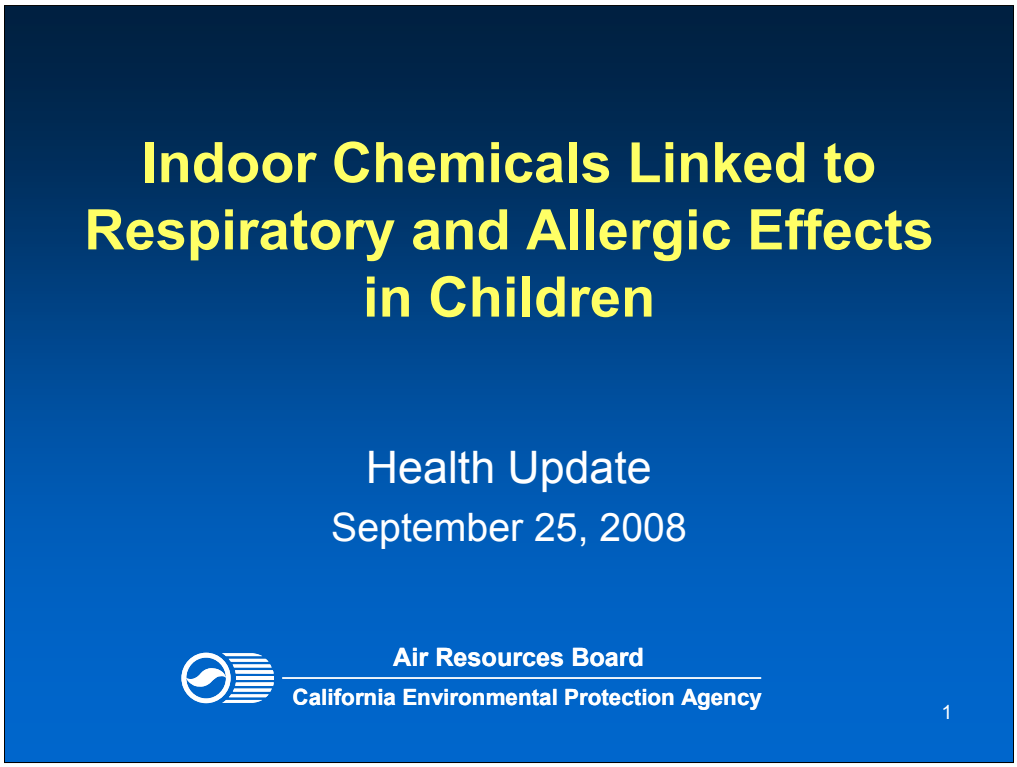

Good morning Madam Chair and members of the Board. As you know, asthma is a chronic respiratory disorder affecting millions of Californians. Between 1984 and 2005, lifetime prevalence of asthma among California adults increased from about 8 percent to 14 percent, and today over 5 million Californians have been diagnosed with asthma.[1] However, the reasons for this increase are not known.

Today I will present a review of literature that examined the link between indoor chemical contaminants and asthma, allergies, and other respiratory diseases in children.

[1] *Strategic Plan for Asthma in California 2008-2012*. California Department of Public Health; 2008.

Background

Indoor Air Links with Asthma, Allergies

- Dust Mites
- Cockroaches
- Animal Dander
- ETS
- Ozone
- NO_2, NO_x

Emerging Concerns

- VOCs
- Formaldehyde
- Phthalates

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Links between the indoor environment and asthma and allergies have already been established. Known biological triggers include house dust mites, cockroaches, and animal dander. Also, chemical contaminants associated with asthma include Environmental Tobacco Smoke (or ETS), ozone, nitrogen dioxide and NOx.

However, there is a growing body of literature that points to a potential link between other indoor chemical contaminants, and asthma and allergies.

These emerging concerns include volatile organic compounds, or VOCs, formaldehyde, and phthalates. VOCs and formaldehyde are commonly found in paints, consumer products, building materials, furnishings, and cleaning agents. Phthalates are used as plasticizers, or softeners, in many plastic products. They are semi-volatile organic compounds, which means they can exist as either gases or particles; thus, dust can be a major source of exposure to phthalates.

