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Are we selling personalized medicine before its time?

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We may be a long way off from using genetics to reliably gauge our risks for specific diseases, say researchers at the University of Pittsburgh Graduate School of Public Health in a study published on Feb. 5 in the online journal *PLoS Genetics.* Yet, many companies currently offer personalized genetic testing for diseases like cancer, heart disease and diabetes, and tout the ability of DNA testing to predict future health risks.

"The rapid discovery of new genetic risk factors is giving us vitally important insights into human health, but a strong association between these factors and disease risk may not reliably predict which health issues a specific individual will face in the future," said Daniel E. Weeks, Ph.D., senior author and professor of human genetics and biostatistics at the University of Pittsburgh Graduate School of Public Health. "Our study indicates that even though we can paint a picture of our genetic makeup with current tests, this may not be enough to help us understand our individual risk for disease."

The study focused on single nucleotide polymorphisms, or SNPs - variations in short DNA sequences that have been linked to the presence of particular diseases, and that exist in the millions in the human genome. A number of companies currently offer individualized estimates for disease risks based on genome-wide SNP genotyping. These tests typically scan 500,000 to 1 million SNPs, searching for only a handful associated with a specific disease.

Dr. Weeks and colleagues focused their study on diseases for which there are strongly associated genetic variants: age-related macular degeneration, type 2 diabetes, prostate cancer, cardiovascular disease and Crohn's disease. They found that a strong genetic association did not guarantee they could accurately discriminate between actual disease cases and controls in both mathematical models and real-world examples.

Part of the problem may be a statistical one. To provide meaningful insights, a test for disease risk needs to accurately identify positive cases and, at the same time, provide a low false positive rate. One of the challenges with current approaches to genetic testing is that they are based on a very small number of common variants, "making it likely that you will identify people at high risk who may not be at risk at all," said Dr. Weeks. "With such a small pool of variants, it's difficult to develop a very meaningful test for predicting disease risk."

In addition, he said, few health care providers have adequate genetics training to make sense of the risk calculations now commercially offered and to advise their patients accordingly.

Dr. Weeks suggests the need for longitudinal studies to define true risk and to understand how genetic susceptibility may interact with known environmental and lifestyle risk factors.

"With more study, our hope is that genetic testing will benefit people and encourage positive lifestyle changes and guide clinical decisions. In the meantime, we need to take a step back and proceed with caution and allow the insights gained from these new association findings to be used to explore the basic biological causes of disease," he said.

Source: University of Pittsburgh Schools of the Health Sciences

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