

**Evaluation of Research Impacts: The NIEHS Extramural  
Asthma Research Portfolio**

**Presentation to the National Institutes of Health  
Special Interest Group for Evaluation**

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NIEHS

October 10, 2007

# AGENDA

- Why did DERT enter into this contract?
- How was the statement of work developed?
- How was the contract initiated?
- What are the tasks in the contract?
- What is the status of the various tasks?
- Detailed presentation of Work Assignment #2  
Impacts of the NIEHS Extramural  
Asthma Research Program
- What are the next steps?

# Why have a contract for evaluation?

- To develop tools for analysis.
- To determine the possibilities of tracking inputs to outputs to outcomes. Is NIEHS research making a difference in the regulatory and public health arenas?
- To search for outcomes **beyond publications.**

# How did DERT develop the statement of work?

- Put together an *ad hoc* committee from within DERT to identify key scientific portfolios that would benefit from an evaluation or assessment.
  - Assessment is defined as -- *a study to be used by DERT staff internally to help understand the topic in more detail, to understand the extramural grant portfolio and its contribution to the subject, and to help assess the portfolio balance. This information does not have to be reviewed by an external panel.*
  - Evaluation is defined as -- *a larger study that builds upon the elements of an assessment or report, but attempts to create dialogue with the stake holders by vetting it through an external expert panel and eventually through the National Advisory Environmental Health Sciences Council. These studies attempt to place NIEHS' contributions into a larger context of all research, help to understand past performance, and attempt to understand the current and future opportunities.*

# Committee Members

- *Gwen Collman-SPHB*
- *Pat Mastin-COSPB*
- *Claudia Thompson-CRIS*
- *Patricia Thompson-WETP*
- *Shobha Srinivasan-SPHB*
- *Sally Tinkle-COSPB*
- *Allan Benton-RCB*
- *Ben Van Houten-PAB*
- *Martha Barnes-PAB*
- *John Grason-NIH Emerging Leader Intern-PAB*
- *Anne Thompson-PAB*
- *Jerry Phelps-PAB*

# How did the DERT working group develop the statement of work?

- Weekly meetings
- Identified topics to be considered

**Asthma**, air pollution, metals, oxidative stress, EGP, SBIR, CBPR, **development of tools to assess public health impact**, productivity by mechanism, impact of Worker Training Program, **endocrine disruptors**, neurosciences

- Topics discussed at DERT Spring Retreat—DERT branches met to prioritize topics. *Ad hoc* group made final decisions based on all comments

# How was the contract initiated?

- Anne Thompson and Jerry Phelps prepared draft Statement of Work—revised with committee input.
- Allan Benton researched best way to initiate a contract considering time constraints.
- Pursued Task Order Contract through the HHS Program Support Center
- Sent out announcement and received Capability Statements from several Task Order Contractors.
- Selected Battelle as best choice based on experience, proximity, and history of evaluating HHS/NIH research programs.
- Task Order awarded September 2005.

# What are the tasks in the contract?

- Work Assignment 1—Literature Review on Research Impact Assessment Methods and Concepts  
Status: complete—manuscript prepared and submitted to EHP.

## Highlights/Recommendations:

Development of a Logic Model that detail the connections between inputs, outputs, and outcomes

Identified potential metrics and indicators that link back to their source and forward to their area of influence.

## Work Assignment #2—Asthma Research Evaluation Status—Complete-Final Report received 4/3/2007

### Feasibility Assessment

- Are data available for all the components of the logic model?
- Do the available data help answer our main evaluation questions?

Expert Panel Review (Eggleston, Holian, Leaderer, Mayrides, Peters, Postlethwait)

Minutes of the meeting were developed into a report that was vetted through the Expert Panel

# Logic Model for Asthma Evaluation

**Inputs**

**Activities**

**Outputs**

**Outcomes**

**Immediate**

**Intermediate**

**Ultimate**

Changes Over Time Compared with Other Agencies

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Home >  
**Asthma\_Reports**

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Search for:

**Contents** **Properties**

Show Details

- 1 - Inputs**
- 2 - Activities
- 3 - Outputs
- 4 - Immediate Outcomes
- 5 - Intermediate Outcomes
- 6 - Ultimate Outcomes

SQL Server Reporting Services

Home > Asthma Reports >

# 1 - Inputs

Contents Properties

Show Details

- [Asthma Related Funding by Mechanism and FY](#)  
Chart - Asthma-Related Grants by Research Mechanism
- [Asthma-Related Grants by PI and Institution](#)  
Chart - Number of Asthma-Related Grants by PI and Grantee Institution
- [Distribution of Grantee Institutions by Number of Asthma-Related Grants Received](#)  
Report - Distribution of Grantee Institutions by Number of Asthma-Related Grants Received
- [Distribution of Grantee Institutions by Number of Asthma-Related Grants Received and FY](#)  
Report - Distribution of Grantee Institutions by Number of Asthma-Related Grants Received and Fiscal Year
- [Distribution of PIs by Number of Asthma-Related Grants Awarded](#)  
Report - Distribution of PIs by Number of Asthma-Related Grants Awarded
- [Distribution of PIs by Number of Asthma-Related Grants Awarded and FY](#)  
Report - Distribution of PIs by Number of Asthma-Related Grants Awarded and FY
- [NIH Mechanism Detail](#)
- [NIH Mechanism Detail Charts](#)
- [Number of Asthma-Related Grants and Funding by Agency and Year](#)  
Report - Research Funding: Total amount of asthma-related funding by year
- [Number of Awards and Amount of Funding by Grantee and Year](#)  
Report - Number of Awards and Amount of Funding by Grantee and Year
- [Number of awards and amount of funding by grantee institution and year](#)  
Report - Number of awards and amount of funding by grantee institution and year
- [Unique Grants By Agency](#)  
Report - View Unique Grants by Agency

Items in 1 - Inputs

SQL Server Reporting Services  
Home > Asthma Reports > 1 - Inputs >  
**Unique Grants By Agency**

Home | My Subscriptions | Help

Search for:  Go

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View Report

17 of 23 100% Find | Next Select a format Export

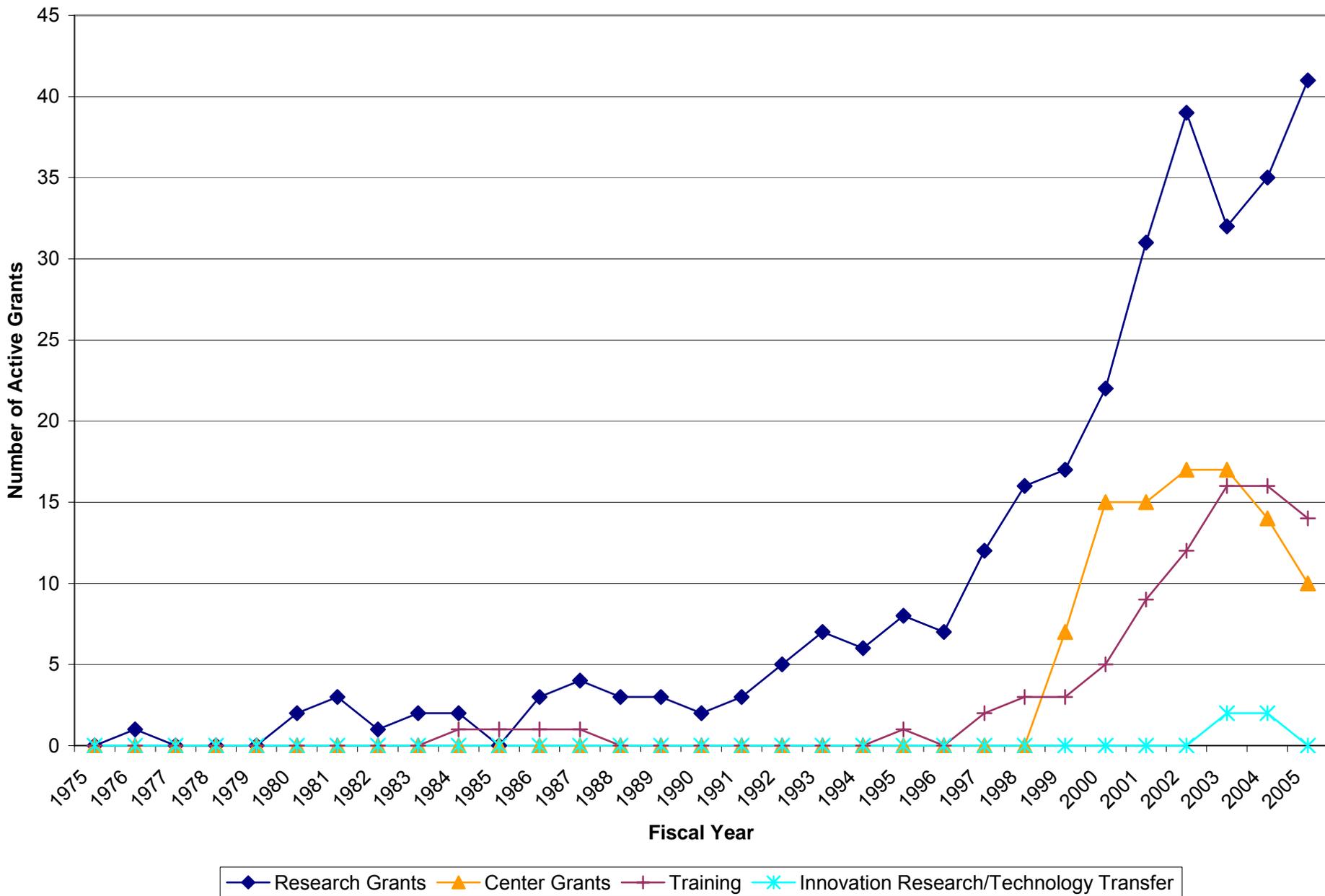
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Fiscal Year: 1999

