New DNA tool predicts height, shows promise for serious illness assessment

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A new DNA tool created by Michigan State University can accurately predict people's height, and more importantly, could potentially assess their risk for serious illnesses, such as heart disease and cancer.

For the first time, the tool, or algorithm, builds predictors for human traits such as height, bone density and even the level of education a

person might achieve, purely based on one's genome. But the applications may not stop there.

"While we have validated this tool for these three outcomes, we can now apply this method to predict other complex traits related to health risks such as heart disease, diabetes and breast cancer," said Stephen Hsu, lead investigator of the study and vice president for research and graduate studies at MSU. "This is only the beginning."

Further applications have the potential to dramatically advance the practice of precision health, which allows physicians to intervene as early as possible in patient care and prevent or delay illness.

The research, featured in the October issue of *Genetics*, analyzed the complete genetic makeup of nearly 500,000 adults in the United Kingdom using machine learning, where a computer learns from data.

In validation tests, the computer accurately predicted everyone's height within roughly an inch. While bone density and educational attainment predictors were not as precise, they were accurate enough to identify outlying individuals who were at risk of having very low bone density associated with osteoporosis or were at risk of struggling in school.

Traditional genetic testing typically looks for a specific change in a person's genes or chromosomes that can indicate a higher risk for diseases such as breast cancer. Hsu's model considers numerous genomic differences and builds a predictor based on the tens of thousands of variations.

Using data from the UK Biobank, an international resource for health information, Hsu and his team put the algorithm to work, evaluating each participant's DNA and teaching the computer to pull out these distinct differences.

"The algorithm looks at the genetic makeup and height of each person," Hsu said. "The computer learns from each person and ultimately produces a predictor that can determine how tall they are from their genome alone."

Hsu's team will continue to improve the algorithms, while tapping into larger, more diverse data sets. Doing this would further validate the techniques and continue to help map out the genetic architecture of these important traits and disease risks.

With greater computing power and decreasing costs around DNA sequencing, what was once thought to be five to 10 years out, is now a lot closer when it comes to this type of work, Hsu added.

"Our team believes this is the future of medicine," he said. "For the patient, a genomic test can be as simple as a cheek swab, with a cost of about $50. Once we calculate the predictors for genetically based diseases, early intervention can save billions of dollars in treatment costs, and more importantly, save lives."

More information: Louis Lello et al. Accurate Genomic Prediction of Human Height, *Genetics* (2018). DOI: 10.1534/genetics.118.301267

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