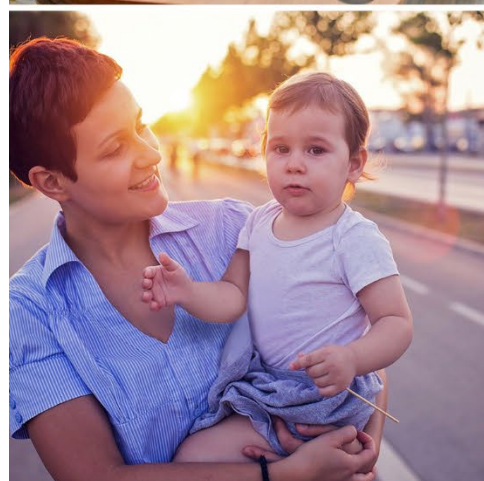


Report to the California Legislature and Governor

Children's Environmental
Health Center

August 2023



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Summary

Children are often impacted by environmental contaminants in different ways than adults. In recognition of this fact, the [Children's Environmental Health Protection Act](#) (Escutia, Chapter 731, Statutes of 1999) established the Children's Environmental Health Center, as part of the California Environmental Protection Agency (CalEPA). The center is responsible for ensuring that all CalEPA programs specifically protect children's health in California, and is required by law to report every two years on all agency activities that inform or protect children's environmental health in the state of California.

“CalEPA is dedicated to protecting the most vulnerable from environmental impacts, and children's health is one of our top priorities. Because they are small and still developing, environmental pollution and toxic chemicals can pose an even greater risk to our children whether at home, in school or in communities. The effects of exposure not only impact children when they are young but can contribute to a lifetime of illness. Tracking and transparently reporting environmental and health outcomes affecting children, in particular, is key to CalEPA's work to protect and enhance the environment and deliver benefits to all Californians.”

- *Secretary for Environmental Protection Yana Garcia*

This report to the Legislature and Governor describes the work between early 2019 and fall 2021 by CalEPA Boards, Departments, and Offices (BDOs), referred to collectively as CalEPA, to help ensure that children and pregnant people are adequately protected from environmental contaminants. It begins with CalEPA's efforts to protect children from exposure to wildfire smoke in wildfire-affected areas, safeguarding them from this increasing health threat. Then, the report describes how CalEPA is protecting children while they are at home, at school, and in their communities.

Highlights from the report's four sections—(1) Children, Wildfires, and Wildfire Smoke, (2) Children at Home, (3) Children at School, and (4) Children in their Communities—are provided below.

Children, Wildfires, and Wildfire Smoke

Children in California are being exposed to more wildfire smoke now than in prior decades. Mitigating the health risks posed by wildfire smoke has become a focal point of the CalEPA's children's health activities, through efforts before, during, and after wildfires.

- *Before:* CalEPA coordinated with national stakeholders on best practices for protecting children's health during wildfire smoke events. The agency has also educated scientists, health professionals, and others on the harmful effects of wildfire smoke on children's health, and how to mitigate them.
- *During:* CalEPA increased access to clean air shelters (places that vulnerable people can go to access clean air during wildfire events) and provided guidance to schools on how to protect children's health during wildfire smoke events.
- *After:* CalEPA is integral to the cleanup of hazardous materials and sites following wildfire events so children can return to safe spaces. CalEPA has also engaged in research to understand children's exposures to wildfire smoke from prior events, and how to best protect children's health during future wildfire smoke events.

Children at Home

Minimizing exposures in children's home environments is important because children spend a large amount of their time at home. CalEPA works to understand and decrease toxicants present in the foods they eat, the water they drink, the various consumer products brought into their homes, and in the physical and social structures of the home. During the reporting period:

- *Food and Water:* CalEPA increased the understanding of the risks of exposure to toxic chemicals in food and water (e.g. through reports on synthetic food dyes), and created tools (such as fish advisories) and regulations (e.g. lead in candies) to decrease exposures.

- *Consumer Products:* CalEPA worked to decrease children's exposure to toxic chemicals in the products they encounter at home (e.g. Perfluoroalkyl substances in carpets).
- *Household Environments:* CalEPA provided tools to identify risks of lead related to lead-based paint in the housing stock, and has also contributed to work that identifies interactions between exposures to environmental toxicants and social stressors.

Children at School

Because many children spend time at each school site, interventions in schools present an important opportunity to efficiently improve the health of children in California. CalEPA's programs address toxicants in and around schools, and educate children about environmental health. During the reporting period:

- *School Transportation:* CalEPA worked to decrease school bus emissions to mitigate children's exposure to traffic-related air pollutants.
- *Products used in schools:* CalEPA updated lists of art and craft products to avoid in schools, and also has worked to increase schools' access to integrated pest management solutions, in order to decrease pesticide exposures.
- *School Sites:* CalEPA assessed school and childcare sites for environmental hazards to provide safer school environments.

Curriculum: CalEPA assisted in educating children in California about the environment and health.

Children in their Community

Community factors can affect the health of many children. CalEPA's programs work to mitigate children's exposures to toxicants, not only in their homes but in the broader community. During the reporting period:

- *Outdoor Air:* CalEPA has decreased children's exposures to toxic air contaminants (e.g., diesel) and supported community air protection programs in particularly exposed and vulnerable communities. CalEPA also adopted health guidance values for

several chemicals to support control of toxic emissions in communities.

- *Pesticides*: CalEPA assessed the risk to children from harmful pesticides, and took action to mitigate those risks, including restricting their use. CalEPA also educated the public and health providers about pesticide risks.
- *Recreational Sites*: CalEPA notified the public of hazards at recreation sites (e.g. algal blooms), worked to clean up known hazards (e.g. lead in soil) and continues to study other exposures (e.g. synthetic turf)

During the period of activity covered by this report (2019-2021), California children and their families faced the challenges of unprecedented wildfires and a global pandemic. CalEPA's Children's Environmental Health Center worked alongside our sister agencies, local governments, and other partners, to protect children's health through that period. CalEPA continues efforts to decrease children's exposure to toxic substances and improve children's health.

Introduction

Children can be affected by environmental chemicals more than adults. They eat, drink, and breathe more than adults do for each pound of body weight. Thus, a child's exposure to contaminants in our air, water, and food is higher than an adult's in the same setting. Additionally, because children are still growing and developing, they can be more sensitive than adults are to the adverse health effects of chemicals. In some cases, these effects are irreversible, and exposure to chemicals and other stressors early in life can result in adult disease. Thus, reducing childhood exposure to environmental chemicals is key to ensuring the health and well-being of the entire population.

The Children's Environmental Health Center (CEHC) was established in 1999 by the Children's Environmental Health Protection Act¹ in the California Environmental Protection Agency (CalEPA), and is administered by the Office of Environmental Health Hazard Assessment (OEHHA). The CEHC serves as a resource for CalEPA and the State of California and is responsible for ensuring that CalEPA's existing expertise and programs specifically protect children's health. It performs outreach and educational work for the medical and public health community, as well as for the general public, and collaborates with others in CalEPA to promote policies and efforts that protect children's health.

This report covers the two years since the CEHC's last report to the California Legislature and Governor, submitted in August 2019. During the reporting period there were several important accomplishments in the area of children's environmental health within each of the following Boards, Departments and Offices in CalEPA:

- California Air Resources Board (CARB)
- Department of Resources, Recycling and Recovery (CalRecycle)
- Department of Pesticide Regulation (DPR)
- Department of Toxic Substances Control (DTSC)
- Office of Environmental Health Hazard Assessment (OEHHA)
- State Water Resources Control Board (Water Boards)

In this report we describe a selection of these accomplishments.

¹ SB 25 (Escutia, Chapter 731, Statutes of 1999)



Children, Wildfires, and Wildfire Smoke

Protecting children's health from wildfire smoke and the aftermath of wildfires is a cross-cutting environmental issue that is a shared responsibility and priority across the CalEPA. In addition to smoke from burning vegetation, wildfires generate hazardous waste and toxic air contaminants from burning homes and consumer products, and affect drinking water quality and soil health.

"We are deploying every available tool we have to keep communities safe as California battles these catastrophic wildfires driven by climate change."

– Governor Gavin Newsom

Background on Children's Exposure to Wildfire Smoke in California

Climate change is causing an increase in the number of large California wildfires. Of the 20 largest wildfires in California history, six have occurred since the last Children's Center Report to the Legislature and Governor in 2019.(1) California's Fourth Climate Change Assessment predicted that there will be an increase of 77% in the annual average area burned by wildfires by 2100.(2)

Wildfires produce large smoke plumes that can travel hundreds of miles or more.(3) Millions of California children have been affected by wildfire smoke,

even if they don't live near the site of a blaze. In the 2018-2019 school year, more than 1.2 million California children had their schools closed for a day or more due to wildfires.(4)

The locations of the smoke plumes—which result from a combination of the locations of the fires and climactic conditions—are key to understanding how many children are affected by wildfire smoke.

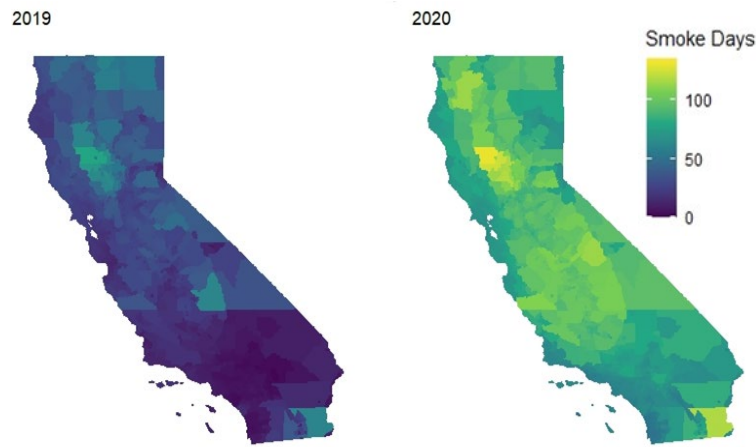


Figure 1. Days with a Visible Smoke Plume Above Each Census Tract in the Years 2019 and 2020

These maps show the number of days that visible smoke plumes were present over every census tract in California, in both 2019 and 2020, with the number of smoke plume days ranging from 1 to 131 days.² Smoke days are generally trending upward,³ and the difference between 2019 and 2020, when lightning started a large complex of fires, presents a

particularly stark contrast. However, a similarity between the years is that some of the most brightly colored areas on the maps—those with the most days of overlying smoke plumes—are in many of the same locations, at the north and south ends of the Central Valley. Local topography in the valley likely plays a role: the ends of the valley create inversions that can trap smoke masses, a well-known local phenomenon.(6)

² Estimated using the National Oceanic and Atmospheric Administration (NOAA) smoke plume data and census data.(5)The Hazard Mapping System Smoke product geographic shapefiles were downloaded for every day from January 1, 2019 through December 31, 2020. We combined this data with population estimates at the census tract-level, from the American Community Survey, 2015-2019 data (the most recent data available).