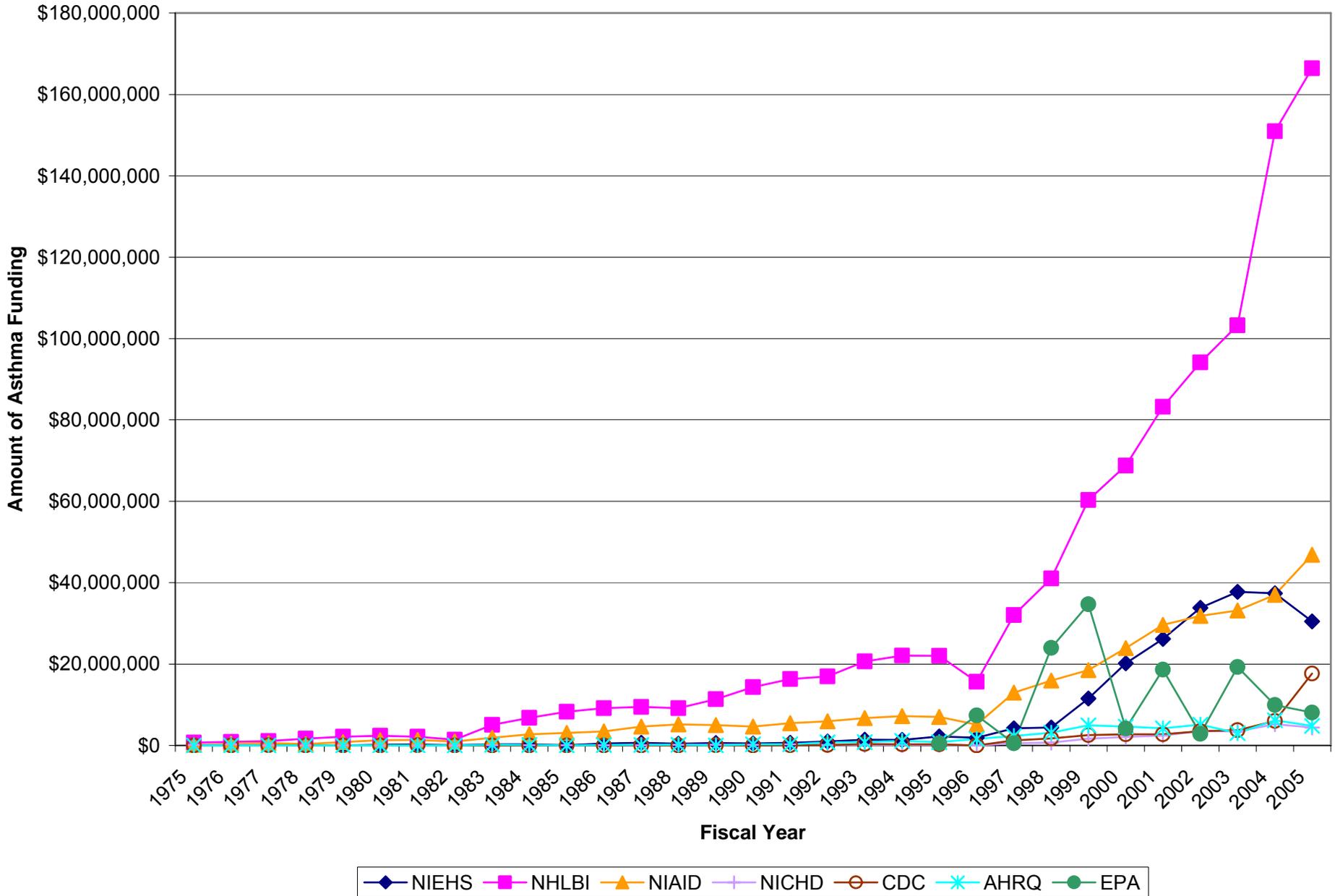
- Unique Grants
- 1976
- 1978
- 1980
- 1981
- 1983
- 1984
- 1986
- 1987
- 1991
- 1992
- 1993
- 1994
- 1995
- 1996
- 1997
- 1998

Grant	Title	PI Name	Institution
P01ES009581-01	RESPIRATORY DISEASE AND PREVENTION	GONG, HENRY	UNIVERSITY OF SOUTHERN CALIFORNIA
P01ES009589-01	MICHIGAN CENTER FOR THE ENVIRONMENT AND CHILDRENS HEALTH	ISRAEL, BARBARA A	UNIVERSITY OF MICHIGAN AT ANN ARBOR
P01ES009600-01	COLUMBIA CENTER FOR CHILDRENS ENVIRONMENTAL HEALTH	PERERA, FREDERICA P	COLUMBIA UNIVERSITY HEALTH SCIENCES
P01ES009605-01	EXPOSURE AND HEALTH OF FARMWORKER CHILDREN IN CALIFORNIA	ESKENAZI, BRENDA	UNIVERSITY OF CALIFORNIA BERKELEY
P01ES009606-01	CENTER FOR CHILDHOOD ASTHMA IN URBAN ENVIRONMENT	EGGLESTON, PEYTON A	JOHNS HOPKINS UNIVERSITY
P01ES009607-01	AIRWAY DISEASE IN CHILDREN FROM RURAL COMMUNITIES	SCHWARTZ, DAVID A	UNIVERSITY OF IOWA
R01ES006700-06	LUNG TOXICOLOGY AND THE IMMATURE CLARA CELL	PLOPPER, CHARLES G.	UNIVERSITY OF CALIFORNIA DAVIS

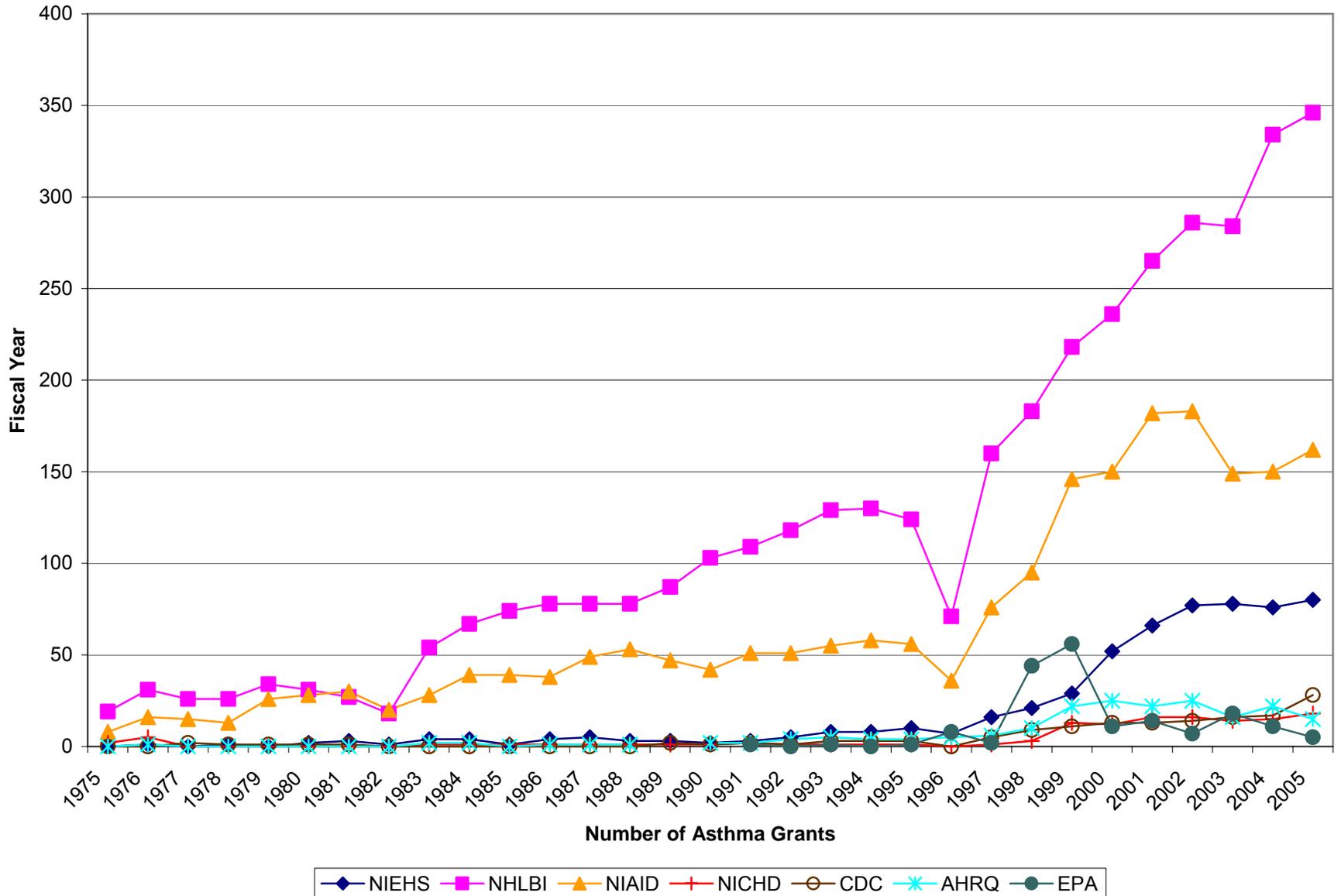
# Exhibit 2-2 Number of NIEHS asthma-related grants by research mechanism, 1975-2005



