

Evolution is alive and well in modern women

WOMEN of the future are likely to be slightly shorter and plumper, have healthier hearts and longer reproductive windows. These changes are predicted by the strongest proof to date that humans are still evolving.

Medical advances mean that many people who once would have died young now live to a ripe old age. This has led to a belief that natural selection no longer affects humans and, therefore, that we have stopped evolving.

"That's just plain false," says Stephen Stearns, an evolutionary biologist at Yale University. He says that although differences in survival may no longer select "fitter" humans and their genes, differences in reproduction still can. The question is whether women who have more children have distinguishing traits which they pass on to their offspring.

To find out, Stearns and his colleagues turned to data from the Framingham Heart Study, which has tracked the medical histories of more than 14,000 residents of the town of Framingham, Massachusetts, since 1948 – spanning three generations in some families.

The team studied 2238 women

who had passed menopause and so completed their reproductive lives. For this group, Stearns's team tested whether a woman's height, weight, blood pressure, cholesterol or other traits correlated with the number of children she had borne. They controlled for changes due to social and cultural factors to calculate how strongly natural selection is shaping these traits.

Quite a lot, it turns out. Shorter, heavier women tended to have more children, on average, than taller, lighter ones. Women with lower blood pressure and lower cholesterol levels likewise reared more children, and – not surprisingly – so did women who had their first child at a younger age or who entered menopause later. Strikingly, these traits were passed on to their daughters, who in turn also had more children.

If these trends continue for 10 generations, Stearns calculates, the average woman in 2409 will be 2 centimetres shorter and 1 kilogram heavier than she is today. She will bear her first child about 5 months earlier and enter menopause 10 months later (*Proceedings of the National Academy of Sciences*, DOI:



Slim, tall... doomed?

10.1073/pnas.0906199106).

It's hard to say what is selecting for these traits, and to discern whether they are being passed down through the women's genes. But because Stearns controlled for many social and cultural factors, it is likely that his results document genetic, rather than cultural evolution at work.

It is not the first study to conclude that natural selection is operating on humans today; the difference is that much of the earlier work has drawn that

conclusion from geographic differences in gene frequencies, rather than from direct measurements of reproductive success. That leaves Stearns's study as perhaps the most detailed measure of evolution in humans today.

"It's interesting that the underlying biological framework is still detectable beneath the culture," he says. Analyses of other long-term medical data sets could explore the interplay between genetics and culture. **Bob Holmes** ■