CLEARSKY: ESTIMATING CO AND PM2.5 EXPOSURE VARIATIONS FROM TRAFFIC SENSORS

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Background and Aims: Traffic sensors are pervasive in urban environments. Used to monitor traffic congestion, roadway sensors can be re-purposed for opportunistic sensing of roadway air pollution emissions. Further integration of emissions with meteorological systems and dispersion models can allow for real-time estimates of air pollutant concentrations near major roadways. In development of the ClearSky project, we demonstrated near real-time and historical exposure assessment based on traffic sensing in the San Francisco Bay Area in California, United States. We discuss the role of ClearSky in informing equity for health impact assessments related to land use and transportation planning.

Methods: For ClearSky, an information system was developed that integrated data from roadway traffic sensors (PEMS), mobile emissions factors (EMFAC), meteorology (Weather Underground), and line source dispersion model (CALINE) to estimate CO and PM2.5 concentrations near major roadways in Alameda County, CA. As a demonstration, the system was used to document the variability in exposures over a 2-day live trial period. Concentrations were assigned to census blocks to assess the relationships between exposure variation and several vulnerability factors, such as age, poverty, and race/ethnicity.

Results: The demonstration illustrated data quality and computational challenges that needed to be overcome to make the system publically available. In the region, 20% of the population lives within 500m of a freeway. The initial trial, illustrated disparities in exposure, particularly for low income populations and populations of color, for which more than a quarter of the population lived in areas with the highest quartile exposures. While no disparities in exposure were found by age, roughly a quarter of children in the county lived in the highest quartile exposure.

Conclusions: The ClearSky project demonstrated both challenges and opportunities for integrating sensing and information systems to inform equity-focused health impact assessments of land use and transportation projects.