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Biostatistics for the Detection of Anomalous Discoveries

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EDITORIAL

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Biostatistics and data science are vast fields that cover a wide range of topics. A focus on quantitative ways for handling complex problems is common across them. The overlap is further strengthened when the substantive topic is health and health care. Statistics, data management and analysis, and health and medicine are just a few of the skills that researchers in these fields possess. However, there are crucial and sometimes mutually exclusive characteristics of these domains that call for more integration. Data scientists undergo equivalently intense training in high-dimensional data computing and visualization methodologies. Epidemiologists and biostatisticians may have less computer science and informatics competence than data scientists, but data scientists may benefit from a working knowledge of research design and causal inference. Collaboration and cross-training allow people from other professions to exchange and learn about each other's constructions, frameworks, theories, and methods, to provide new and innovative approaches to tackling difficult challenges in health and health care.

Biostatistics, which combines rigorous mathematical laws of probability and statistics to the exciting but unpredictable diversity of living beings, is the major scientific foundation for epidemiology. This is accomplished by taking a certain amount of risk. If the sample from which we document data is large enough and representative of the population from which the sample is drawn, we can be confident that the measure in the population is close to that found in the sample and falls within a range of values known as the Confidence Interval (at a typically chosen 5% risk of being wrong) (CI). The Confidence Interval (CI) is a basic statistical technique for estimating values and comparing them across groups. The upper and lower boundaries of a Confidence Interval (CI) for risk or ratio calculated using a normal or binomial distribution are both identical distances from the estimated value.

Unlike dangers and ratios, rates are typically extremely modest numbers: The numerator can change, but the denominator is usually much bigger, especially when the number of people is exposed multiplied by several days, weeks, or months. 3 CIs for rates are calculated using a Poisson distribution and can be heavily skewed towards the upper bound, particularly for rates of recurrent events. This skew has important implications: When calculating COVID-19 endpoint incidence rates to compare them between different populations or groups (especially repeatable events like hospital admissions or repeat clusters over time), computing their CIs using a normal rather than a Poisson distribution would incorrectly cut them short on the right. When compared to a Poisson distribution, this could result in a statistically significant difference in incidence rates between groups. This has implications when determining the sample size required attaining desired power before comparing incidence rates between samples.