³ See for example, the Indicators of Climate Change in California: Fourth edition, page i-15 or VI-42 through VI-53. Available at: <https://oehha.ca.gov/media/downloads/climate-change/document/2022caindicatorsreport.pdf>

On average, children living in California in 2019 had a visible smoke plume hanging over them for 13.1 days; in 2020 that average was 70.4 days. Regardless of where children lived, all children in California lived under a smoke plume at least one day each of the two years (See Figure 2). The year 2019 had fewer large fires and fewer areas exposed to heavy smoke. Still that year, more than 3 million California children lived in census tracts that had a smoke plume above them for more than 14 days. In 2020, about 8 million children (roughly 80% of California's children) lived in census tracts that had a smoke plume above them for more than 60 days.

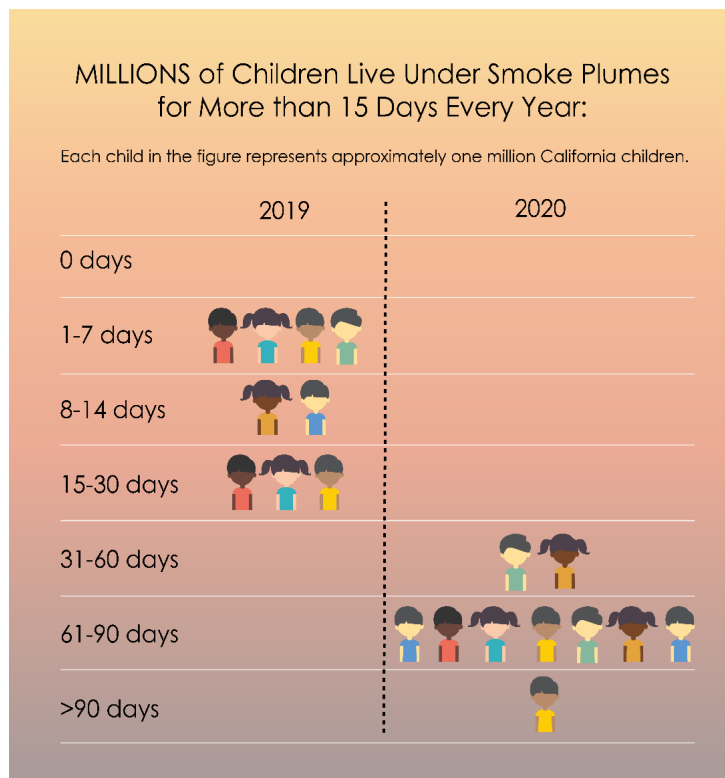


Figure 2. Graphic depicting the number of days that children in California lived under a smoke plume in 2019 and 2020.

These numbers are based on satellite data and analyses by the National Oceanic and Atmospheric Administration to determine the presence of a smoke plume and assign it a category. While the assigned category of a smoke plume is not clearly predictive of a specific air pollution concentration at ground level, in general, ground-level particulate matter levels are higher on days with visible smoke plumes than those without.⁽⁷⁾ This is concerning because wildfire-associated particulate matter is known to have a variety of adverse health effects in children.⁽⁸⁾

There is robust evidence showing an increase in breathing problems among children exposed to wildfire smoke. ⁽⁸⁾ There are also studies that show increases in the risk of preterm births associated with exposure to wildfire smoke during pregnancy. Recent estimates from Southern California suggest that particles

resulting from wildfire smoke may be particularly toxic for children, compared to particles from other sources.(9) Since there are established adverse health effects for children and pregnant people, and an increasing frequency and severity of exposure to wildfire smoke, it is a key focus of the Children's Environmental Health Center.

Before Wildfire Events

CalEPA has partnered with other state and federal organizations to increase shared knowledge of health effects related to children's exposures to wildfires and wildfire smoke, and to develop ways to better protect children in advance of wildfires. This has included outreach to important stakeholders within public health, and health care providers who care for children.

Wildfire Smoke and Children's Health Workshop

OEHHA and **CARB**, in collaboration with U.S. EPA and Pediatric Environmental Health Specialty Units, planned and held a conference called 'Children's Health and Wildfire Smoke: A Workshop for Public Health Officials' on May 5-6, 2021. The workshop included an overview from CalEPA scientists of the white paper they wrote covering existing research on the health effects of wildfire smoke, as well as some of the public health tools available to respond to them. Prior to the workshop, virtual working groups were convened to discuss

- the use of respirators by children,
- how to improve indoor air quality guidelines,
- the use of low-cost sensors, and
- how to make school activity decisions related to wildfire smoke exposure.

The working groups reviewed and discussed scientific evidence to arrive at public health messages, based on the extant scientific evidence.

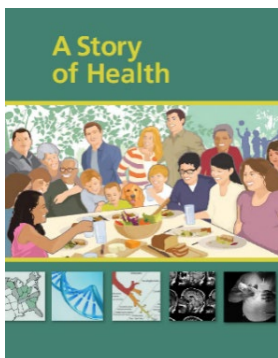
At the workshop, working groups presented the evidence-based messages they created. Experts also provided lectures on these and other topics including protecting children in schools and communities, communication strategies, research needs, and policy issues affecting children. The workshop was well attended, with more than 160 attendees, including people from national agencies, state and local agencies from multiple states (AZ, GA, KY, MT, NC, NM, NV, OR, WA), tribes, industry groups, medical associations, educators, and a

variety of groups within California (CalEPA, CDPH, CAPCOA, county public health, educators, and others). Key messages included the following:

- Masks are safe for children over 2 who can report if they are having difficulties.
- Children likely receive more protection from a NIOSH-certified N95, than a medical/surgical mask.
- Cloth face masks should not be relied on for protection from wildfire smoke.

Working Group guidance and the meeting summary are available on the "Air Now"³ Wildfire Guide Post - Production page, under the children's health header at: <https://www.airnow.gov/wildfire-guide-post-publication-updates/>

Health Provider Education

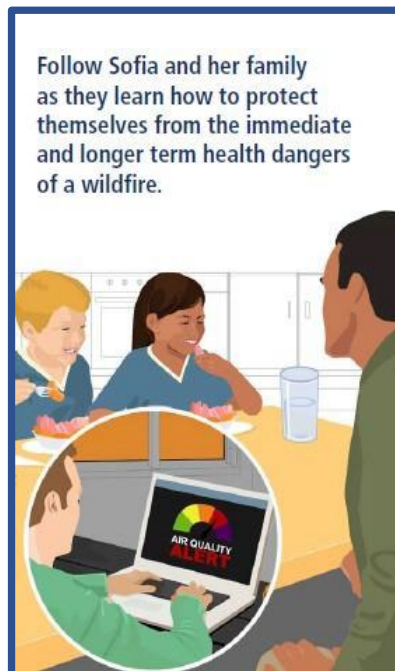


OEHHA and the CEHC have continued partnering with the Western States Pediatric Environmental Health Specialty Unit at the University of California, San Francisco, the federal Agency for Toxic Substances and Disease Registry, and other entities to create a new chapter for the multi-media e-book *A Story of Health*. "Wildfire Health Impacts: Sofia's Story" was published online in August 2021. This multi-media e-book and continuing education (CE) course, already used by over 16,000 health professionals to obtain CE

credits, is designed to harness the power of storytelling to increase environmental health literacy for physicians and other health professionals, policy makers, and health advocates. Like the rest of the e-book, this new chapter uses videos, infographics, and articles by experts, woven through a narrative story, to illustrate how exposure to wildfire events from childhood to adult life can influence health. The *Story of Health* received an award for "excellence in communication" from the Centers for Disease Control and Prevention (CDC) in 2016.

³ AirNow is a partnership of certain federal, tribal, state, and local air quality agencies.

In the chapter of the book about Sofia, a fictional girl and her friend discuss the fact that soccer practice has been repeatedly canceled due to wildfire smoke events. Sofia, her fathers, and her friend discuss ways to respond to wildfire smoke events, and protect their own health as well as the health of others in their community. The chapter was written to provide health care providers with grounding in the scientific evidence base for health effects of wildfire smoke and wildfire emergencies in both childhood and pregnancy, as well as to educate providers on ways to prepare their patients, communities, and practices for wildfire events.



'A Story of Health' is available at:

http://oehha.ca.gov/public_info/public/kids/storyofhealth.html

During Wildfire Events

CalEPA has also taken steps to improve the health of children in California during wildfire smoke events, by providing guidance for schools and clean air shelters.

School Guidance

In late 2019, **OEHHA** released a fact sheet with guidance for schools during wildfire smoke events. It includes guidance for reducing outdoor activity and improving indoor air quality at schools. It also provides specific recommendations based on the US EPA's air quality index (AQI) scale. This fact sheet was created to respond to the need for school-specific guidance, given the increasing number of smoke days experienced by California schools.

This OEHHA schools and wildfire smoke fact sheet is available at:

<https://oehha.ca.gov/media/downloads/air/fact-sheet/wildfiresmokeguideschoolsada.pdf>

Clean Air Shelters

CARB released guidelines in July 2021 for the creation of a network of clean air shelters. (<https://ww2.arb.ca.gov/our-work/programs/wildfire-smoke-clean-air-center-grant>) These guidelines were developed as part of the 'Wildfire Smoke Clean Air Centers for Vulnerable Populations Incentive Pilot Program', (AB 836, Wicks, Chapter 393, Statutes of 2019). Funding from this program will be used for facility ventilation upgrades, high-efficiency air filter purchases, and portable air cleaner purchases for facilities that serve communities that have vulnerable populations and a high cumulative smoke exposure burden.

After Wildfire Events

In the aftermath of wildfire events, CalEPA also works to protect children's health through clean up of hazardous materials.

