

Variability in Human Exposure to Traffic Emissions with respect to Spatial Resolution and its Health Risks Implications

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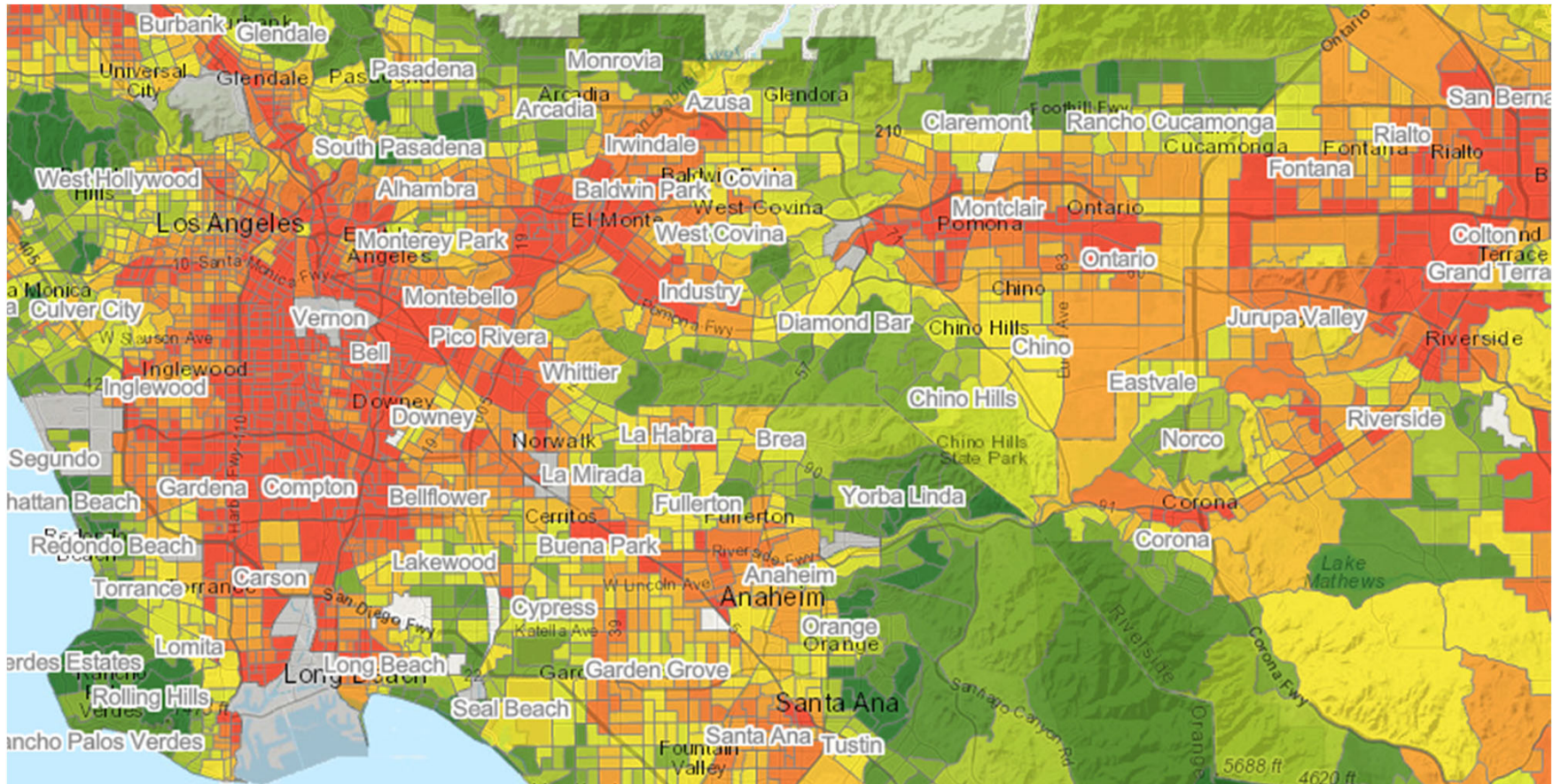


