

Publication

Adopting clean fuels and technologies on school buses : pollution and health impacts in children

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More than 25 million American children breathe polluted air on diesel school buses. Emission reduction policies exist, but the health impacts to individual children have not been evaluated.; Using a natural experiment, we characterized the exposures and health of 275 school bus riders before, during, and after the adoption of clean technologies and fuels between 2005 and 2009. Air pollution was measured during 597 trips on 188 school buses. Repeated measures of exhaled nitric oxide (FeNO), lung function (FEV1, FVC), and absenteeism were also collected monthly (1,768 visits). Mixed-effects models longitudinally related the adoption of diesel oxidation catalysts (DOCs), closed crankcase ventilation systems (CCVs), ultralow-sulfur diesel (ULSD), or biodiesel with exposures and health.; Fine and ultrafine particle concentrations were 10-50% lower on buses using ULSD, DOCs, and/or CCVs. ULSD adoption was also associated with reduced FeNO (-16% [95% confidence interval (CI), -21 to -10%]), greater changes in FVC and FEV1 (0.02 [95% CI, 0.003 to 0.05] and 0.01 [95% CI, -0.006 to 0.03] L/yr, respectively), and lower absenteeism (-8% [95% CI, -16.0 to -0.7%]), with stronger associations among patients with asthma. DOCs, and to a lesser extent CCVs, also were associated with improved FeNO, FVC growth, and absenteeism, but these findings were primarily restricted to patients with persistent asthma and were often sensitive to control for ULSD. No health benefits were noted for biodiesel. Extrapolating to the U.S. population, changed fuel/technologies likely reduced absenteeism by more than 14 million/yr.; National and local diesel policies appear to have reduced children's exposures and improved health.

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