Hazardous Materials Risk to Children After a Wildfire

DTSC's emergency response activities help children and their families recover from unprecedented wildfires. DTSC's Emergency Response Unit hazmat crews assess properties for the presence of household hazardous waste and asbestos, and then oversee cleanup of debris so that children and their families can safely return to their properties.

DTSC's Emergency Response Unit assessed and removed household hazardous waste and bulk asbestos from more than 2,500 parcels in the 2021 wildfires. Since 2017, DTSC has posted maps on its website to track progress on individual fires, leveraging award-winning, innovative technology developed by DTSC's office of Environmental Information Management, in collaboration with a vendor. In 2021, a new statewide fire dashboard allowed people to follow the recovery process on multiple fires from a single dashboard. The "Select an Incident" tool in the upper right corner of the dashboard also gives users additional details on individual fires.

DTSC Wildfire Clean-Up Dashboard at:

<https://dtsc.maps.arcgis.com/apps/dashboards/cecc021ffd47412aae9921e8a9296693>

Researching Children's Exposure to Wildfire Smoke and Its Effects

In addition to the educational and protective measures described above, CalEPA scientists are advancing our understanding of children's wildfire smoke exposures through new research identifying the components of smoke and smoke health effects during early life.

Heavy Metals in Smoke

The 2018 Camp Fire resulted in elevated levels of airborne metals that were detected as far away as San Jose, according to a recent air quality analysis by **CARB**. These metals included lead, manganese, and iron. Lead exposure (even for brief periods) is concerning, as there is no safe level of lead exposure for children. The presence of heavy metals in wildfire smoke is an emerging area of research and this recent report by CARB provides an important quantification of the heavy metal concentrations for this particular fire.

Changes in Immune Function

CARB has funded work at the California National Primate Research Center at the University of California, Davis, to assess health outcomes in rhesus macaques exposed in infancy to wildfire smoke from the 2008 Trinity and Humboldt County fires. A 2019 report from the research center updated prior findings from this cohort of primates. It noted that changes in immune function and lung structure persisted into adulthood for the wildfire-smoke-exposed primates, and that unexposed offspring of the wildfire-exposed females also showed immune function changes, suggesting the possibility of epigenetic⁴ changes that can persist into future generations.(10)

⁴ heritable changes that alter the way that a gene is expressed but does not involve a change to the DNA sequence itself.



Even in their own homes, children in California encounter a variety of toxic substances. These may be present in the foods they eat, the water they drink, the various consumer products brought into their homes by themselves or others, and in the physical and social structures of the home. CalEPA is working towards understanding and decreasing these exposures, including by performing risk assessments, developing regulations, and creating advisories and educational materials.

“CalEPA is dedicated to protecting the most vulnerable from environmental impacts, and children's health is one of our top priorities. Because they are small and still developing, environmental pollution and toxic chemicals can pose an even greater risk to our children whether at home, in school or in communities. The effects of exposure not only impact children when they are young but can contribute to a lifetime of illness. Tracking and transparently reporting environmental and health outcomes affecting children, in particular, is key to CalEPA's work to protect and enhance the environment and deliver benefits to all Californians.”

- Secretary for Environmental Protection **Yana Garcia**

Contributing to Healthier Environments at Home: Food and Water

Relative to their size, children eat and drink more than adults. This means that children get effectively higher doses of toxic chemicals present in their food or water. Providing children access to healthy food and safe drinking water is a priority for CalEPA.

Synthetic Food Dyes

The percentage of American children and adolescents diagnosed with Attention Deficit/Hyperactivity Disorder (ADHD) has increased from an estimated 6.1% to 10.2% during the last 20 years. Concerns about increasing rates of ADHD and other behavioral disorders prompted the California Legislature to fund **OEHHA** to conduct an assessment of the neurobehavioral impacts of synthetic food dyes in children. OEHHA invited the public to submit scientific information on the health effects of synthetic food dyes, and conducted a symposium in September 2019 to foster discussion among researchers in academia, industry, government, and the public on the potential effects of synthetic food dyes on children.

OEHHA's assessment of synthetic food dyes, released in April 2021, found that current federal levels for the safe intake of synthetic food dyes may not sufficiently protect children's neuro-behavioral health. These levels were established by the U.S. Food and Drug Administration (FDA) decades ago, and do not reflect newer research.

The report is the product of a two-year, multifaceted evaluation of seven synthetic food dyes that have been approved by the FDA. OEHHA extensively reviewed existing studies of the effects of these dyes on both humans and laboratory animals. Overall, the human studies indicate that synthetic food dyes are associated with adverse neurobehavioral outcomes in children, and that children vary in their sensitivity to synthetic food dyes. "Challenge studies" placed the children on a dye-free diet for several weeks in order to compare their behavior while exposed to the dyes in their food or drinks to their behavior without exposure to these dyes. These studies demonstrated clearly that some children are more likely to be adversely affected by synthetic food dyes than others. Also, animal studies indicate that synthetic food dyes affect activity, memory, and learning; cause changes in neurotransmitters (chemicals that

carry signals from one nerve to the next) in the brain; and cause microscopic changes in brain structure.

“Evidence shows that synthetic food dyes are associated with adverse neurobehavioral outcomes in some children. With increasing numbers of U.S. children diagnosed with behavioral disorders, this assessment can inform efforts to protect children from exposures that may exacerbate behavioral problems.”

-OEHHA Director, Lauren Zeise

OEHHA researchers also found that the FDA's Acceptable Daily Intake levels (ADIs) for synthetic food dyes are based on 35- to 70-year-old studies that were not designed to detect the types of behavioral effects that have been observed in children. Comparisons with newer studies indicate that the current ADIs may not adequately protect children from adverse behavioral effects. For some of the dyes, these comparisons indicate that, if these levels were to be updated, they would likely be lowered to form a more protective standard.

OEHHA collaborated with scientists at the University of California, Berkeley and the University of California, Davis to estimate the levels of exposure to synthetic food dyes during pregnancy and by U.S. children of varying ages. The research team found that the average child is exposed to multiple dyes in a day, and that the highest exposures are usually from juice drinks and soft drinks. Were current ADI levels revised to reflect recent studies, this amount of exposure would likely exceed recommended intake levels. The report was finalized after considering public comment and external peer review by experts identified by the University of California Office of the President.

The OEHHA report is available here: <https://oehha.ca.gov/risk-assessment/press-release/report-links-synthetic-food-dyes-hyperactivity-and-other>

The agenda and video presentations from the 2019 OEHHA Symposium on Synthetic Food Dyes Impact on Children's Health can

be found here: <https://oehha.ca.gov/risk-assessment/general-info/2019-symposium-synthetic-food-dyes>

Lead in Candy

Lead is a neurotoxicant with no safe level for children. **OEHHA** developed a regulation establishing a maximum level of 0.02 ppm for naturally-occurring lead in candies flavored with chili and/or tamarind that was adopted on September 22, 2021 (California Code of Regulations, Title 27, Section 28500), and became effective a year after this date.

To establish the naturally-occurring lead level at 0.02 ppm, OEHHA developed an ingredient-based approach to estimate the amount of naturally-occurring lead in candy containing chili and tamarind. This was based on an evaluation of the level of naturally-occurring lead plausibly contributed by a given ingredient, and the amount of each such ingredient typically present in candies. The potential ingredients containing naturally-occurring lead were identified as chili peppers and chili powder, tamarind, food-grade salt, sugar, food-grade silicon dioxide, and food-grade titanium dioxide.

The notice regarding the regulation adoption is available here: <https://oehha.ca.gov/risk-assessment/cnr/notice-adoption-new-chapter-and-section-naturally-occurring-lead-candy>

Healthy Fish Consumption

Fish can contain toxic chemicals such as mercury and polychlorinated biphenyls (PCBs), which can be highly persistent in the environment, accumulate up the food chain, and in the human body. Mercury and PCBs are known to cause neurodevelopmental impairments in children. **OEHHA** provides advice specific to children and people of childbearing age on safe levels of fish consumption for fish caught in California lakes, rivers and coastal waters, based on the level of harmful chemicals found in different fish. In 2020 and 2021, OEHHA released more than twenty advisories. These included information based on species and locations throughout California's inland and coastal waters. Advisories are provided in multiple languages to reach the widest audience possible to support protecting all people in California.

OEHHA fish advisories and fact sheets are available here:

<https://oehha.ca.gov/fish/advisories>

Food Access

Before the COVID-19 pandemic, food insecurity affected 1 in 8 people in California, including 1 in 5 children. Since the 2019 CEHC report, food insecurity rates have doubled or tripled in many areas across the state. Families in need who have access to food banks or food pantries have benefited from two Department of Resources, Recycling and Recovery (**CalRecycle**) programs--the implementation of the short-lived climate pollutants act (SB 1383, Lara, Chapter 395, Statutes of 2016) and the Food Waste Prevention and Rescue (FWP&R) grant (from 2016-2020). SB 1383 sets a statewide edible food recovery goal that by 2025, no less than 20% of edible food that would otherwise be disposed of must be recovered for human consumption.

From 2016-2019, the FWP&R grant has diverted over 138 million pounds of food from landfills and helped provide over 86 million meals. Many food insecure children most consistently receive meals during the school day, and grant funds help expand their access to fresh, healthy food. In 2018-2019, White Pony Express rescued edible food from donors to build food pantries at schools, community centers, and child programs such as the Boys and Girls Club in Contra Costa County, rescuing 2,721,000 pounds of food for the community.

SAFER Drinking Water

Children are at particular risk from well water contaminants. According to the State water policy (AB 685, Eng, Chapter 524, Statutes of 2012), every Californian has the right to clean, safe and affordable drinking water. The **Water Boards'** SAFER program responds to this mandate by using funding from the Drinking Water act (SB 200, Monning, Chapter 120, Statutes of 2019) and cap-and-trade funding to ensure that people without access to safe water can receive it as soon as possible. The Aquifer Risk Map is a publicly available map that shows a color-coded risk scale, combining data on water quality risk and well density, such that areas with more wells and poorer quality ground water are marked as being at higher risk. This tool, initially published in Oct 2020, will be updated annually, and is used to prioritize areas for SAFER program funding.

Aquifer Risk Map available here:

<https://gispublic.waterboards.ca.gov/portal/apps/webappviewer/index.html?id=17825b2b791d4004b547d316af7ac5cb>

More information about the SAFER program here:

https://www.waterboards.ca.gov/safer/safer_data.html

Perfluorooctanesulfonic acid and perfluorooctanoic acid (PFOS and PFOA) are chemicals that have been linked to elevated cholesterol levels, as well as possible problems for developing fetuses. In response to updated health recommendations for PFOS and PFOA developed by **OEHHA**, the Water Board lowered the notification level (health-based advisory levels for chemicals in drinking water that may prompt certain requirements or recommendations) for these chemicals in August 2019. In October 2019, statewide testing results for PFOS and PFOA became available on interactive maps.

