Thank grandmothers for lower incidence of cancer

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If it weren't for caring grandmothers, almost every woman would have a gene that gives them up to an 80 per cent chance of getting breast cancer and a 64 per cent chance of ovarian cancer. At least so says one researcher.

A US study last year found that women with either of the *BRCA1* or *BRCA2* "breast cancer genes" tend to have more children. In fact, the increase in fertility is so extreme that geneticist Jack da Silva from the University of Adelaide, Australia, says that after just four generations, pretty much every woman should have picked up one of the genes.

"This represents an extremely strong selection and begs the question: why are these mutations not extremely common?" says da Silva.

He thinks it all comes down to grandma. Most women who develop cancer and die because of *BRCA1* or BRCA2 do so after menopause, so the genes do not directly limit the number of children they have.

But the genes do limit the number of grandchildren the women can help their daughters care for, since they are more likely to die in their 50s and 60s than women without the genes. When humans were mostly hunter-gatherers, grandmother care was so important for the survival of youngsters that it may have cancelled out the fertility advantage of those with *BRCA1* or *BRCA2*, says da Silva.

"If there was a grandmother effect then that could go towards explaining why these mutations aren't as common as you would expect from the increase in fertility they cause," he says.

Contraceptive effect

Last year's study, led by Ken Smith at the University of Utah in Salt Lake City, found fertility was about 50 per cent higher among women with *BRCA1* or *BRCA2* born before 1930. The differences were still present among women born later but they were less pronounced, probably because contraception has reduced fertility rates regardless of genetics.

When da Silva analysed Smith's results, he found very little evidence of a grandmother effect, but he thinks this is a reflection of modern society – the effect would have been much stronger in the past.

"My take on it is that we've been living as hunter-gatherers for 95 per cent of our history or more," he says. "What mainly explains the frequency of these mutations today is probably what was going on in hunter-gatherer populations."

What about the period during which humans had mostly shifted away from hunter-gathering but had yet to adopt contraception?

"That has been bothering me too," da Silva says. The key question is how long that period

lasted, he says. "I don't know."

Tell-tale telomeres

Nobody knows exactly why women with the *BRCA* genes have more children, but Smith thinks it has to do with their telomeres.

"The idea is that women with *BRCA1/2* mutations have longer telomeres and that women with longer telomeres have greater reproductive success," Smith says. "And those with longer telomeres have higher rates of cancer."

Smith thinks da Silva's arguments are interesting but "the task of reconstructing the evolutionary past is inherently difficult".

It didn't occur to Smith that the grandmother effect might be responsible for the genes not being ubiquitous but he says his work was concerned with the opposite question.

"Our main objective, without knowing what we would find, was to ask why the mutation was still present in the population at all."

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