We found a genetic link between routine blood test results and mental health disorders

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Credit: AI-generated image ([disclaimer](#))

Mental health disorders including depression, schizophrenia, and anorexia show links to biological markers detected in routine blood tests, according to [our new study](#) of genetic, biochemical and psychiatric data from almost a million people.

The research will increase our understanding of what causes mental

illness and may help to identify new treatments.

Healthy body, healthy mind

People often consider mental health as separate from the health of the rest of the body. This is far from true: there is clear evidence many biochemical substances involved in diseases such as [diabetes](#) and [autoimmune conditions](#) directly impact the function of our brain.

Many studies have tried to address this by focusing on substances called biomarkers that can be readily measured in blood.

A biomarker is simply something in the body that is a sign of a particular disease or process. These often relate to the kind of things reported in a blood test ordered by your doctor, such as cholesterol, blood sugar, liver enzymes, vitamins, or markers of inflammation.

Biomarkers found in routine blood tests are useful as they are often affected by diet and lifestyle, or by treatment with a drug.

The complex role of genetics in mental health

It's often difficult to study the role of these blood biomarkers in mental health conditions. Many studies in this area are often not large enough to make strong conclusions.

One solution is to look at genetic influences on both mental illness and substances measured in blood. Genetics is useful as we now have data from millions of individuals who have volunteered in research studies.

Both mental illnesses and blood biomarkers are what geneticists call "[complex traits](#)." In complex traits, many genes are involved and

environmental factors also contribute.

The widespread availability of genetic data has allowed us to investigate how huge numbers of tiny changes in the DNA sequence (or "variants") are related to the risk of mental illness. These same variants can then also be linked to the measured levels of a biomarker in blood.

For example, a variant in a particular gene may increase the risk of developing schizophrenia and also be linked to a decrease in the levels of a vitamin circulating in the blood. Most of these variants are individually associated with very small changes in something like risk of a mental illness, but they may add together to produce larger effects.

How are blood biomarkers related to mental illness?

Our recent study sought to use genetics to investigate the relationship between nine mental health disorders and 50 factors measured in routine blood tests, such as cholesterol, vitamins, enzymes, and indicators of inflammation. We used data from very large studies conducted by other people, with data from almost a million volunteers included in total.

Our study first confirmed the existence of what is called *genetic correlation* between blood biomarkers and mental illness, which was more widespread than has previously been shown. Genetic correlation means the effect of DNA sequence changes on the risk of a mental illness and the levels of a given biomarker were more similar to each other than what would occur by chance alone.

To take one example, there was a positive genetic correlation in our study between white blood cell count and depression. This could indicate some process in our body influences both depression and white blood cells.

If we could identify what this shared process is, it could lead to a better understanding of what causes depression and this could be targeted for treatment.

Correlation verses causality

Our study showed there was *correlation* between the genetics of mental illness and factors in the blood, but this does not tell us whether blood biomarkers are involved in what *causes* mental illness.

To distinguish correlation from causation in medicine, the gold standard approach is to conduct clinical trials where patients randomly receive a treatment or a placebo. However, these trials are expensive and difficult to conduct.

We did the next best thing: using DNA variants linked to changes in blood biomarkers to act as a [natural clinical trial](#). This process takes advantage of the fact we randomly inherit DNA variants from our parents, in much the same way that participants in a clinical trial randomly receive a treatment or a placebo.

It's a complex method and the results need careful interpretation.

We found evidence some substances measured in blood may actually be involved in the cause of some mental illnesses. Proteins related to the immune system, for example, may be involved in depression, schizophrenia, and anorexia.

Further work is now needed to identify how these blood measures are precisely involved in these disorders, and to find out if they can be targeted for treatment.

  More information: William R. Reay et al, Genetic estimates of

correlation and causality between blood-based biomarkers and psychiatric disorders, *Science Advances* (2022). [DOI: 10.1126/sciadv.abj8969](#)

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