	7	7	688	-0.088	0.124	8	0.000	0.086	10	-0.088	0.475
School attendance^	7	4	142	0.002	0.219	8	n/a	n/a	n/a	0.002	0.994

^WSIPP's benefit-cost model does not monetize this outcome.

Meta-analysis is a statistical method to combine the results from separate studies on a program, policy, or topic in order to estimate its effect on an outcome. WSIPP systematically evaluates all credible evaluations we can locate on each topic. The outcomes measured are the types of program impacts that were measured in the research literature (for example, crime or educational attainment). Treatment N represents the total number of individuals or units in the treatment group across the included studies.

An effect size (ES) is a standard metric that summarizes the degree to which a program or policy affects a measured outcome. If the effect size is positive, the outcome increases. If the effect size is negative, the outcome decreases.

Adjusted effect sizes are used to calculate the benefits from our benefit cost model. WSIPP may adjust effect sizes based on methodological characteristics of the study. For example, we may adjust effect sizes when a study has a weak research design or when the program developer is involved in the research. The magnitude of these adjustments varies depending on the topic area.

WSIPP may also adjust the second ES measurement. Research shows the magnitude of some effect sizes decrease over time. For those effect sizes, we estimate outcome-based adjustments which we apply between the first time ES is estimated and the second time ES is estimated. We also report the unadjusted effect size to show the effect sizes before any adjustments have been made. More details about these adjustments can be found in our Technical Documentation.

Detailed Monetary Benefit Estimates Per Participant

Affected outcome:	Resulting benefits:[1]	Benefits accrue to:				
		Taxpayers	Participants	Others[2]	Indirect[3]	Total
Hospitalization	Health care associated with general hospitalization	($5)	$0	($5)	($2)	($12)
Emergency department visits	Health care associated with emergency department visits	$15	$4	$23	$8	$50
Program cost	Adjustment for deadweight cost of program	$0	$0	$0	($41)	($41)
Totals		$11	$4	$18	($36)	($3)

[1]In addition to the outcomes measured in the meta-analysis table, WSIPP measures benefits and costs estimated from other outcomes associated with those reported in the evaluation literature. For example, empirical research demonstrates that high school graduation leads to reduced crime. These associated measures provide a more complete picture of the detailed costs and benefits of the program.

[2]"Others" includes benefits to people other than taxpayers and participants. Depending on the program, it could include reductions in crime victimization, the economic benefits from a more educated workforce, and the benefits from employer-paid health insurance.

[3]"Indirect benefits" includes estimates of the net changes in the value of a statistical life and net changes in the deadweight costs of taxation.

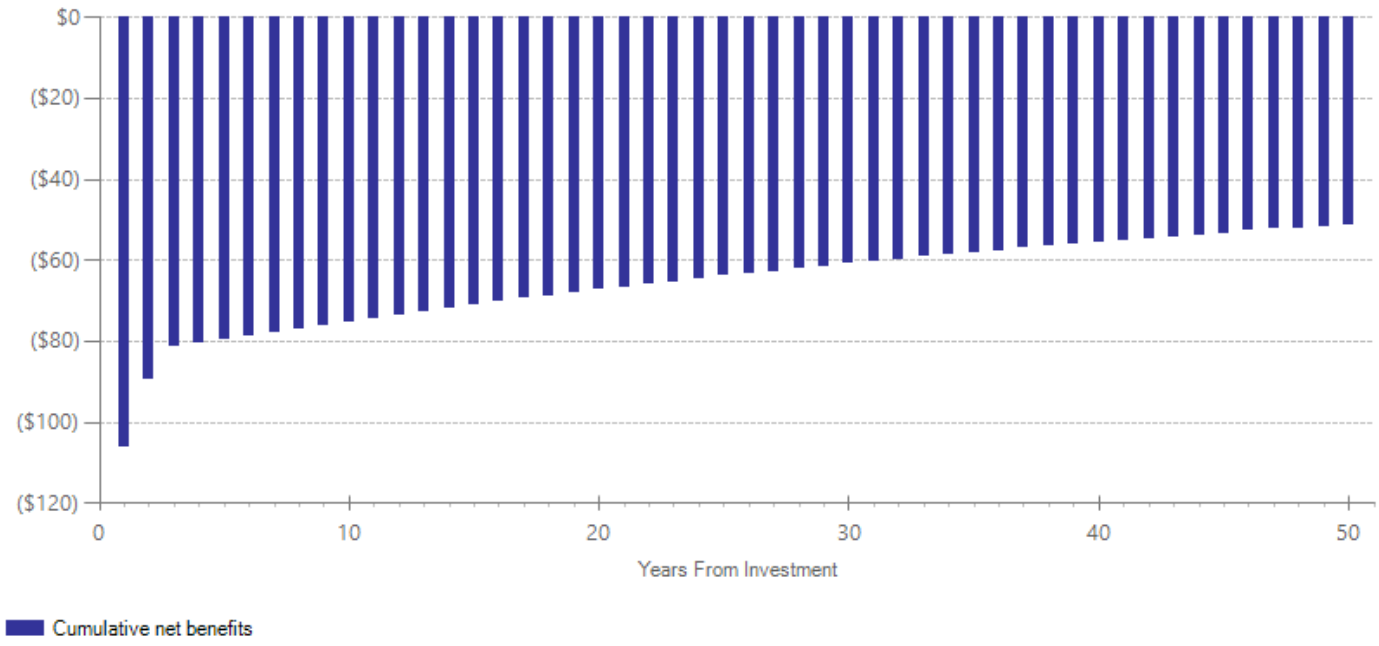
Detailed Annual Cost Estimates Per Participant