In response to the microplastics act (SB 1422, Portantino, Chapter 902, Statutes of 2018), the Water Board also adopted a formal definition of microplastics in June 2020; this is a key early step in decreasing children's exposure to endocrine disrupting chemicals in plastics. A microplastics health effects workshop was convened in October-November 2020. A standardized sampling and analysis plan is being developed, and a workshop for this was held in November 2021.

PFOS and PFOA Maps available at the bottom of the page here:

<https://www.waterboards.ca.gov/pfas/>

More information about this microplastics program is available here:

https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/microplastics.html

Consumer Products

Because children breathe more air relative to their size compared to adults, and have a larger surface area to mass ratio, children are particularly susceptible to exposures that are inhaled or absorbed through the skin. CalEPA has strengthened regulations and other actions on products that children commonly encounter.

Cannabis (Marijuana) Smoke

Cannabis (marijuana) smoke and delta-9-tetrahydrocannabinol (Δ^9 -THC, commonly known as THC) have been shown to cause harm to developing fetuses, by affecting birthweight, memory, and attention. **OEHHA** listed cannabis smoke and Δ^9 -THC under Proposition 65 as developmental toxicants, effective January 3, 2020. The listing was made following the vote of the Developmental and Reproductive Toxicity Identification Committee, which had evaluated available scientific data, including animal and human data. As of January 3, 2021, businesses that sell cannabis products must warn consumers of harm to the developing baby from mother's exposure during pregnancy.

OEHHA creates fact sheets for the public for chemicals listed under Proposition 65. In addition to the new fact sheet for cannabis and THC, between late 2019 and late summer 2021 24 fact sheets were created or updated that contain information specific to children and pregnancy. A number of these are specific to children's health, including one on amusement parks, and one on flame retardant chemicals that may be in children's products, carpeting, plastics, upholstered furniture, or textiles. Many fact sheets include information specific to exposure during pregnancy, including information about acrylamide, alcohol, and benzene.

Proposition 65 fact sheets are available here:

<https://www.p65warnings.ca.gov/fact-sheets>

Children's Products

Children under the age of 12 and, especially infants and toddlers, are particularly susceptible to adverse impacts from exposure to hazardous chemicals. This is because childhood is a critical period of development, and

exposure during this period to environmental contaminants can have adverse consequences later in life. **DTSC**'s Safer Consumer Products (SCP) Program is using its regulatory authority to compel manufacturers of consumer products to look for safer alternatives to the use of chemicals that may harm children.

The mission of the SCP Program is to advance the design, development, and use of products that are chemically safer for people and the environment. The ultimate objective is to reduce the potential for exposure to chemicals in consumer products that harm public or environmental health. The SCP Program gives special consideration to the most sensitive people who may be exposed, including children in their homes, schools, and communities. The program identifies specific product-chemical combinations with potential to expose people or environmental organisms to harmful chemicals, and requires product manufacturers to systematically look for safer alternatives to the use of these chemicals.

Every three years, the SCP Program issues a work plan, which specifies the consumer product categories it will evaluate, and provides a list of policy priorities that will inform its regulatory decisions. One of the priorities DTSC identified in its 2021-2023 Priority Product Work Plan, is identifying products that can adversely impact the health of children. Under the two prior work plans, the SCP Program identified several of what DTSC calls 'Priority Products' that are relevant to children's environmental health. The current work plan identifies a specific category, Children's Products. DTSC has several efforts underway to evaluate potential exposures to hazardous chemicals found in children's products and adverse impacts that may result. These include a systematic literature review and an exposure modeling project, with preliminary findings of these efforts expected in 2023. This work aligns with SCP's prioritization of chemicals in consumer products with the potential to adversely impact the health of children in California.

PFAS in Carpets

On July 1, 2021, **DTSC** regulations went into effect identifying carpets and rugs containing per- or polyfluoroalkyl substances (PFASs) as a Priority Product (California Code of Regulations, Title 22, Section 69511.4). These regulations apply to any carpets and rugs in the stream of commerce in California. Carpets and rugs are common in homes, schools, daycares, and many other indoor

environments where children spend the majority of their time. Carpets and rugs that are treated with PFASs for stain- or soil-resistance are potential long-term sources of widespread human and ecological exposure to this class of chemicals. Exposure to PFASs can lead to adverse health outcomes in humans, and once they enter the body, PFASs remain there for a long time.

In response to the pending adoption of these regulations, US carpet manufacturers have stopped adding PFAS-containing treatments to their products, increasing the safety and environmental health of children across California by decreasing indoor exposure to PFASs. DTSC recently launched a compliance and enforcement effort to verify that domestically-produced carpets are free of PFASs and to determine whether manufacturers of imported rugs have also stopped treating their products with chemicals in this class. The recent adoption of carpets and rugs as Priority Products for regulation represents a significant step forward in protecting human and environmental health, as well as demonstrates SCP's ability to effectively regulate chemicals as a class, using a precautionary approach.

These strategies were further outlined in a February 2021 Environmental Health Perspectives article authored by SCP scientists, "Regulating PFAS as a Chemical Class under the California Safer Consumer Products Program." This publication highlights the efforts that SCP has successfully made in prioritizing the health of vulnerable populations (in this case, children) by using a forward-thinking, comprehensive, and preventative regulatory approach.

Hair Straightening Products

DTSC's SCP is also evaluating hair straightening products, which contain any of several hazardous chemicals, for possible regulation under its framework. The use of hair straightening products often begins at an early age. DTSC's evaluation of these chemicals in hair straightening products for possible regulation as Priority Products aims to address these chemical exposures, and supports SCP's prioritization of the health of children, and of environmental justice populations. SCP hosted a two-day public workshop on this topic in June 2021. Overall, the SCP program is well poised to continue, as well as increase, its role in protecting children's health by regulating consumer products within the State of California.

Household Environments

Home is where children and families spend most of their time. Exposures in the home can have large impacts on children's health. This is true both for chemical exposures as well as exposures to stressors that can change how the body responds to those chemicals. CalEPA has contributed to tools and reports that provide a more holistic perspective of children's environmental health.

Lead in Housing

Exposure to lead through paint is a significant source of lead exposure for children.⁽¹¹⁾ Young children are especially susceptible to the effects of lead exposure, and can suffer profound and permanent adverse health effects, particularly in the brain and nervous system. This increased susceptibility is due to children's unique exposure pathways (e.g., dust-to-hand-to-mouth), their developing brains, and differences in the way children absorb ingested lead compared to adults.

In October 2021, **OEHHA** released an update to CalEnviroScreen, a scientific mapping tool used to identify California communities most affected by multiple sources of pollution and where people are vulnerable to the effects of pollution. CalEnviroScreen 4.0 includes a new census-tract scale indicator to identify areas where children may be exposed to lead through lead-based paint used in older homes. This indicator shows the risk of lead in housing to children, calculated using the percentage of households within a community with a likelihood of lead-based paint hazards due to housing age, combined with the percentage of low-income households with children.

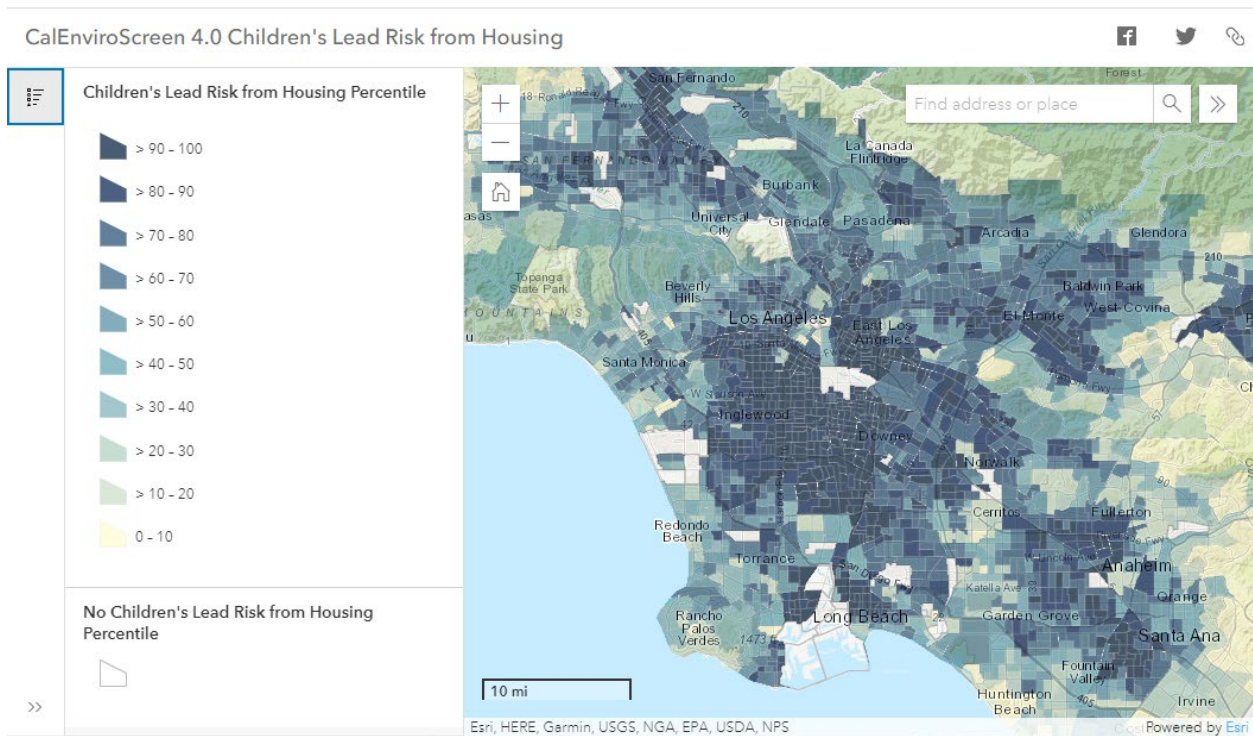


Figure 3. A screenshot of CalEnviroScreen 4.0, showing the new Children's Lead Risk from Housing indicator on a map of the Los Angeles area.

