

## Disease and intelligence

# Mens sana in corpore sano

Parasites and pathogens may explain why people in some parts of the world are cleverer than those in others

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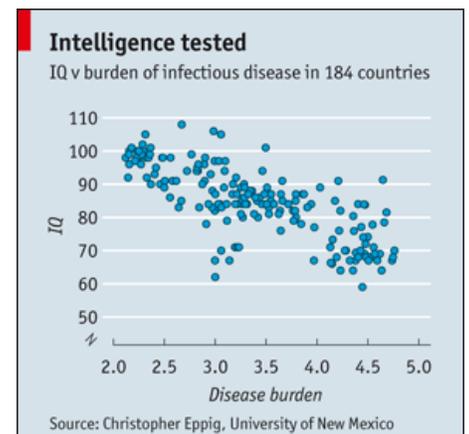
HUMAN intelligence is puzzling. It is higher, on average, in some places than in others. And it seems to have been rising in recent decades. Why these two things should be true is controversial. This week, though, a group of researchers at the University of New Mexico propose the same explanation for both: the effect of infectious disease. If they are right, it suggests that the control of such diseases is crucial to a country's development in a way that had not been appreciated before. Places that harbour a lot of parasites and pathogens not only suffer the debilitating effects of disease on their workforces, but also have their human capital eroded, child by child, from birth.



Christopher Eppig and his colleagues make their suggestion in the *Proceedings of the Royal Society*. They note that the brains of newly born children require 87% of those children's metabolic energy. In five-year-olds the figure is still 44% and even in adults the brain—a mere 2% of the body's weight—consumes about a quarter of the body's energy. Any competition for this energy is likely to damage the brain's development, and parasites and pathogens compete for it in several ways. Some feed on the host's tissue directly, or hijack its molecular machinery to reproduce. Some, particularly those that live in the gut, stop their host absorbing food. And all provoke the host's immune system into activity, which diverts resources from other things.

The inverse correlation that the group calculated between a country's disease burden and the average intelligence of its people is impressive. They estimated the disease burden from World Health Organisation data on DALYs (disability-adjusted life years) lost caused by 28 infectious diseases. These data exist for 192 countries. The intelligence scores came from work carried out earlier this decade by Richard Lynn, a British psychologist, and Tatu Vanhanen, a Finnish political scientist, who analysed IQ studies from 113 countries, and from subsequent work by Jelte Wicherts, a Dutch psychologist.

At the bottom of the average-intelligence list is Equatorial Guinea, followed by St Lucia. Cameroon, Mozambique and Gabon tie at third from bottom.



These countries also have among the highest burden of infectious diseases. At the top of the list of countries with the highest average intelligence is Singapore, followed by South Korea. China and Japan tie in third place. These countries all have relatively low levels of disease. America, Britain and a number of European countries, follow behind the leaders. A list of the countries included in the study can be found [here](#).

### **The consequence of illness**

The correlation is about 67%, and the chance that it might have come about at random is less than one in 10,000. But correlation is not causation, so Mr Eppig and his colleagues tried to eliminate other possible explanations. Previous work has offered income, education, low levels of agricultural labour (which is replaced by more mentally stimulating jobs), climate (the challenge of surviving cold weather might provoke the evolution of intelligence) and even distance from humanity's African homeland (novel environments could encourage greater intelligence) as explanations for national differences in IQ. However, all of these, except perhaps the last, are also likely to be linked to disease and, by careful statistical analysis, Mr Eppig and his colleagues show that all of them either disappear or are reduced to a small effect when the consequences of disease are taken into account.

There is, moreover, direct evidence that infections and parasites affect cognition. Intestinal worms have been shown to do so on many occasions. Malaria, too, is bad for the brain. A study of children in Kenya who survived the cerebral version of the disease suggests that an eighth of them suffer long-term cognitive damage. In the view of Mr Eppig and his colleagues, however, it is the various bugs that cause diarrhoea which are the biggest threat. Diarrhoea strikes children hard. It accounts for a sixth of infant deaths, and even in those it does not kill it prevents the absorption of food at a time when the brain is growing and developing rapidly.

The researchers predict that one type of health problem will increase with rising intelligence. Asthma and other allergies are thought by many experts to be rising in frequency because infantile immune systems, unchallenged by infection, are turning against the cells of the body they are supposed to protect. Some studies already suggest a correlation between a country's allergy levels and its average IQ. Mr Eppig and his colleagues predict that future work will confirm this relationship.

The other prediction, of course, is that as countries conquer disease, the intelligence of their citizens will rise. A rise in intelligence over the decades has already been noticed in rich countries. It is called the Flynn effect after James Flynn, who discovered it. Its cause, however, has been mysterious—until now. If Mr Eppig is right, the near-abolition of serious infections in these countries, by vaccination, clean water and proper sewerage, may explain much if not all of the Flynn effect.

When Dr Lynn and Dr Vanhanen originally published their IQ data, they used them to advance the theory that national differences in intelligence were the main reason for different levels of economic development. This study turns that reasoning on its head. It is lack of development, and the many health problems this brings, which explains the difference in levels of intelligence. No doubt, in a vicious circle, those differences help keep poor countries poor. But the new theory offers a way to break the circle. If further work by researchers supports the ideas of Mr Eppig and his colleagues, they will have done the world a good turn

by providing policymakers with yet another reason why the elimination of disease should be one of the main aims of development, rather than a desirable afterthought.

Science and Technology