Health Studies of Criteria Air Pollutants

Health studies are used to establish guidelines for air quality standards, including those recommended by OEHHA and established by the California Air Resources Board. These include epidemiology studies, which examine real-life exposures in human populations, and how they relate to the incidence or prevalence of disease. Together with controlled human exposure studies and toxicology studies, they form the scientific basis for our air quality standard recommendations.

OEHHA has conducted a number of epidemiological studies on the health effects of particulate matter in California, and are working on a number of studies looking at other widespread air pollutants identified in the Clean Air Act. These studies join other studies done in California, nationally, or internationally that examine the health impacts of air pollution exposure.

Our work at OEHHA has focused on a number of areas based on two legislative mandates: 1) the ascertainment of air pollution constituents most strongly linked to disease, and 2) the identification of subpopulations most vulnerable to the impacts of pollutants (e.g. young children, the elderly, low socioeconomic status individuals).

Criteria Pollutants Studied by OEHHA Staff

$PM_{2.5}$

Fine particulate matter, or $PM_{2.5}$, encompasses any airborne liquids or solids less than 2.5um in diameter. Airborne particles of this size are troublesome because they can penetrate deep into the lungs, sometimes entering the bloodstream and causing systemic impacts. These generally form through combustion processes. Main sources of emission include gas- and diesel-fueled vehicles, power plants, fireplaces and other biomass burning sources, and combustion and other process emissions from industrial sources. Health effects of $PM_{2.5}$ are wide-ranging, with strong links to all-cause mortality, cardiovascular mortality and hospitalizations, and respiratory and asthma hospitalizations. Impacts on health have been observed within hours or days of exposure, but chronic exposure impacts have also been seen for a number of endpoints. Similarly, PM2.5 exposures over pregnancy periods have been associated with birth outcomes, like reduced birth weight and preterm birth.

Coarse Particles

Coarse particles, sized between 2.5 and 10um in diameter, are generated through mechanical, erosive processes, and can deposit in the larger airways in the lungs and cause inflammation. Research points to a relationship between coarse particle exposures and respiratory hospitalizations and ER visits, especially among children, with additional evidence that coarse particles may be related to cardiovascular morbidity and mortality as well.

Nitrogen Dioxide and Ozone

Nitrogen dioxide is produced as a result of emissions from the burning of fuels in vehicles and stationary sources. Ozone is formed through the combination of nitrogen oxides, including nitrogen dioxide, and volatile organic compounds, with help from sunlight and heat. Exposure to either can impact respiratory health, causing respiratory inflammation and asthma exacerbations.

Published Health Studies

2020

Association of Air Pollution and Heat Exposure With Preterm Birth, Low Birth Weight, and Stillbirth in the US (erratum)

- Press release: Adverse Pregnancy Outcomes Linked to Climate Change
- News article: Climate Change Tied to Pregnancy Risks, Affecting Black Mothers Most. Flavelle, C. *The New York Times*. June 18, 2020.

Impact of Maternal Demographic and Socioeconomic Factors on the Association Between Particulate Matter and Adverse Birth Outcomes: a Systematic Review and Meta-analysis

A case-crossover study of short-term air pollution exposure and the risk of stillbirth in California, 1999-2009

Examining the relationship between ambient carbon monoxide, nitrogen dioxide, and mental health-related emergency department visits in California, USA

Changes in US air pollution during the COVID-19 pandemic

2019

Exposure to coarse particulate matter during gestation and term low birthweight in California: Variation in exposure and risk across region and socioeconomic subgroup

Age-specific seasonal associations between acute exposure to PM2.5 sources and cardiorespiratory hospital admissions in California

Associations between fine particulate matter and changes in lipids/lipoproteins among midlife women

Five-year exposure to $PM_{2.5}$ and ozone and subclinical atherosclerosis in late midlife women: The Study of Women's Health Across the Nation

Residential Exposure to $PM_{2.5}$ and Ozone and Progression of Subclinical Atherosclerosis Among Women Transitioning Through Menopause: The Study of Women's Health Across the Nation