Data on elevated blood lead levels (EBLLs) in children in California is limited because universal testing of children for lead is not required by the state. However, factors such as age of housing, income, race, and enrollment in public assistance programs have been significantly associated with EBLLs; these have been used to screen for places where children may be at high risk for lead exposure. This new CalEnviroScreen indicator allows for a state-wide data layer that can be used to help identify areas where children might have a higher risk for lead exposure, even in the absence of universal blood lead testing. The indicator also helps measure cumulative exposure burdens to identify disadvantaged communities, and address environmental justice concerns.

CalEnviroScreen is accessible here: <https://oehha.ca.gov/calenviroscreen/report/draft-calenviroscreen-40>

Psychosocial Stressors and the Environment

Repeated early adversity is known to activate a “toxic stress” response in children's bodies, where prolonged activation of the biological stress response can cause permanent changes to the body's structure and function. Children exposed to toxic stress in addition to toxic chemicals experience worsened health outcomes compared to children exposed to either toxic chemicals or toxic stress in isolation. For example, children exposed to lead and stress have lower IQs and are more likely to have ADHD than children not exposed to this combination. The first-ever report from the recently established Office of the California Surgeon General was released on December 10, 2020, and was entitled “Roadmap for Resilience: The California Surgeon General's Report on Adverse Childhood Experiences, Toxic Stress and Health.” CalEPA scientists (from both **CARB** and **OEHHA**) contributed to this report, highlighting areas of scientific research that demonstrate how toxic exposures and toxic stress related to adverse childhood experiences can interact to create worsened health outcomes for children. Significant exposure to toxic chemicals and stress can impact the same hormonal pathways, leading to what scientists call biological overlap in mechanisms of toxicity (as seen in the case of exposure to both lead and toxic stress).

The First California Surgeon General's Report is available here:

<https://osg.ca.gov/sg-report/>

Researching Children's Environmental Exposures at Home

In order to advance new requirements to protect the health of children, CalEPA has also engaged in research of the efficacy of technologies intended to decrease exposures to environmental contaminants.

Researching Indoor Air Quality

One way to protect children from the harmful effects of fine particle air pollution is for them to be in clean indoor spaces, especially considering that Californians spend, on average, over 85 percent of their time indoors. Research on the health impacts of fine particle air pollution (PM_{2.5}) exposures indoors and in vehicles has focused on high-efficiency filtration. Recent **CARB**-funded research in buildings has found that high-efficiency filtration (i.e., filtration that can

remove much smaller particles than those removed by standard filters) in homes can remove over 90 percent of the particles from incoming outdoor air, with relatively low energy consumption. A study of high-efficiency filtration in the homes of children with asthma found that high-efficiency portable air cleaners can be effective in reducing particle levels, and that particle reduction may help reduce these children's need for doctors' visits. These important findings were used to update building energy codes by the California Energy Commission. These new requirements started January 2020, and will help protect Californians from exposures to PM_{2.5}.



Children spend much of their day in schools or at child-care centers, so decreasing exposures to environmental toxicants in school settings is a good way to improve the health of many children simultaneously. CalEPA is working to ensure that children are safer while getting to school, in school buildings, and at school sites. In addition, CalEPA is helping to develop school curricula to teach the next generation about environmental health.

School Transportation

School Bus Emissions

Replacing older, more polluting school buses with newer, cleaner school buses in California is an important action to improve air quality overall, and especially to protect the health of sensitive populations, like that of children. The Children's Health Study,⁽¹²⁾ initiated in 1992, confirmed that children's exposure to high concentrations of particulate matter (PM) reduces lung development, has immediate adverse health effects, and, in the case of continued exposure, has lasting adverse health effects later in life. Following the identification of particulate matter from diesel emissions as a Toxic Air Contaminant, and the adoption of guidance levels by **OEHHA** in 1998, a number of actions followed to

reduce risks to children. Research, such as the Children's School Bus Exposure Study,(13) conducted in 2003, demonstrated that school bus exhaust greatly increases children's exposure to air pollutants, and that children riding in the oldest, most polluting buses have the highest rates of exposure while riding in the vehicle, compared to children riding in lower polluting buses.

CARB has sponsored mitigation studies to research additional ways to reduce children's exposure to air pollutants while riding in school buses.(13) Based on these findings, CARB undertook several regulatory actions to reduce children's exposure to school bus-related pollutants. Under the Truck and Bus Regulation (California Code of Regulations CCR, Title 13, section 2025), CARB requires that diesel-fueled school buses with an over 14,000-pound gross vehicle weight rating (GVWR) have a PM exhaust filter (using retrofitted or original equipment), or else must operate less than 1,000 miles per year. School buses of any fuel type are restricted from idling (California Code of Regulations, Title 13, section 2480) at or near public or private schools. Drivers are required to turn off engines immediately upon arrival at a school and restart no more than 30 seconds before departure. School bus fleets must be regularly tested for excessive smoke (California Code of Regulations, Title 13, sections 2190, 2191 and 219).

CARB has also supported a reduction in school bus emissions by funding incentives for school bus cleanup projects. Prioritizing the oldest, most polluting school buses in the turnover of the fleet is essential for reducing children's exposure to pollutants, even if the new school buses use conventional fuel.



Figure 4. Image on the side of a Twin Rivers Unified School District Lion Electric LionC school bus, noting that it is powered by renewable energy. This was displayed at the Low Carbon Transportation: Heavy-Duty Project

Where possible, CARB's aim in turning over the school bus fleet to newer, cleaner technologies goes beyond simply protecting children's health. School bus replacement with zero-emission vehicles has the added benefits of supporting California's air quality, climate change, and petroleum reduction goals. Cleaning up the school bus fleet is an opportunity to reduce children's direct exposure, while offering them a chance to experience an environmentally friendly form of public transportation. As children ride zero-emission school buses, they become accustomed to these cleaner options, inspiring the next generation of vehicle buyers to choose zero-emission vehicles.

State agencies at the local, state, and federal level have engaged in a collective effort to invest nearly a billion dollars in funding for school bus cleanup projects since the early 2000's, with more funds on the way.

For more background on California's school bus funding history please refer to the California clean bus, truck and vehicle program (SB 1403, Lara, Chapter 370, Statutes of 2018) State School Bus Incentive Report: <https://ww2.arb.ca.gov/resources/documents/state-school-bus-annual-reports-sb-1403>

Products Used in Schools

To help schools reduce their students' exposure to toxicants in products, CalEPA provides schools with resources for selecting safer art supplies and pest management practices.

Safer Art and Craft Supplies

Some chemicals in art and craft supplies can cause immediate adverse health effects, including eye and skin irritation, headache, dizziness, and nausea. Long-term exposure to some of these chemicals has been associated with cancer. Children are particularly susceptible to the toxic effects of chemicals due to their small size, high metabolic rates, and developing organs. Children are also more likely than adults to sniff art and craft products, and to put products in their mouths and on their skin.

Art and craft products may contain solvents or other toxic chemicals. The California Education Code Section 32064 (Watson, Chapter 1023, Statutes of

1996) prohibits schools from ordering or purchasing any product that contains toxic or carcinogenic substances for use in grades K-6. Annually, **OEHHA** updates the list of art and craft materials which cannot be purchased for use in grades K-6. OEHHA compiled the list, linked below, based on product evaluations conducted by other entities according to federal requirements. Other art and craft materials on the list are products recalled in the past two years, as well as those brought to OEHHA's attention as bearing health hazard labels. Additionally, in August 2019, OEHHA developed guidelines for the purchasing and safe use of art and craft materials in schools, along with a fact sheet with quick tips for the safe use of art and craft materials.

Art Hazards page and list:

<https://oehha.ca.gov/risk-assessment/art-hazards>

School Integrated Pest Management

Through its School and Child Care Integrated Pest Management programs, **DPR** assists California schools and day care centers with their pest management goals, encouraging the use of effective “least toxic” pest management strategies. The Healthy Schools Act of 2000 (Shelley, Chapter 718, Statutes of 2000) requires most pesticide applications made at California school sites to be reported to DPR, allowing outreach and training activities to be tailored to match prevailing pests and pesticides at specific sites. For example, data from 2018 indicate that of a total of 97,629 school site pest control applications, insecticides were the most used class of pesticides, followed by herbicides and rodenticides, implying that outreach and training can be tailored to focus on insecticides for many sites.

Outreach and training sessions conducted by DPR staff help school districts comply with the Healthy Schools Act. Participation in DPR-approved training and educational activities is increasing markedly ([2020 Healthy Schools Act Outreach Summary \(ca.gov\)](#)). For example, there was a 96% increase from 2019 to 2020 in school and child-care staff completing a training course in pesticide application (including information on IPM and safe pesticide use). Over the same period, there was a 200% increase in completions of one of three Healthy Schools Act training courses and a 106% increase in attendance at school IPM

workshops with the addition of virtual events. Moreover, in response to the COVID-19 pandemic, many of DPR's training efforts have been oriented toward appropriate uses of anti-viral disinfectants intended for surface sterilization purposes. A public survey conducted by DPR in 2019 indicated that the training requirement instituted by the Healthy Schools Act "was viewed as the requirement that has the most positive impact on pest management at school sites" (DPR 2018 California School & Child Care Pesticide Use Report Summary).

School Sites and Buildings

Beyond the products selected for use in schools, the sites where schools are built and the building infrastructure itself also affect the health of the school environment. CalEPA programs assess and ensure cleanup of publicly funded new school sites and support remediation of water for lead in childcare centers.

Site Contamination Review and Cleanup

DTSC's Site Mitigation and Restoration Program has been tasked by the Education Code (Greene, Chapter 277, Statutes of 1996) to oversee the environmental assessment, investigation, and cleanup of proposed new schools and school expansions that receive state funding for construction or modernization. DTSC ensures that proposed properties are free of contamination or, if the properties were previously contaminated, that they are cleaned up to a level that protects the students and staff who will occupy the new school or school expansion. All proposed school sites that receive state funding for acquisition or construction are required to go through a rigorous environmental review and cleanup process under DTSC's oversight.

School districts conduct environmental assessments to help determine if there has been a release of hazardous material at the sites, or if a naturally-occurring hazardous material that presents a risk to human health or the environment may be present. Outreach activities are integrated into the process to allow a more active role for stakeholders in the school site selection process. Through this process, DTSC ensures that children, staff, and the environment are protected from the potential effects of exposure to hazardous materials. The DTSC School Evaluation Program is the only comprehensive school environmental evaluation program in the U.S, and continues to set a national standard. From July 1, 2019

and July 1, 2021, DTSC contributed to the protection of children's health at more than 100 new schools or school expansions, benefiting over 32,000 students.

