



Standard Practice for Statistical Analysis of One-Sample and Two-Sample Interlaboratory Proficiency Testing Programs¹

This standard is issued under the fixed designation E2489; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This practice describes methods for the statistical analysis of laboratory results obtained from interlaboratory proficiency testing programs. As in accordance with Practice E1301, proficiency testing is the use of interlaboratory comparisons for the determination of laboratory testing or measurement performance. Conversely, collaborative study (or collaborative trial) is the use of interlaboratory comparisons for the determination of the precision of a test method, as covered by Practice E691.

1.1.1 Method A covers testing programs using single test results obtained by testing a single sample (each laboratory submits a single test result).

1.1.2 Method B covers testing programs using paired test results obtained by testing two samples (each laboratory submits one test result for each of the two samples). The two samples should be of the same material or two materials similar enough to have approximately the same degree of variation in test results.

1.2 Methods A and B are applicable to proficiency testing programs containing a minimum of 10 participating laboratories.

1.3 The methods provide direction for assessing and categorizing the performance of individual laboratories based on the relative likelihood of occurrence of their test results, and for determining estimates of testing variation associated with repeatability and reproducibility. Assumptions are that a majority of the participating laboratories execute the test method properly and that samples are of sufficient homogeneity that the testing results represent results obtained from each laboratory testing essentially the same material. Each laboratory receives the same instructions or protocol.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appro-*

priate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 *ASTM Standards*:²

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E178 Practice for Dealing With Outlying Observations

E456 Terminology Relating to Quality and Statistics

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E1301 Guide for Proficiency Testing by Interlaboratory Comparisons (Withdrawn 2012)³

E2586 Practice for Calculating and Using Basic Statistics

3. Terminology

3.1 *Definitions*—The terminology defined in Terminology E456 applies to this practice unless modified herein.

3.1.1 *collaborative study, n*—interlaboratory study in which each laboratory uses the defined method of analysis to analyze identical portions of homogeneous materials to assess the performance characteristics obtained for that method of analysis.

Horwitz⁴

3.1.2 *collaborative trial, n*—see *collaborative study*.

3.1.3 *interlaboratory comparison, n*—organization, performance, and evaluation of tests on the same or similar test items by two or more laboratories in accordance with predetermined conditions.

3.1.4 *median, $\bar{X}$, n*—the 50th percentile in a population or sample.

E2586

3.1.4.1 *Discussion*—The sample median is the $[(n + 1)/2]$ order statistic if the sample size n is odd and is the average of the $[n/2]$ and $[n/2 + 1]$ order statistics if n is even.

3.1.5 *outlier, n*—see *outlying observation*.

E178

¹ This practice is under the jurisdiction of ASTM Committee E11 on Quality and Statistics and is the direct responsibility of Subcommittee E11.20 on Test Method Evaluation and Quality Control.

Current edition approved Nov. 15, 2016. Published November 2016. Originally approved in 2006. Last previous edition approved in 2011 as E2489 – 11. DOI: 10.1520/E2489-16.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Horwitz, W., "Protocol for the Design, Conduct and Interpretation of Collaborative Studies," *Pure and Applied Chemistry*, Vol 60, No. 6, 1988, pp. 855–864.