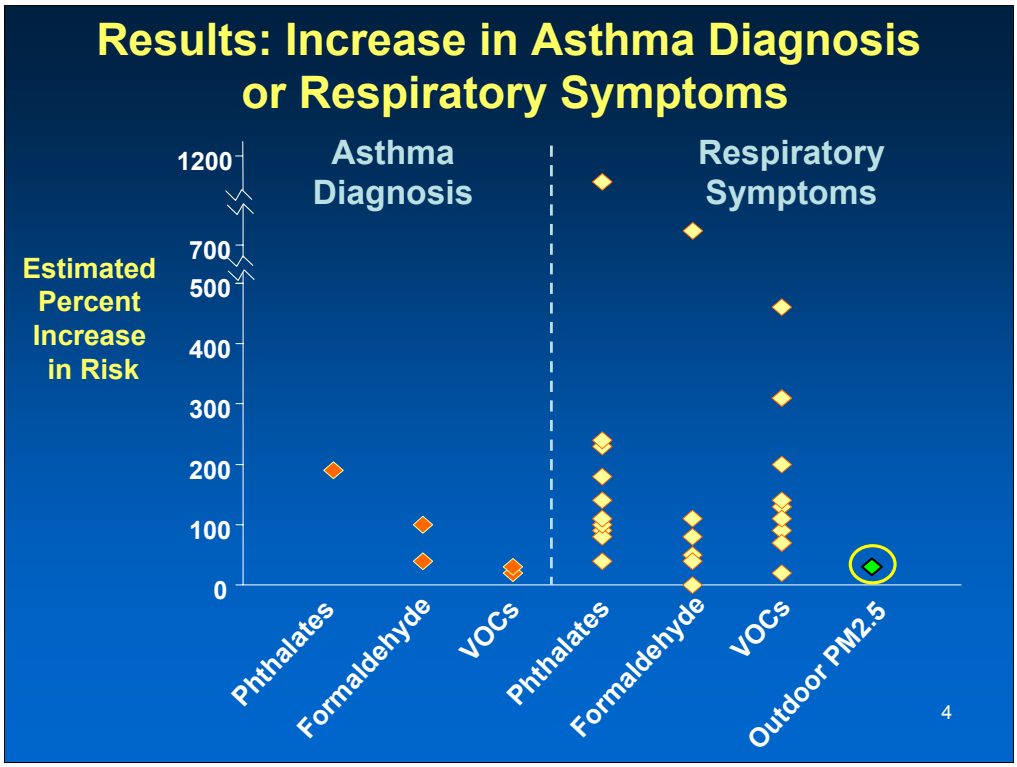
Methods

- Literature Review of 21 Studies[1]
- Two exposure categories
  - Indoor chemical *concentrations*
  - Indoor chemical *sources*
- Children 0-15 years old
- Health outcomes
  - Asthma and respiratory effects
  - Allergic effects

[1] Mendell MJ. Indoor residential chemical emissions as risk factors for respiratory and allergic effects in children: a review. *Indoor Air,* 2007; 17(4): 259-77. Funded by U.S. EPA and U.S. DOE.

The study presented today is a review by Dr. Mark Mendell of Lawrence Berkeley National Laboratory, who looked at the results from 21 studies presented in peer-reviewed, scientific articles. All but two of the studies were conducted outside of the United States, and all had to meet strict criteria in order to be included in this analysis. In each study, the researchers either measured concentrations of specific chemical contaminants in indoor air, or they identified the presence of typical sources of these chemical contaminants.

Each focused on children, and the studies used a variety of study designs. For this review, the numerous health outcomes of the studies were split into two categories. The first category included diagnosed asthma or other respiratory effects, such as bronchial obstruction or wheezing. The second category included allergic effects, such as increased sensitivity to common allergens.



