The impacts of traffic congestion on air quality

Many studies suggest an increased risk for adverse health effects for people living near roadways (Hamra et al 2015). The question was raised as to the influence of traffic congestion on air quality. Vehicle emissions are not uniform over a driving cycle, varying by speed, acceleration events and other factors. Modifying roadway conditions that influence these factors can result in observable changes in air quality and health effects. The implementation of electronic tolling by reducing lines and stop-and-go traffic at toll booths on the Pennsylvania and New Jersey Turnpikes and the Garden State Parkway resulted in a significant reduction in low birth weight and premature births among mothers living within 2 kilometers of the tolling plaza (Currie, Walker 2009). During the 1996 Summer Olympic Games in Atlanta a number of strategies were put in place to reduce vehicle traffic and emissions, including 24 hour a day public transportation, 1000 additional buses for park and ride services, business use of alternative work hours, telecommuting, closing the downtown to private auto use, altering downtown delivery schedules and a significant public education campaign. Traffic counts decreased by 22 percent, public transportation use increased by 217 percent, peak daily ozone concentrations dropped 27.9 percent and asthma acute care events were reduced by 41.6 to 11.1 percent among Atlanta health care facilities surveyed (Friedman et al 2001).

Ordinarily costs associated with congestion consider economic costs associated with congestion relating to fuel wasted and time lost. One study (Levy et al 2010) quantified the public health benefits among 83 urban areas, holding infrastructure constant but accounting for increased vehicle miles travelled from 2000 to 2030 to compare public health costs to the typical congestion impacts of time lost and fuel wasted. The study found the monetized value of PM$_{2.5}$ related mortality associated with congestion in the areas studied to be $31 billion in 2000 (2007 dollars) as compared to time and fuel wasted value at $60 billion. By 2030 the ordinary economic impacts grew to $100 billion while the public health impacts decreased to $13 billion. The shift reflects increased population and congestion but lower emissions per vehicle. The paper concludes that the public health impacts are likely significant enough to warrant inclusion in comprehensive assessment of benefits of measures to reduce congestion.

Looking specifically at the role that heavy-duty vehicles play in congested traffic, researchers at Portland State University concluded that while heavy duty vehicles are a small portion of total traffic volume, these vehicles can emit a large share of PM and NOx (Bigazzi, Fugliozzi 2013). These emission rates can be more sensitive to congestion than for light duty vehicles and thus could result in greater emission reductions from congestion mitigation efforts targeted towards this sector. A key factor to determine the validity and scale of this effect is the elasticity of travel demand for this class of vehicles, for which there has been minimal research as of the date of publication.
Bibliography


