

PI: Frank Gilliland

Grant Number:

P01ES009581

Grant Title: Children's Environmental Health Center

Background/Context:

At the inception of our Center in 1996, the issue of air pollution from the ports and goods movement was not a high priority for regulatory agencies, scientists, or even many community residents in Southern California. Over the course of the current grant cycle, issues around ports and goods movement in the region began to surface widely, as the volume of cargo containers handled at the Ports of Los Angeles and Long Beach has doubled since our Center's founding.

Center investigators became aware of the emerging situation in 2001 by listening to residents of port communities at our first NIEHS Town Meeting.

In response to local and community concerns elsewhere, the Center has sponsored two other large national conferences on this topic (in 2005 and 2007, with more than 900 attendees total)

COEC has become the leading academic and outreach organization in the country knowledgeable about EH impacts of international trade, ports and goods movement. The Center hosted a conference, "Moving Forward Together: A Conference on Global Trade, Health and the Environment" on October 2010.

Key Translational Milestones

- Bronchitis and bronchitic symptoms are associated with health issues for children with asthma
- Exposure to air pollution is associated with increased bronchitic symptoms among children with asthma
- Exposure to air pollution is associated with increased risk of asthma
- Exposure to air pollution is associated with lung function impairment in children
- Adverse effects of air pollution on the lungs in childhood can potentially have long-term effects: lung function lower than the predicted value for a healthy adult is associated with an increased risk of cardiovascular disease and increased mortality rate
- Levels of ambient air pollution in Southern California may be associated with effects on schoolchildren's respiratory morbidity
- Decreases in air pollution levels were associated with reductions in bronchitic symptoms among kids with and without asthma
- California rules that particulate matter is a toxic air contaminant in the Report on Diesel Exhaust
- Ports of LA and Long Beach approve new law to improve health risks: Clean Air Action Plan
- Improved air quality in southern California is associated with statistically and clinically significant improvements in childhood lung-function growth
- Improved air quality in southern California is associated with statistically and clinically significant improvements in childhood lung-function growth
- Executive order on freight setting targets for zero emissions technologies and strategies
- EPA finalized new national ambient air quality standards for ozone, reducing primary and secondary ozone standard levels to 0.070 parts per million (ppm), down from 0.075 from 2008-20015 and a high of .12 from 1979 to 1993

Starting Point Description:

- Bronchitis and bronchitic symptoms are associated with health issues for children with asthma

Fundamental Science Interactions Ring:

Driver: Identification

Experimental Setting: Population

Organism: Human

Timeframe: Late 1980s to mid 2000s

Collaborators:

- Department of Preventive Medicine, University of Southern California School of Medicine
- Department of Environmental Health, Harvard School of Public Health
- Lots of International Departments of Health and Environmental Science

Citations:

McConnell R, Berhane K, Gilliland F, et al. Prospective study of air pollution and bronchitic symptoms in children with asthma. *Am J Respir Crit Care Med.* 2003;168(7):790-797.

Aalto P, Hämeri K, Paatero P, et al. Aerosol particle number concentration measurements in five European cities using TSI-3022 condensation particle counter over a three-year period during health effects of air pollution on susceptible subpopulations. *J Air Waste Manag Assoc.* 2005;55(8):1064-1076.

Heinrich J, Hoelscher B, Wichmann HE. Decline of ambient air pollution and respiratory symptoms in children. *Am J Respir Crit Care Med.* 2000;161(6):1930-1936.