	Annual cost	Year dollars	Summary	
Program costs	$77	2014	Present value of net program costs (in 2018 dollars)	($82)
Comparison costs	$0	2014	Cost range (+ or -)	25 %

The asthma self-management education programs that we reviewed required an average of 1.14 hours of staff time per child. A nurse educator provided the self-management education in most of these programs. We estimated the cost of the program by multiplying the hours of staff time by the average registered nurse's hourly salary in Washington State (http://www.bls.gov/oes/current/oes_wa.htm#29-0000). This product is then multiplied by the ratio of total compensation to wages described in WSIPP's Technical Documentation.

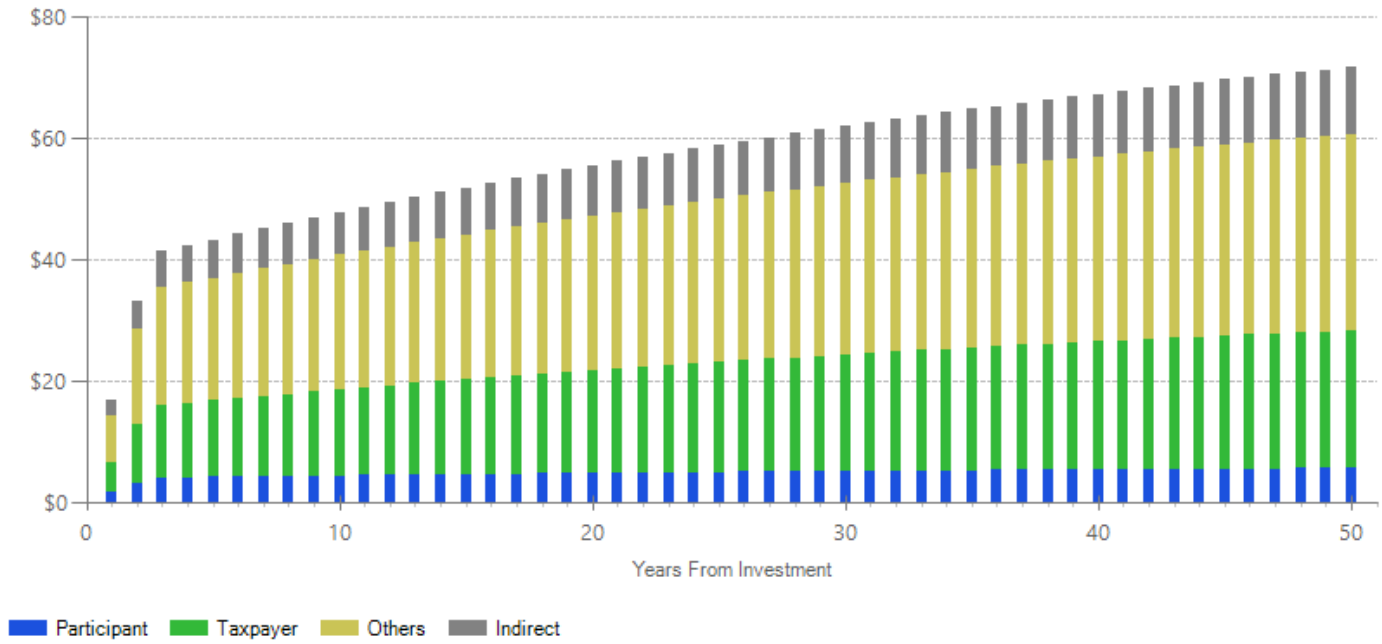
The figures shown are estimates of the costs to implement programs in Washington. The comparison group costs reflect either no treatment or treatment as usual, depending on how effect sizes were calculated in the meta-analysis. The cost range reported above reflects potential variation or uncertainty in the cost estimate; more detail can be found in our Technical Documentation.