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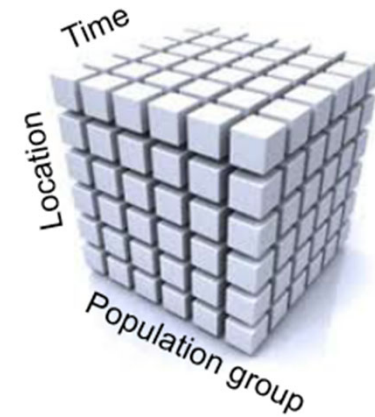
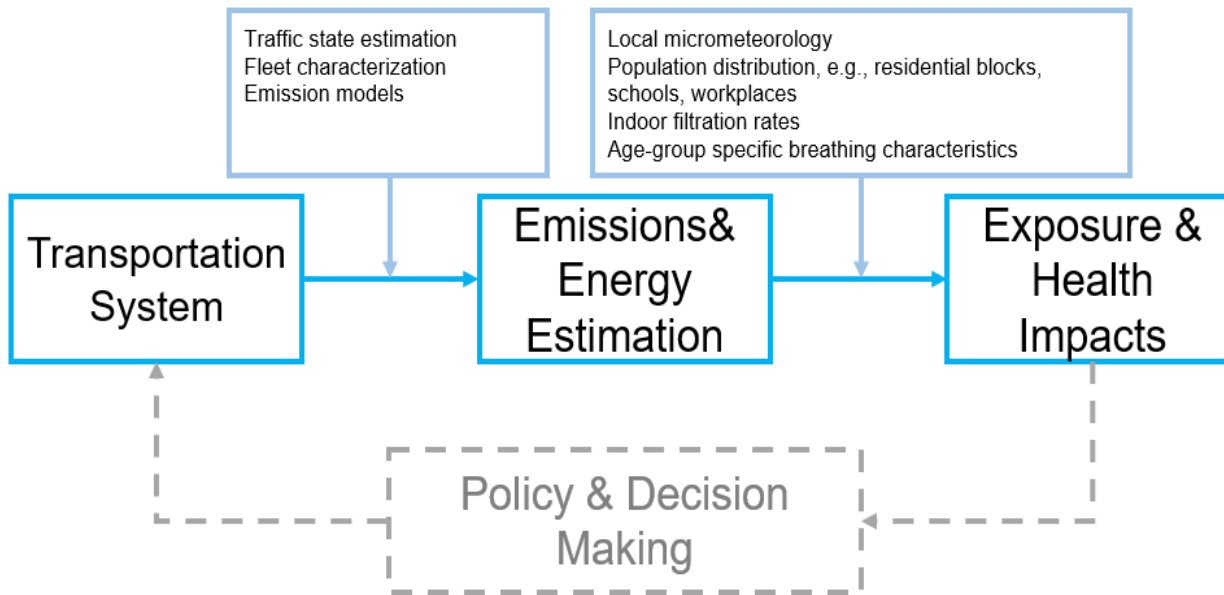
Motivation

- Air quality and disadvantaged communities (DAC) screening tools are used in health and climate policies or programs.
- Existing tools generally estimate air pollutants or traffic density at the census tract or grid level.
- However, variability within census tract could be high.
- We examine this variability by quantifying inhaled mass of traffic-related air pollutants at finer spatial resolutions.