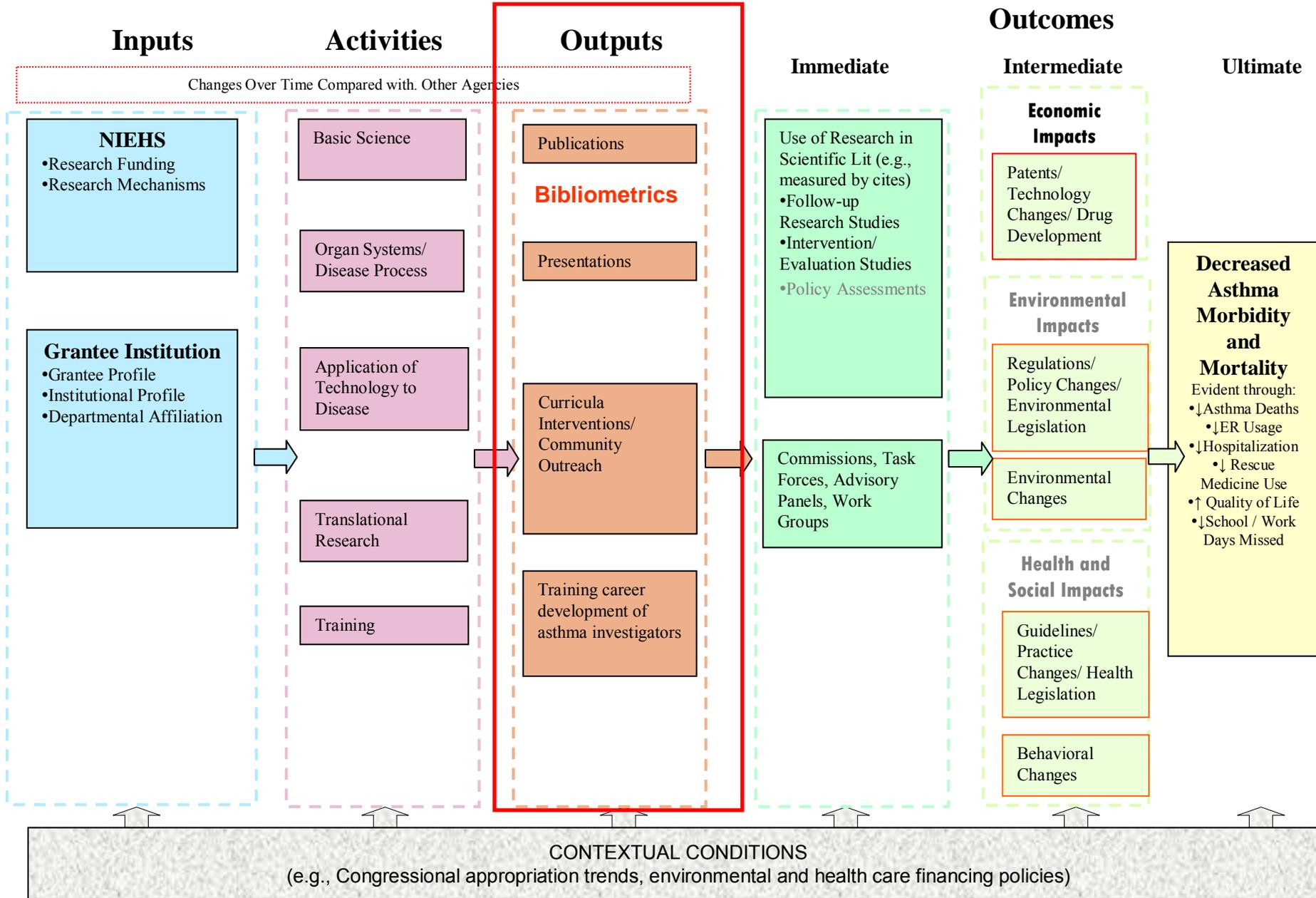
# Asthma funding levels by funding agency 1975-2005



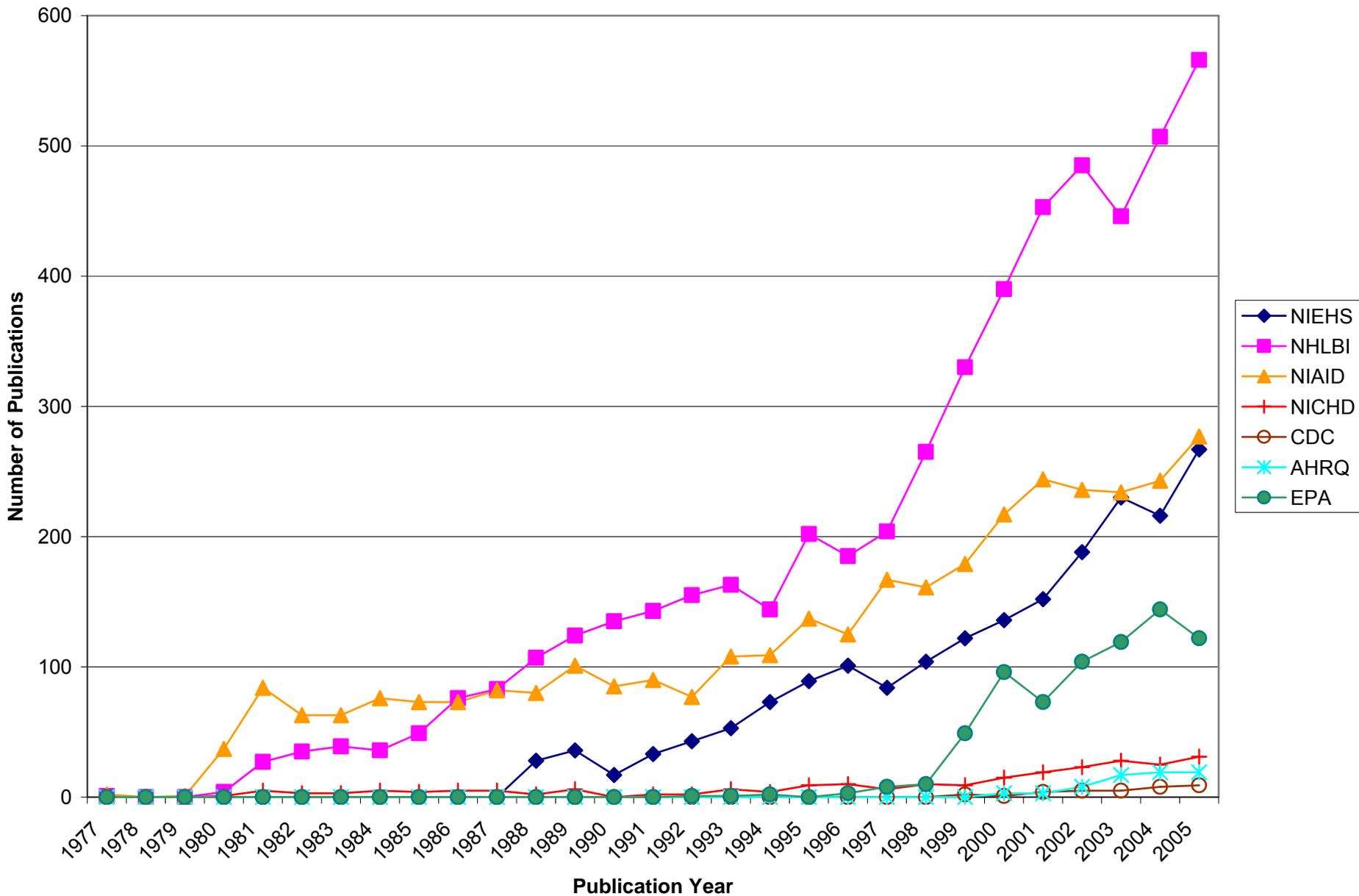
# Number of asthma-related grants by funding agency 1975-2005



# Logic Model for Asthma Evaluation



# Number of publications associated with asthma-related grants by agency and publication year, 1975-2005



# Curricula developed through agency funding

Funding Agency	Number of curricula
NIEHS	69
NHLBI	6
NIAID	6
NICHD	0
CDC	9
AHRQ	0
EPA	22

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Home > Asthma Reports >  
**3 - Outputs**

[Home](#) | [My Subscriptions](#) | [Help](#)

Search for:

**Contents** **Properties**

Show Details

[Asthma-Related Publications By Year](#)  
Report - View Asthma-Related Publications By Year

[Intervention Publications](#)  
Report - View Intervention Publications

[Curricula](#)  
Report - View Curricula

Items in 3 - Outputs

SQL Server Reporting Services

Home > Asthma Reports > 3 - Outputs >

## Curricula

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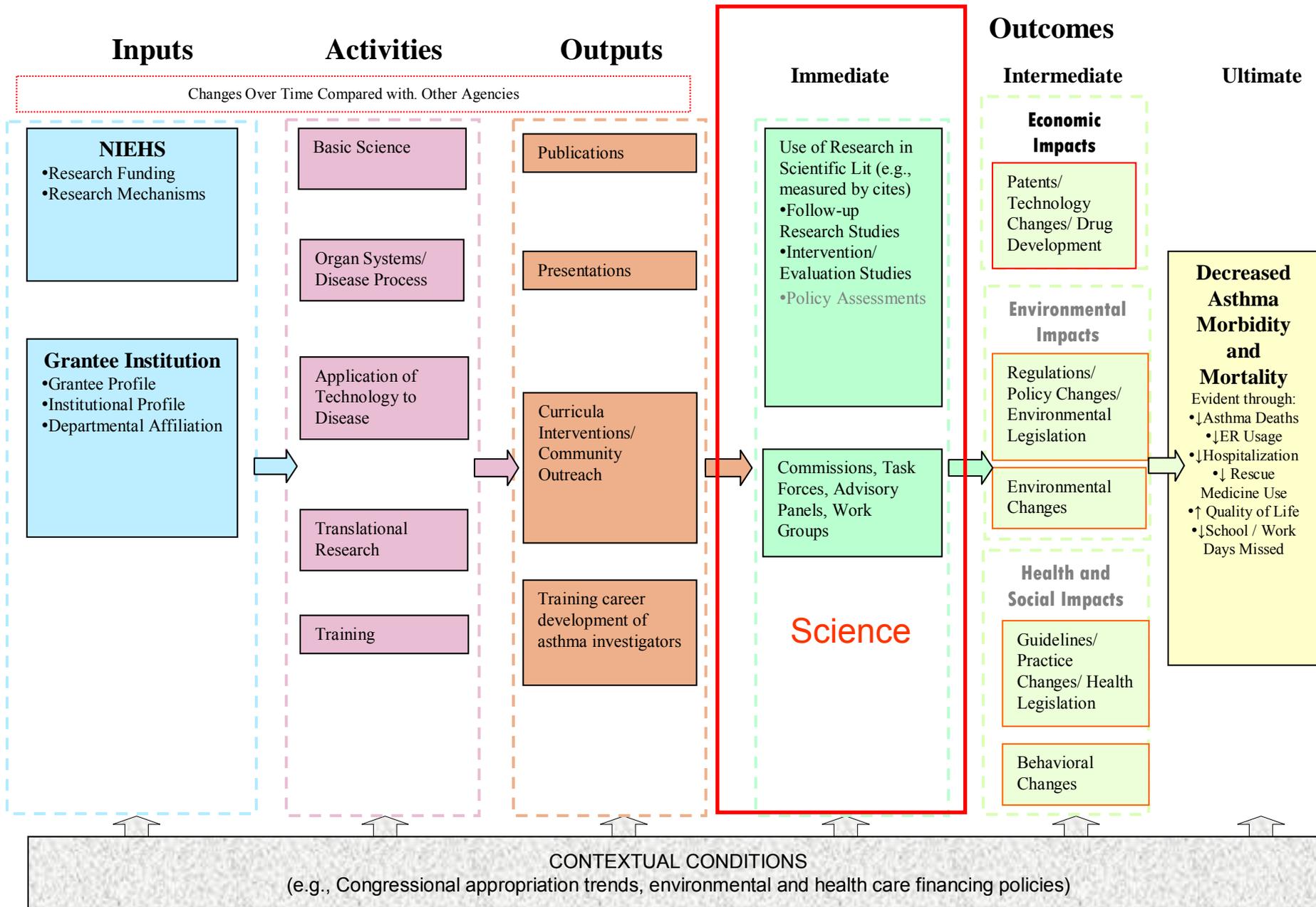
Agency NIEHS

