Scientific and Public Health Impacts of the NIEHS Extramural Asthma Research Program from Existing Data

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Research Portfolio Evaluation

- Conventional bibliometric analysis, which assesses contributions to knowledge, may not be sufficient as a public health impact assessment tool

- An enlarged focus of "research impact assessment" is needed to measure accountability of research investment in terms of:

  – human health and environmental improvements
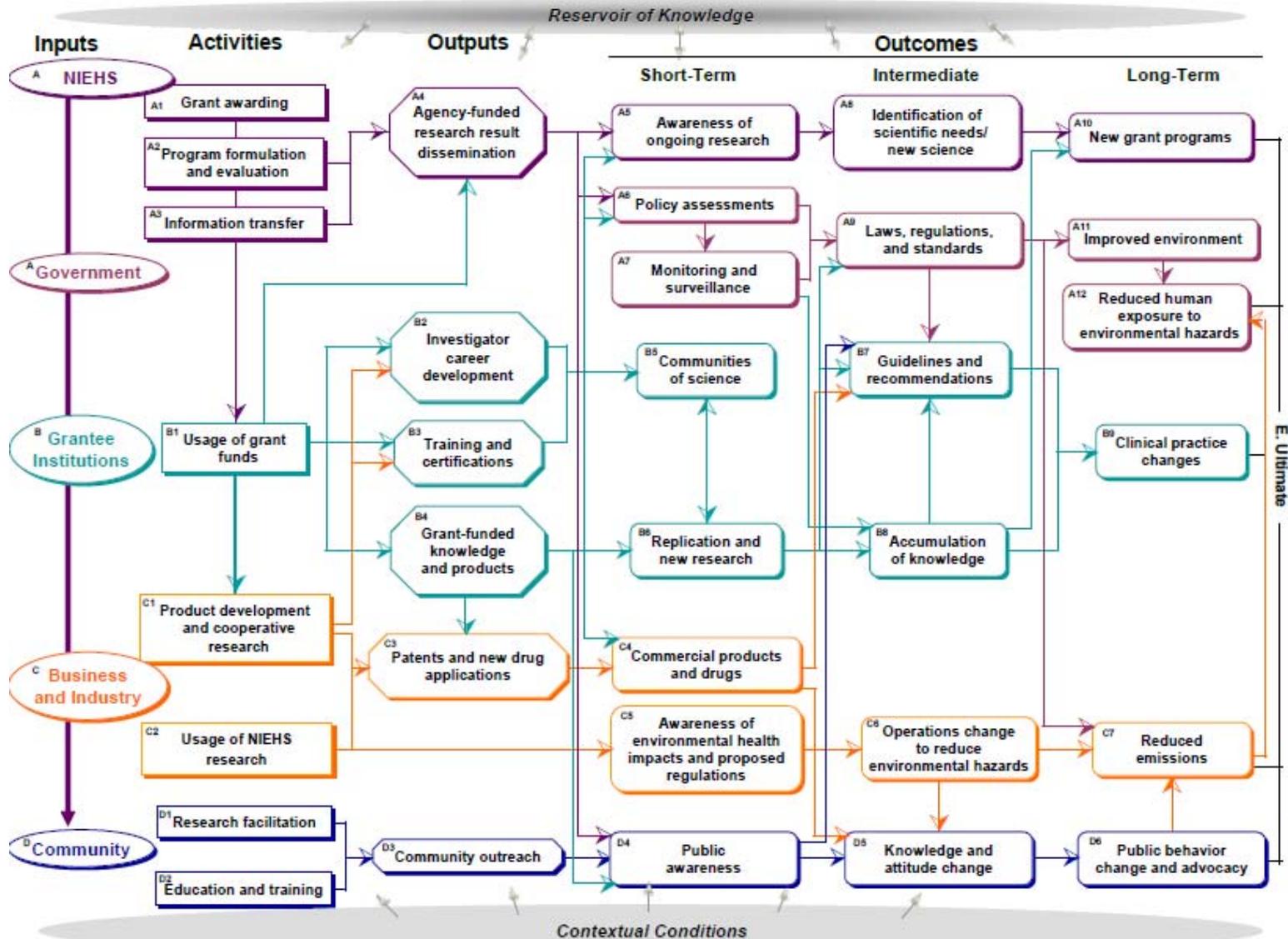
  – economic benefits