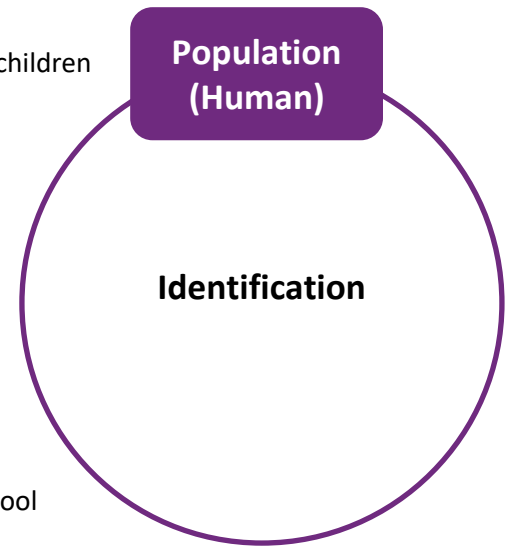
Dockery DW, Cunningham J, Damokosh AI, et al. Health effects of acid aerosols on North American children: respiratory symptoms. *Environ Health Perspect.* 1996;104(5):500-505.

Dockery DW, Speizer FE, Stram DO, Ware JH, Spengler JD, Ferris BG Jr. Effects of inhalable particles on respiratory health of children. *Am Rev Respir Dis.* 1989;139(3):587-594.

Braun-Fahrländer C, Vuille JC, Sennhauser FH, et al. SCARPOL Team. Swiss Study on Childhood Allergy and Respiratory Symptoms with Respect to Air Pollution, Climate and Pollen. Respiratory health and long-term exposure to air pollutants in Swiss schoolchildren. *Am J Respir Crit Care Med.* 1997;155(3):1042-1049.

McConnell R, Berhane K, Gilliland F, et al. Air pollution and bronchitic symptoms in Southern California children with asthma. *Environ Health Perspect.* 1999;107(9):757-760.

Jedrychowski W, Flak E. Effects of air quality on chronic respiratory symptoms adjusted for allergy among preadolescent children. *Eur Respir J.* 1998;11(6):1312-1318



Translational Narrative:

What led to the next step?

How did the idea evolve?

Who was involved?

What needed to happen (collaborations, tools, technologies, serendipity) to cross the translational bridge?

How did you know what to do next?

TRANSLATIONAL MILESTONE 2

Translational Research Description:

- Exposure to air pollution is associated with increased bronchitic symptoms among children with asthma

Fundamental Science Interactions Ring:

Driver: Observation

Experimental Setting: Population

Organism: Human

Timeframe: 2006-2008

Collaborators:

- Department of Preventive Medicine, University of Southern California School of Medicine
- Department of Environmental Health, Harvard School of Public Health

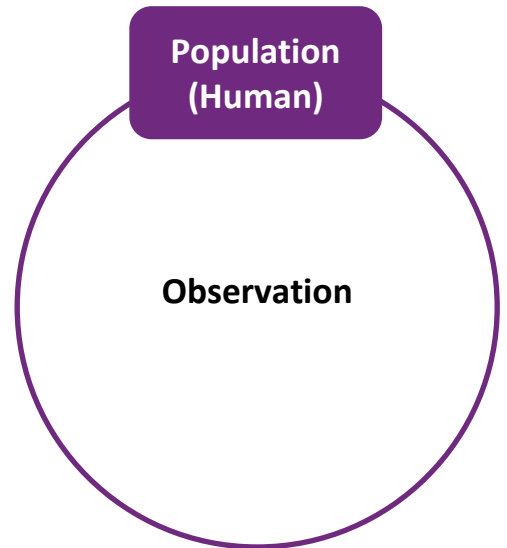
Citations:

McConnell R, Berhane K, Gilliland F, et al. Prospective study of air pollution and bronchitic symptoms in children with asthma. *Am J Respir Crit Care Med.* 2003;168(7):790-797.

Dockery DW, Speizer FE, Stram DO, Ware JH, Spengler JD, Ferris BG Jr. Effects of inhalable particles on respiratory health of children. *Am Rev Respir Dis.* 1989;139(3):587-594.

McConnell R, Berhane K, Molitor J, et al. Dog ownership enhances symptomatic responses to air pollution in children with asthma. *Environ Health Perspect.* 2006;114(12):1910-1915.

