Scoping Plan Public Health Workshop

FEBRUARY 15, 2022
Fossil Fuel Combustion Phase Down Can Reduce Both GHGs and Other Air Pollution

- CO2
- Greenhouse Gas Pollution
- Black Carbon
- Methane
- HFCs
- Ozone
- PM
- NOx
- Short-Lived Climate Pollutants
- Criteria and Toxic Pollutants
- Public Health Benefits

CALIFORNIA AIR RESOURCES BOARD
California’s Integrated Air Quality and Climate Programs
Health Effects of Climate Change

- Extreme weather, heat waves, drought, wildfires
- Vector borne disease, increased allergens
- Poor living conditions, social inequities, reduced food supply
- Air and water pollution, degraded environment
At-Risk Groups Suffer More Health Consequences

- Low-income; marginalized groups
- Race and Ethnicity
- Pre-existing diseases (cardiovascular disease and respiratory disease),
- Immigrant, refugee and tribal communities
- People with disabilities
- Older adults; Children
- Pregnant women

Defining Key Terms

Health Endpoints:
- Health outcomes used in health impact assessment (quantitative or qualitative)
- Outcomes that can be measured and improved - Asthma attacks, Hospitalizations

Climate Resilience:
- Capacity of people and communities to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience.
Background on CARB’s Health Analysis

Health analysis informs the benefits of CARB regulations, plans, and programs

Current approach quantifies small subset of full suite of benefits (PM2.5 only):

- Cardiopulmonary mortality
- Hospitalizations for heart and lung causes
- Emergency room visits for asthma
Air Pollution and Health Impacts

- Ozone
- Particulate Matter
- Toxic Air Contaminants
- Secondary Particulate Matter

Mortality
- ER Visits, Hospital Admissions, Heart Attacks
  - Doctor Visits, Lost Work & School Days
  - Respiratory Symptoms, Medication Use, Asthma Attacks
  - Lung Function Decrement, Inflammation, Cardiac Effects

(Graphic adapted from EPA BenMAP website
Example: Advanced Clean Trucks

CARB health analysis of Advanced Clean Trucks estimates potential statewide health benefits of PM2.5 reductions between 2020 - 2040:

- 943 fewer premature deaths
- 453 fewer emergency room visits (respiratory)
- 325 fewer hospital admissions (respiratory and cardiovascular admissions)
**Strong Evidence for Broader Health Impacts**

<table>
<thead>
<tr>
<th>Asthma Onset/Exacerbation*</th>
<th>Work Loss Days*</th>
</tr>
</thead>
<tbody>
<tr>
<td>School Loss Days</td>
<td>Brain Health*</td>
</tr>
<tr>
<td>Birth Outcomes*</td>
<td>Metabolic* Outcomes</td>
</tr>
</tbody>
</table>

*CARB research underway
Expanding Health Endpoints for Ongoing Analysis of Rules, Plans

<table>
<thead>
<tr>
<th>Updated Endpoints</th>
<th>New Endpoints</th>
</tr>
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<tbody>
<tr>
<td>Hospital Admissions, Cardiovascular Outcomes*</td>
<td>Emergency Department Visits, Cardiovascular</td>
</tr>
<tr>
<td>Hospital Admissions, Respiratory Outcomes*</td>
<td>Acute Myocardial Infarction, Nonfatal</td>
</tr>
<tr>
<td>Emergency Department Visits, Respiratory</td>
<td>Asthma Onset</td>
</tr>
<tr>
<td></td>
<td>Asthma Symptoms / Exacerbation</td>
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<tr>
<td></td>
<td>Work Loss Days</td>
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<tr>
<td></td>
<td>Lung Cancer Incidence</td>
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<tr>
<td></td>
<td>Alzheimer's Disease</td>
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<td></td>
<td>Parkinson's Disease</td>
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*CARB will update the underlying study
CARB is currently calculating ED visits for specifically asthma
Health Analysis: Qualitative and Quantitative Outcomes

Quantitative
- ✔ Reduced cases of mortality and morbidity

Qualitative
- ✔ Directional and scale of effects
- ✔ Broader set of health outcomes
- ✔ Health disparities
## Why Do a Qualitative Analysis?

