



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

AGENDA: 4

Health and Equity Assessments for Rulemaking

**Stationary Source and Climate Impacts
Committee Meeting**

June 21, 2023

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Presentation Outcomes



- Informational Item
- Describe the supplemental information that modeling-based assessments can provide on health and equity benefits for proposed new rules or amendments

Presentation Outline



- Modeling can link proposed emission reductions to health impact reductions
- These examples illustrate the type of information that can be developed in future rule development applications:
 - Rule 6-5 (particulate emissions from refinery fluidized catalytic cracking units)
 - Rules 9-4 and 9-6 (nitrogen oxides from natural gas space and water heaters)



Modeling assessments can link proposed emission reductions to impact reductions

Emissions to Health Effects



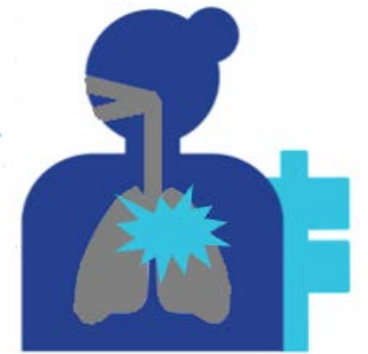
Emissions



Ambient Concentrations



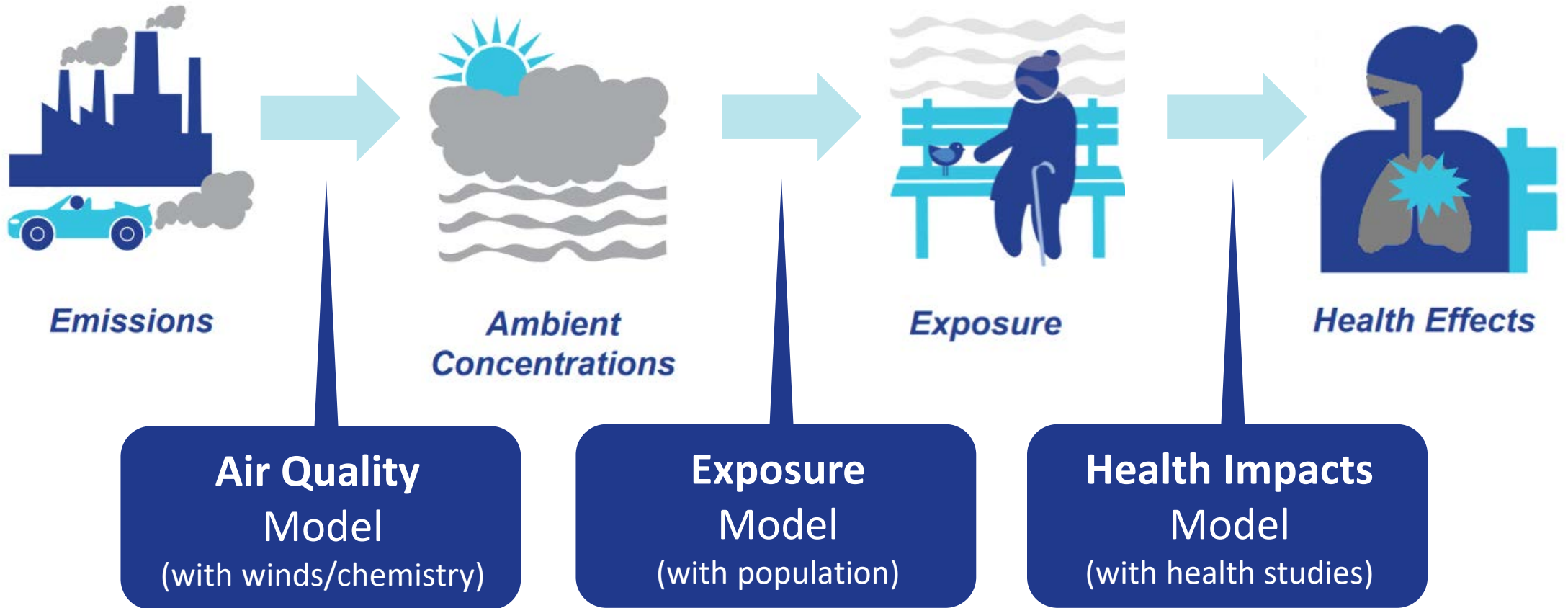
Exposure



Health Effects

Modeling Shows the Links:

What We Can Control → What We Care About



Assessments to Support Rules



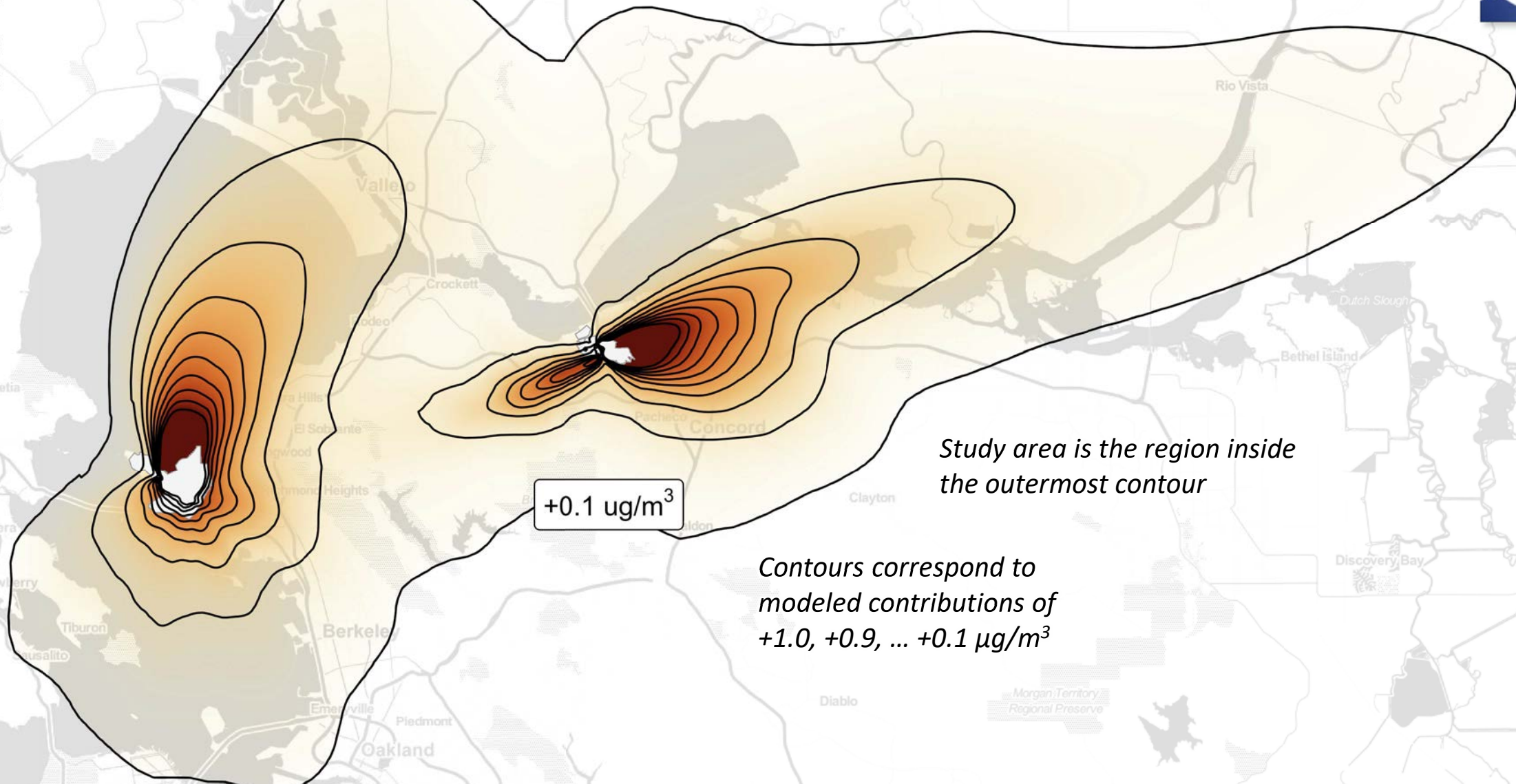
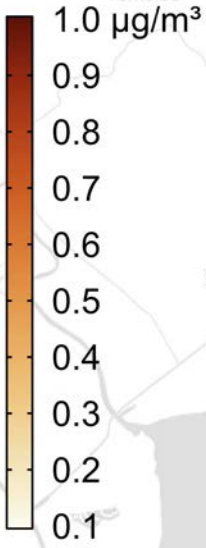
- Models can link expected emission reductions to benefits
- Reductions in exposures
 - Who benefits the most?
- Reductions in adverse health outcomes
 - Monetizing health benefits
 - Focus has been on fine particulate matter (PM_{2.5})
- No statutory requirement for it, but this type of assessment can provide supplemental information to the Board and public