1 of 2 100% Find | Next Select a format Export

## Curricula

Author	Year	Grantee	Curriculum
Columbia Center for Children's Environmental Health	2000	Columbia Center for Children's Environmental Health	The Health of Our Children in the Urban Environment: A Conference
Columbia Center for Children's Environmental Health	2000	Columbia Center for Children's Environmental Health	The Truth About Garbage: Don't Just Put a Lid on It!
American Lung Association of New York	2000	Columbia University Center for Environmental Health in Northern Manhattan COEP	Know Your Early Warning Signals for Asthma
Columbia Presbyterian Hospital	2000	Columbia University Center for Environmental Health in Northern Manhattan COEP	Mold
American Lung Association of New York	2000	Columbia University Center for Environmental Health in Northern Manhattan COEP	Can My Environment Affect My Asthma?
Columbia University Center for Environmental Health in Northern	2000	Columbia University Center for Environmental Health in Northern	Does Asthma Make You..

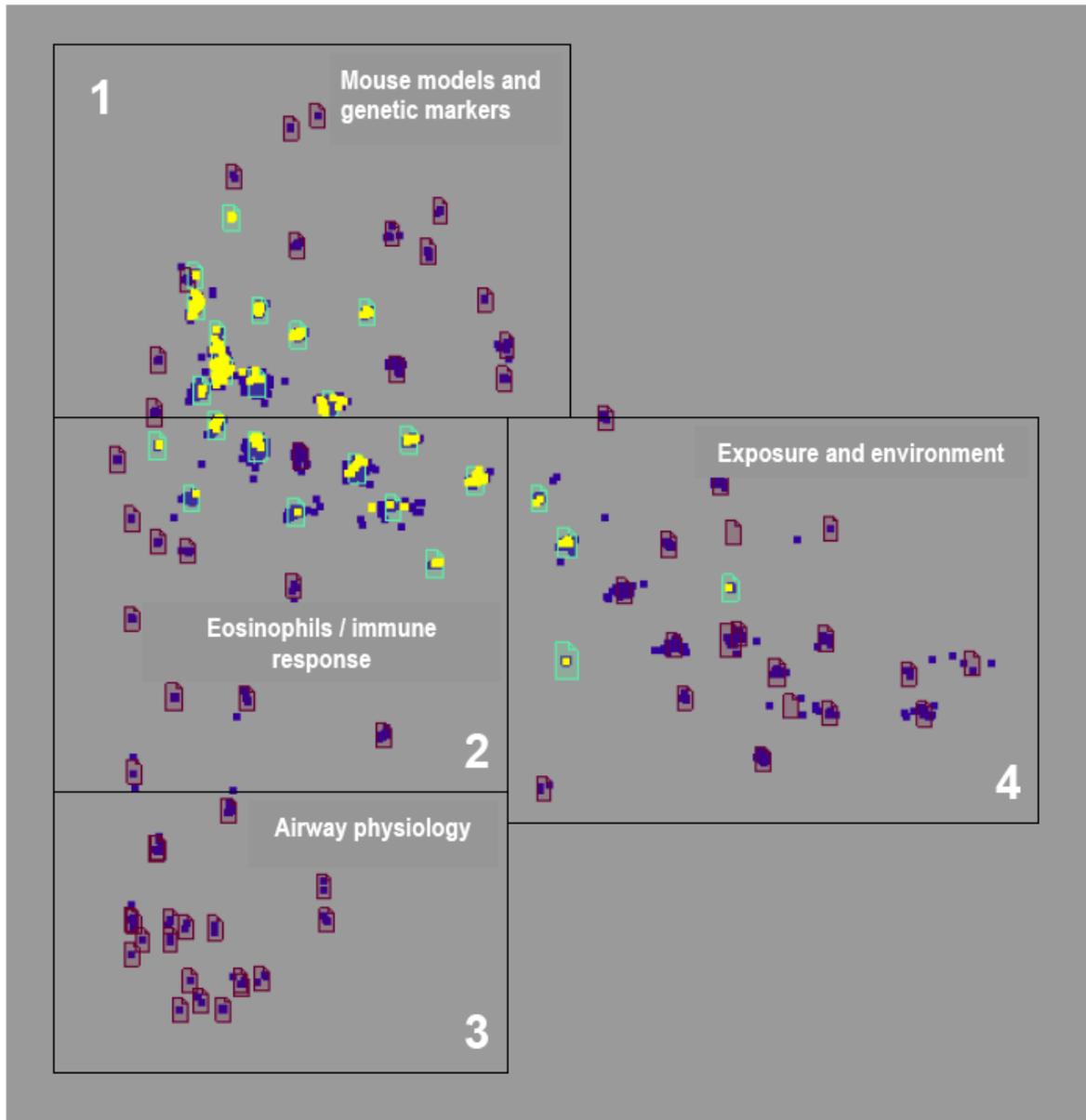
# Logic Model for Asthma Evaluation



# Immediate Outcomes

- Scientific Content of Publications
  - Genetics
  - Role of Environment in Asthma Susceptibility
- Intervention Studies
- Commissions & Task Forces

# Galaxy view of grants mentioning genes of interest\*



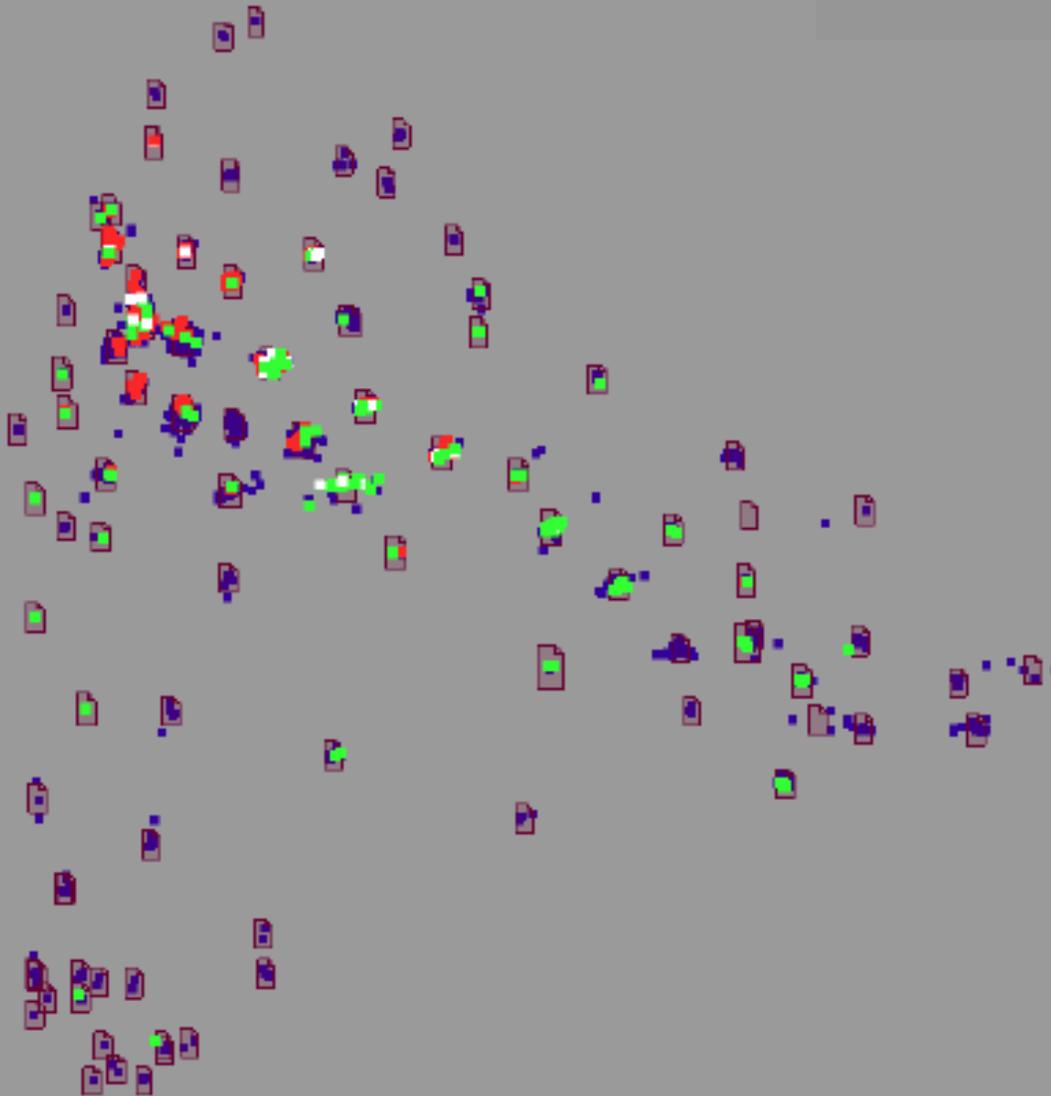
Ober and Hoffman (2006)\* reviewed studies that identify more than 70 genes reported to be associated with asthma phenotypes or susceptibility.

