The Economist, A poisoned mind

Older men are more prone to cognitive impairment from dirty air

A new study from China highlights air-pollution concerns

LIVING under thick layers of smog is known to cause illness and reduce life expectancy. The degree to which pollution harms the mind is less clear. In theory some of the toxins that get inhaled could damage the nervous system and hamper intellect, but few studies have looked into this. One just has, however, and the results are worrying, particularly for older men.

The new study is by Xiaobo Zhang, Xin Zhang and Xi Chen of Peking University, in China. When Dr Zhang returned to China in 2012, after teaching in America, he found it difficult to concentrate during days when the air in Beijing was heavily polluted. He knew from previous research conducted by another lab that young students living in polluted areas performed more poorly in exams, but there was no exploration of whether this held true for a broader population and, if it did, what specific effects the toxins were having on cognitive function.

To find out, the team looked at tests carried out as part of the China Family Panel Studies (CFPS), a survey by Peking University. In 2010 and 2014 the same group of around 20,000 people were tested in standardised mathematics and given a verbal test in word recognition. Crucially, the CFPS logged precise information about the date and location of each test.

Putting this information together allowed the researchers to match test scores at each location with the local air quality as reported by the air-pollution index, a measure that rates pollution levels in different cities across China based on daily readings of sulphur dioxide, nitrogen dioxide and tiny bits of particulate matter. The index ranges from zero to 500, signifying the highest level of pollution.

As they report in *Proceedings of the National Academy of Sciences*, the researchers showed that chronic exposure to pollution lowered the scores on the verbal tests, and that the higher the pollution levels were the more the scores dropped. On average, an increase of 13.23 units (one standard deviation) in the pollution index over the course of three years resulted in a reduction of 1.36 points for men and 0.91 points for women, on the 34-point verbal exam. In contrast, mathematics scores were hardly altered by pollution exposure.

The effects were particularly dramatic in older men who had no education beyond primary school. The data showed that these men lost an average of 9.18 points on the verbal exam if they were exposed to an increase of 13.23 units of pollution over three years. For men who had attended middle school at least, this loss was reduced to just 1.88 points.

Precisely why the mathematics scores barely changed, and why men were harmed most, remains unclear. Dr Zhang speculates that pollutant damage is probably accumulating in the white matter of the brain, which people depend upon more heavily for verbal tasks; and men have less white matter than women. It is possible, too, that men with a poor education may work outside, and are thus more exposed to air pollution. Whatever the reasons, the results ought to be food for thought in polluted cities everywhere.

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