Example: Rule 6-5: Particulate Emissions from Refinery Fluidized Catalytic Cracking Units (FCCUs)



Modeled PM_{2.5} from Chevron and MRC



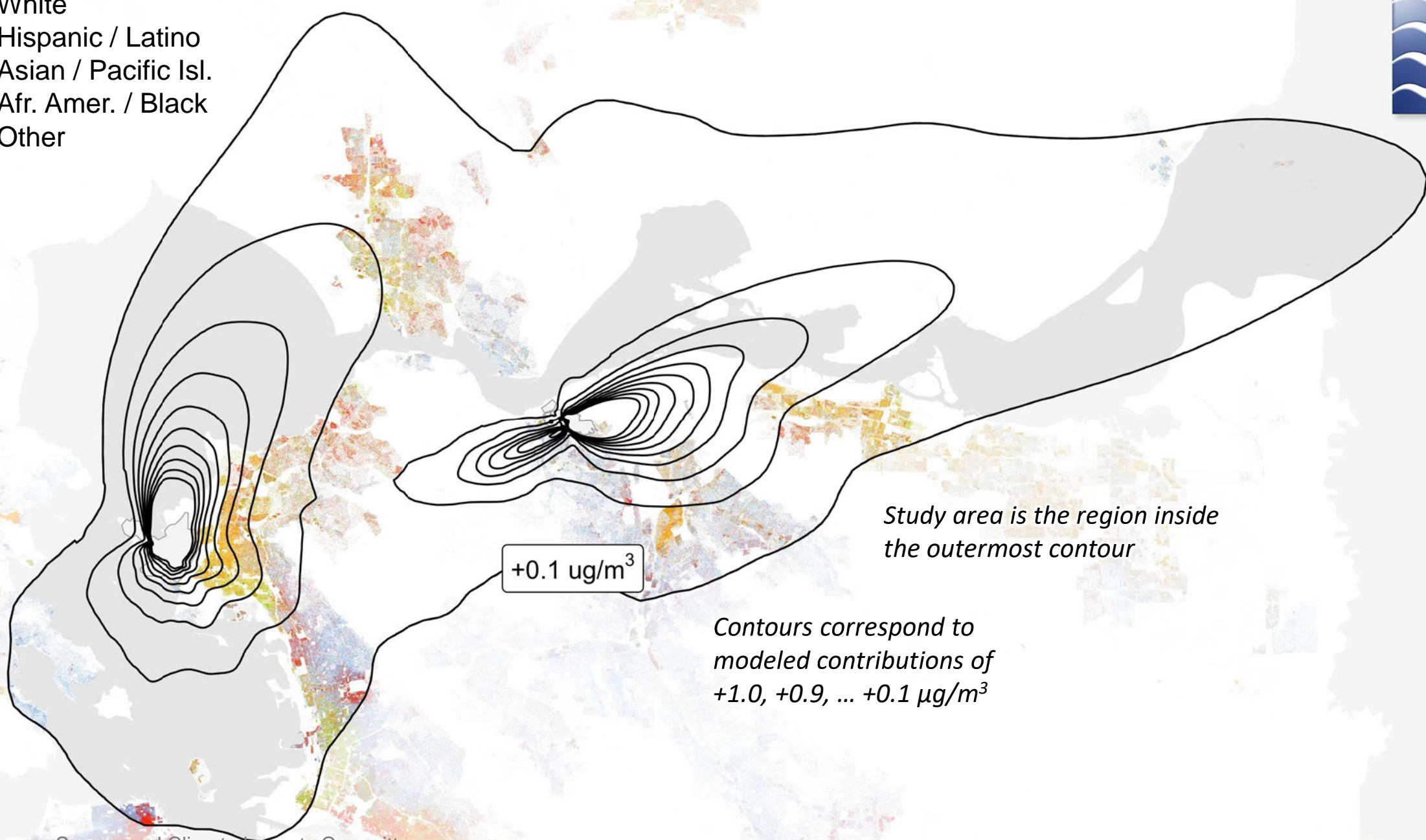
+0.1 $\mu\text{g}/\text{m}^3$

Study area is the region inside the outermost contour

Contours correspond to modeled contributions of +1.0, +0.9, ... +0.1 $\mu\text{g}/\text{m}^3$