Yellow = any grant mentioning any of the 70 genes

Blue = Grants not mentioning any of the 70 genes

\*Genes of interest are highlighted in yellow

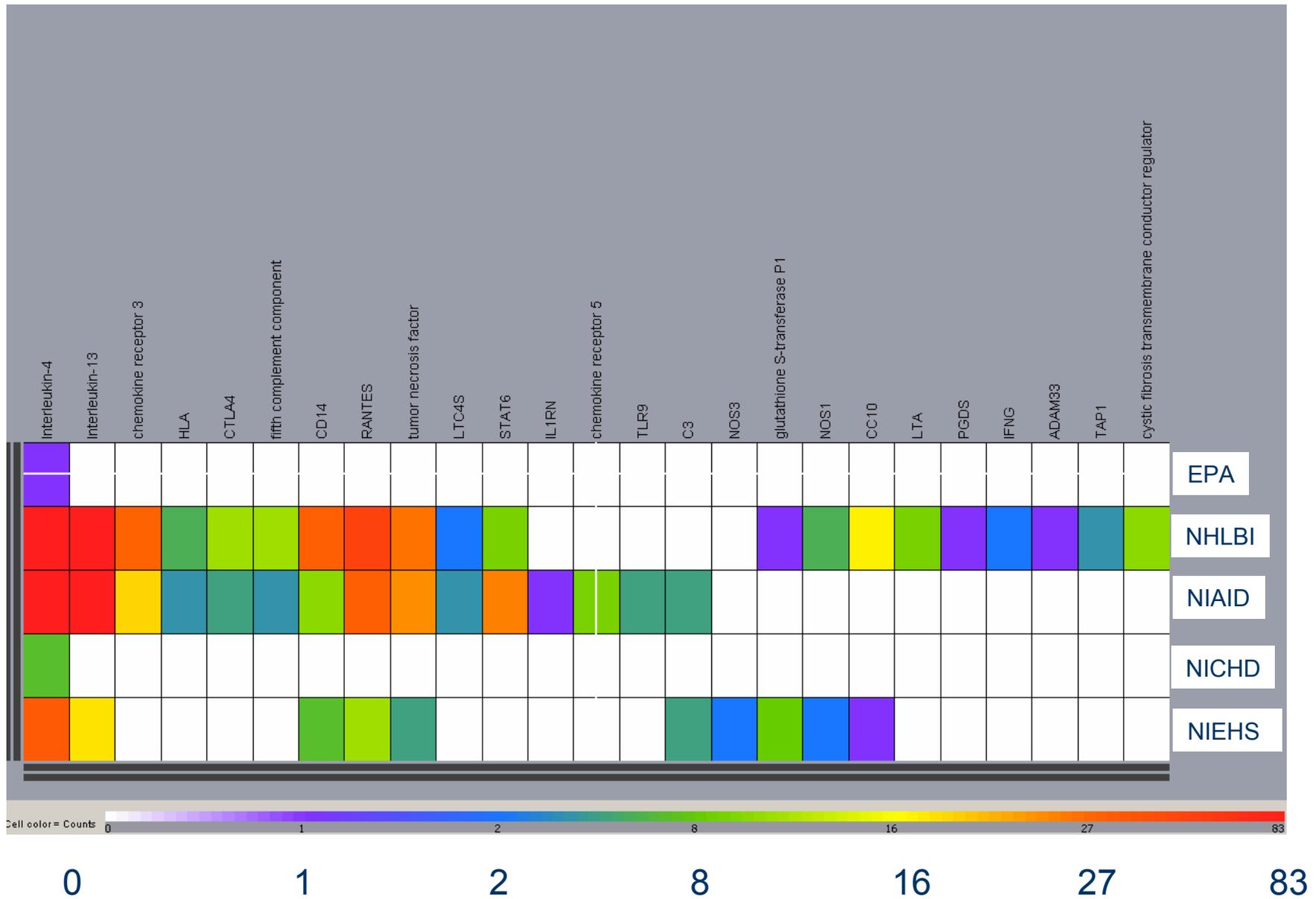
# Galaxy view of grants mentioning genes of interest\*



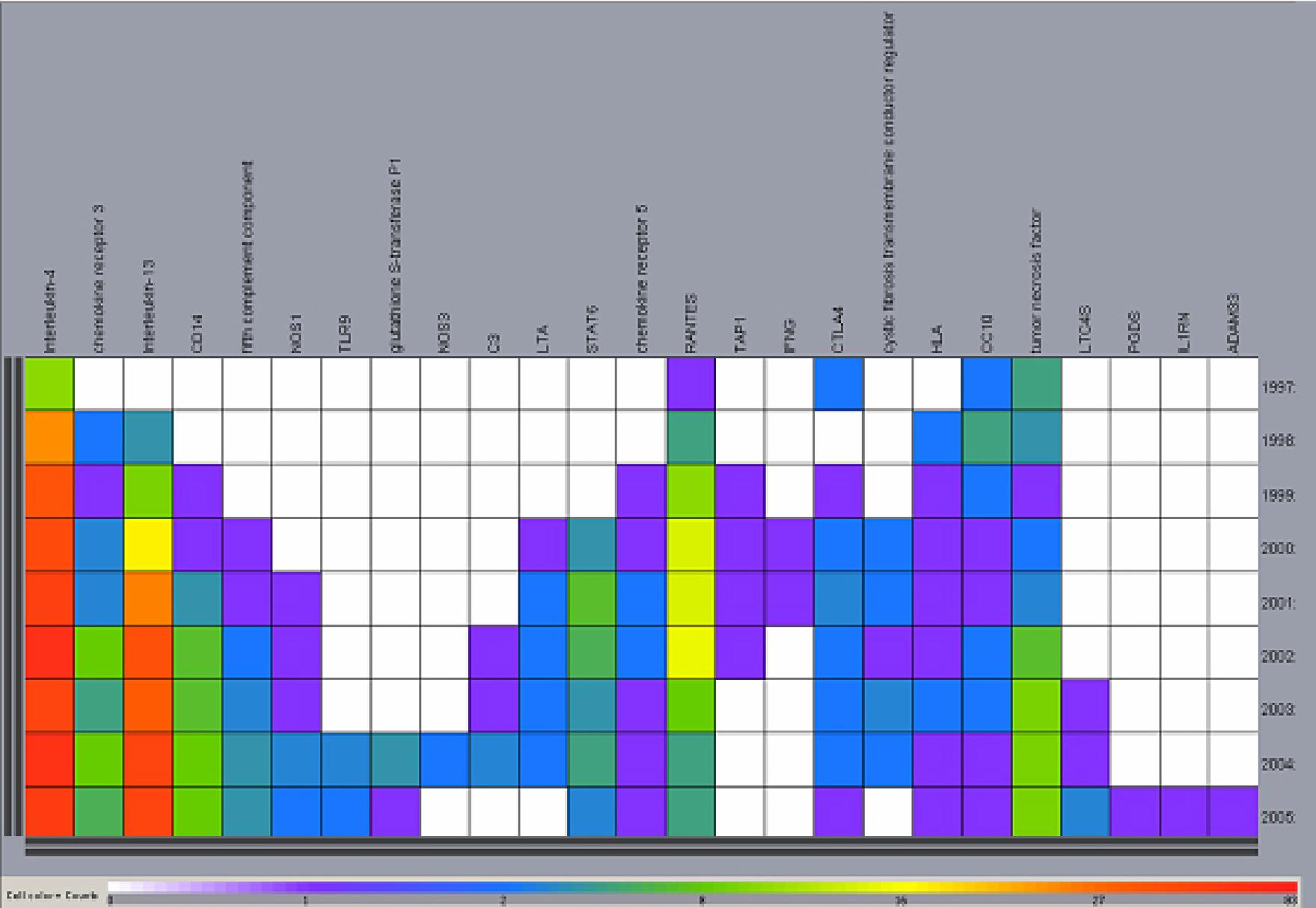
“NIEHS-sponsored genetic research is centrally situated among the research focusing on genetic predisposition to asthma susceptibility.”

Green = NIEHS grants  
Red = Mentions one of the 70 Genes  
White = Overlap (NIEHS and one of the 70 genes)

