

## Extrapolating from populations to individuals in the OMICS era

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Epidemiologists often provide “Expert Testimony” in legal cases, to support or refute whether some “exposure” resulted in the development or exacerbation of a health problem/disease. In these situations, one of the generally accepted tenets of epidemiology is broken; viz. that studies of populations cannot be used to predict what happens in any individual. Even for well-established causal relationships, like between tobacco use and lung cancer, heavy smoking does not always produce lung cancer and lung cancer occurs among persons who never smoked.

Criminal prosecutions must show that the likelihood that an action/exposure resulted in a particular outcome was “beyond a reasonable doubt.” In civil cases, establishing the relationship between a preceding action/exposure and an outcome allows for more uncertainty, but there still must be either a “preponderance of the evidence” or “clear and convincing evidence.” The linkage between evidence and policy development is often even weaker, with politics determining policy as much as science and policy is frequently promulgated on individuals as members of a “class.”

How do these issues relate to epidemiology? Although *in-vivo* or *in-vitro* research may support a determination of causality, extrapolation from cells/tissues or animals to humans is often unjustified. Randomized clinical or population trials may be unethical or unfeasible. Epidemiologic studies benefits are that they result from humans, but do they predict what would happen to any particular individual? Do studies involving -omics better extrapolate results of population studies to individuals who have the same genetic/epigenetic/metabolomic/proteomic make-up as those in population based epidemiologic studies?

### Biography

Edward J. Trapido is Associate Dean for Research at the Louisiana State University School of Public Health; and Professor of Epidemiology. He is President of the American College of Epidemiology, and Associate Editor of *Annals of Epidemiology*, and Editor in Chief of *Epidemiology On Line (OMICS)*. Dr. Trapido also leads the International Atomic Energy Agency “Program of Action in Cancer Therapy’s evaluation. He was Deputy Director for International Cancer Control in the Office of International Affairs at the NCI and Associate Director of their Epidemiology and Genetics Research Program. He has also been Senior Advisor to the Director of the International Agency for Research on Cancer. His degrees include an MS in Public Health from the University of North Carolina, and a Master’s and Doctor of Science in Epidemiology from Harvard.

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