- White
- Hispanic / Latino
- Asian / Pacific Isl.
- Afr. Amer. / Black
- Other



Study area is the region inside the outermost contour

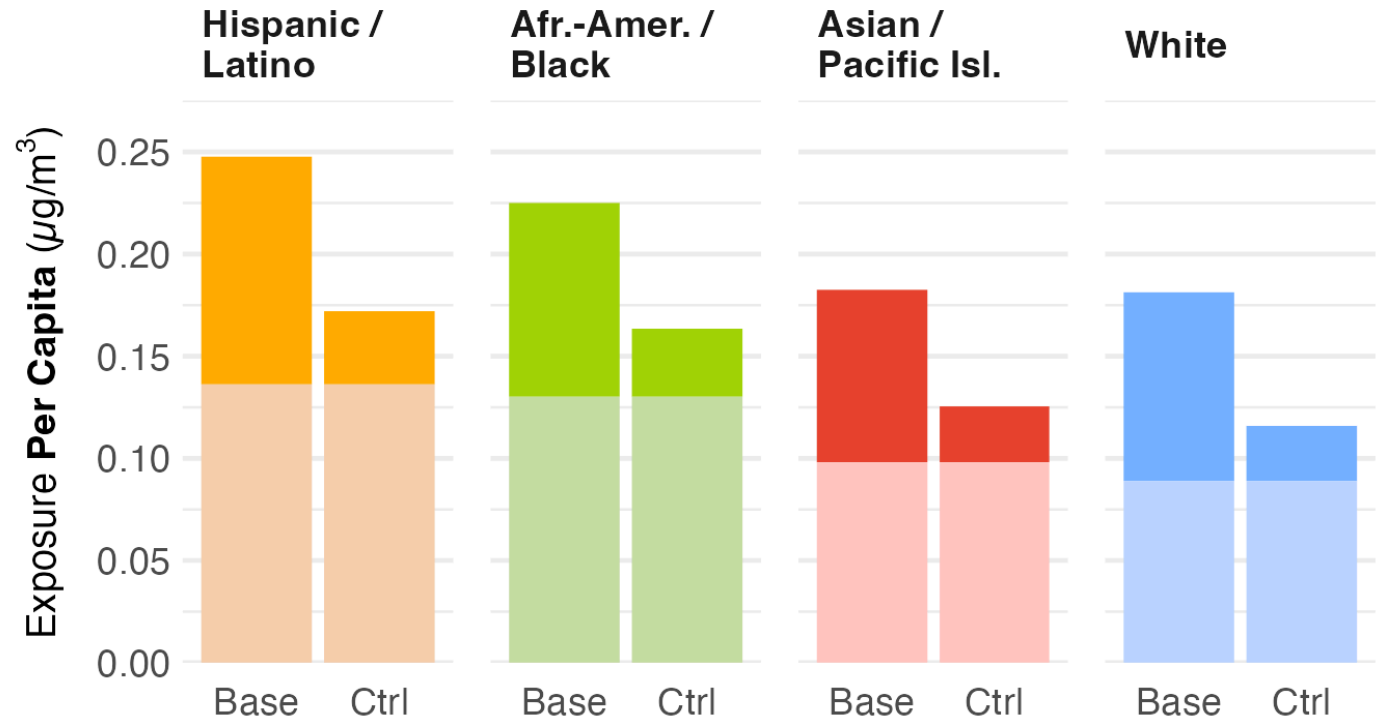
Contours correspond to modeled contributions of +1.0, +0.9, ... +0.1 $\mu\text{g}/\text{m}^3$

Equity Assessment



Disparities in Exposure

- On average, Hispanic/Latino and African American/Black residents are exposed to more PM_{2.5} from Chevron and MRC in all modeled scenarios
- Sources other than the FCCUs drive these disparities



*Fluidized Catalytic Cracking Unit (FCCU) impacts shown in darker colors
Bar heights = total impacts (FCCU + Non-FCCU)*