# Distribution of Genes of Interest Across Grants by Agency



# Distribution of Genes of Interest Across Grants by Budget Start Year

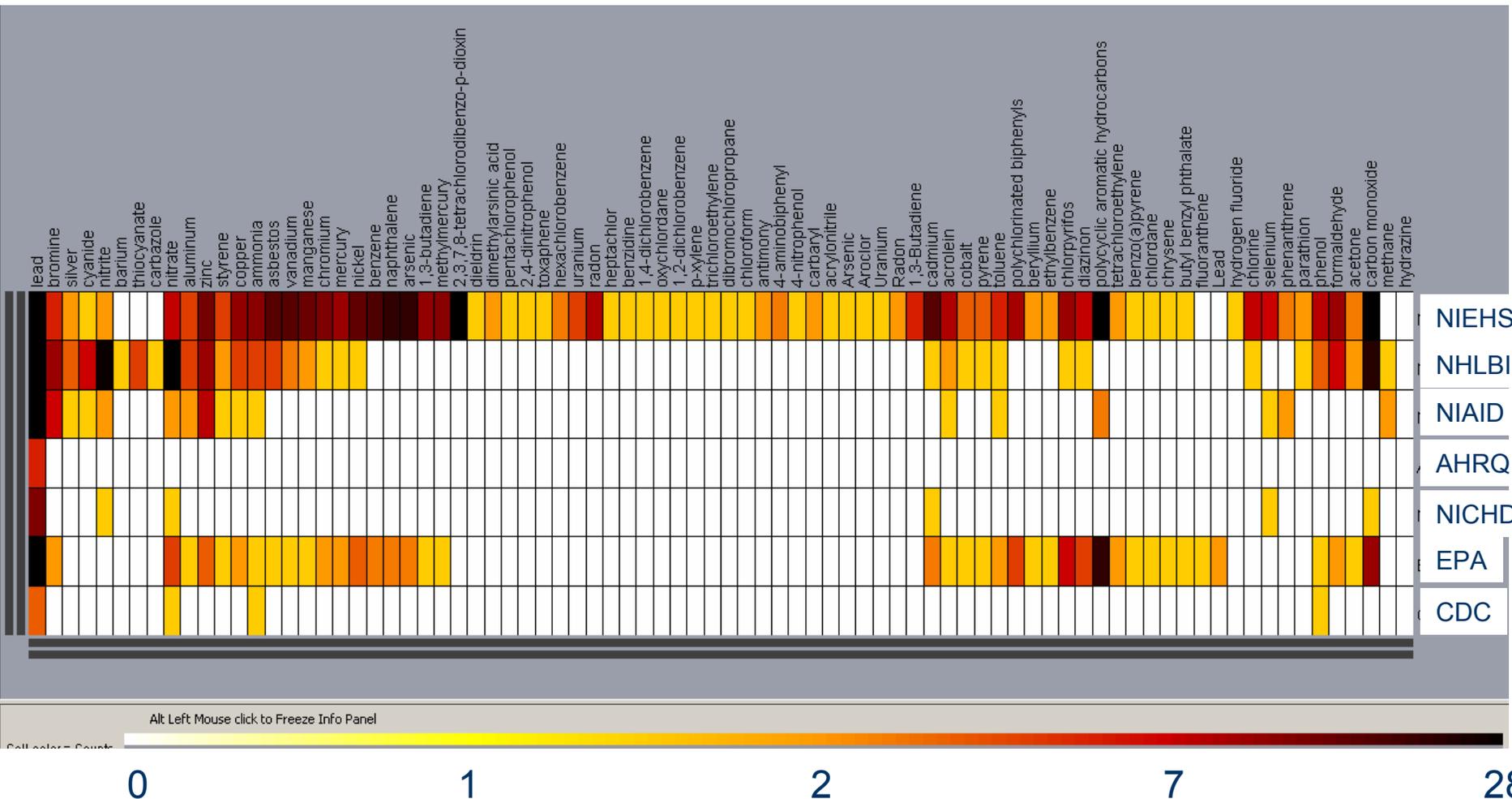


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# Immediate Outcomes: Role of the Environment in Asthma

- NIEHS research:
  - Linked asthma susceptibility to the combined effects of oxidant pollutants such as **diesel exhaust** particles (Gauderman et al 2005)
  - Showed asthmatic children are particularly **vulnerable to ozone** at levels that are considered safe for the general population (Gent et al. 2003)
  - Showed modest increases in **ambient ozone concentration** are associated with increases in **school absenteeism** (Gilliland et al. 2003)
  - Showed the role of **environmental tobacco smoke** and children's risk for the development of asthma = persuasive reason for investing in smoking cessation programs (Gilliland et al. 2002; Gilliland et al. 2003; Zhong et al. 2006; Biagini et al. 2006)
  - Established that exposures to **mold, dust mites, cockroaches** and household pets may increase the risk of asthma (Belanger et al. 2003; Celedon et al. 2002)
  - Identified public health importance of effective **rural models** for asthma diagnosis and management, as children with asthma living in rural areas commonly go without diagnosis; location of **elementary school near large livestock feedlots** (Chrischilles et al. 2004; Sigurdarson and Kline 2006)

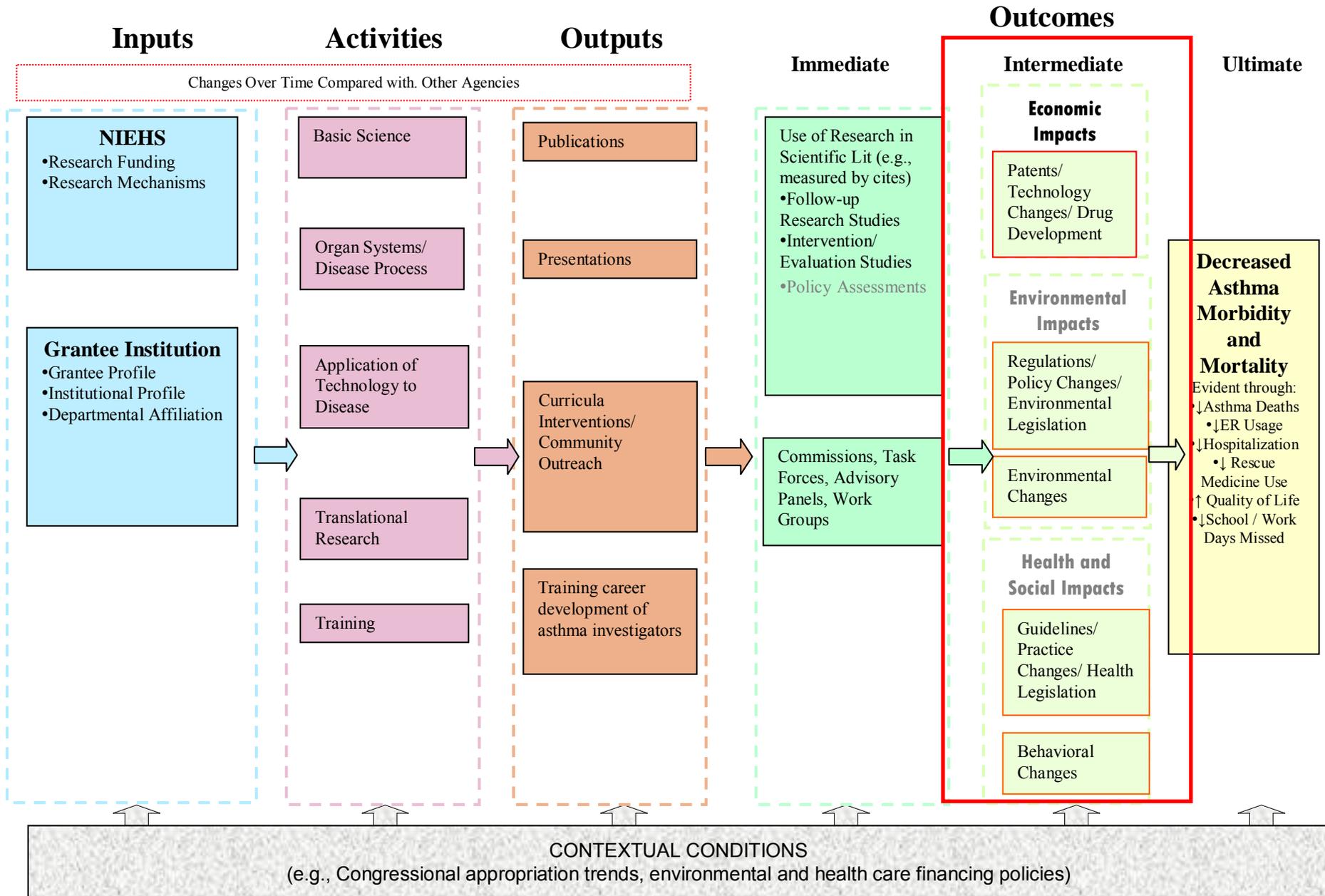
# Immediate Outcomes: Publications mentioning Toxicants by Agency



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# Logic Model for Asthma Evaluation



# Intermediate: Clinical Guideline Development

NIEHS, EPA, NIAID, and NHLBI each funded research that contributed to the development of clinical guidelines as evidenced through citations in the published guideline. (NIEHS contributed to NAEPP, occupational asthma, and algorithm for diagnosis and management of asthma)

NHLBI- and NIAID-funded research had the greatest impact on the development of a broad range of guidelines from the general management of asthma to specific clinical guidelines for providers.

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Home > [Asthma Reports](#) >

## 5 - Intermediate Outcomes

[Home](#) | [My Subscriptions](#) | [Help](#)

Search for:

[Contents](#) [Properties](#)

- [Air Pollution - Bad Air Days](#)  
Number of Days with Air Quality Index Values Greater than 100 at Trend Sites, 1990-2005
- [Air Pollution - Bad Ozone Days](#)  
Number of Days with Air Quality Index Values Greater than 100 at Trend Sites, 1990-2005, Ozone Only
- [Air Pollution MSA Trends](#)  
Air Quality Trends by City, 1990-2005
- [Drugs](#)  
Report - View Drugs

- [Guidelines](#)  
Report - View Guidelines
- [Legislation](#)  
Asthma-related Legislation data
- [Patents](#)  
Report - View Patents