Dockery DW, Pope CA III. Acute respiratory effects of particulate air pollution. *Annu Rev Public Health.* 1994;15:107-132.



TRANSLATIONAL MILESTONE 3

Translational Research Description:

- Exposure to air pollution is associated with increased risk of asthma

Fundamental Science Interactions Ring:

Driver: Observation

Experimental Setting: Population

Organism: Human

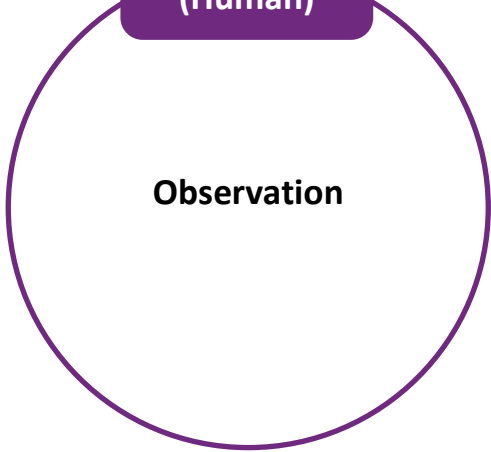
Timeframe: Late 1990s to mid 2000s

Collaborators:

- Department of Preventive Medicine, University of Southern California School of Medicine

Citations:

Population
(Human)



TRANSLATIONAL MILESTONE 4

Translational Research Description:

- Exposure to air pollution is associated with lung function impairment in children

Fundamental Science Interactions Ring:

Driver: Observation

Experimental Setting: Population

Organism: Human

Timeframe: ? to 2015

Collaborators:

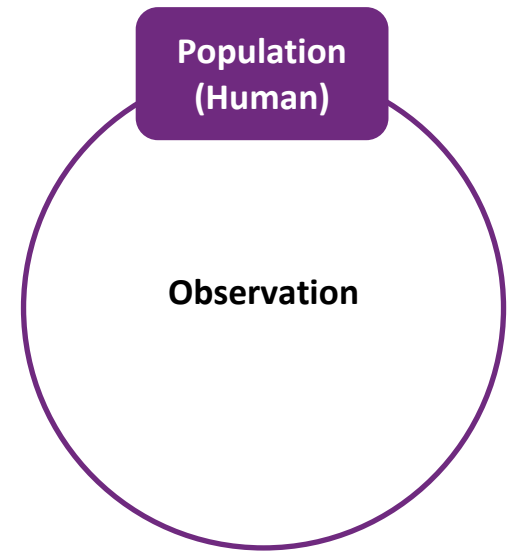
- Department of Environmental Health, Biomedical Research Center, School of Medicine, University of Coahuila, Torreón, Coahuila, Mexico

Citations:

<http://usceh.blogspot.com/p/infographic-living-near-diesel-exhaust.html>

<http://www.ncbi.nlm.nih.gov/pubmed/?cmd=historysearch&querykey=1>

Recio-Vega R et al. 2015. In utero and early childhood exposure to arsenic decreases lung function in children. *J Appl Toxicol.* 2015 Apr;35(4):358-66. doi: 10.1002/jat.3023.



TRANSLATIONAL MILESTONE 5

Translational Research Description:

- Adverse effects of air pollution on the lungs in childhood can potentially have long-term effects: lung function lower than the predicted value for a healthy adult is associated with an increased risk of cardiovascular disease and increased mortality rate

Fundamental Science Interactions Ring:

Driver: Observation

Experimental Setting: Population

Organism: Human

Timeframe: Late 1990s to 2011

Collaborators:

