This study investigated changes in headlamp beam patterns as a function of the level of haze in sheets of plastic materials that were inserted in front of either a U.S. or a European low-beam headlamp. The level of haze was measured according to the method required by the U.S. National Highway Traffic Safety Administration. This method (ASTM Standard D 1003-92) measures the percentage of transmitted light that deviates from the incident beam through forward scatter by more than 2.5°. The actual effects on the beam pattern were then compared with predictions based on modeling the effects by assuming Gaussian distributions of the scattered light. The main finding is that the predictions for the four different plastic materials tested were neither uniformly accurate nor uniformly inaccurate. This lack of consistency is in agreement with the fact that the ASTM definition of haze does not uniquely specify the distribution of the scattered light. This problem with using the ASTM definition was confirmed by measuring the distributions of light scattering by two materials that had essentially the same ASTM index of haze.

The implication of this research is that establishing a justifiable maximum haze level for headlamp lens materials would require using a definition of haze that uniquely defines the resultant distribution of the light scatter. Consequently, it is recommended that future research should evaluate the distribution of scattered light using actual materials for headlamp lenses after different lengths of weathering exposure.