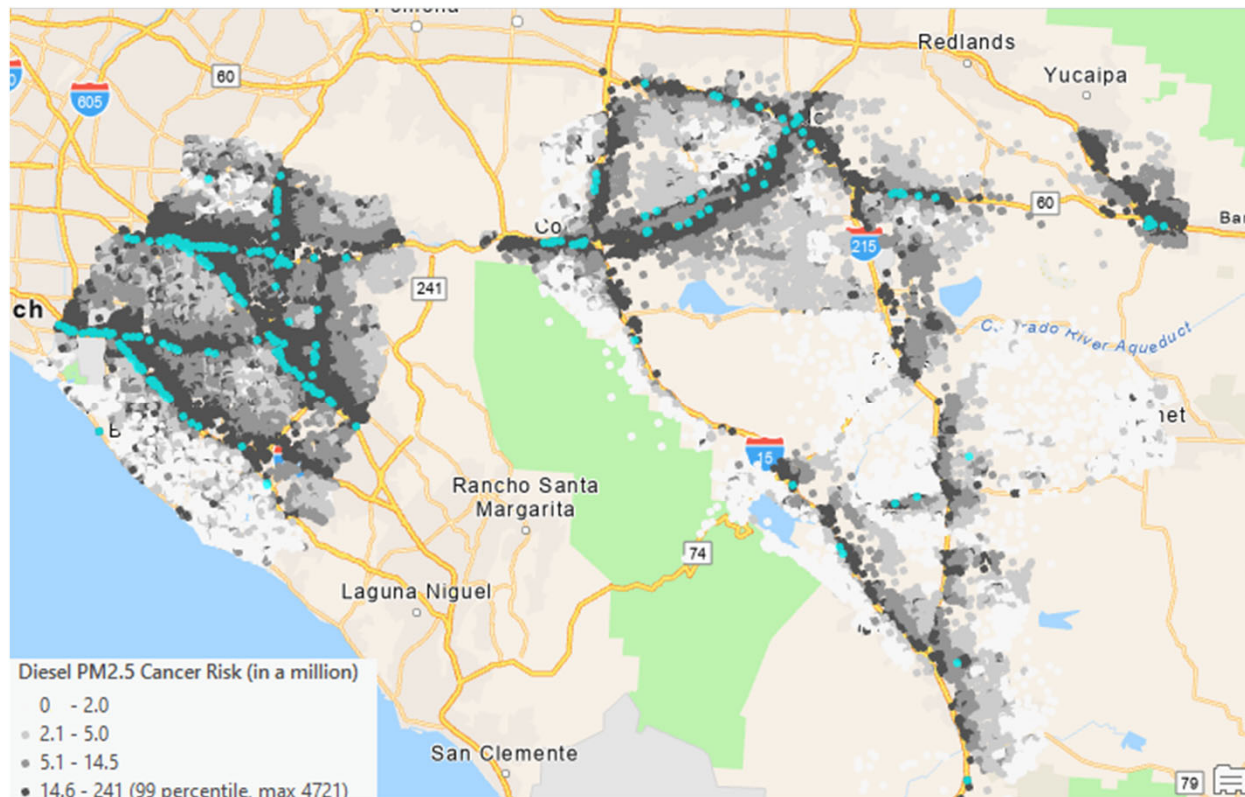
CalEnviroScreen 4.0



Methodology



Cancer Risks from 9-Year Exposure to Traffic-Related Diesel Fine Particles (PM_{2.5})



Orange County

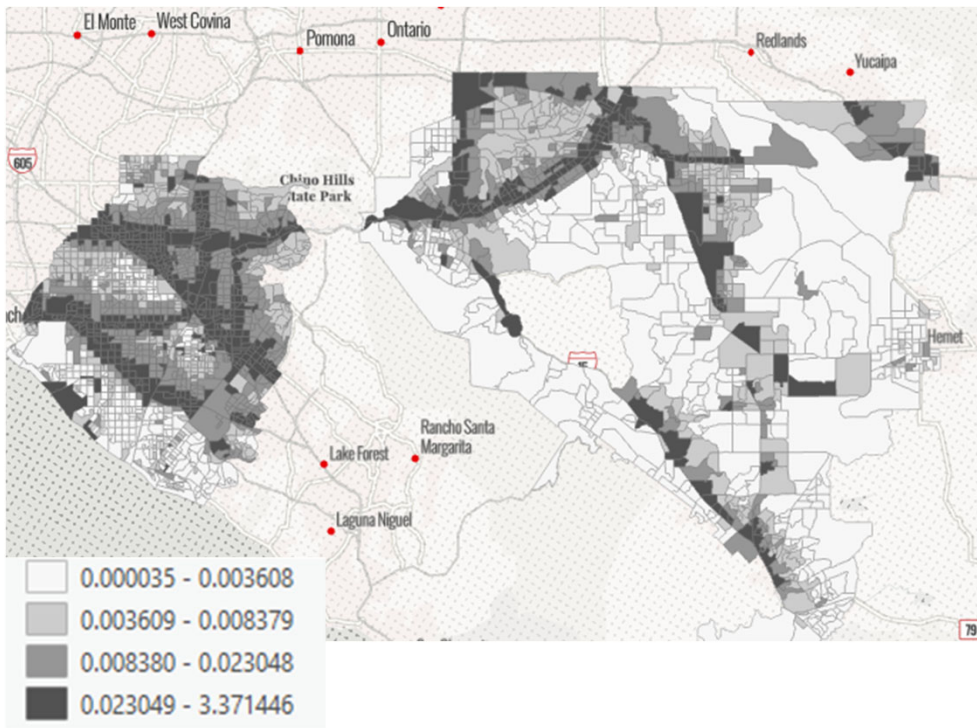
- 458 census tracts
- 1,503 block groups
- 14,951 blocks
- 2.3 million population

