Pressure broadening of the (J, K) = (1, 1), (2, 2) and (3, 3) inversion transitions of NH$_3$ was measured using normal-H$_2$ as the broadening agent at kinetic temperatures of 15 to 40 K. Measurements were taken in a quasi equilibrium cell using the collisional cooling technique. H$_2$ pressure broadening cross sections were compared to low temperature He pressure broadening of the same transitions and found to be from 2.5 to 8 times larger than corresponding He cross sections. Measured normal H$_2$ and He cross sections were also compared to calculated J = 0, para- H$_2$ cross sections. Preliminary experimental results for broadening by para- H$_2$ will also be presented.