This paper applies statistical methods to analyze the large, noisy data sets produced in measurements of tunneling c.d. (J) through self-assembled monolayers (SAMs) in large-area junctions. It describes and compares the accuracy and precision of procedures for summarizing data for individual SAMs, for comparing two or more SAMs, and for determining the parameters of the Simmons model (β and J0). For data that contain significant nos. of outliers (i.e., most measurements of charge transport), commonly used statistical techniques-e.g., summarizing data with arithmetic mean and std. deviation and fitting data using a linear, least-squares algorithm-are prone to large errors. The paper recommends statistical methods that distinguish between real data and artifacts, subject to the assumption that real data (J) are independent and log-normally distributed. Selecting a precise and accurate (conditional on these assumptions) method yields updated values of β and J0 for charge transport across both odd and even n-alkanethiols (with 99% confidence intervals) and explains that the so-called odd-even effect (for n-alkanethiols on Ag) is largely due to a difference in J0 between odd and even n-alkanethiols. This conclusion is provisional, in that it depends to some extent on the statistical model assumed, and these assumptions must be tested by future experiments