Riverside County

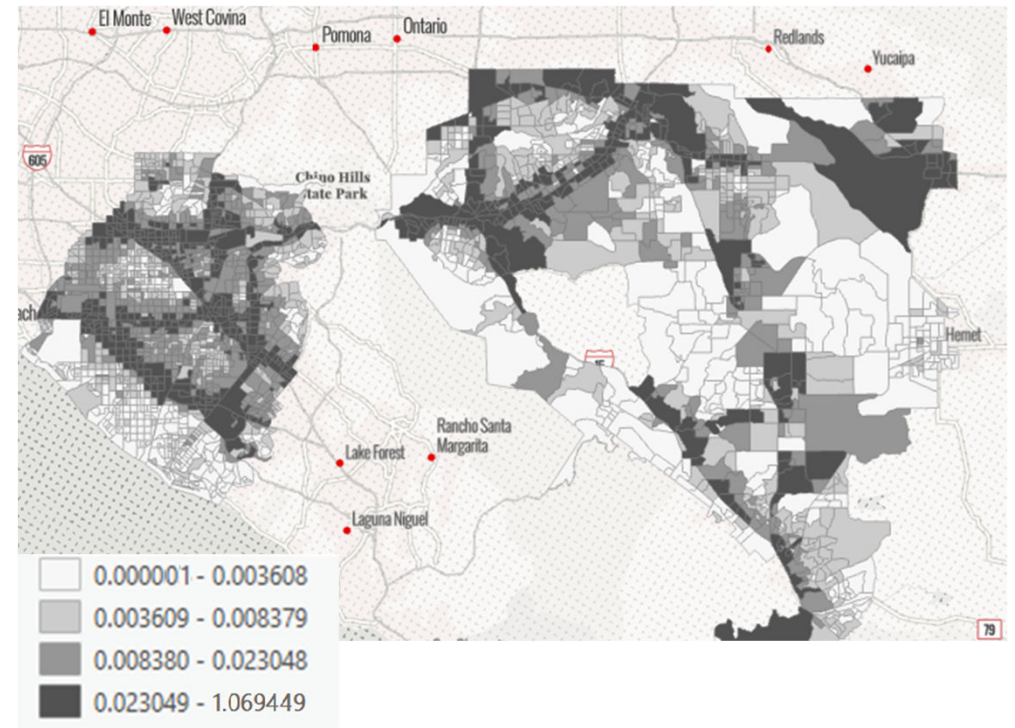
- 351 census tracts
- 945 block groups
- 14,044 blocks
- 1.8 million population