Health Benefits and Valuations



Health Impacts	Annual Health Benefits (Incidence Avoided)	Annual Valuations (US\$, 2015)
Premature mortality	2.6–5.8	26.3M–59.2M
Non-fatal heart attack	0.24–2.2	32k–307k
Hospital admission, respiratory	0.4	14k
Hospital admission, cardiovascular	0.5	12k
ER visit, asthma	2	<1k
Restricted activity days	2,400	180k
Work loss days	410	90k
Asthma exacerbation	100	6k
Respiratory illness – upper tract	70	2k
Respiratory illness – lower tract	50	1k
Acute bronchitis	4	2k
Chronic lung disease	0.1	3k
		27M–60M

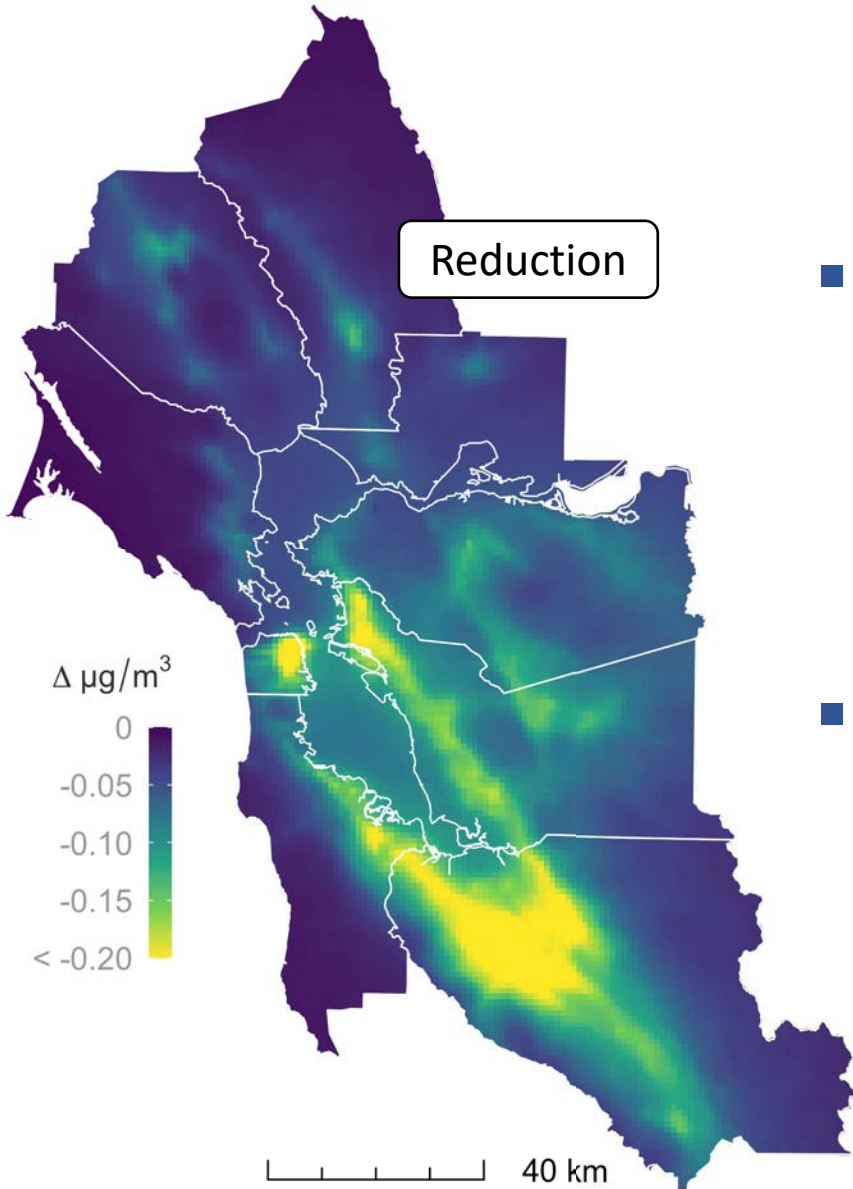


Assessment within a “combined plumes” study area



