Grant Deliverables and Reporting Requirements for UTC Grants

UTC Project Information	
Project Title	Impacts of Transportation Emissions on the Risk of Mortality: Findings from the Literature and Policy Implications
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Funding Source(s) and Amounts Provided (by each agency or organization)	USDOT: $0 Cornell: $8,949
Total Project Cost	Total: $8,949
Agency ID or Contract Number	Sponsor Source: Federal Government CFDA #: 20.701 Agreement ID: 69A3551747119
Start and End Dates	Start date: 10/01/2019 End date: 09/30/2020
Brief Description of Research Project	Background: Exposure to vehicle emissions have been considered a cause of several negative health outcomes including mortality. The existing findings are too inconsistent to drive a well-founded exposure-response function to be fully exploited to curb the negative impacts of transportation systems on public health. In this study, we investigate the association between exposure to air pollution and mortality. We then evaluate how using different air quality methods may result in detecting different health outcomes. Methods: We conducted an analysis of reviewing a representative sample of main published studies that specifically focused on the association between vehicle air pollution and mortality. Results: Our study found that vehicle air pollution may increase the risk of mortality through a high association. The risk of overall mortality increases by 5% per 10 μg/m3 increase in NO2 concentration, 2% per unit of traffic intensity on the road, and 7% per unit of distance closer to the road. Conclusion: The findings imply the role of exposure to vehicle emissions in increasing risk of mortality. The method used to detect the health outcomes can alter the health finding from

	positive to null or vice versa and even extensively affect the analysis outcomes. The results suggest the need for establishing indicators to benchmark the performance of air quality methods and emphasize the necessity to integrate public health measures into urban and transportation planning process.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	Our results find that the risk of mortality increases by exposure to vehicle emissions; 10 $\mu g/m^3$ increase in NO_2 concentrations increase the risk of overall mortality, cardiovascular mortality, and respiratory mortality by 5%, 6%, and 3% respectively. The risk of overall mortality, cardiovascular mortality, and raspatory mortality increases by 2%,4%, and 4%, per unit of traffic intensity and increases by 7%, 17%, and 4% per unit of distance to the road. 10 $\mu g/m^3$ increase in $PM_{2.5}$ concentrations increase the risk of cardiovascular mortality, and respiratory mortality by 8% and 4%, respectively. Despite these evidences, federally mandated air quality analysis related to the transportation sector provides very little information regarding exposure to air pollutants in vehicle exhaust. One example is the air quality analysis, the inventory analysis, conducted by planning agencies such as Metropolitan Planning Organizations (MPOs). Estimating emission inventory, however, is not an appropriate method to study the negative effects of vehicle emissions on human health because of the high gradient of variation in air pollutant concentration. If MPOs fail to formulate the best plans and projects that address air quality problems, they waste large sums of money (roughly US$350 billion each year) while also failing to address major issues pertaining to factors such as public health and environmental equity, among other contemporary. Therefore, a more detailed air quality analysis is required not only to evaluate exposure to transportation-related air pollution but also to select transportation projects that reduce the risk of adverse health effects. The findings along with previous findings implied the necessity of integrated transportation, land use, and health planning so not only to save on urban infrastructure sectors' cost but also to promote preventive medicine and save on public health costs.
Impacts/Benefits of Implementation (actual, not anticipated)	The results show that different exposure approaches can substantially affect analytical health outcomes. The results indicate that some surrogate models, such as proximity, tend to show a higher association, but traffic intensity, finds a lower association between exposure to vehicle emission and mortality. It seems that for overall mortality and cardiovascular mortality, using proximity methods such as distance to major roads and highways shows higher risk than other methods like LUR and dispersion. For respiratory mortality, the risks taken from all four

	methods including LUR, dispersion, proximity, and intensity are almost equal. Based on the results, proximity methods are more reliable than what had been previously described in the literature, since the proximity methods more strongly agree with the mathematical modeling methods, such as air dispersion modeling. The health and transportation sectors should consider the tradeoff between the simplicity of using the surrogate models against the accuracy of the mathematical air quality modeling and spatially detailed exposure analysis.
Web Links • Reports • Project website	http://ctech.cee.cornell.edu/final-project-reports/