Analyses at Two Spatial Resolutions

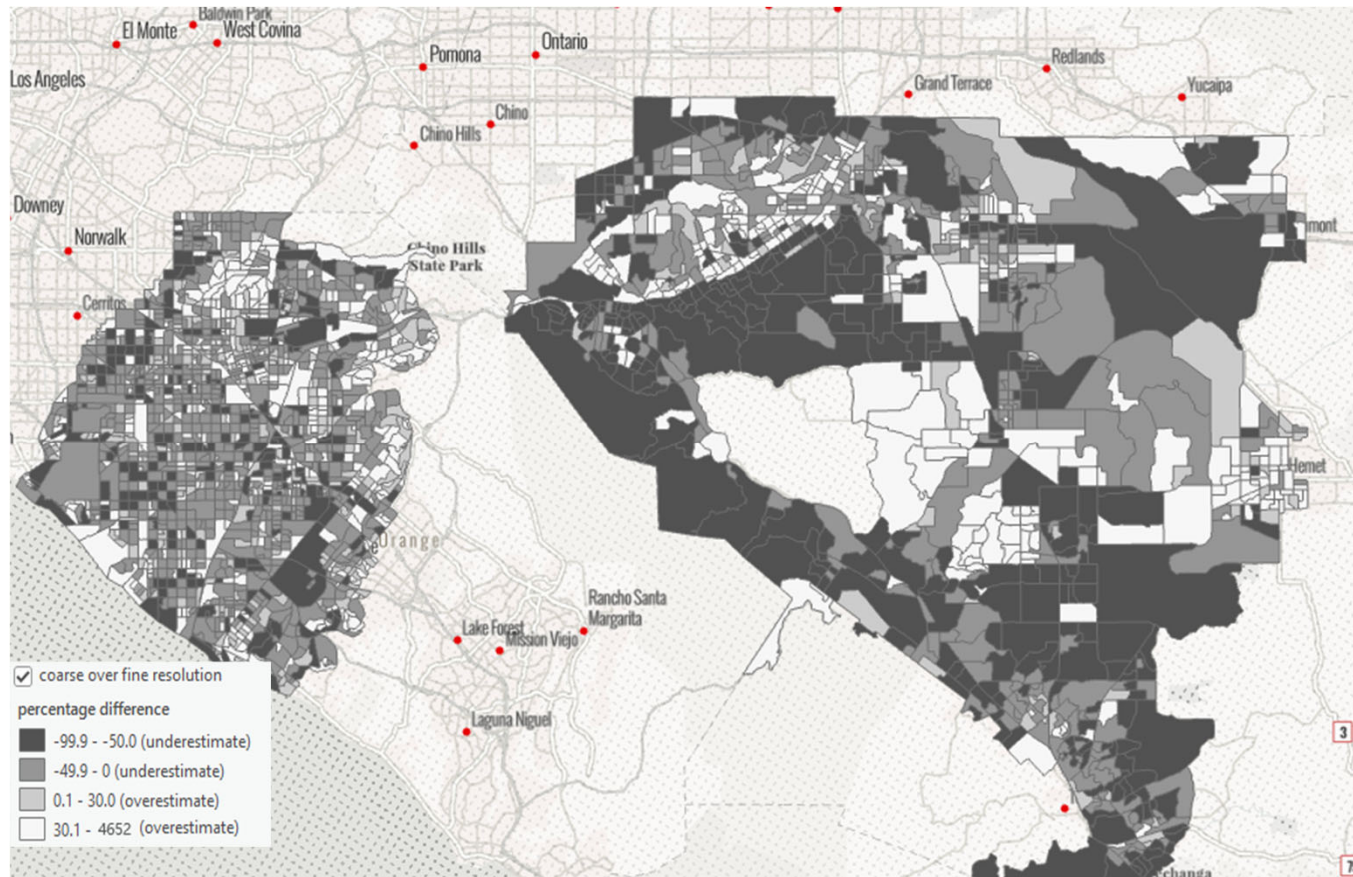
Block group cancer cases (coarse)



Block aggregated cancer cases (fine)