Lead Testing of Water

Lead has known adverse neurodevelopmental effects in children. To protect children from these effects, the Lead exposure in child day care facilities act (AB 2370, Holden, Chapter 676, Statutes of 2018) requires that all child care centers built before 2010 begin testing water at their facilities, and repeat such testing every five years. In May 2020, the **Water Boards** reached an agreement to provide \$5 million in grant funds for the testing and remediation of drinking water at child care centers, especially those serving infants. AB 2370 also requires the Water Board's Division of Drinking Water to: consult with the California Department of Social Services (CDSS) regarding sampling directives and regulations, including the recommended action level for lead; facilitate electronic data submittal from certified laboratories; notify CDSS of results showing elevated lead levels; and post test results publicly online.

Curriculum

The California Education and the Environment Initiative

To ensure California's future prosperity, health, and safety, it is important for people throughout the state to consider how they depend on and influence the environment. This kind of environmental awareness is especially important for young people, enabling them to actively participate in environmental decision-making. The California Education and the Environment Initiative (EEI) curriculum is designed with this goal in mind. Administered by **CalRecycle**'s Office of Education and the Environment (OEE), the curriculum is part of a statewide effort to ensure that all California K-12 students have the opportunity to learn about the environment in the course of a typical school day.

The curriculum consists of 85 K-12 curriculum units that meet both science and history-social science standards. The EEI curriculum is available as a free download for educators and the public. The curriculum was approved by the State Board of Education in 2010, and was designed as a model of how to incorporate California's Environmental Principles and Concepts (EP&Cs) into standards-based instruction. Following the example of the EEI curriculum, these

EP&Cs are now reflected in California's academic frameworks for science, history-social science, visual and performing arts, health, and math as of early 2022 (frameworks are required for use by textbook publishers and educators).

Since 2010, the OEE has focused on getting the EEI into the hands of teachers and students. While use of the EEI curriculum is voluntary, over 35,000 teachers have been trained in its use. EEI units have been distributed to over 36,000 classrooms and to over half of California's public schools. These schools represent 812 districts (approximately 78% of the state total).

A survey of over 16,000 teachers using the EEI curriculum in their classrooms reported that:

- 99% are sure the curriculum is helping them teach Common Core State Standards (CCSS) in English Language Arts and Literacy.
- 99% plan to continue using the curriculum in future years.
- 99% would recommend the curriculum to other teachers.
- 98% reported that their students were engaged or very engaged by the curriculum.
- 97% of teachers who work with English Language learners reported that the curriculum effectively served the needs of their students.

The EEI curriculum is an engaging and effective tool for students to see the relevance of science and engineering to their lives.

*Education and the Environment Initiative curriculum and trainings
available here: <https://www.californiaeei.org/>*



Some environmental chemical exposures can affect entire communities, such as those which contaminate outdoor air, pesticides that are used on food and drift into the community's air, or toxicants present at children's recreational sites. The BDOs within CalEPA have created health risk levels, developed regulations, and created educational materials about children's exposures in these communities.

Contributing to Healthier Environment's in Communities: Outdoor Air

The Toxic Air Contaminant Identification and Control Act (Tanner, Chapter 1047, Statutes of 1983) created California's program to reduce emissions of toxic air contaminants (TACs) that pose the highest risks to public health. This program was amended in 1999 by the Children's Environmental Health Protection Act, SB 25 (Escutia, Chapter 731, Statutes of 1999), and special provisions were added for TACs that make infants and children especially susceptible to illness.

TACs are defined as air pollutants which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health. In the last decade, scientific research has shown that exposure to air toxics in early life contributes to a higher lifetime risk of developing cancer or other adverse health effects than does exposure to air toxics in adulthood.

CARB considers the impacts on the most sensitive population groups, such as children, during the development of air toxics regulations called 'airborne toxic control measures.' Each regulation considers health impacts on children and is designed to control emissions of specific pollutants or groups of pollutants. The health effects of these pollutants are analyzed with information from **OEHHA**. Health risk assessments are conducted using OEHHA's *Air Toxics Hot Spots Program Guidance Manual*, which reflects advances in the field of risk assessment along with explicit consideration of the physiology and health of infants and children. The risk assessment methodology addresses children's greater sensitivity and incorporates the most recent data on childhood and adult exposure to air toxics, along with other exposure-related scientific findings.

Between 2019 and 2021, in support of CARB's efforts to control emissions, **OEHHA** adopted guidance values to be used in risk assessment calculations (reference exposure levels for toluene and hexamethyldiisocyanate and cancer unit risk factors for para-chlorotrifluorotoluene and cobalt and cobalt compounds).

Values and risk assessment guidance available via this portal:
<https://ww2.arb.ca.gov/our-work/programs/ab-2588-air-toxics-hot-spots/hot-spots-risk-assessment>

Chrome Plating Operations

Hexavalent chromium is released from chrome plating activities. Exposure to hexavalent chromium during childhood increases the lifetime risk of cancer. **CARB** is in the process of amending the *Airborne Toxic Control Measure for Chromium Plating and Chromic Acid Anodizing Facilities*, and held six working group meetings between September 2020 and the end of 2021. The amendments are intended to further reduce the emissions of hexavalent chromium in communities. Chrome plating facilities are primarily located in disadvantaged communities and are often close to schools, homes, or other locations where children are present. The use of additional controls or alternative technologies has the potential to further reduce or eliminate hexavalent chromium emissions from these facilities.

Dry Cleaner Emissions

Perchloroethylene is a carcinogen released from dry cleaning operations. On January 25, 2007, **CARB** approved amendments to the *Airborne Toxic Control Measure for Emissions of Perchloroethylene Associated with Dry Cleaning Operations and Requirements for Perchloroethylene Manufacturers and Distributors* (Dry Cleaning ACTM) that will phase out the use of perchloroethylene dry cleaning machines and related equipment by January 1, 2023. As of today, there are only about 30 dry cleaning facilities still operating in California that use perchloroethylene. The 2007 updates to the Dry Cleaning ACTM have been highly successful in reducing the emissions of this carcinogen to children living near dry cleaning operations.

Diesel Risk Reduction Plan

In 1998, **CARB** identified particulate matter from diesel-fueled engines (diesel PM) as a toxic air contaminant based in part on **OEHHA**'s health risk assessment. In 2000, CARB released the *Diesel Risk Reduction Plan* designed to significantly reduce diesel PM emissions from many types of engines and vehicle types. Over 20 years later, CARB has adopted almost two dozen regulations and reduction strategies to control emissions of diesel PM from a full range of regulated vehicles and equipment, especially in communities near highways, ports, and other high traffic areas that are disproportionately affected by diesel emissions.

Great progress has been made over the past two decades in reducing children's exposure to diesel PM (13). Efforts to further reduce diesel PM exposure continue apace: cleaner-burning diesel fuel and alternative diesel fuels have displaced previous formulations in use; existing heavy duty engines were retrofitted with particle-trapping filters by 2014 and will be entirely replaced with factory installed filters (2010 or newer engines) by the end of 2022; the Heavy-Duty Vehicle Inspection and Maintenance Program (HVIP) prompts timely emissions repairs; lower new engine tailpipe standards continue to scale down both the directly emitted primary diesel PM and the NO_x (precursors that form secondary PM), to each reduce particle emissions. Simultaneously the integrated pursuit of Zero-Emission vehicle sales mandates, combined with fleet purchase requirements and focused incentive funding, are working to rapidly transition away from combustion and into new, advanced technologies. These strategies are being applied across medium and heavy duty on-road trucks and

buses as well as accelerating progress on the remaining off-road diesel PM emissions. The direction of incentive funding, enforcement activity, and regulatory action is being aligned to address community-identified impacts of these vehicles and off-road equipment on our children and schools. For example, 63% of HVIP and 73% of Clean Off Road Equipment voucher funding to date has gone to projects benefitting priority communities. While 100% of ZANZEFF (Zero- and Near Zero-Emission Freight Facilities) and 100% of Advanced Technology Freight Demonstrations projects have been located in these communities. (data from Table 2 of 2021-2022 funding plan [FY 2021-2022 Funding Plan For Clean Transportation Incentives \(ca.gov\)](#)). CARB tracks compliance rates across heavy-duty programs statewide and specifically in priority communities providing the accountability to assure comparable or better compliance adjacent our vulnerable populations. (Table 2, [2021 Annual Enforcement Report https://ww2.arb.ca.gov/sites/default/files/2022-07/2021_Annual_Enforcement_Report_2_0.pdf](https://ww2.arb.ca.gov/sites/default/files/2022-07/2021_Annual_Enforcement_Report_2_0.pdf)).

Diesel trucking spans state borders, emphasizing the need for collaboration. CARB technical engagement with U.S. EPA has contributed to U.S. EPA nationally proposing the same PM standard found in CARB's newest heavy-duty tailpipe standards. California's zero-emission truck sales requirements and analogs of the Low Carbon Fuel Standard have been adopted by our west coast neighbors Oregon and Washington, while Nevada recently signed onto the Medium and Heavy-Duty ZEV Memorandum of Understanding (MOU) as the 17th state along with District of Columbia and Quebec. The market for these zero-emission vehicles is growing with three additional east coast states adopting California's zero emission truck sales requirements for a total of 5 heavy-duty "Section 177" states with more actively considering. Oregon has patterned additional truck programs after CARB tailpipe standards for heavy duty diesel engines and in-use particle filter retrofit program that they are implementing in the greater Portland area.

Community Air Protection

In addition to work on toxic air contaminants, **CARB** established the Community Air Protection Program (CAPP) in response to the Nonvehicular air pollution act, AB 617 (C. Garcia, Chapter 136, Statutes of 2017). CAPP focuses on reducing air

pollutant emissions and exposure to these pollutants in communities most impacted by air pollution, thus protecting some of the most vulnerable children.

This first-of-its-kind statewide effort funds community air monitoring and community emissions reduction programs in selected communities, “AB 617 Communities,” that are highly impacted by air pollution. The Legislature appropriated funding to support actions to address localized air pollution through targeted incentive funding to deploy cleaner technologies in these communities, as well as grants to support community participation in creating community emission reduction plans. AB 617 also requires accelerated retrofitting of pollution controls on industrial sources, increased penalty fees for non-compliant polluters, and greater transparency and availability of air quality and emissions data.