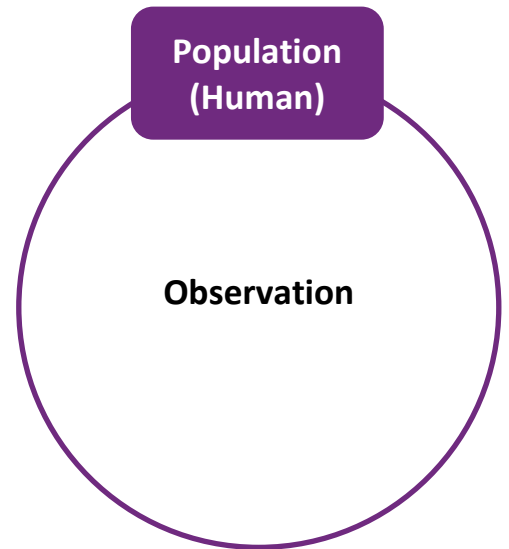
- Department of Medicine, Emory University
- Department of Medicine, Respiratory Division, University of British Columbia
- The James Hogg iCAPTURE Center for Cardiovascular and Pulmonary Research, St. Paul's Hospital, Vancouver, BC
- West Australia Sleep Disorders Research Institute, Queen Elizabeth II Medical Centre, School of Medicine and Pharmacology
- University of Western Australia Centre for Medical Research, University of Western Australia
- Laboratory for Genetic Epidemiology, Western Australian Institute for Medical Research
- Department of Respiratory Medicine, Sir Charles Gairdner Hospital, Nedlands, Australia

Citations:

Georgiopoulou VV, Kalogeropoulos AP, Psaty BM, et al. Lung function and risk for heart failure among older adults: the Health ABC Study. *Am J Med* 2011;124:334-341

Sin DD, Wu L, Man SF. The relationship between reduced lung function and cardiovascular mortality: a population-based study and a systematic review of the literature. *Chest* 2005;127:1952-1959

Ryan G, Knuiman MW, Divitini ML, James A, Musk AW, Bartholomew HC. Decline in lung function and mortality: the Busselton Health Study. *J Epidemiol Community Health* 1999;53:230-234



TRANSLATIONAL MILESTONE 6

Translational Research Description:

- Levels of ambient air pollution in Southern California may be associated with effects on schoolchildren's respiratory morbidity

Fundamental Science Interactions Ring:

Driver: Observation

Experimental Setting: Population

Organism: Human

Timeframe: Mid 1980s to Late 1990s

Collaborators:

- Department of Preventive Medicine, University of Southern California School of Medicine

Population
(Human)

Observation

Note – AIR SENSORS WERE SET UP IN 12 COMMUNITIES – NEED TO ASSESS WHETHER ANY TECHNOLOGY FINDINGS OR OUTPUTS TO REPORT

Citations:

Peters JM, Avol E, Navidi W, et al. A study of twelve Southern California communities with differing levels and types of air pollution, I: prevalence of respiratory morbidity. *Am J Respir Crit Care Med.* 1999;159(3):760-767.

Peters JM, Avol E, Gauderman WJ, et al. A study of twelve Southern California communities with differing levels and types of air pollution, II: effects on pulmonary function. *Am J Respir Crit Care Med.* 1999;159(3):768-775.



TRANSLATIONAL MILESTONE 7

Translational Research Description:

- Decreases in air pollution levels were associated with reductions in bronchitic symptoms among kids with and without asthma

Fundamental Science Interactions Ring:

Driver: Observation

Experimental Setting: Population

Organism: Human

Timeframe: 1993-2012

Collaborators:

- Department of Preventive Medicine, University of Southern California, Los Angeles, California
- Sonoma Technology Inc

Citations:

Berhane, K., Chih-Cheng, C., McCONNell, R. et al. (2016). Association of changes in air quality with bronchitic symptoms in children in California, 1993-2012. *Journal of the American Medical Association*, 314(14), 1491-1501. Doi:10.1001/jama.2016.3444.