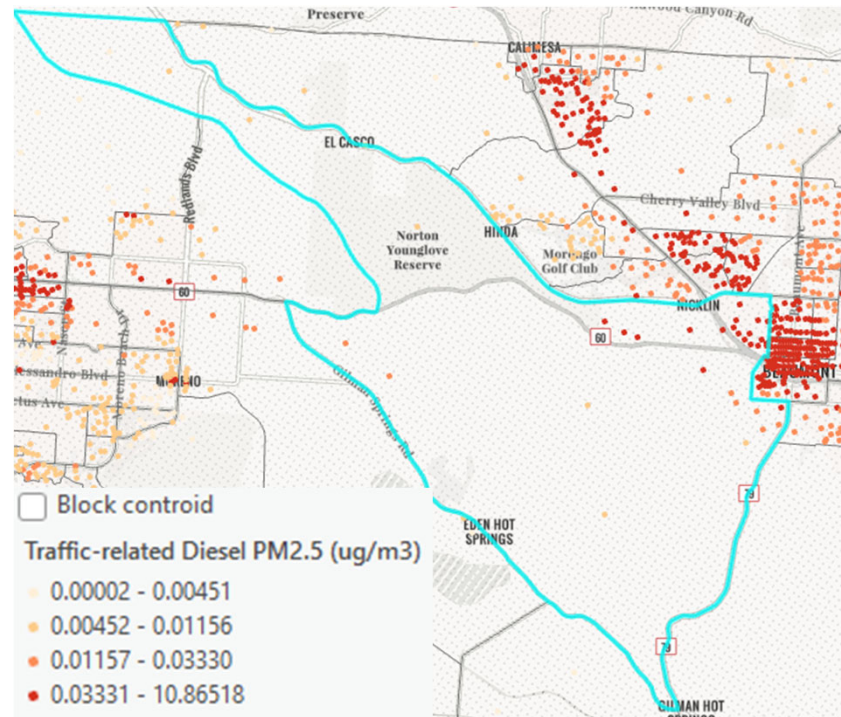
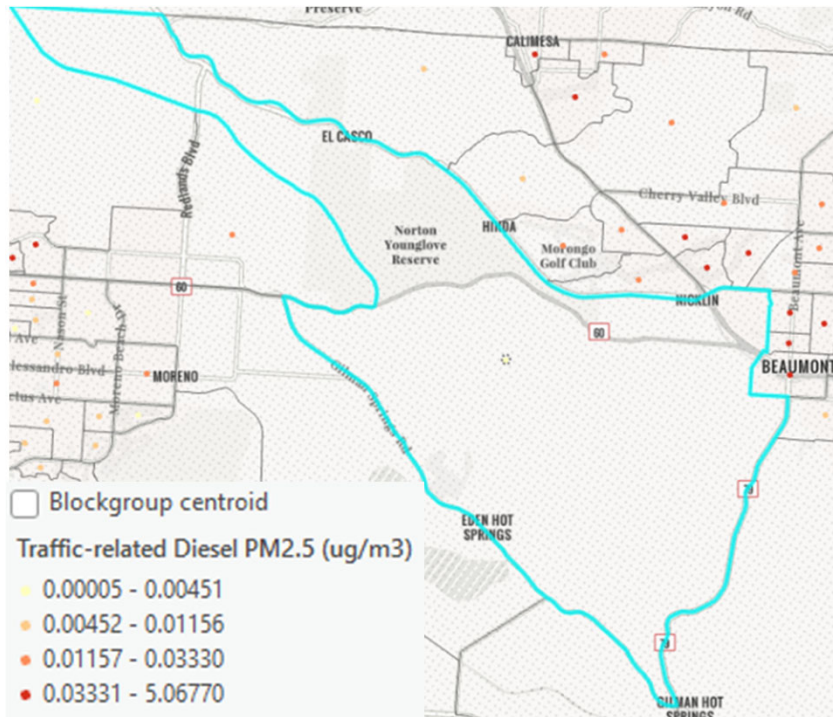
Comparison of results between two spatial resolutions