Evaluation Questions

- NIEHS Compared to Other Research Organizations

- Role of the Environment

- Gene – Environment Interactions

- Intervention Effectiveness

- Impact / Contribution to the Field
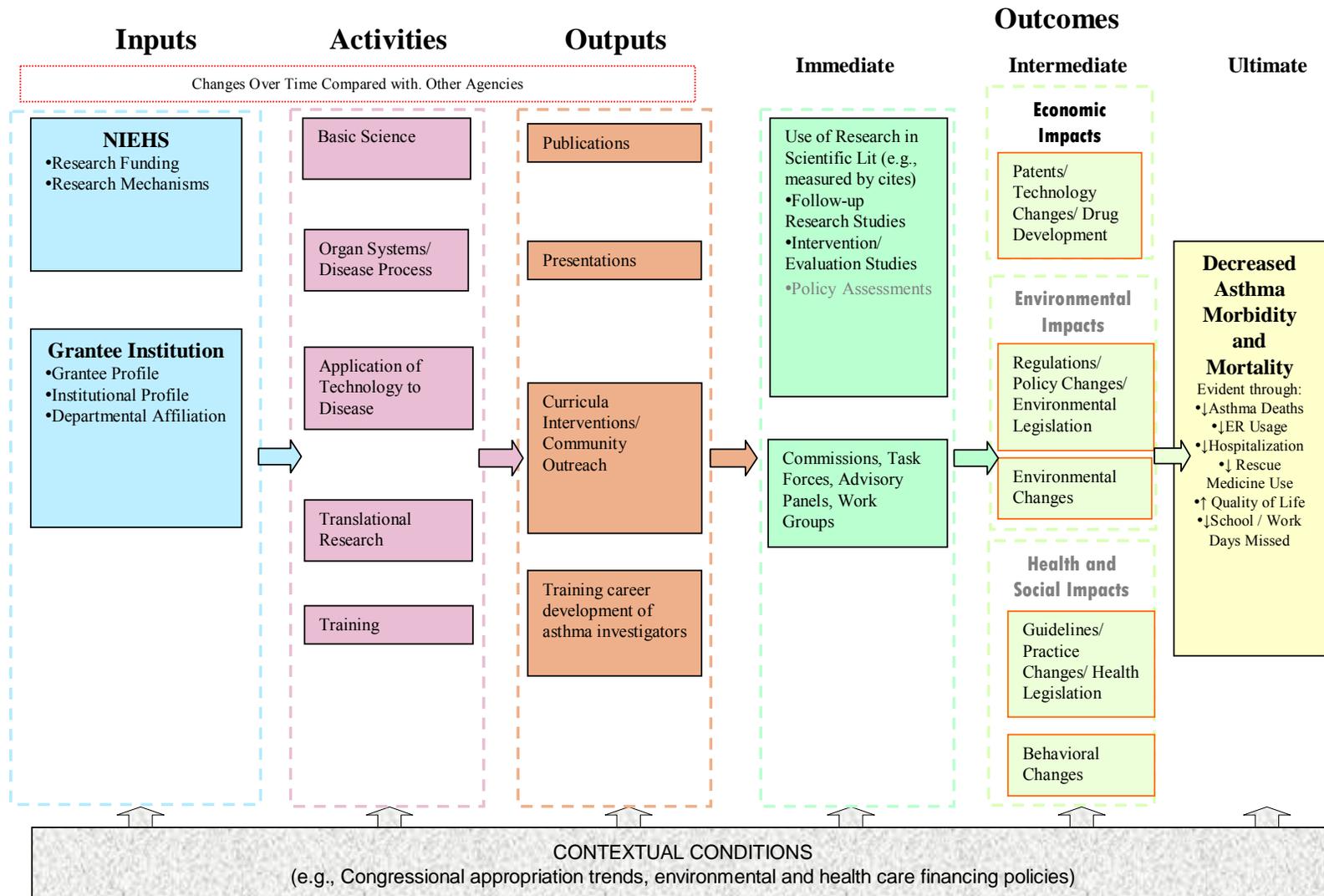
- Gaps / Future Directions