CARB, local air districts, community members, and other stakeholders are already learning from initial efforts and integrating lessons learned into implementation. The initial 10 communities were selected in September 2018, and in the following year (2019) monitoring began in those communities and community emission reduction plans (CERPs) were adopted. These communities began providing annual reports in 2020. Additional communities are being selected annually.

The CERPs include strategies to lessen children's exposure to air pollution through mitigation and emission reductions. Some of these strategies include:

- implementing a School Flag Program to inform parents and school staff when students should avoid outdoor activity because of harmful air quality.
- replacing diesel-powered school buses with zero-emission buses.
- improving school indoor air filtration systems.
- implementing vegetative barriers around schools and other locations where children are present.
- reducing truck idling near local schools. CARB is working with local agencies and community members to post no idling signs around schools and other facilities where children are present.

Many CERPs also carry out education and outreach to schools and childcare centers in the form of air quality-related programs.

The Community Air Protection Program Online Resource Center is a one-stop shop to obtain data, guidance, and tools to support improving air quality at the community scale.

https://ww2.arb.ca.gov/ocap_resource_center

Pesticides

Pesticides can cause wide-ranging and severe health effects in children, including rashes, vomiting, altered neurodevelopment, and seizures. Because pesticide residues can be high in foods children commonly eat (e.g. apple-based products), and because children eat more food relative to their body weight than adults and often have much more restricted diets, children can face higher pesticide exposures than adults. Thus, CalEPA's work focuses on assessing children's exposures, protecting children from harmful pesticides and educating about pesticide exposures to pregnant people and children in California.

“Exposure to harmful pesticides carries risks – to our health and to our environment – and these risks are disproportionately borne by communities already overburdened by pollution. If we truly want to build a healthy and safe California for all, we must phase out and replace the highest-risk pesticides.”

- Secretary for Environmental Protection **Yana Garcia**

(from <https://www.cdpr.ca.gov/docs/pressrls/2023/012623.htm>)

Pesticide Risk Assessments

DPR conducts comprehensive risk assessments of pesticides with active ingredients expected to have adverse effects on human health to determine the health risks of using pesticides within the state. Children's health considerations constitute a critical part of these analyses, as children can be especially sensitive to the effects of pesticides. Risk assessments are based on the health outcome that is most sensitive to the pesticide among the most

sensitive population subgroups, meaning that many of the assessments are based on a specific, known, outcome in children.

Risk assessments released in the last two years include an addendum to the 2006 risk characterization of sulfuryl fluoride (May 2020), and draft risk characterizations of allyl isothiocyanate (July 2020) and fipronil (January 2021). In addition, more than thirty “mini” risk assessments (MRAs) have been completed. MRAs are acute health assessments used to support DPR’s California Pesticide Residue Monitoring and cannabis programs. All of these evaluations consider risks from children’s exposure to pesticides, and recommend specific reference levels (recommended action levels) to address those risks.

Chlorpyrifos Cancellation

DPR announced on October 9, 2019, that virtually all agricultural use of the pesticide chlorpyrifos in California must end by December 31, 2020. This decision was triggered by evidence presented in DPR’s 2018 Toxic Air Contaminant Act risk assessment, which demonstrated that chlorpyrifos is a developmental neurotoxicant. This was consistent with the addition of the chemical to the Proposition 65 list because of its neurodevelopmental toxicity by the Governor-appointed Developmental and Reproductive Toxicant Identification Committee in 2017.

A workgroup was convened to solicit public input on the transition to safer replacements for chlorpyrifos, with a report issued in July of 2020. In response to that report, DPR issued a memo in February of 2021 indicating actions that its staff would take to improve outreach to growers, build institutional capacity, improve regulatory frameworks, and make research into integrated pest management a high priority, while creating a roadmap for future work. In March 2021, this process was extended by DPR and the Department of Food and Agriculture to other high-risk pesticides through the establishment of the Sustainable Pest Management Work Group (SPMWG). The goal of the SPMWG is “to develop a recommended roadmap with ambitious, measurable goals to practically achieve the state’s vision to accelerate a system-wide transition to safer, more sustainable pest management.” (Sustainable Pest Management Work Group, https://www.cdpr.ca.gov/docs/pestmgmt/sustainable_pest_management_workgroup.htm).

Pesticide Exposure Education

In conjunction with the California Department of Food and Agriculture, **OEHHA** informs people in California about the risks of pesticide applications that may affect them, and fields questions about the safety of these chemicals during pregnancy and childhood. A fact sheet released in March of 2021 was designed to help healthcare providers assess risk from pesticide exposure to pregnant agricultural workers.

Fact sheet available here:

<https://oehha.ca.gov/sites/default/files/media/downloads/pesticides/general-info/pregnancypesticidesinfosheet.pdf>

Raising patient awareness of health outcomes associated with pesticide exposure before, during, and after pregnancy can help reduce the number of miscarriages, preterm births and birth defects, cases of low birth weight, and adverse changes in neurodevelopment. Healthcare providers of agricultural workers are encouraged to inform patients of their rights to several protections, including time off work and/or reasonable accommodations, such as modified work practices, duties, or schedules to limit pesticide exposure. Healthcare providers also have access to OEHHA's online course designed to educate them on the toxicity of specific pesticides, and present information on how to diagnose and treat pesticide-related illnesses.

Recreational Sites

CalEPA recognizes the importance of protecting the environmental health of children in the places in which they play. Multiple programs have contributed to improving children's health in recreational spaces by studying or decreasing environmental exposures, for example to lead, chemicals in synthetic turf, and harmful algal blooms.

Cleaning up Lead-contaminated Soil

The former Exide Technologies, Inc. (Exide) facility located in Vernon, California is a Resource Conservation and Recovery Act (RCRA) mitigation site, with **USEPA** serving as the lead regulatory agency and **DTSC** as a co-lead. From 1922 to 2014, lead smelting and metals processing operations (mostly in the form of

lead-acid battery recycling) occurred at the facility, which Exide acquired in 2000. As a result of these activities, lead was emitted onsite and impacted residential communities surrounding the facility. Lead is a neurotoxic chemical and impacts the developing fetus and child.

In early 2015, DTSC informed Exide it would not grant the facility a permit to operate and ordered it to permanently cease operations. Decontamination of the site began in September 2019 and is ongoing. The work follows the 2016 DTSC-approved Exide Closure Plan and is consistent with South Coast Air Quality Management District's Exide Title V permit. The work is being performed in a way that protects both the on-site workers and the surrounding communities.

On May 19, 2020, Exide filed for Chapter 11, liquidation bankruptcy, and in October 2020, a Delaware bankruptcy court transferred the facility to the newly created Vernon Environmental Response Trust (VERT). VERT removed a significant portion of the regulated buildings, in accordance with DTSC's guidance, using limited funds from a settlement agreement financed by Exide. In July 2021 the State budget included \$132M to complete active closure work and facilitate implementation of the corrective action. On May 1, 2022, DTSC took over cleanup activities.

In areas within 1.7-mile of the site, DTSC continues to lead the residential soil sampling and cleanup program. In 2016, then-Governor Jerry Brown proposed — and the Legislature approved — a \$176.6 million loan from the state's general fund that led to testing and cleanup of thousands of properties. Additional funds requested by Governor Gavin Newsom have since been allocated to increase the number of crews working in the field and parcels cleaned:

- \$74.5 million in 2019 — \$24.5 million to address increased costs and \$50 million to increase the number of parcels to be cleaned.
- \$322.4 million in 2021 – to complete cleanup of 3,200 parcels and add 2,700 additional parcels with soil-lead concentrations above 200 parts per million.

These funds were used to expedite and expand the testing of the approximately 10,000 sensitive land-use properties in the area (such as residential properties, schools, parks, day care centers and childcare facilities) located within an

approximately 1.7-mile radius of the former Exide Facility. These funds are also being used to:

- Oversee the cleanup of properties with the highest concentration of lead in soil, representing the greatest potential for exposure to sensitive populations.
- Expand community engagement and create a workforce development and job training program for community residents to perform sampling and cleanup.

As of July 7, 2023, a total of 9,509 parcels had been sampled as part of the Exide residential cleanup, and 4,765 parcels had been cleaned up. Sampling data and an associated online live map, located on DTSC's website, were released to the public on March 2, 2018. The cleanup of the parcels will lead to lower lead exposure during pregnancy and childhood for those living in homes within those parcels.

The map can be accessed at <https://dtsc.ca.gov/soil-sampling-data-for-the-exide-preliminary-investigation-area/>

Senate Bill 840 (Mitchell, Chapter 29, Statutes of 2018) appropriated funding for DTSC to hire a contractor to sample approximately 6,800 parkways within an approximately 1.7-mile radius of the former Exide Facility. By the time sampling was completed in November 2019, 8,124 residential properties had been sampled, of which 6,425 qualify for cleanup.

DTSC has partnered with academic and workforce training providers -- the Los Angeles Trade Technical College (LATTC), and the University of California Los Angeles Labor Occupational Safety and Health Program (UCLA-LOSH) -- for its Workforce for Environmental Restoration in Communities (WERC) Program.

In August 2017, a Project Labor Agreement was executed which include a 50 percent local hire requirement for trained residents from communities near the former Exide facility to perform sampling and assessment fieldwork. Over one hundred students have graduated from the WERC Program, and about 70 graduates are currently employed by the cleanup and sampling contractors.

The WERC Program is currently being refreshed and expanded in coordination with the unions in consideration of the upcoming parkways and facility cleanup.

Detail can be accessed at <https://dtsc.ca.gov/workforce-corner/>

Synthetic Turf

Crumb rubber manufactured from recycled tires has been used for more than two decades as infill material in synthetic turf fields across the U.S. and other countries. The Department of Resources, Recycling and Recovery (**CalRecycle**) has funded grants to support the installation of crumb rubber infill synthetic turf fields all over the state in its efforts to support the recycling of used tires. In order to address the health concerns that have been raised about these fields, **OEHHA** began the Synthetic Turf Study in 2015, following on OEHHA's prior work on this topic. OEHHA continues to work under contract with CalRecycle to evaluate the complex chemical composition of crumb rubber infill material, the ways that people may be exposed to these chemicals in the turf and the potential health effects from the use of synthetic turf fields. When completed, OEHHA's evaluation will be the most extensive health assessment of synthetic turf conducted in the U.S. The study will also assess potential health impacts associated with exposure to chemicals in playground mats. The study will help guide future decisions concerning the recycling and use of tire materials in synthetic turf and playground mats.