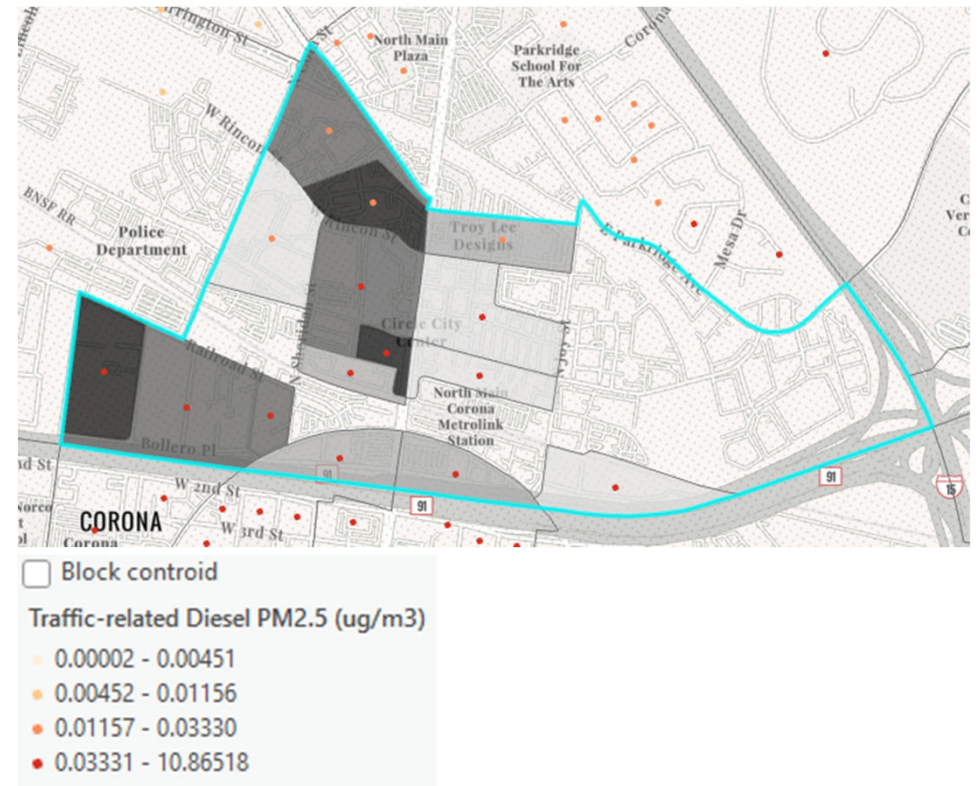
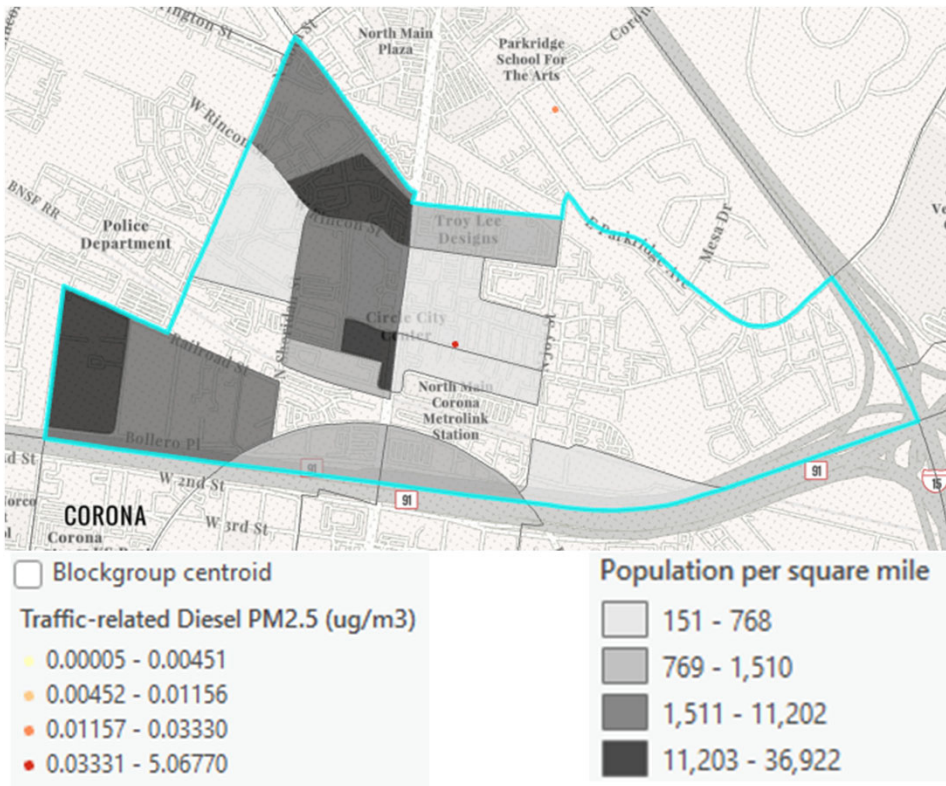
Coarse resolution:

- 1,281 block groups (52% of total) are underestimated by more than 10%
- 626 block groups (26% of total) are overestimated by more than 10%

