Policy strategies to reduce health impacts from urban particulate pollution

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Context: Regional Air Pollution Challenges for Infill Development

- **Infill Benefits: Reducing Regional VMT**
  - Energy efficiency
  - Lowered regional pollution emissions
  - Increased active transportation

- **Infill Costs: Health and Social Equity Hazards**
  - Increased exposure to urban environmental hazards (air noise, traffic)
  - Displacement
San Francisco Approach Cumulative Effects Analysis

- Analyze different health outcomes independently
- Assess “cumulative” exposure to key individual pollutants at the neighborhood level
- Incorporate social vulnerability by allowing baseline health outcomes to vary by neighborhood in health impacts analysis

**Sources**

**Emissions**

**Concentrations**

**Exposures**

**Biological & Health Effects**
Limits of Regional Air Pollutant Monitoring

- Regional monitors not sufficient for neighborhood scale exposure and health impact analysis
- May not provide sufficient data for good policy
Estimated cumulative PM 2.5 concentration

Average Annual PM 2.5 Concentration from All Sources (ug/m3)

PM 2.5 Concentration (ug/m3)
- Less than 8.5
- 8.5 - 9
- 9 - 9.5
- 9.5 - 10
- Greater than 10

Source: SFDPH - Bay Area Air Quality Management District
City and County of San Francisco Department of Public Health Environmental Health Section
Available at www.biteanddrink.org
Pre-mature mortality attributable to cumulative PM 2.5 in San Francisco

<table>
<thead>
<tr>
<th>Modeled PM2.5 Concentration (μg/ m³)</th>
<th>Residential Population Exposed</th>
<th>Estimated Excess Annual Pre-mature Deaths</th>
<th>Annual Pre-mature Deaths (Lower Bound Estimate)</th>
<th>Annual Pre-mature Deaths (Upper Bound Estimate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-8.99</td>
<td>700,529</td>
<td>82.8</td>
<td>42.5</td>
<td>126.2</td>
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<tr>
<td>9-9.99</td>
<td>100,785</td>
<td>19.0</td>
<td>9.7</td>
<td>29.0</td>
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<td>&gt;=10</td>
<td>3,895</td>
<td>1.3</td>
<td>0.7</td>
<td>2.0</td>
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<tr>
<td>Unclassified Exposure</td>
<td>25</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td>Total</td>
<td>805,235</td>
<td>103</td>
<td>52</td>
<td>157</td>
</tr>
</tbody>
</table>
Relationship Between Average PM2.5 Concentration and Median Household Income
Local PM 2.5 Risk Reduction Strategies

Emissions Reductions

- Limit growth of traffic density through land use, pricing, parking control, impact fees, improved transit, bicycle, and pedestrian environments
- Construction equipment air pollution controls

Exposure Management

- Enhanced ventilation systems for new residences with high fine particulate levels or high cancer risks
- Improving ventilation in existing residential dwellings
Sensitive Use Protections for Air Pollution Hot Spots (SF Health Code Article 38)

- Identify Areas with Potential Conflicts
- Establish Action Level for Mitigations
- Mitigation via Building Design or Engineered Ventilation to remove 80% of outdoor PM 2.5
Benefits and Limits to Exposure Mitigations

- Inexpensive/low marginal costs
- No change to land use or transportation systems
- Multiple health benefits of filtered air
- Can be implemented via planning, health, or building codes
- Does not address noise or other roadway proximity hazards!
- Does not protect existing sensitive uses!
Thoughts for Regional Air Pollution Policy

- Priority need for neighborhood scale air pollution models – regional monitors are not sufficient
- Regionalize local best practices
  - Ventilation upgrades via weatherization programs
- Regulated of traffic corridors as emissions sources
  - Limits on highway capacity expansion
  - Innovative solutions such as urban freeway speed control
- Identify and prevent new of local air pollution use conflicts (e.g. commercial exhausts)
Speed and Flow Controls Reduce Roadway Particulate Emissions

- Technology
  - Lowered / variable Speed Limits with photo enforcement

- Benefits
  - GHGs
  - PM 2.5 and NOx
  - Injuries and fatalities
  - Noise
  - Congestion

- Needs regional agency leadership and public education
Protecting Urban Air Quality: A Work in Progress

- Industry
- Roadways
- Construction & demolition
- Generators /Boilers
- Recycling and waste handling
- Truck routes
- Restaurant exhausts
- Urban canyons