Population
(Human)

Observation



TRANSLATIONAL MILESTONE 8

Translational Research Description:

- California rules that particulate matter is a toxic air contaminant in the Report on Diesel Exhaust

Practice Ring: State Policy

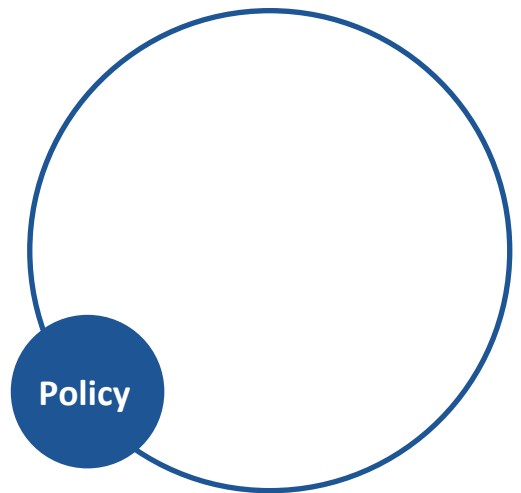
Timeframe: 1998

Collaborators:

- California EPA Air Resources Board

Source:

<http://www.arb.ca.gov/toxics/dieseltac/de-fnds.htm>



TRANSLATIONAL MILESTONE 9

Translational Research Description:

- Ports of LA and Long Beach approve new law to improve health risks: Clean Air Action Plan

Practice Ring: Regional Policy

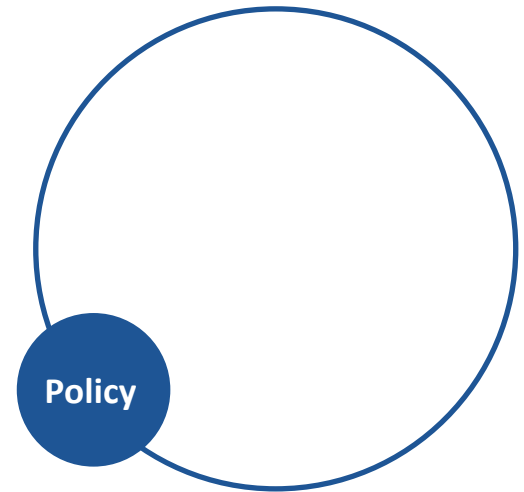
Timeframe: 2006

Collaborators:

- Port of Los Angeles and Long Beach
- USC COEC (Note: USC COEC was a key stakeholder responsible for implementation of the Clean Trucks Program at the Ports, which has significantly reduced diesel truck emissions.)

Source:

<http://www.cleanairactionplan.org/>



TRANSLATIONAL MILESTONE 10

Translational Research Description:

- Improved air quality in southern California is associated with statistically and clinically significant improvements in childhood lung-function growth

Health Impact Ring:

Change in Environmental Exposures

Change in Population Health Outcomes

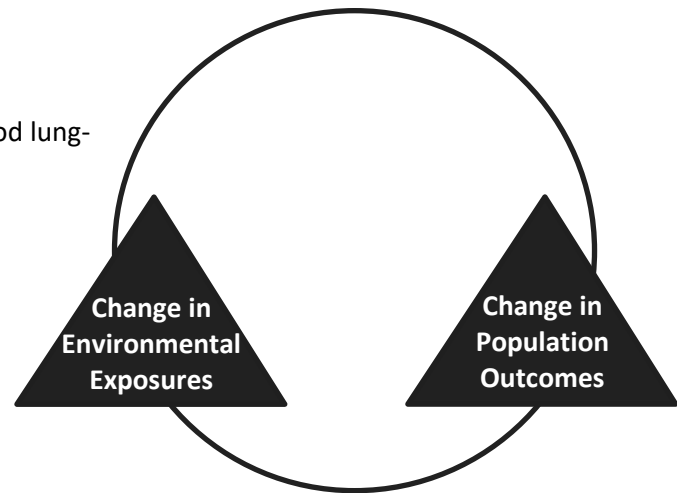
Timeframe: 1993-2012

Collaborators:

- Department of Preventive Medicine, University of Southern California, Los Angeles, California
- Sonoma Technology Inc

Source:

Gauderman, W. J., Urman, R., Avol, E. et al. (2015). Association of Improved Air Quality with Lung Development in Children. *New England Journal of Medicine*, 372:905-913, DOI: 10.1056/NEJMoa1414123.