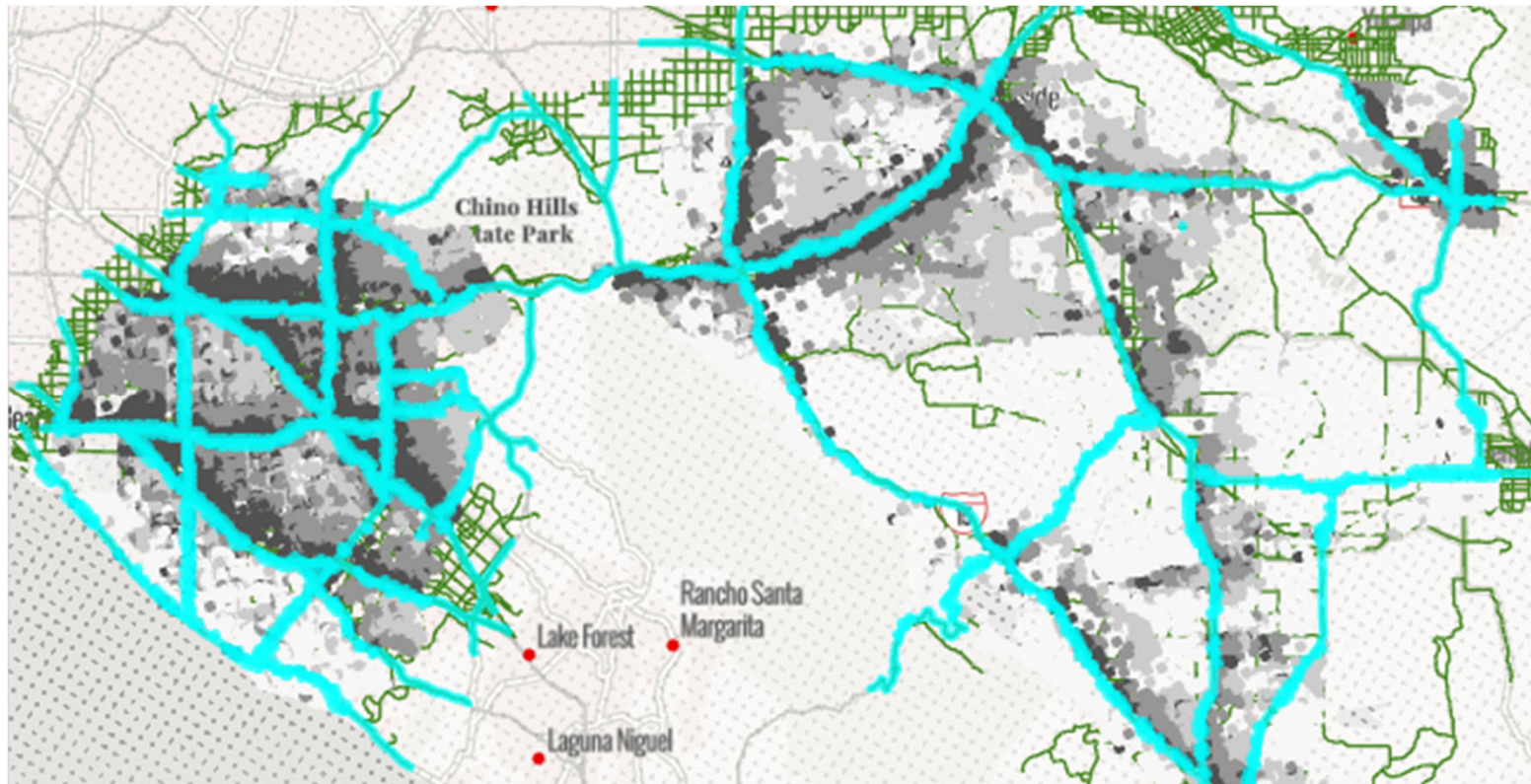
Underestimation by 97%



Overestimation by 9 times



Census Blocks within 1,000 feet of freeways



Projected cancer cases associated with traffic diesel PM_{2.5} within study area

	Year 2003	Year 2016	% Change
Number of census blocks within study area	33,144	28,995	
Number of population	3,309,027	4,148,123	25
Number of census blocks within 1,000 feet of major freeways and highways	5,389	3,508	
Number of population within census blocks within 1,000 feet of major freeways and highways	380,246	512,772	35
Total projected cancer cases in study area	1,320	172	-87
Projected cancer cases within 1,000 feet of major freeways and highways	485	85	-82

Observations

- Cancer risk estimates in about *a half of the study area* are *underestimated* when compared with the estimates performed at a finer resolution.
- Cancer risk estimates in about *a quarter of the study area* are *overestimated* when compared with the estimates performed at a finer resolution.
- Health risk indicators developed using the bottom-up approach will allow for more refined analyses of health impacts.