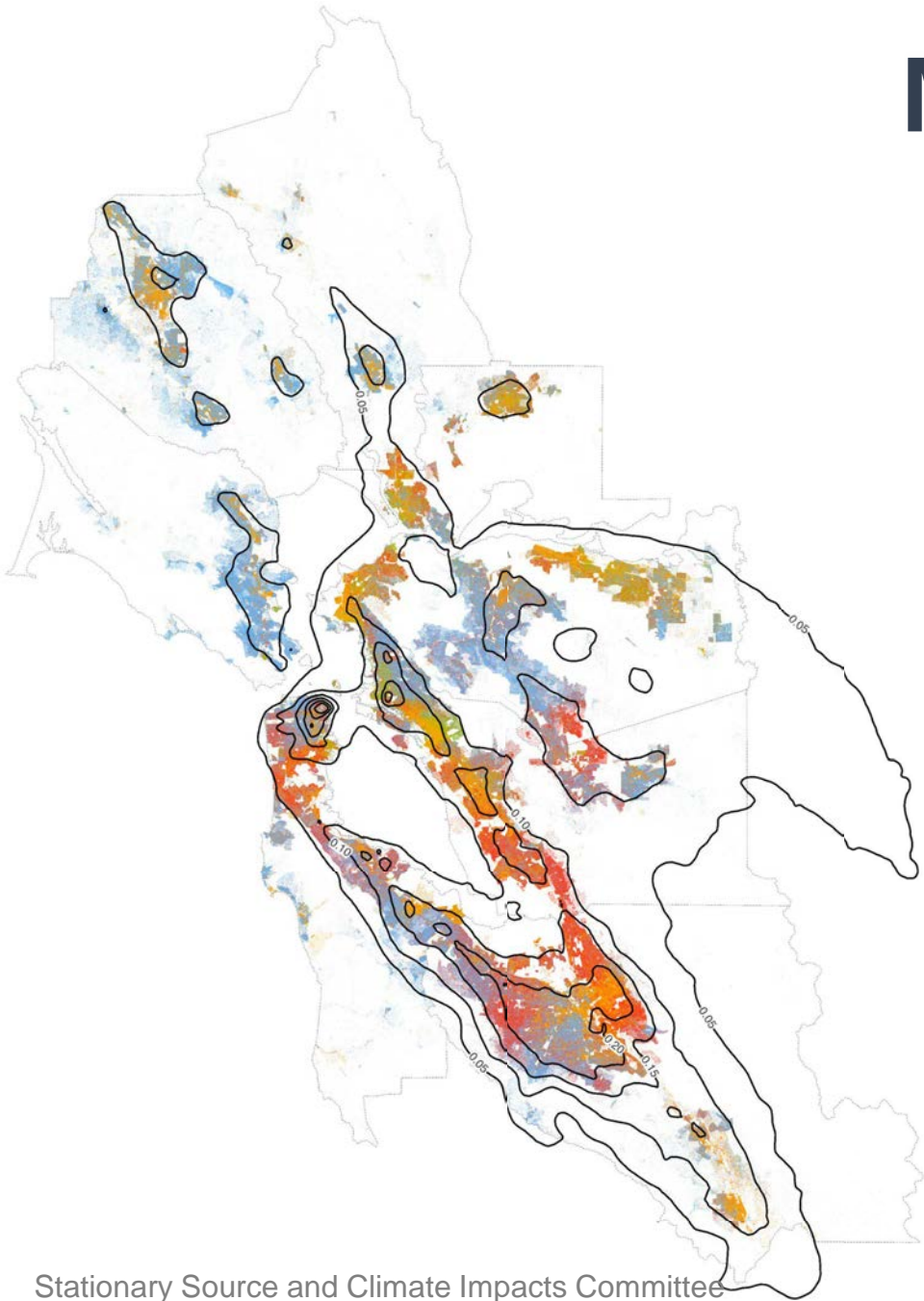
Example: Rules 9-4 and 9-6: Nitrogen Oxides (NO_x) from Natural Gas Space and Water Heaters

Modeled PM_{2.5} Reductions with Electric Appliances



- From elimination of **NO_x and PM_{2.5} emissions** from Bay Area natural gas-fired commercial & residential space/water heating appliances covered by Rules 9-4 and 9-6
- Reductions in total (primary and secondary) PM_{2.5} attributed to these appliances

Modeled PM_{2.5} Exposure



- Exposures highest in high-density areas where PM_{2.5} concentrations are also high (2020 residential population)
- Exposure levels vary by county and by race/ethnicity