Benefits Minus Costs Over Time (Cumulative Discounted Dollars)



The graph above illustrates the estimated cumulative net benefits per-participant for the first fifty years beyond the initial investment in the program. We present these cash flows in discounted dollars. If the dollars are negative (bars below $0 line), the cumulative benefits do not outweigh the cost of the program up to that point in time. The program breaks even when the dollars reach $0. At this point, the total benefits to participants, taxpayers, and others, are equal to the cost of the program. If the dollars are above $0, the benefits of the program exceed the initial investment.

Benefits by Perspective Over Time (Cumulative Discounted Dollars)



The graph above illustrates the breakdown of the estimated cumulative benefits (not including program costs) per-participant for the first fifty years beyond the initial investment in the program. These cash flows provide a breakdown of the classification of dollars over time into four perspectives: taxpayer, participant, others, and indirect. “Taxpayers” includes expected savings to government and expected increases in tax revenue. “Participants” includes expected increases in earnings and expenditures for items such as health care and college tuition. “Others” includes benefits to people other than taxpayers and participants. Depending on the program, it could include reductions in crime victimization, the economic benefits from a more educated workforce, and the benefits from employer-paid health insurance. “Indirect benefits” includes estimates of the changes in the value of a statistical life and changes in the deadweight costs of taxation. If a section of the bar is below the $0 line, the program is creating a negative benefit, meaning a loss of value from that perspective.

Taxpayer Benefits by Source of Value Over Time (Cumulative Discounted Dollars)

The graph above focuses on the subset of estimated cumulative benefits that accrue to taxpayers. The cash flows are divided into the source of the value.

Citations Used in the Meta-Analysis

Alexander, J.S., Younger, R.E., Cohen, R.M., & Crawford, L.V. (1988). Effectiveness of a nurse-managed program for children with chronic asthma. *Journal of Pediatric Nursing, 3*(5), 312-317.

Clark, N.M., Feldman, C.H., Evans, D., Levison, M.J., Wasilewski, Y., & Mellins, R.B. (1986). The impact of health education on frequency and cost of health care use by low income children with asthma. *The Journal of Allergy and Clinical Immunology, 78*(1), 108-15.

Evans, R. ., Gergen, P.J., Mitchell, H., Kattan, M., Kercsmar, C., Crain, E., Anderson, J., ... Wedner, H.J. (1999). A randomized clinical trial to reduce asthma morbidity among inner-city children: results of the National Cooperative Inner-City Asthma Study. *The Journal of Pediatrics, 135*(3), 332-338.

Farber, H.J., & Oliveria, L. (2004). Trial of an Asthma Education Program in an Inner-City Pediatric Emergency Department. *Pediatric Asthma, Allergy & Immunology, 17*(2), 107-115.

Fireman, P., Friday, G.A., Gira, C., Vierthaler, W.A., & Michaels, L. (1981). Teaching self-management skills to asthmatic children and their parents in an ambulatory care setting. *Pediatrics, 68*(3), 341-8.

Homer, C., Susskind, O., Alpert, H.R., Owusu, M., Schneider, L., Rappaport, L.A., & Rubin, D.H. (2000). An evaluation of an innovative multimedia educational software program for asthma management: report of a randomized, controlled trial. *Pediatrics, 106*(1), 210-205.

Lukacs, S.L., France, E.K., Baron, A.E., & Crane, L.A. (2002). Effectiveness of an asthma management program for pediatric members of a large health maintenance organization. *Archives of Pediatrics & Adolescent Medicine, 156*(9), 872-876.

Madge, P., McColl, J., & Paton, J. (1997). Impact of a nurse-led home management training programme in children admitted to hospital with acute asthma: a randomised controlled study. *Thorax, 52*(3), 223-228.

Mitchell, E.A., Ferguson, V., & Norwood, M. (1986). Asthma education by community child health nurses. *Archives of Disease in Childhood, 61*(12), 1184-1189.

Rubin, D.H., Leventhal, J.M., Sadock, R.T., Letovsky, E., Schottland, P., Clemente, I., & McCarthy, P. (1986). Educational intervention by computer in childhood asthma: a randomized clinical trial testing the use of a new teaching intervention in childhood asthma. *Pediatrics, 77*(1), 1-10.

Shields, M.C. (1990). The Effect of a Patient Education Program on Emergency Room Use for Inner-City Children with Asthma. *American Journal of Public Health, 80*(1), 36-38.

Stevens, C.A., Wesseldine, L.J., Couriel, J.M., Dyer, A.J., Osman, L.M., & Silverman, M. (2002). Parental education and guided self-management of asthma and wheezing in the pre-school child: a randomised controlled trial. *Thorax, 57*(1), 39-44.

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