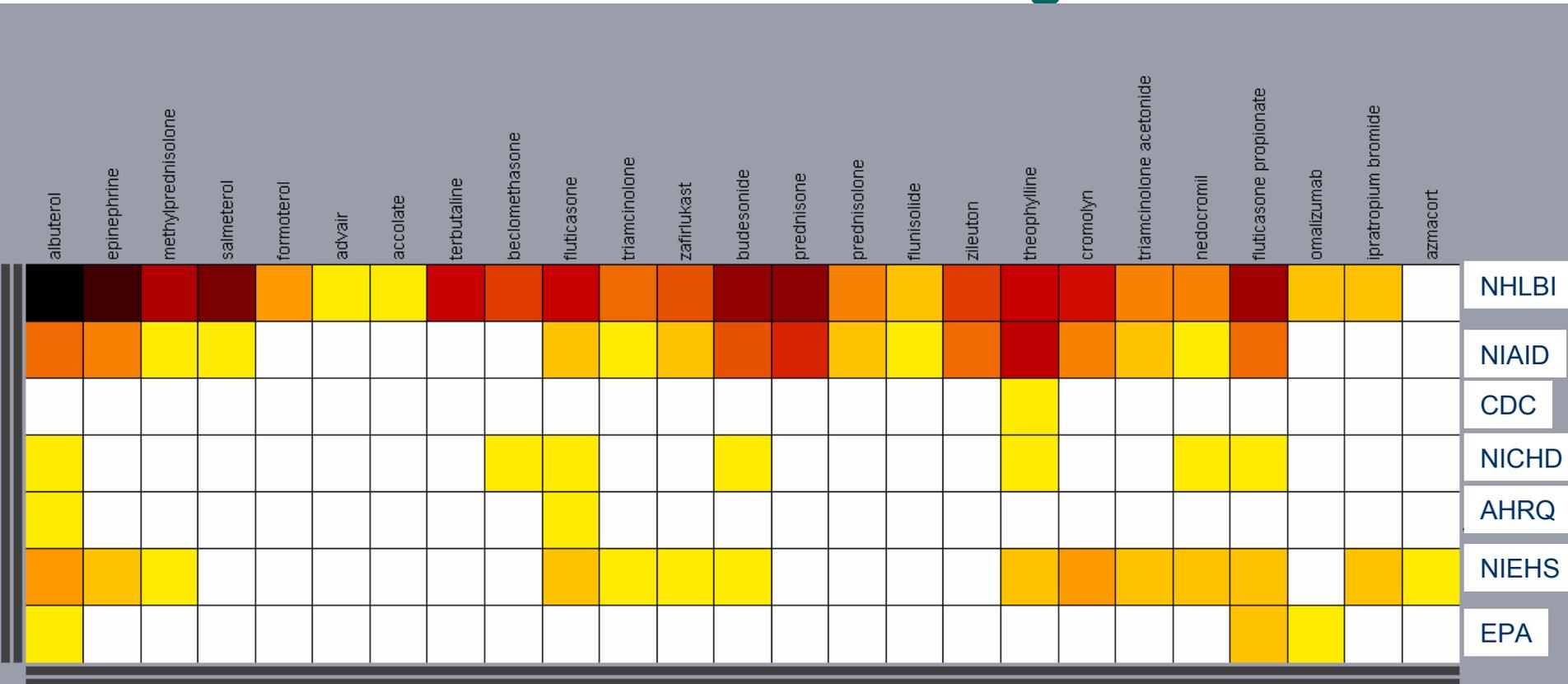
Items in 5 - Intermediate Outcomes

## Asthma-related clinical guidelines and agency sponsoring supporting research

Clinical guideline	Attribution?	NIEHS	NHLBI	NIAID	NICHD	CDC	AHRQ	EPA
NAEPP Guidelines for the Diagnosis and Management of Asthma (2002)		2	7	10				
Global Strategy for Asthma Management and Prevention (2005)			6	9				2
NAEPP: A practical summary for emergency physicians (1998)			1					
Attaining optimal asthma control: a practice parameter (2005)			5	2				
British guideline on the management of asthma (2003)			9	3				
Diagnosis and management of rhinitis (1998)			1	3				
Evidence based guidelines for the prevention, identification, and management of occupational asthma (2005)		2	2					
Managing asthma during pregnancy: recommendations for pharmacologic treatment (2005)			1	1				
Algorithm for the diagnosis and management of asthma: a practice parameter update (1998)		3	4	11				
Provider adherence to a clinical practice guideline for acute asthma in a pediatric emergency department (2001)			1					
Update on National Asthma Education and Prevention Program pediatric asthma treatment recommendations (2004)			2					
Disease management of atopic dermatitis: a practice parameter (1997)				1				
Practice parameters for the diagnosis and management of immunodeficiency (1996)				2				
Practice parameters for allergy diagnostic testing (1995)				3				
<b>Total</b>		<b>7</b>	<b>39</b>	<b>45</b>				<b>2</b>

# Intermediate Outcome – Technology Development

## Publications by Sponsoring Agency Concerning known Asthma Drugs



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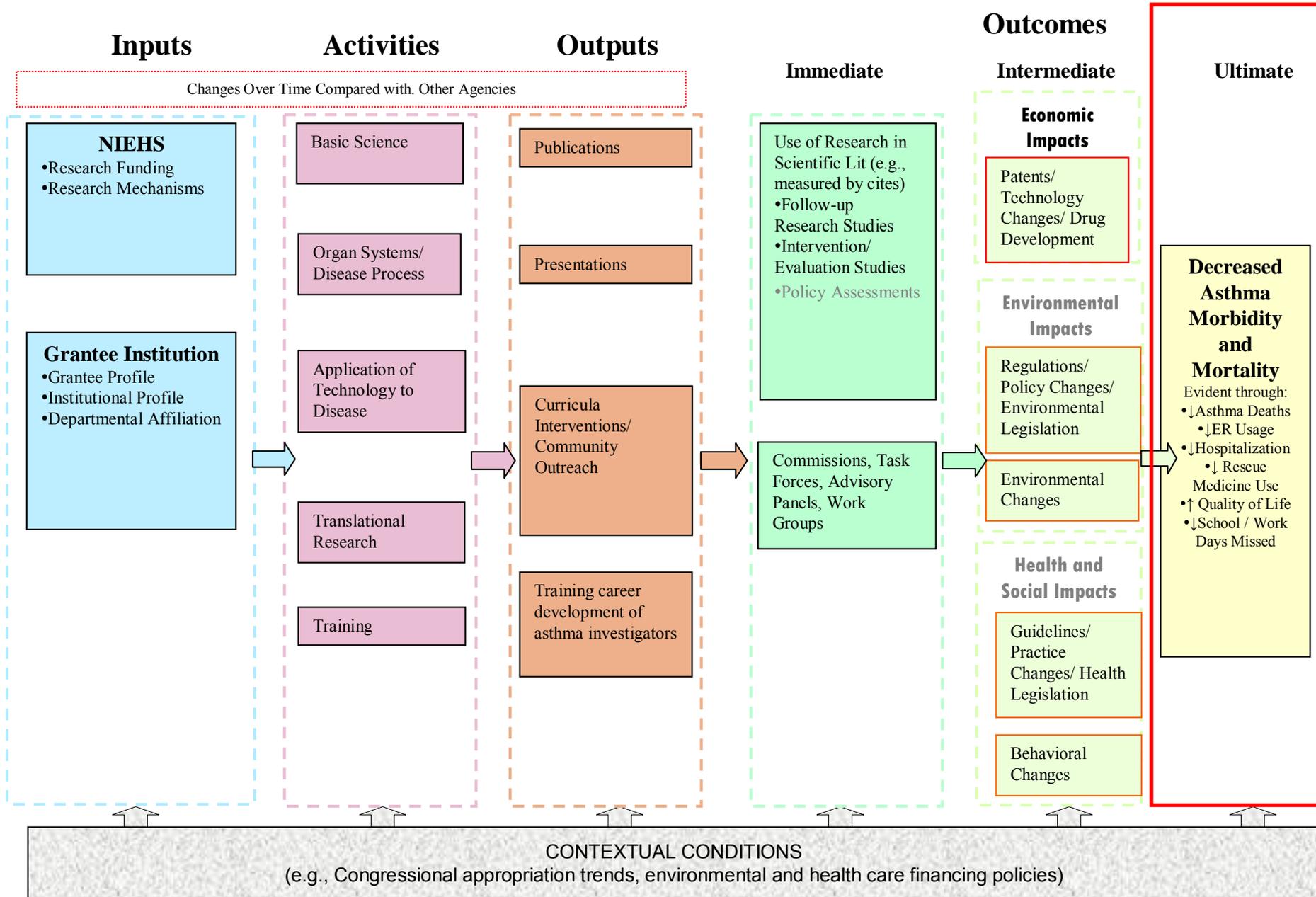
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36

# Intermediate Outcomes: Environmental Impacts

- Environmental Legislation
  - Library of Congress Thomas Legislative Database (<http://thomas.loc.gov/home/multicongress/multicongress.htm>).
  - National Conference of State Legislatures (NCSL) (<http://www.ncsl.org/programs/environ/air/airqualitydb.cfm>).
- Environmental Changes
  - Air Quality Index
  - US Environmental Protection Agency's Air Quality System (<http://www.epa.gov/air/data/aqsdb.html>).

# Logic Model for Asthma Evaluation



## 6.0 Ultimate outcomes

- Decreases in asthma mortality
- Decreases in emergency room utilization
- Decreases in hospitalization rates
- Decreases in rescue medicine use
- Decreases in activity limitations among persons with asthma
- Decrease number of school or work days missed by persons with asthma
  
- Statistics can be identified for ultimate outcomes, but it is nearly impossible to attribute these outcomes to individual agencies, grants or publications.

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[Home](#) > [Asthma Reports](#) >
**6 - Ultimate Outcomes**
[Contents](#) [Properties](#)

[Beta Agonist Usage \(Rescue Medication\)](#)

Distribution of people by age group who have used "rescue medicine" in the past 3 months (weighted), National Asthma Survey, 2004

[Emergency Department Usage Rates](#)

Estimated annual rate of emergency department visits for asthma as the first-listed diagnosis, by race, sex, and age group -- United States, National Hospital Ambulatory Medical Care Survey, 1992-2004

[Hospitalization Numbers](#)

Estimated average and annual number of hospitalizations for asthma as the first-listed diagnosis, by race, sex, and age group -- United States, National Hospital Discharge Survey, 1979-1994

[Hospitalization Rates](#)

Estimated average and annual rates of hospitalization the first-listed diagnosis, by race, sex, and age group -- United States, National Hospital Discharge Survey, 1979-2004

[Mortality Numbers](#)

Average and Annual number of deaths with asthma as the underlying cause of death diagnosis, by race, sex, and age group -- United States, Underlying Cause of Death dataset, 1972-2003

[Mortality Rates](#)

Average and Annual Rates of death with asthma as the underlying cause of death diagnosis, by race, sex, and age group -- United States, Underlying Cause of Death dataset, 1972-2003

[Number of Emergency Department Visits](#)

Estimated annual and average number of emergency department visits for asthma as the first-listed diagnosis, by race, sex, and age group - - United States, National Hospital Ambulatory Medical Care Survey, 1992-2004

[Number of Office Visits](#)