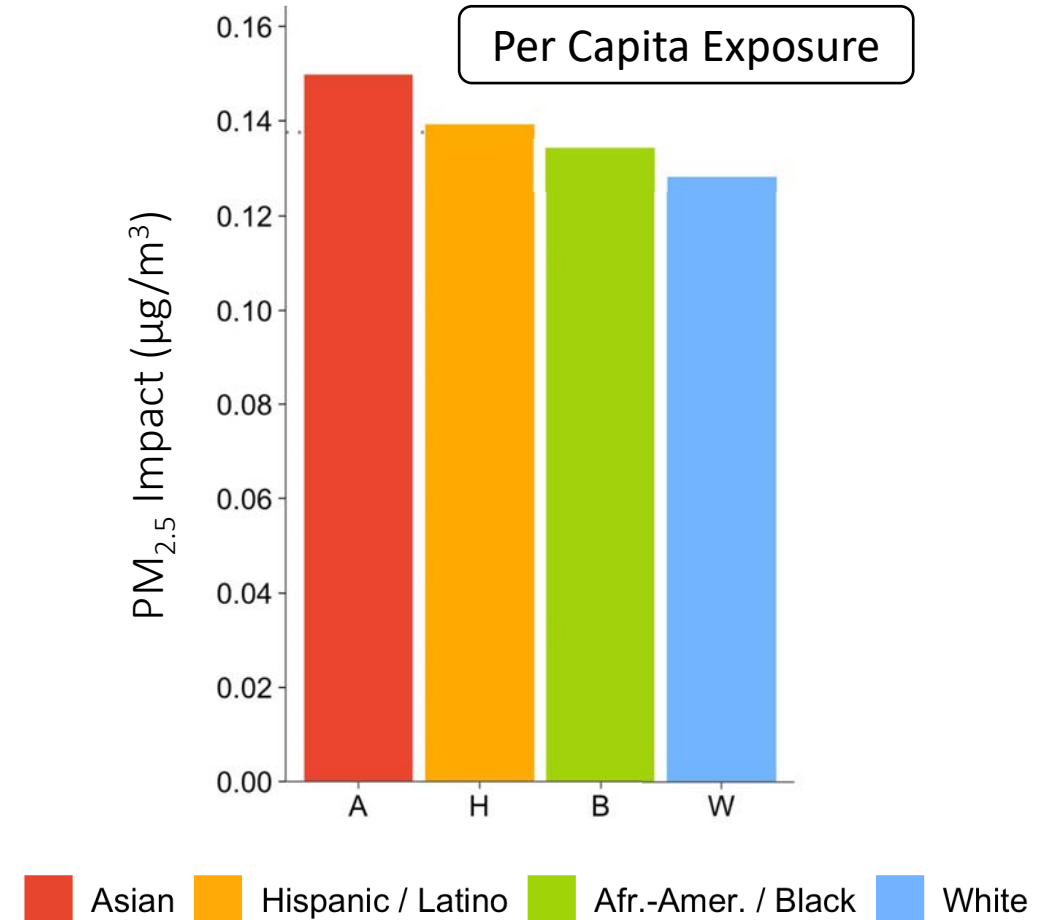
Population (2020)
● White
● Hispanic / Latino
● Asian / Pacific Islander
● African American / Black

Equity Assessment



Disparities in Exposure

- The counties most affected by these sources, like Santa Clara, tend to be higher % Asian / Pacific Islander. This explains most of the regional pattern (shown at right).
- Within every county, the most-impacted residents tend also to be people of color: primarily Hispanic and African-American/Black.



Health Benefits and Valuations



Health Impacts	Annual Health Benefits (Incidence Avoided)	Annual Valuations (US\$, 2020)
Premature mortality	37–85	380M–870M
Non-fatal heart attack	4.2–39	0.4M–3.5M
Hospital admission, neurological	13	190k
Out of hospital cardiac arrest	0.73	30k
Stroke	2.4	96k
Lung cancer	3.1	91k
Hospital admission, respiratory	3.9	45k
Hospital admission, cardiovascular	4.9	91k
ER visit, respiratory	20	21k
ER visits, cardiovascular	10	14k
Restricted activity days	39,000	3.2M
Work loss days	6,700	1.8M
Hay fever/allergic rhinitis	710	520k
Asthma symptoms/albuterol use	15,000	6k
Asthma onset	110	5.8M
		400M–890M



Assessment for Bay Area Air District

Summary and Next Steps



- The Air District can apply modeling-based methods to provide supplemental information for rule development
- These methods can provide information
 - On health benefits for rules that would reduce exposures to PM_{2.5} or ozone, for populations of about 1 million people or more
 - On the equity of exposure changes, by race/ethnicity
- Review rule development calendar to identify candidate rules where application of these methods would be helpful



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AGENDA: 5

Overview of Socioeconomic Analyses for Air District Rulemaking

**Stationary Source and Climate Impacts Committee
June 21, 2023**

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Presentation Outcome



To provide the committee with an overview of how the Air District evaluates socioeconomic impacts of rulemaking activities.

