

Unscrambling the egg: How research works out what really leads to an increased disease risk

26 November 2018, by Sean Martin



A study showed it's social circumstance, and not biology, that explains most of the differences in the occurrence of diabetes among racial and ethnic groups. Credit: [Omar Lopez/Unsplash](#), [CC BY](#)

Science is only ever as good as the research that sits behind it.

That means the methods we use to conduct science must be robust, repeatable and suitable to the questions we want to ask.

When these questions become very complex – for instance, why are some groups of people more likely to get [diabetes](#) than others? – we need to ensure that the tools we use are capable of handling such complexity.

This is really important when it comes to teasing apart the impact of distinct but sometimes interrelated factors, like ethnic background and [socioeconomic factors](#). We need accurate answers so we can design successful health programs.

How do we know what truly increases disease

risk?

Some disease processes seem quite straightforward – bacteria like Salmonella can give you food poisoning, the HIV virus can lead to AIDS if untreated. Conditions like [sickle cell anaemia](#) and cystic fibrosis are the result of a single genetic mutation.

However non-[infectious diseases](#) – think [cancer](#), heart disease or Alzheimer's – are much more complex. In such cases, is a person's risk for disease primarily determined by their genetics? Their cells? What about their organ systems? How about the role of social and cultural influences? What about their diet or other factors in their surroundings. And lastly what about their race or ethnicity?

Epidemiology – the science of understanding the patterns and causes of diseases in populations – aims to answer these questions.

A particular approach known as [multi-level modelling](#) can tease apart the roles of different risk factors – let's look at [type 2 diabetes as an example](#).

Type 2 diabetes

Diabetes, particularly [type 2 diabetes](#), has reached epidemic levels in most developed (and some developing) countries.

[Many risk factors](#) for type 2 diabetes have been identified in the past 20 years alone. These include genetic, lifestyle and behavioural risk factors. There's also an increasing recognition that cultural and environmental factors, including your ancestry, also influence your risk of disease. This is supported by evidence that type 2 diabetes occurs

at [different rates](#) among different ethnic and racial groups.

Multi-level modelling allows epidemiologists to study the influence of these factors at two or more levels (e.g. within an individual and at the neighbourhood level) to generate models that account for the influence of these factors alone, and in combination, to influence type 2 diabetes risk.

Multi-level modelling as a technique has its [origins](#) in the behavioural and social sciences, but is now [successfully adapted](#) to suit the study of many phenomena, including complex human diseases.

Race and ethnicity, or...

In [this paper](#), the authors wanted to work out how race and ethnic background might interact with other factors to increase type 2 diabetes risk.

The data was collected as part of the third wave of large, representative cohort study from Boston – in total, 2,764 men and women were extensively examined.

The researchers pooled results into five possible groups of factors that influence type 2 diabetes: biological, socioeconomic, environmental, psychosocial and lifestyle/behavioural.

Then they performed analyses to work out how each of these factors were linked, both directly and indirectly, to the type 2 diabetes [risk](#) for people in different racial and ethnic groups.

The results showed, as expected, that diabetes was more prevalent in black and Hispanic study participants compared to white participants. But – counter to the prevailing view – this was only in small part due to biological and lifestyle/behavioural factors. Such factors were only found to account for a combined 15% and 10% of the total direct effect of black and Hispanic race on type 2 diabetes.

By contrast, approximately 22% and 26% of the total direct effect were the result of socio-economic factors alone – especially income, health literacy, and health care access.

This suggests it's social circumstance, and not biology, that explains most of the differences in the occurrence of diabetes among racial and ethnic groups.

This multilevel modelling study design allowed the researchers to unravel very complex, interwoven factors that contribute to [type 2](#) diabetes.

No model is perfect

Almost no epidemiological [model](#) can perfectly predict the occurrence and causes of a [disease](#) process. And multilevel modelling is not without its limitations.

In this instance, the groupings of factors used in this modelling process are often defined by researchers, and may not precisely reflect their occurrence in the real world.

Nevertheless, in an era of [precision public health](#), and where funding for expensive population interventions and targeted treatments is under intense pressure, approaches such as this are promising.

The right research techniques may provide ways to optimise strategies to tackle the growing inequality that is already apparent in many diseases.

More information: Rebecca S. Piccolo et al. Relative Contributions of Socioeconomic, Local Environmental, Psychosocial, Lifestyle/Behavioral, Biophysiological, and Ancestral Factors to Racial/Ethnic Disparities in Type 2 Diabetes, *Diabetes Care* (2016). [DOI: 10.2337/dc15-2255](https://doi.org/10.2337/dc15-2255)

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