

Impact of the Draft 2016 AQMP on Community Health Benefits and Health Risk Distribution

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Introduction

- Implementation of the Draft 2016 AQMP control measures will improve air quality and lead to public health benefits in the South Coast Air Basin.
- The distribution of these air quality improvements and health benefits vary spatially. These benefits are summarized by EJ and non-EJ community designations.
- We also examined the differences in a set of inequality indices of the underlying distributions for exposure-related health risks between the Baseline and Policy (Control) scenarios of the Draft 2016 AQMP, specifically for:
 - Mortality risk among adults (25 years or older).
 - Asthma related Emergency Department (ED) visits among children (younger than 18).

EJ Community Definitions

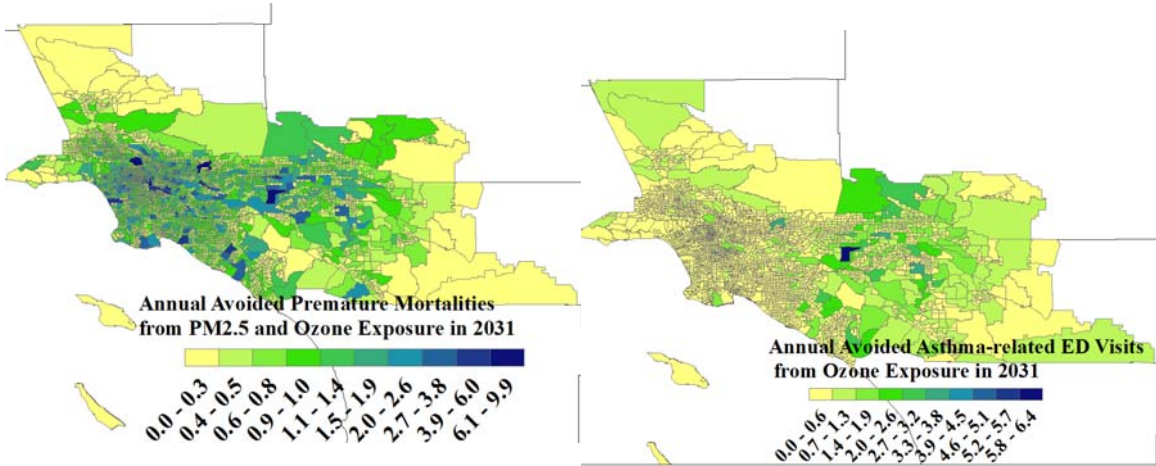
- Health benefits are summarized by EJ community type based on alternative EJ definitions provided by Industrial Economics*:
 - Definition 1: Poverty Status and Air Quality Indicators
 - Definition 2: Poverty Status, Air Quality Indicators, and Demographic Indicators.
 - Definition 3: Poverty Status, Air Quality Indicators, Demographic Indicators, and Other Environmental Indicators.
- Each definition is evaluated at two EJ designation thresholds: top 25% and top 50% of Basin-wide population ranked by EJ screening score (overall degree of impact).

*For a detailed list of the indicators by definition, see Chapter 6 of the Socioeconomic Report

Health Benefits by EJ Designation

- Health impacts and their monetized value, as estimated and described in Chapter 3 of the Preliminary Draft Socioeconomic Report
- Sensitivity Analysis:
 - Public health benefits are summarized by EJ designation under different definitions of EJ communities, to test the sensitivity of results to the definition.
 - Results show that the finding of a greater per-capita benefit to EJ communities is not sensitive to the different EJ definitions.

Spatial Distribution of Health Benefits



Health Benefits by EJ Designation in 2031

Annual Avoided Premature Deaths from Ozone and PM2.5 Exposure Due to Implementation of Draft 2016 AQMP

- Top 50%

EJ Definition	Avoided Premature Deaths per Million Residents 25 or Older		Difference between EJ and Non-EJ
	EJ Communities	Non-EJ Communities	
Definition 1	154	125	30
Definition 2	159	121	38
Definition 3	153	124	28

- Top 25%

EJ Definition	Avoided Premature Deaths per Million Residents 25 or Older		Difference between EJ and Non-EJ
	EJ Communities	Non-EJ Communities	
Definition 1	167	131	37
Definition 2	170	129	41
Definition 3	161	131	30

Note: Numbers may not sum up due to rounding.

Health Benefits by EJ Designation in 2031 (cont.)

Annual Avoided Asthma-related ED Visits from Ozone Exposure Due to Implementation of Draft 2016 AQMP

- Top 50%

EJ Definition	Avoided Asthma ED, Visits per Million Residents Younger than 18		Difference between EJ and Non-EJ
	EJ Communities	Non-EJ Communities	
Definition 1	126	114	12
Definition 2	125	114	11
Definition 3	124	115	9

- Top 25%

EJ Definition	Avoided Asthma ED, Visits per Million Residents Younger than 18		Difference between EJ and Non-EJ
	EJ Communities	Non-EJ Communities	
Definition 1	127	117	1
Definition 2	129	117	12
Definition 3	119	119	0

Note: Numbers may not sum up due to rounding.

Health Benefits by EJ Designation in 2031 (cont.)