Estimated average number of office visits for asthma as the first-listed diagnosis, by race, sex, and age group -- United States, National Ambulatory Medical Care Survey, 1975-1995

[Office Visit Rates](#)

Estimated average rates\* of office visits for asthma as the first-listed diagnosis, by race, sex, and age group -- United States, National Ambulatory Medical Care Survey, 1975-1995

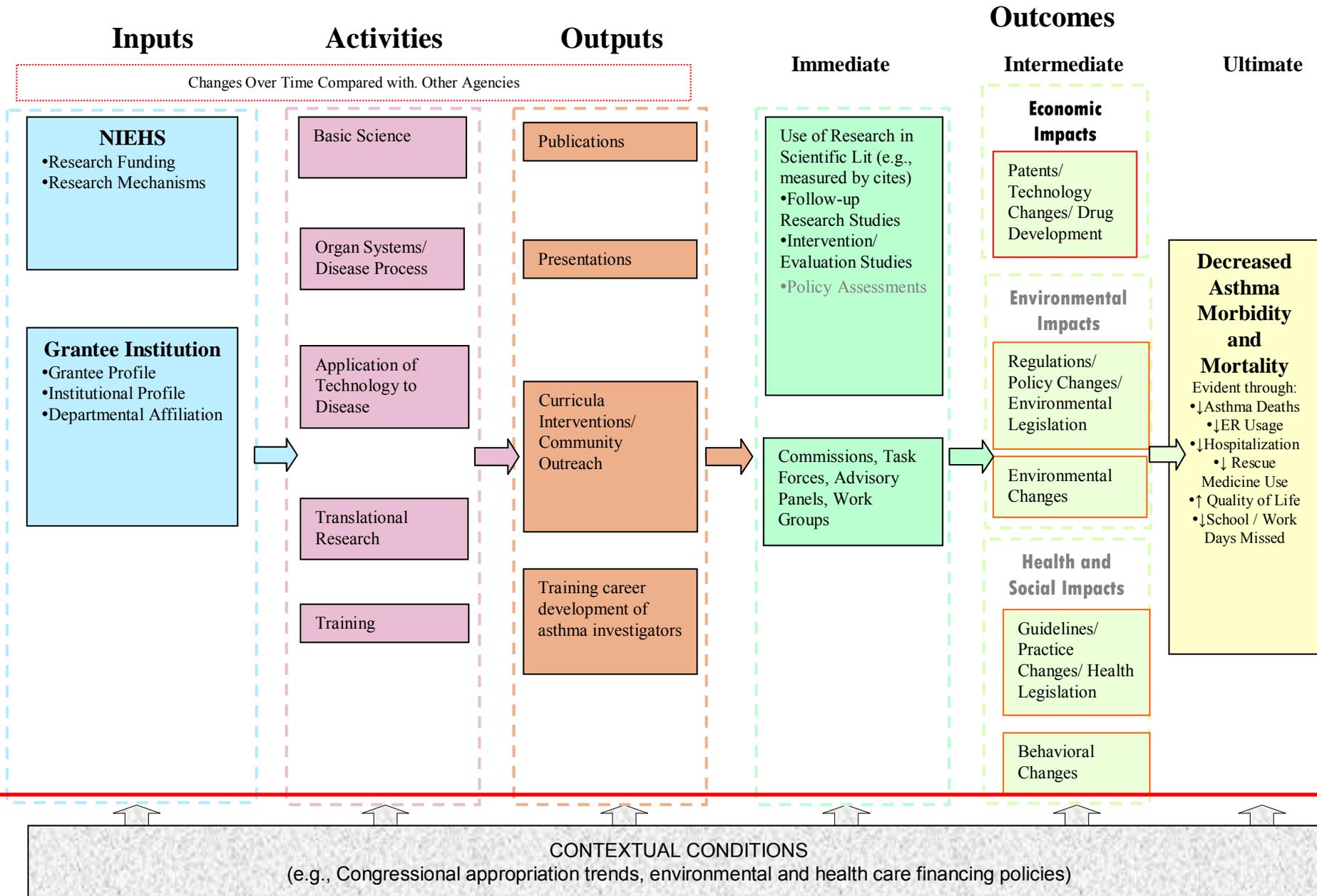
[Quality of Life](#)

Indicators of physical and mental health status among the population with asthma, 2001-2005 Centers for Disease Control, Behavioral Risk Factor Surveillance System, <http://www.cdc.gov/brfss/>

[School and Work Days Missed](#)

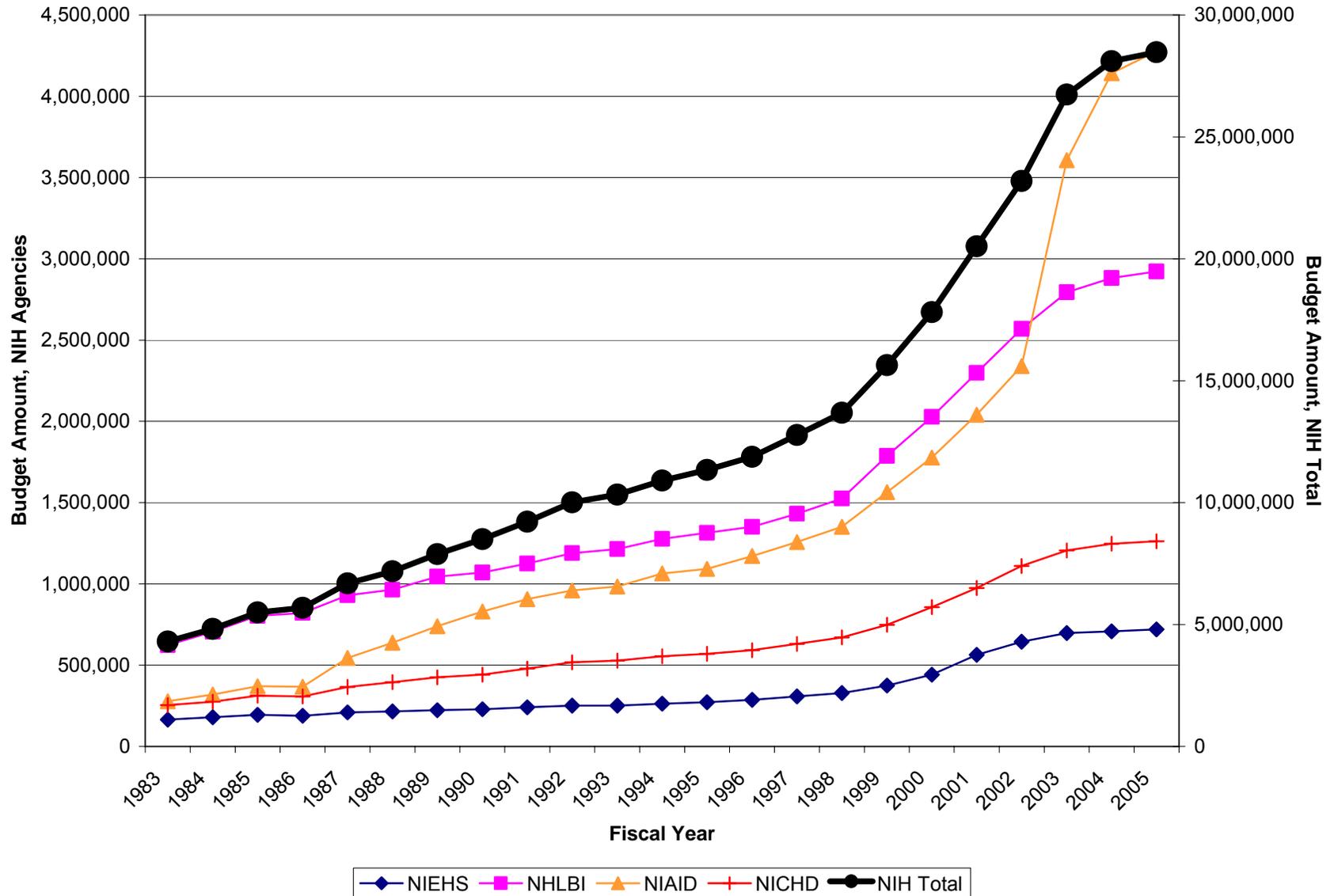
Estimated average annual number of school and work absence days related to asthma, percentage with  $\geq 1$  absence days in the previous 2 weeks, and activity limitation caused by asthma among children aged 5-17 years and adults aged  $\geq 18$  years with self-reported asthma during the preceding 12 months, National Health Interview Survey - United States, 1980-1996

# Logic Model for Asthma Evaluation



# NIH Budget by Benchmark IC, FY 1983-2005

## \$ in 000s



# Discussion

Evaluation model under-estimates NIEHS impact, because:

- Experts advising policy or regulatory institutions build on cumulative experience, not just one grant or publication
- Information on guidelines, interventions, legislation, regulations often leave out data links to underlying knowledge base

Environmental impacts could not be attributed to grant funding:

- Either it was infeasible to collect the data, OR
- Available data sources lacked information on publication sources or grants in order to make such a linkage
- Planned research with end users of such research (i.e., regulators, legislators) may help to fill this gap

## What are the other tasks in the contract?

- Work Assignment #3—Primary Data collection of end users of asthma data. Status: Underway. Pilot questionnaires are being tested with 9 members of various groups including asthma researchers, regulators, and congressional staff. OMB clearance is being sought for a large survey on NIEHS/NIH asthma researchers.

## What are the other tasks in the contract?

- **Work Assignment #4—Assessment of Endocrine Disruptor Research Portfolio**  
Status: Underway—Bibliometric analysis is nearing completion to benchmark the NIEHS ED portfolio. Will aid in setting priorities in relation to recent ED meeting.

# Next Steps

- Finish Work Assignments 3 and 4.
- Publish findings in peer reviewed journals.
- Explore options for better tracking NIEHS research into regulations.

# Acknowledgments:

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- Battelle Contractors –
  - Ed Liebow
  - Shyanika Rose
  - Jill Engel-Cox
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- DERT Planning Committee
- Expert Panel Members
- PAB Colleagues