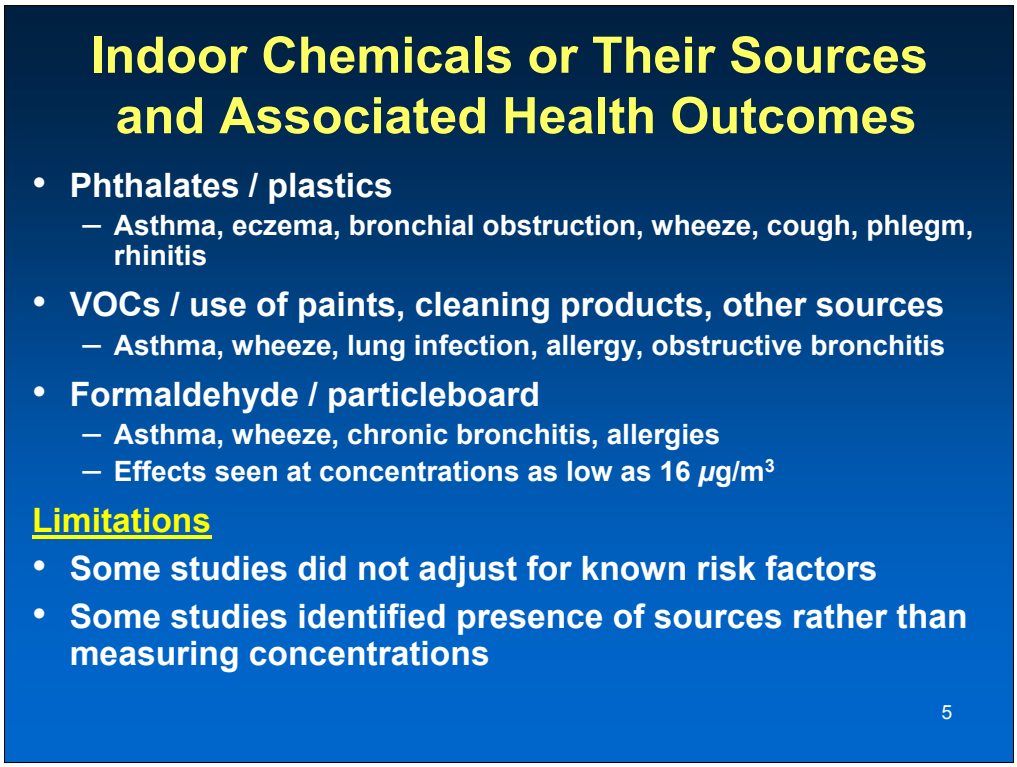
The key results are shown on this slide. This figure shows the estimated increases in risk associated with specific categories of chemicals or their sources. Each diamond represents a reported risk estimate for an individual study.

For diagnosed asthma, shown on the left side, the increase in risk ranges from 20 to 190 percent. ***<MOUSE CLICK>*** For respiratory symptoms, shown on the right side, most of the risk estimates were similar in magnitude to those for asthma diagnosis, but some studies showed much higher risks.

This figure shows that substantial increases in asthma diagnosis and respiratory symptoms were seen in children exposed to higher concentrations of phthalates, formaldehyde, and VOCs, or their sources.

For comparison, on the far right ***<MOUSE CLICK>*** we have shown the 30 percent increase in risk of lower respiratory symptoms per 15 micrograms per meter cubed of PM2.5.

Although not shown on this slide, results for allergenic effects were similar to those shown here for asthma and respiratory effects.



This slide shows the specific respiratory and allergenic health outcomes that were reported for each category of chemicals or their sources. For example, in one study of phthalates, exposure to one of the most common phthalates, di-2-ethyl hexyl phthalate, was associated with diagnosed asthma and eczema. In other studies, sources of phthalates such as PVC or linoleum flooring, and textile wall coverings, were associated with the other outcomes shown for phthalates. VOCs and formaldehyde had similar outcomes. For formaldehyde, some of the effects shown were seen at levels as low as 16 $\mu g/m^3$. By comparison, levels in California homes are typically two or three times higher than this level.

The research included in this study had some limitations. For instance, some studies did not adjust for known risk factors related to asthma and allergies, which may have inflated their resulting risk estimates. Additionally, some studies identified the presence of known sources of the chemicals, rather than measuring the concentrations of the chemicals. In such studies, the exposure was assumed, rather than measured.

Despite these limitations and some others, these studies together suggest that phthalates, VOCs, and formaldehyde may contribute substantially to the burden of asthma and allergies in California.

Conclusions and Implications

- **Suggests new indoor risk factors**
- **Supports composite wood ATCM and consumer products regulations**
- **Supports Green Chemistry Initiative**
- **Demonstrates need for asthma and allergy studies of phthalates, formaldehyde, and VOCs in the U.S.**

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The results of these studies point to indoor chemicals as new risk factors for asthma, other respiratory effects, and allergies in children. This research lends further support to the Board's adoption of the Air Toxics Control Measure to limit formaldehyde emissions from composite wood products, and our regulations that reduce VOCs in consumer products. It also supports Cal/EPA's Green Chemistry Initiative to reduce harmful chemicals in products.

However, there is a need for new, U.S.-based studies in order to validate these findings for current U.S. sources and exposures. Additionally, despite the growing concern over phthalates, formaldehyde, and volatile organic compounds, causal links between these chemical contaminants and health effects still need to be identified. For these reasons future studies should focus on these chemical contaminants as risk factors for asthma and allergies. This will increase our understanding and ultimately help guide efforts to reduce the burden of asthma and allergies in the state of California.

This concludes my presentation, and I would be happy to answer any questions that you might have.