Presentation Outline



- Background on Rule Development
- Statutory Requirements for Socioeconomic Impacts
- Overview of Socioeconomic Analyses
- Questions

Requested Action



- None; informational item only.

Rule Development Background



- Air District develops new rules and rule amendments to be considered by the Board of Directors for adoption
- Number of requirements for evaluating and considering different impacts as part of the rule development process include estimates of:
 - Emission reductions
 - Compliance costs
 - Cost-effectiveness and incremental cost-effectiveness
 - Environmental impacts
 - Socioeconomic impacts

Statutory Requirements



- California Health and Safety Code, Section 40728.5
- “...agency shall, to the extent data are available, perform an assessment of the socioeconomic impacts of the adoption, amendment, or repeal of the rule or regulation.”
- “The district board shall actively consider the socioeconomic impact of regulations and make a good faith effort to minimize adverse socioeconomic impacts...”

Statutory Requirements (cont.)



- “Socioeconomic impact” means the following:
 - (1) The type of industries or business, including small business, affected by the rule or regulation.
 - (2) The impact of the rule or regulation on employment and the economy of the region affected by the adoption of the rule or regulation.
 - (3) The range of probable costs, including costs to industry or business, including small business, of the rule or regulation.

Statutory Requirements (cont.)



- “Socioeconomic impact” means the following (cont.):
 - (4) The availability and cost-effectiveness of alternatives to the rule or regulation being proposed or amended.
 - (5) The emission reduction potential of the rule or regulation.
 - (6) The necessity of adopting, amending, or repealing the rule or regulation to attain state and federal ambient air standards.

Overview of Socioeconomic Analyses



- Air District performs some of these assessments as part of other analyses and requirements (such as evaluating emission reductions, cost-effectiveness of alternatives, necessity findings)
- Impacts to industries, businesses, and regional employment and economy assessed with support of socioeconomic consultants

Socioeconomic Analysis: Current Process



Limitations of the Current Process



- Current analysis is narrow and focused on broad regional macroeconomic indicators
- Not designed to answer more nuanced local/community-level questions
- Socioeconomic analyses have limited information on consumer impacts or changes to consumption patterns resulting from regulation
 - Direct impact is measured currently, but analysis of impacts on consumers or consumption patterns, i.e., induced impact, are limited.

Limitations of the Current Process (cont.)



- Regulated community often objects to analyses as having incorrect or incomplete data on business operations, profits, and compliance impacts
 - ... but better impact analysis is often hard to achieve because of the limited data availability – proprietary business data, such as profit details, data availability to measure impact on certain specific areas, etc.



Improvements to Socioeconomic Analyses

- Several improvements to the current process are being implemented for future assessments
- Vendors were selected from a 2022 RFP solicitation to provide socioeconomic support services, with capabilities to perform the following analyses/actions – given that appropriate data are available for analysis

Improvements to Socioeconomic Analyses (cont.)



- Additional analysis:
 - Perform an analysis to establish who pays for the regulatory action – whether industry passes down the cost of regulation to consumers;
 - Assess the level of significance of socioeconomic impacts, including regional economic impacts and any special impacts to small businesses caused, directly or indirectly, by the rule.

Improvements to Socioeconomic Analyses (cont.)



- Additional analysis (cont.):
 - Provide an estimation of cumulative regional economic impact, location, and market structure of the affected industries – establish a baseline scenario and compare baseline with regulation;
 - Estimate total regulatory impact and how a new regulation impacts business;
 - Estimate availability and incremental impacts of potential alternative control options.

Improvements to Socioeconomic Analyses (cont.)



- Some of these items to improve analyses are still aspirational at present
 - Much depends – crucially – on relevant data availability;
 - Should improve as relevant data becomes more readily available;
 - There is no change at present to how the final report is compiled:
 - Contractor compiles report with assistance from the Air District's Rules & Strategic Policy Division – such as, for example, providing costs of device and alternatives for compliance;
 - The report is reviewed by Air District staff;
 - The report is presented to the Committee/Board for approval as part of the rule development process.

Questions?



- Questions and Comments