Materials related to this study can be accessed at:
<https://oehha.ca.gov/risk-assessment/synthetic-turf-studies>

In its 2021 – 2023 Priority Product Work Plan, **DTSC**'s SCP Program identified artificial turf as the focus of its evaluation of chemicals in the building products and materials category. Frequent use of artificial turf fields by children was an important factor in DTSC's decision to prioritize this product for screening and possible regulation under the SCP framework.

Harmful Algal Blooms

Recreational exposure to cyanotoxins from harmful fresh water algal blooms can have wide-ranging health effects including irritation to the respiratory system, skin, and eyes, as well as nausea and vomiting. In early September 2020,

the **Water Boards** announced that testing for harmful algal blooms had been ramped up in California waterways in advance of the Labor Day holiday, and updated information was posted to the Harmful Algal Bloom (HAB) online portal.

HAB online portal:

https://mywaterquality.ca.gov/habs/where/freshwater_events.html

Additional outreach materials in 2019-2021 regarding harmful marine algal blooms and domoic acid, a potent neurotoxin, include **OEHHA**-created fact sheets and OEHHA's half-day webinar of scientific experts discussing the recent evidence on the potential risks from prenatal exposure to these algal blooms. Educational materials inform the public on how to minimize the risk associated with exposure to these toxins, including guidance related to pregnancy and childhood.

Clear Lake is perennially affected by harmful algal blooms, which have been shown to produce microcystins at levels that are hazardous to human health. The Water Board's Division of Drinking Water issued microcystin monitoring orders on March 22, 2021, to 18 public water systems that obtain source water from Clear Lake. The orders require periodic water analysis when a water system is subject to potential contamination. The primary purpose of the orders is to gather data on microcystin occurrence near drinking water intakes, and after the corresponding treatment processes. Concurrently, the Division of Drinking Water asked OEHHA to develop recommendations for drinking water notification levels (NLs). On May 3, 2021, OEHHA provided recommended NLs for anatoxin-a, saxitoxins, microcystins and cylindrospermopsin.

OEHHA HAB resources:

<https://oehha.ca.gov/risk-assessment/harmful-algal-blooms-habs>

Researching Children's Environmental Exposures to Air Pollution and Heat in Communities

To inform future regulatory efforts, CalEPA has a robust research program assessing children's exposures to air pollution and to heat. This includes work on respiratory disease, birth outcomes, mental health and other significant health impacts.

Respiratory Health

For decades, **CARB** has funded health research on the impact of exposure to air pollution in vulnerable populations. This research includes the Children's Health Study (CHS), as well as studies on asthmatics, the elderly, and women. The CHS revealed the extent to which ozone, nitrogen dioxide, acid vapors consisting of nitric acid and hydrogen chloride, and particulate matter (PM) affect children's lung development.⁽¹⁴⁾ The results of this study provide evidence for classifying children as particularly sensitive to air pollution, have influenced further research, and have shaped California legislation addressing children's microenvironments. The CHS helped support passage of The Children's Environmental Health Protection Act (Escutia, Chapter 731, Statutes of 1999), along with other legislation that requires California to reassess its air quality standards to ensure children's health.

The CHS has spurred other researchers to investigate the links between air pollution and other adverse health effects among children, including children in communities that are disproportionately affected by environmental exposures. This work has leveraged population health studies such as the Los Angeles Family and Neighborhood Survey (LAFANS),⁽¹⁵⁾ the East Bay Kids Study,⁽¹⁶⁾ and the California Health Interview Survey.⁽¹⁷⁾ These studies sought to determine whether asthma burden disparities between regions of California are due to exposure to higher levels of air pollutants, greater vulnerability, or both.

Results from CARB-supported research showed that asthmatic children in lower-income families had higher exposure to pollution, particularly traffic pollution, were disproportionately impacted by this pollution, and experienced increased exacerbation of their asthma compared to children with asthma from higher-income families. Studies of asthmatic Hispanic children in Huntington Park, children attending schools in lower-income neighborhoods in the Bay Area, and

asthmatic children in Orange County all confirmed that some ethnic and lower socioeconomic groups are more vulnerable to the effects of traffic-related pollution than others and those with asthma suffer from increased exacerbation of their asthma. Findings from these studies have helped inform policy decisions on motor vehicle emissions control and enforcement, and asthma prevention, control, and education in communities with low socioeconomic status.

Recent results from the CHS show that decreased air pollution levels in California have led to health benefits for children, who see less reduced lung function and lower levels of bronchitis symptoms. However, within California some children are still exposed to higher levels of pollution due to elevated pollutant levels in their local area. CARB research continues to investigate children's health and pollution exposure, assessing the impact of exposure to air pollutants near roadways and in proximity to stationary sources including rail yards, ports, and refineries. Those near-roadway exposures include effects from non-tailpipe emissions such as tire and brake wear. Findings from this ongoing work have helped develop California air quality standards, as well as voluntary planning guidelines for how close places that serve children (e.g., daycare centers, schools, and playgrounds) should be to nearby emission sources.

Since its inception **OEHHA** has studied the impact of air pollution on respiratory-related morbidity and mortality, focusing on sensitive populations. OEHHA has also been engaged in studying the impacts of climate change including the relationship between heat and infectious diseases. A recent OEHHA study examined age-specific associations between short-term exposure to PM_{2.5}, chemical constituents and their sources, and hospital admissions. It concluded that exposure to PM_{2.5} (and its related constituents) from vehicular emissions increased the risk of respiratory-related hospitalizations among children aged 0-18 years.(18) In 2020, OEHHA published an exploratory study examining ambient temperature and hand, foot, and mouth (HFMD) disease, which mainly affects children, using emergency department visit data. The results indicated a positive overall association between HFMD cases and temperature (as temperature increases so do the number of cases) during both the warm and cold seasons.(19) OEHHA has also completed a review examining temperature, changes to land use, climate change and their relationship to Valley fever (caused by the fungus *Coccidioidomycosis*). Many studies in the literature have found an increased risk for this disease among people whose immune responses

are compromised, including people whose immune responses are naturally attenuated due to pregnancy.(20)

Birth Outcomes

In the last two years, researchers from **OEHHA** have published 7 studies that have investigated the influence of air pollutants or heat on birth outcomes. The findings from these studies have important public health implications, as climate change is predicted to make human exposure to heat and air pollutant exposure worse.

Adverse birth outcomes, such as low birth weight (less than 2,500g) or preterm birth (less than 37 gestational weeks) may be exacerbated by exposure to air pollutants or high temperature. OEHHA scientists conducted studies in California and found that exposures to coarse particulate matter (PM_{10-2.5}) during the entire gestational period increased the risk of term low birth weight.(21) Mothers who had higher exposure to fine particulate matter (PM_{2.5}) delivered lower weight infants as well.(22) Full gestation PM_{2.5} exposure increased the risk of preterm birth, as did exposure during gestational weeks 17-24 and 36 specifically.(23) Short-term exposure to high apparent temperature, a combination of temperature and humidity, and criteria air pollutants also increased the risk of adverse birth outcomes, particularly during the last week of gestation prior to premature delivery.(24) Short-term exposure to high apparent temperature and sulfur dioxide (SO₂), ozone (O₃), or PM_{10-2.5} also increased the risk for stillbirth.(25) In a systematic literature review, investigators explored the relationships between multiple exposures (PM_{2.5}, O₃ and heat) and preterm delivery, stillbirth, and low birth weight in the U.S. More than 80% of studies showed consistent evidence for increases in these adverse birth outcomes associated with the exposures.(26)

These adverse birth outcomes from exposure to air pollutants and heat vary by population, and certain people are at higher risk. Specifically, OEHHA's findings consistently indicated that non-Hispanic Black mothers were the most vulnerable subgroup.(21-23) A systematic literature review in the U.S. also concluded that non-Hispanic Black mothers, as well as mothers with asthma or low educational attainment, were more susceptible to pollution-associated adverse birth outcomes.(26, 27) The reasons for this disparity may include multiple differences

in both environmental exposures and social determinants of health that non-Hispanic Black people face compared to other racial and ethnic groups.

Mental Health

Because of rapid brain development, children may be especially vulnerable to mental health problems associated with environmental stressors such as heat or air pollutants. In a 2020 study from **OEHHA** scientists, a positive association was found between carbon monoxide (CO) and nitrogen dioxide (NO₂), and emergency department visits due to homicide/inflicted injury, with children (0 to 18 years old) being the most vulnerable.(28) Another study found that exposure to O₃ among children aged 0 to 18 years was associated with increased risks of emergency department visits for most mental health outcome categories, compared to exposure to O₃ among adults. (29)

Conclusion

Environmental exposures continue to be pressing concerns for California's children, with many known and potential health effects. CalEPA—across its Boards, Departments and Offices—worked actively during the reporting period to learn more about how these exposures affect children's health, and to protect children from exposures that adversely affect their health.

Related in part to climate change, wildfire smoke exposures are increasing. Steps have been taken by CalEPA to educate itself, the public, other agencies and health care providers about what is known about wildfire smoke exposures and the best practices needed to protect children during and in the aftermath of a wildfire. CalEPA also plays an integral role in the cleanup of hazardous materials and sites following wildfire events so children can return to safe spaces.

Because children spend much of their time at home, CalEPA's contributions to healthier environments at home can markedly decrease children's exposures to toxic substances. Activities have included increasing access to healthy food and water, educating about harmful substances, decreasing exposures to toxic substances in consumer products, researching children's exposures at home and educating broad audiences about exposures in the home.

Children's health can also be improved through changes at school sites. Therefore, CalEPA has focused efforts on ensuring that children are exposed to fewer toxic substances at school and in transit to school. CalEPA has also contributed to bringing Environmental Principles and Concepts to the children in our state through curriculum development.

Lastly, in their broader communities, CalEPA has taken efforts to protect children from exposures to toxic substances in outdoor air and at recreational sites, while also enriching the body of knowledge on children's health effects from exposure to heat, air pollution and other toxic substances.

In total, the activities of CalEPA described in this report have helped to mitigate the health effects for children from numerous and varied ongoing exposures. CalEPA remains committed to continuing its efforts to protect children into the future.

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