Asthma Portfolio Impact Evaluation Approach

- For quality and sustainability, indicator data should be:
  - Readily accessible to NIEHS staff;
  - Consistently organized over the assessment period;
  - Electronically available; and
  - Documented with respect to population covered, geographic area covered, and interval or frequency of collection.
- Logic model development adapted from one pathway in overall assessment scheme
- Feasibility test to assess data availability
- Subject matter expert review of logic model and feasibility results
- Revision / reduction of indicators based on feasibility results

Conceptual Model of Comprehensive Research Metrics for Improved Human Health and Environmental Quality

Engel-Cox JA, Van Houten B, Phelps J, Rose SW. Conceptual Model of Comprehensive Research Metrics for Improved Human Health and Environment. *Environmental Health Perspectives* 2008. 116(5):583-592 . http://www.ehponline.org/members/2008/10925/10925.pdf

NIEHS Extramural Asthma-Related Research Program Logic

Inputs

Activities

Outputs

Outcomes

Immediate | Intermediate | Ultimate

Changes Over Time Compared with. Other Agencies

NIEHS
- Research Funding
- Research Mechanisms

Grantee Institution
- Grantee Profile
- Institutional Profile
- Departmental Affiliation

Basic Science

Organ Systems/ Disease Process

Application of Technology to Disease

Translational Research

Training

Publications

Presentations

Curricula Interventions/ Community Outreach

Training career development of asthma investigators

Use of Research in Scientific Lit (e.g., measured by cites)
- Follow-up Research Studies
- Intervention/ Evaluation Studies
- Policy Assessments

Commissions, Task Forces, Advisory Panels, Work Groups

Economic Impacts

Patents/ Technology Changes/ Drug Development

Environmental Impacts

Regulations/ Policy Changes/ Environmental Legislation

Environmental Changes

Health and Social Impacts

Guidelines/ Practice Changes/ Health Legislation

Behavioral Changes

Decreased Asthma Morbidity and Mortality
Evident through:
- ↓Asthma Deaths
- ↓ER Usage
- ↓Hospitalization
- ↓ Rescue Medicine Use
- ↑ Quality of Life
- ↓School / Work Days Missed

CONTEXTUAL CONDITIONS
(e.g., Congressional appropriation trends, environmental and health care financing policies)

# Evaluation Findings

- ## Overall Contribution to the Field

  - NIEHS is the third largest source of asthma-related extramural research grant funding (after NHLBI and NIAID)

  - NIEHS support has led to key breakthroughs in scientific research concerning susceptibility to asthma, environmental conditions that heighten asthma symptoms, and cellular mechanisms that may be involved in treating asthma

  - NIEHS-sponsored work on the role of the environment has linked asthma susceptibility to the combined effects of oxidant pollutants, and also shown that asthmatic children are particularly vulnerable to ozone at levels that are considered safe for the general population.