Ambient Fine Particulate Matter and Preterm Birth in California: Identification of Critical Exposure Windows

2018

Associations of Source-apportioned Fine Particles with Cause-specific Mortality in California

Cause-specific stillbirth and exposure to chemical constituents and sources of fine particulate matter

2017

Decomposition analysis of Black-White disparities in preterm birth: the relative contribution of air pollution and social factors in California

Source apportionment of fine particulate matter and risk of term low birth weight in California: Exploring modification by region and maternal characteristics

Association between gaseous air pollutants and inflammatory, hemostatic and lipid markers in a cohort of midlife women

Association between $PM_{2.5}$ and $PM_{2.5}$ constituents and preterm birth in California, 2000-2006

Long- and Short-Term Exposure To Air Pollution and Inflammatory/Hemostatic Markers in Midlife Women

A Time-Stratified Case-Crossover Study of Ambient Ozone Exposure and Emergency Department Visits for Specific Respiratory Diagnoses in California (2005-2008)

2016

Associations of Source-Specific Fine Particulate Matter With Emergency Department Visits in California

2011-2015

Association of stillbirth with ambient air pollution in a California cohort study

Associations of mortality with long-term exposures to fine and ultrafine particles, species and sources: results from the California Teachers Study Cohort

- Press release: Study Finds Long-term Exposure to Ultrafine Particle Air Pollution Associated with Death From Heart Disease

Chronic PM2.5 exposure and inflammation: determining sensitive subgroups in mid-life women

- Press release: Study Provides a Plausible Explanation for the Link Between Cardiovascular Mortality and Fine Particle Air Pollution Exposure

Effects of fine particulate matter and its constituents on low birth weight among full-term infants in California

Coarse particles and respiratory emergency department visits in California

Long-Term Exposure to Air Pollution and Cardiorespiratory Disease in the California Teacher's Study Cohort

2005-2010

Long-term exposure to constituents of fine particulate air pollution and mortality: results from the California Teachers Study (erratum)

Coarse particles and mortality: evidence from a multi-city study in California

The effects of fine particle components on respiratory hospital admissions in children

The impact of components of fine particulate matter on cardiovascular mortality in susceptible subpopulations

The effects of components of fine particulate air pollution on mortality in California: results from CALFINE

Fine particulate air pollution and mortality in nine California counties: results from CALFINE

- Press release: New OEHHA Study Finds Links Between Fine Airborne Particles and Deaths in California

Health Studies of Criteria Air Pollutant News

Jun 18, 2020: Adverse Pregnancy Outcomes Linked to Climate Change
Higher rates of preterm birth, low birth weight and stillbirth are linked to increased heat, ozone and fine particulate matter, according to a meta-analysis released today and co-authored by...

Feb 25, 2015: Study Finds Long-term Exposure to Ultrafine Particle Air Pollution Associated With Death From Heart Disease
The study is the first to consider the effects on people of long-term exposure to ultrafine particles and analyzed data from more than 100,000 middle-aged women whose health status was followed from...

Jun 19, 2014: Study Provides a Plausible Explanation for the Link Between Cardiovascular Mortality and Fine Particle Air Pollution Exposure
http://www.ncbi.nlm.nih.gov/pubmed/24792413Study is among the first to link long-term exposure to fine particle air pollution, also known as PM2.5, to elevated levels of the reactive protein CRP.

Sep 23, 2005: New OEHHA Study Finds Links Between Fine Airborne Particles and Deaths in California
Scientists from OEHHA and UC published a study that found that fine particles emitted by motor vehicles and other sources may increase deaths from heart and lung ailments in California.

Oct 19, 2004: OEHHA Study Shows Possible Link Between Traffic Pollution, Children's Respiratory Symptoms
Even in an area with good regional air quality, air pollution from nearby traffic may pose a health risk.

- Cal Recycle
- Department of Pesticide Regulation
- Department of Toxic Substances Control
- State Water Resources Control Board
- Cal Alerts
- My Hazards
- Lt. Governor
- California Data
- Save Our Water
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