TRANSLATIONAL MILESTONE 11

Translational Research Description:

- Improved air quality in southern California is associated with statistically and clinically significant improvements in childhood lung-function growth

Health Impact Ring:

Change in Environmental Exposures

Change in Population Health Outcomes

Timeframe: 1994-2015

Collaborators:

- Sonoma Technology Inc

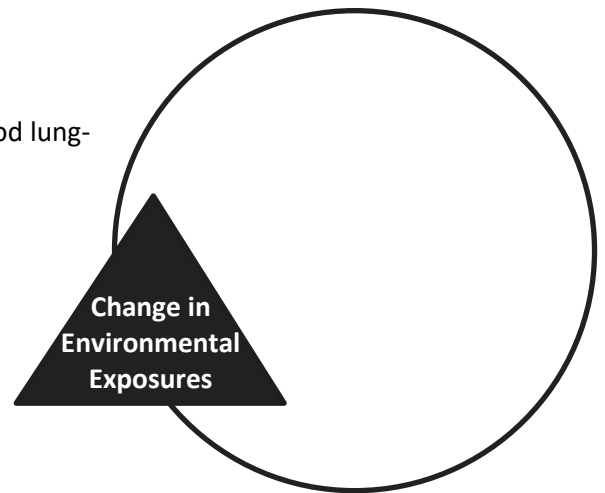
Source:

Lurmann, F. and Gilland, F. (2015). Emissions reduction policies and recent trends in Southern California's ambient air quality. *Journal of the Air and Waste Management Association*, 65(3), DOI:10.1080/10962247.2014.991856

<http://usceh.blogspot.com/2015/04/most-effective-air-quality-policies.html>

<http://usceh.blogspot.com/p/infographic.html>

<http://www.tandfonline.com/doi/full/10.1080/10962247.2014.991856>



TRANSLATIONAL MILESTONE 12

Translational Research Description:

- Executive order on freight setting targets for zero emissions technologies and strategies

Practice Ring: State Policy

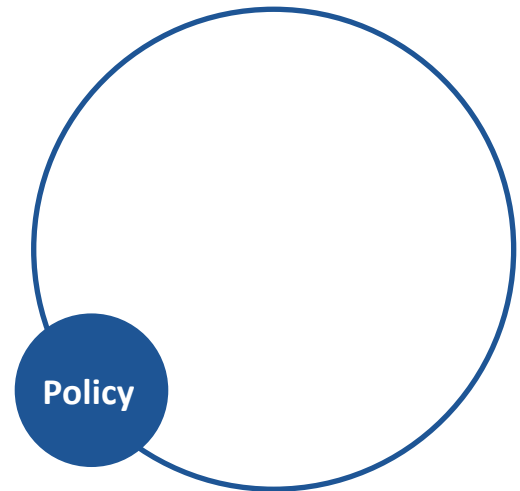
Timeframe: 2015

Collaborators:

- State of California

Source:

<https://www.gov.ca.gov/news.php?id=19046>



TRANSLATIONAL MILESTONE 13

Translational Research Description:

- EPA finalized new national ambient air quality standards for ozone, reducing primary and secondary ozone standard levels to 0.070 parts per million (ppm), down from 0.075 from 2008-20015 and a high of .12 from 1979 to 1993

Practice Ring: Federal Policy

Timeframe: 2015

Collaborators:

- US EPA (376 references were cited in the regulation. ARIA was able to analyze 100. Of these, 43 cited an NIH grant and 39 of these were NIEHS grants.

Source:

<https://www.epa.gov/ozone-pollution/table-historical-ozone-national-ambient-air-quality-standards-naaqs>

<https://www.epa.gov/ozone-pollution/2015-national-ambient-air-quality-standards-naags-ozone>