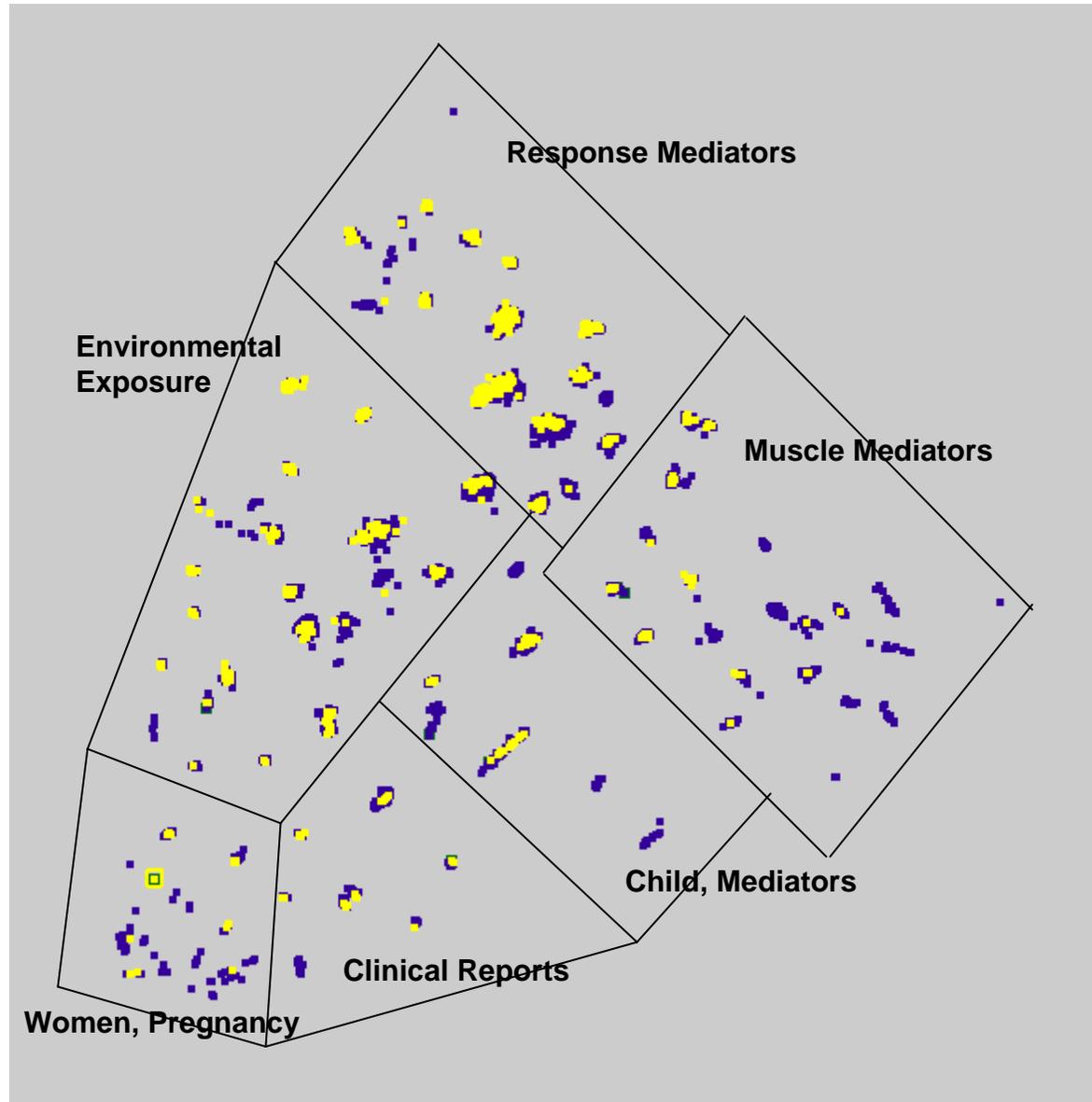# Number of NIEHS asthma-related grants by research mechanism, 1975-2005
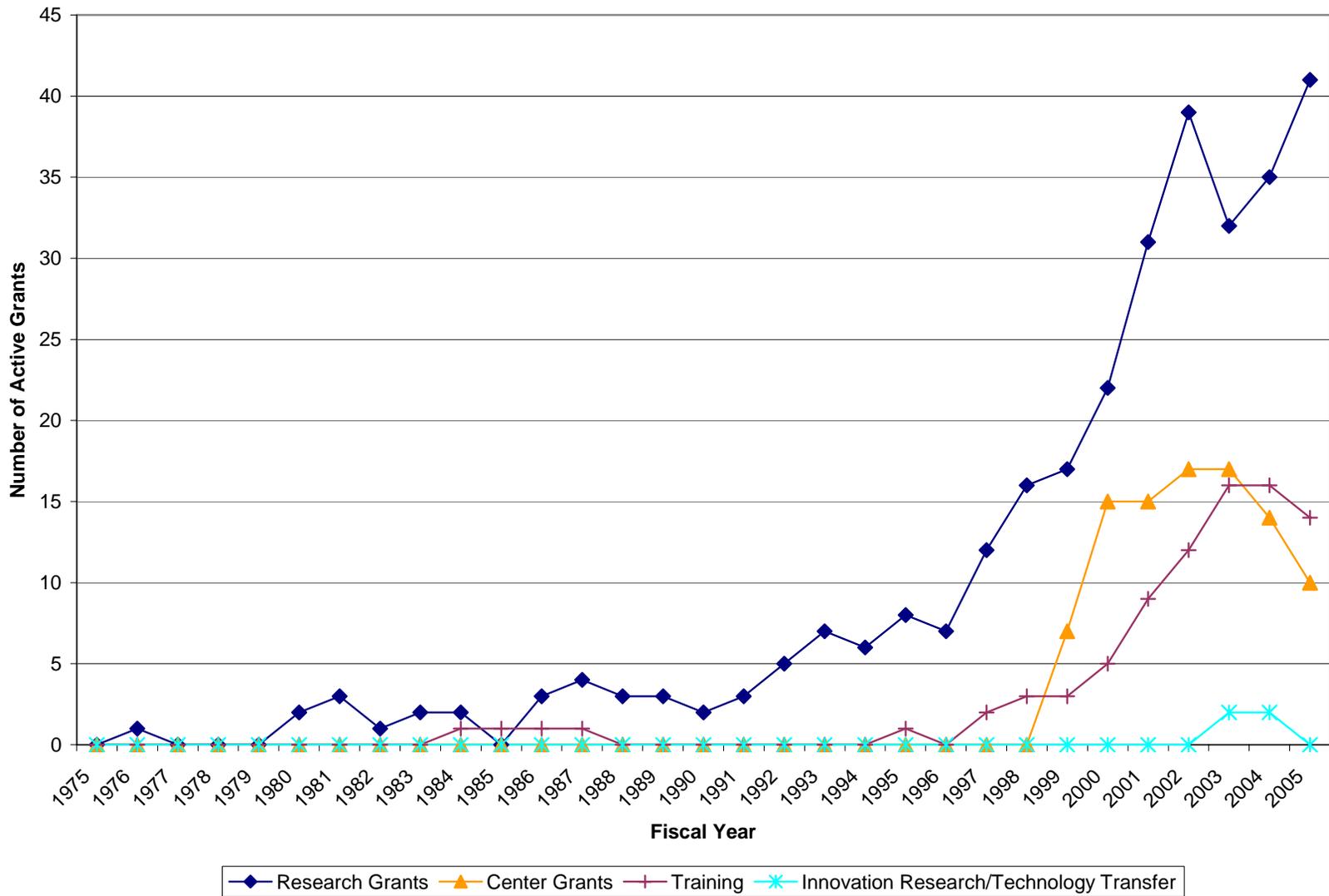