Annual Monetized Public Health Benefits by EJ Definition Due to Implementation of Draft 2016 AQMP

- Top 50%

EJ Definition	Per Capita Benefit (2015\$)		Difference between EJ and Non-EJ
	EJ Communities	Non-EJ Communities	
Definition 1	\$2,268	\$1,836	\$432
Definition 2	\$2,329	\$1,772	\$557
Definition 3	\$2,240	\$1,823	\$417

- Top 25%

EJ Definition	Per Capita Benefit (2015\$)		Difference between EJ and Non-EJ
	EJ Communities	Non-EJ Communities	
Definition 1	\$2,456	\$1,917	\$538
Definition 2	\$2,491	\$1,897	\$594
Definition 3	\$2,358	\$1,920	\$438

Note: Numbers may not sum up due to rounding.

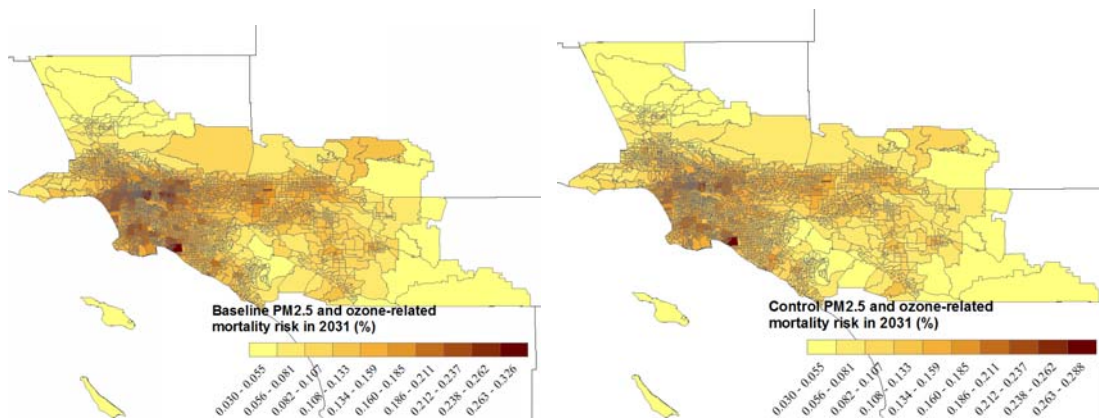
Health Benefits by EJ Designation in 2031 (cont.)

- EJ communities have greater per capita health benefits than non-EJ communities.
- The worst-off EJ communities (i.e., designated by top 25% threshold) benefit a greater amount.
- Results are insensitive to alternative EJ definitions.

Distributional Analysis

- Risk distributions under Baseline and Policy scenarios of:
 - PM2.5 and ozone exposure-related premature deaths among adults
 - Ozone exposure-related asthma ED visits among children
- Inequality indices used are Atkinson and Kolm-Pollak
- Overall health risk inequality within the Basin, which can be decomposed into
 - Inequality between EJ and non-EJ communities, and
 - Inequality within each group

Spatial Distributions of Exposure-related Mortality Risk



Health Risk Inequality in the Basin

Inequality Index*	Scenario	PM2.5 and Ozone-related mortality	PM2.5-related mortality	Ozone-related mortality	Ozone-related Asthma, ED Visits
Atkinson Index (Values in 10 ⁻³)	Baseline	24.0	26.2	16.4	7.5
	Policy	22.2	24.1	14.9	7.6
	Change in Inequality	↓	↓	↓	↑
Kolm-Pollak Index (Values in 10 ⁻⁸)	Baseline	5.0	5.0	0.002	16.5
	Policy	3.4	3.4	0.001	13.6
	Change in Inequality	↓	↓	↓	↓

* Inequality aversion parameters are set at 0.5 for both Atkinson and Kolm-Pollak Indices. A higher value indicates that a society is more "inequality averse". However, it should be noted that the same parameter value does not imply the same degree of inequality aversion between Atkinson and Kolm-Pollak Indices.

- Overall inequality of health risk within the Basin is projected to decrease, as a result of implementing the Draft 2016 AQMP.

Health Inequality between EJ and non-EJ Groups

Distribution	EJ Definition	Scenario	Atkinson (in 10 ⁻³)	Kolm-Pollak (in 10 ⁻⁸)
PM2.5 and Ozone-related mortality	Def 2: Top 50%	Baseline	2.3	0.4
		Control	1.9	0.2
		Change in Inequality	↓	↓
	Def 2: Top 25%	Baseline	1.8	0.3
		Control	1.4	0.2
		Change in Inequality	↓	↓
Ozone-related Asthma, ED Visits	Def 2: Top 50%	Baseline	1.3	2.74
		Control	1.5	2.72
		Change in Inequality	↑	↓
	Def 2: Top 25%	Baseline	0.8	1.6
		Control	0.9	1.7
		Change in Inequality	↑	↑

Sensitivity Analysis of Distributional Analysis Results

- The overall and between-group inequalities were evaluated under all three alternative EJ definitions and for both EJ designation thresholds at top 50% and top 25%.
- Results show that the **directional change** in inequality is generally insensitive to different definitions of EJ.
- All results for subgroup inequality and all sensitivity analyses will be included in Appendix 6 of the Socioeconomic Report.

Summary

- Draft 2016 AQMP measures provide public health benefits and reduce health risk for both EJ and Non-EJ groups. EJ groups benefit by a greater amount per capita than Non-EJ communities.
- Inequality measures generally show that the Draft 2016 AQMP measures reduce basin-wide inequality of health risk.
- Subgroup inequality measures largely show a decrease of both within-group and between-group inequalities.
- However, for ozone exposure- and asthma-related ED visits among children, inequality was shown to increase or decrease, depending on the inequality index and designation threshold used.