<table>
<thead>
<tr>
<th>Elements</th>
<th>Quantitative</th>
<th>Qualitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic valuation</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disease burden from epidemiological studies</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Community impacts</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Statewide and regional analysis</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Strength of evidence</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Vulnerability and disparities</td>
<td></td>
<td>X</td>
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</tbody>
</table>
Key Areas of Focus Qualitative Analysis

- Economic/Food Security
- Green Spaces
- Physical Activity
- Active Transportation
- Children’s Health
- Compact Development/Mobility

Disease Burden
Health Benefits Support
Community Resilience

Reducing disease burden & disparities
Increasing physical and psychological health
Improving community resilience

Quantitative and Directional Health Benefits

<table>
<thead>
<tr>
<th>Decreased Air Pollution</th>
<th>Increased Green Space</th>
<th>Decreased Noise Pollution</th>
<th>Increased Physical Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓ Asthma incidence, ED visits</td>
<td>↓ Cardiovascular mortality</td>
<td>↓ Hypertension</td>
<td>↓ Breast cancer</td>
</tr>
<tr>
<td>↓ Asthma exacerbation</td>
<td>↓ Diastolic blood pressure</td>
<td>↓ Coronary heart disease</td>
<td>↓ Cardiovascular disease</td>
</tr>
<tr>
<td>↓ All-cause mortality</td>
<td>↓ Preterm births</td>
<td>↓ Stroke</td>
<td>↓ Dementia</td>
</tr>
<tr>
<td>↓ Preterm birth/low birth weight</td>
<td>↓ Stress</td>
<td></td>
<td>↓ Colon cancer</td>
</tr>
<tr>
<td>↓ Diabetes incidence</td>
<td>↓ Diabetes incidence</td>
<td></td>
<td>↓ All-cause mortality</td>
</tr>
<tr>
<td>↓ Respiratory mortality</td>
<td>↓ All-cause mortality</td>
<td></td>
<td>↓ Diabetes incidence</td>
</tr>
<tr>
<td>↓ Lung cancer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>↓ Cardiovascular mortality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>↓ COPD</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Understanding Health and Exposure Disparities

(Apte, J.S., Chambliss, S.E., Tessum, C.W., Marshall, J.D. (2019). A Method to Prioritize Sources for Reducing High PM2.5 Exposures in Environmental Justice Communities in California, Contract 17RD006)
Developing New Health Assessment Tools

• Assess benefits of Natural and Working Lands management to reduce wildfire health risks
  • All-cause mortality, respiratory mortality
  • Hospitalizations for asthma and all-cause respiratory conditions
  • Emergency room visits for asthma
• Assess benefits of greenness on health
  • Mortality
  • Birth outcomes
  • Mental health improvements
Assessing Children’s Health Benefits Using Existing Literature

<table>
<thead>
<tr>
<th>Health Endpoint</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung development</td>
<td>Living within 500 m of a freeway: showed a decrease in lung function growth</td>
</tr>
<tr>
<td>Asthma symptoms and medication use</td>
<td>An increase of 72-119% for risk of wheezing and use of asthma medication was associated with increased exposure to NO2</td>
</tr>
<tr>
<td>New-onset asthma</td>
<td>34% increase for risk of developing new-onset asthma was found with increased exposure to traffic pollution</td>
</tr>
</tbody>
</table>

(Gauderman et al. 2007; Gauderman et al. 2005; McConnell 2010)
## Overview: Key Health Analysis Elements

<table>
<thead>
<tr>
<th>Analysis Type</th>
<th>2017 SP</th>
<th>2022 SP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantitative Analysis</td>
<td># cases and value statewide PM</td>
<td># cases and value state and local PM and Ozone</td>
</tr>
<tr>
<td>Health Overview</td>
<td>Literature review</td>
<td>Literature review</td>
</tr>
<tr>
<td>Qualitative Analysis</td>
<td>Not included</td>
<td>Included</td>
</tr>
<tr>
<td>Health Endpoints</td>
<td>3</td>
<td>Proposing 11</td>
</tr>
<tr>
<td>Physical Activity – Chronic Illness and Mortality</td>
<td># cases; 2030 estimate</td>
<td># of cases; Date of estimate TBD</td>
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<tr>
<td>Wildfire Analysis</td>
<td>Not included</td>
<td># cases and value for selected years</td>
</tr>
<tr>
<td>Heat Mortality Analysis</td>
<td>Not included</td>
<td>Under review</td>
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</tbody>
</table>
Health Challenges and Mitigation Opportunities

• Fueling transition: Assessing impacts of transition from petroleum to renewable fuels and electrification
• Mobility transition: Assessing safety issues linked to vehicle traffic during transition to walkable, bike and transit friendly communities
Longer Term Research and Analysis

- More detailed health analysis of specific regulations and policies implemented after SP adoption
- Identifying/tracking health indicators in impacted communities
- Ongoing look at new approaches to health analysis
- Evaluate ways to better understand, account for cumulative impacts in communities
Review and Conclusion

- Overview/update of air pollution and climate change health effects
- Health benefits of decarbonization no later than 2045 vs. Status Quo
- Quantitative and qualitative approaches
- Use expanded health outcomes and tools
- Include information on climate and health disparities
Health Exposure and Assessment Branch Staff Contacts

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