Asthma genes by funding agency, 1997-2005
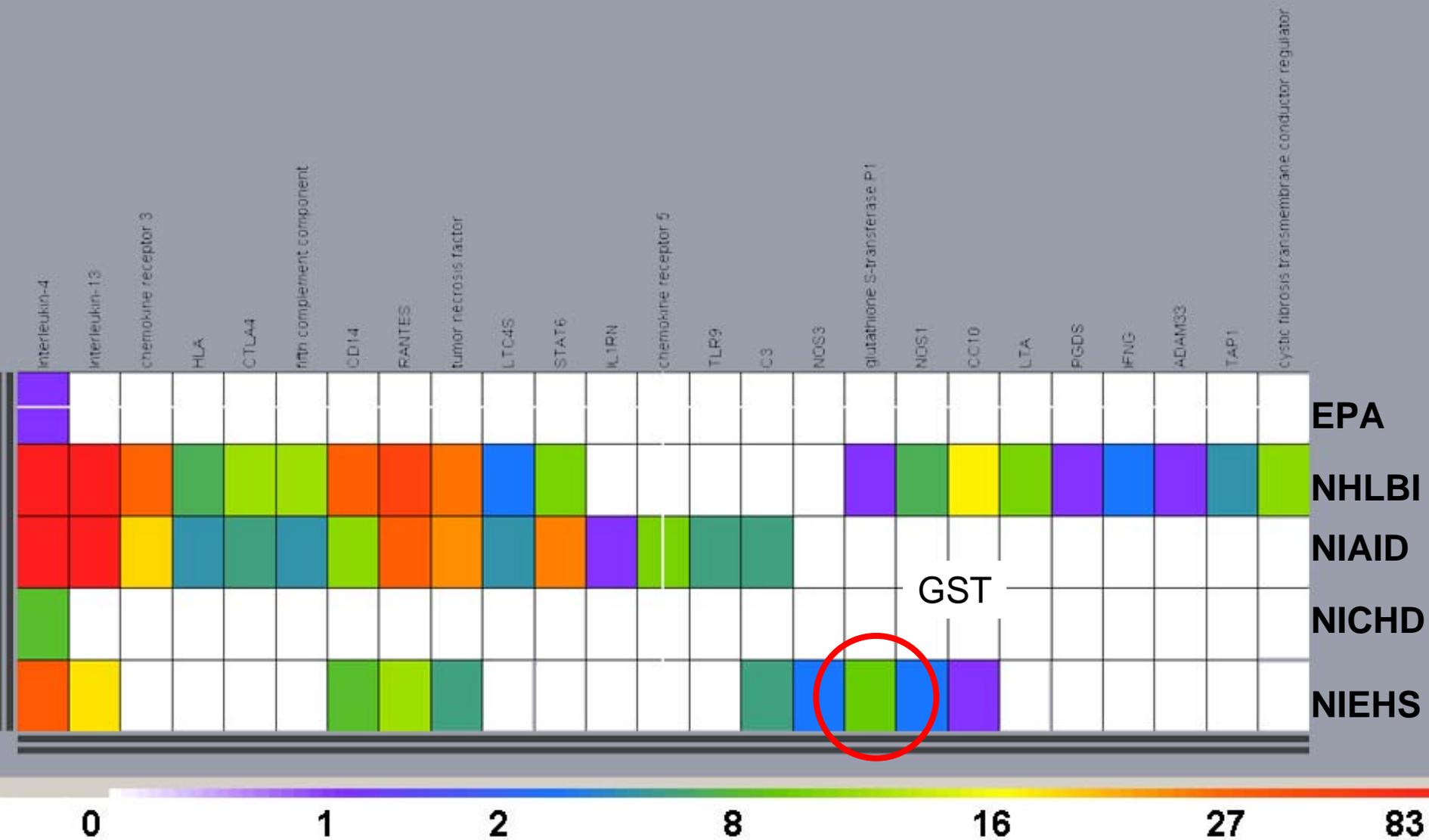
Cell color corresponds with number of grants citing these genes in titles or abstracts.
(COMET™ Map; OmniViz)

