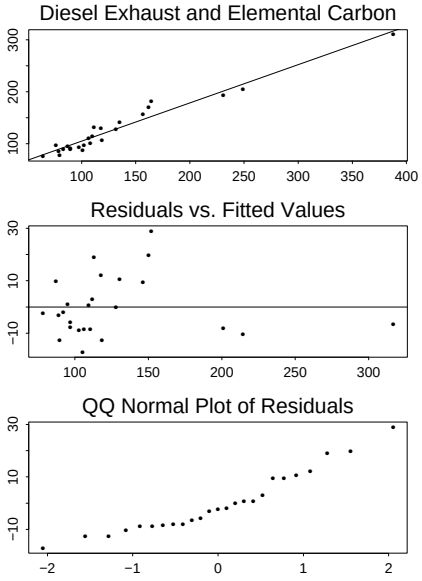
Elemental carbon (EC), a constituent of fine particles or $PM_{2.5}$, consists of tiny black solid particles of soot. This small size allows the pollutant to reach deep in the lungs, where they may be deposited to result in adverse health effects. Some studies have linked elevated EC to mortality in people over the age of 65. Elemental carbon in the atmosphere exerts a warming effect similar to that of Greenhouse Gases.

Early studies looked at the proportion of EC in $PM_{2.5}$ as a surrogate for diesel exhaust. (More recent work has cited other combustion sources of EC, such as fireplaces, cooking, forest fires, gasoline engines, agricultural burning, and power plants, as confounders in these early studies.) In one study, (*Env. Sci. Tech.*, 1984, "Comparison of solvent extraction and thermal optical carbon analysis methods: Application to diesel vehicle exhaust aerosol."), 25 samples were taken of exhaust mass ($\mu g/cm^3$) and elemental carbon ($\mu g/cm^3$).




```
Coefficients:
             Value Std. Error t value Pr(>|t|)
(Intercept) 30.9893  5.0463     6.1411  0.0000
    Exhaust  0.7366  0.0344    21.4044  0.0000

Residual standard error: 11.83 on 23 degrees of freedom
Multiple R-Squared: 0.9522
F-statistic: 458.2 on 1 and 23 df, the p-value is 1.11e-16
```

- Is there a linear association between exhaust mass and elemental carbon?
- What is the mean EC content for exhaust mass of 350 $\mu g/cm^3$? 100 $\mu g/cm^3$? Express your answer with an appropriate statement of uncertainty.
- Under the model, what will be the EC content of a future exhaust sample with an exhaust mass of 350 $\mu g/cm^3$? 100 $\mu g/cm^3$? Again, express uncertainty.
- What is the exhaust mass when the EC is found to be 200 $\mu g/cm^3$? 500 $\mu g/cm^3$? Again, express uncertainty.