



INDIANA UNIVERSITY

BORKENSTEIN  
COURSE

Center for Studies  
*of* Law in Action

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Statistical Applications in  
Breath and Blood Alcohol Analyses

by  
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Breath and/or blood alcohol measurements are persuasive forms of numerical information presented in court to facilitate an informed legal decision. Per se drunk driving laws have increased the focus on the quantitative or numerical aspects of this data. As a result, the forensic issues and challenges are becoming more numerically focused and sophisticated. Forensic scientists must be prepared to interpret and explain the numerical features of the data they present in court. This lecture will assist the forensic scientist in properly interpreting and presenting the numerical features of forensic breath and/or blood alcohol data.

The lecture begins with a thorough discussion regarding basic principles of measurement. The details of a typical breath alcohol measurement algorithm are given. Since measurements are the result of a process, the results can only be properly interpreted when each element of the measurement algorithm are understood. Only after the measurement process is understood can appropriate statistical methods be employed. Although now often appreciated, the final and important step in the measurement process is communication. The importance of clear and honest communication of analytical results is discussed as well. Finally, the importance of acknowledging and reliably determining the measurement error or uncertainty is discussed at length.

The lecture then moves to discuss several statistical methods available to summarize and interpret breath and/or blood alcohol data. The emphasis will be on sound “statistical thinking” rather than detailed computations. Some very basic principles of descriptive and inferential statistics are presented with examples from forensic breath or blood alcohol data. Common pitfalls and abuses of statistics are also noted so the forensic scientist can be aware when performing and interpreting analytical results or reading the literature. Since statistical methods are widely employed in the analytical and forensic science literature, a basic understanding of statistics is necessary for valid interpretation.

Forensic quality control is one of the most important considerations in breath and/or blood alcohol programs today. The lecture includes discussion on several quality control issues. A few of the quality control features discussed are: duplicate testing, internal and external control standards, certified instrumentation, adequate protocols, trained personnel, printout documents, data collection and analyses, etc. Statistical tools for evaluating quality control including control charts and confidence intervals are also presented.

The lecture then ends with several examples of on going research in forensic breath alcohol measurement. These examples include many statistical and mathematical applications that aid in their interpretation and provide insight into the analytical and biological features of breath alcohol measurement.

The lecture is facilitated by slides and handout materials. The handout materials include: (1) illustrations of all slides, (2) selected bibliography, (3) table of selected statistical and mathematical equations useful in breath test programs, and (4) practical statistical and mathematical problems relevant to breath test programs along with complete solutions.

From this lecture the student will gain an appreciation for the complexity of the measurement process and the usefulness of statistical applications when interpreting and communicating results.