Asthma-related publications from NIEHS and comparison-agency sponsored research

Strengths of this approach

- Logic model framework helped us identify pathways from outputs to public health and environmental outcomes

- Combines readily available data with subject matter expertise for framing evaluation questions

- Data are increasingly available to address questions of impact beyond publications, and we have clearly identified the need for specific data structure improvements

Challenges

- Indicator data meeting our quality/sustainability criteria are generally available to support conventional bibliometric analyses, BUT

- Beyond publications, indicators of other activities, outputs and outcomes are not as well supported

- Conference papers and presentations, often a channel for early release of findings, rarely include publicly available information about funding sources

- Current and past Commission / Task Force membership is difficult to cross-reference with grant recipients

- Legislation almost never cites research findings

- The ultimate outcome measures are the least direct of all, and attribution to a particular research project or program will likely never be definitive.

Conclusions

- Bibliometric methods alone are insufficient to assess the broad range of public health contributions made possible by research funding.

- Contingency and serendipity in scientific discovery thwart attribution of public health improvements to a specific research grant award, but a portfolio analysis can point to the necessary and sufficient conditions under which such public health improvements are achieved.

- The call for increased transparency / accountability in federal science policy requires that we think strategically about modifications to current data structures to track expenditures and research results over time.

- Improved linkages between relevant databases (e.g., searchable patent and investigational new drug applications) will assist with attribution of near-term and intermediate outcomes to research funding.

Conclusions (cont.)

- More complete progress reporting will increase the likelihood that grant support will be properly acknowledged in publications and downstream clinical and public health applications.

- New content analysis tools coupled with visualization techniques show great promise in taking documents in diverse formats to highlight patterns over time and across narrowly-defined sub-specialty areas.

- We can now begin to ask questions such as:
  - How should DERT structure its funding portfolio to create the best chances to produce innovation?
  - How should investigators be made aware of ways in which their work can inform policies and environmental management regimes that, in turn, lead to public health improvements?
  - To create interdisciplinary synergies, what is the ideal portfolio blend of institutional depth and breadth of research investments?