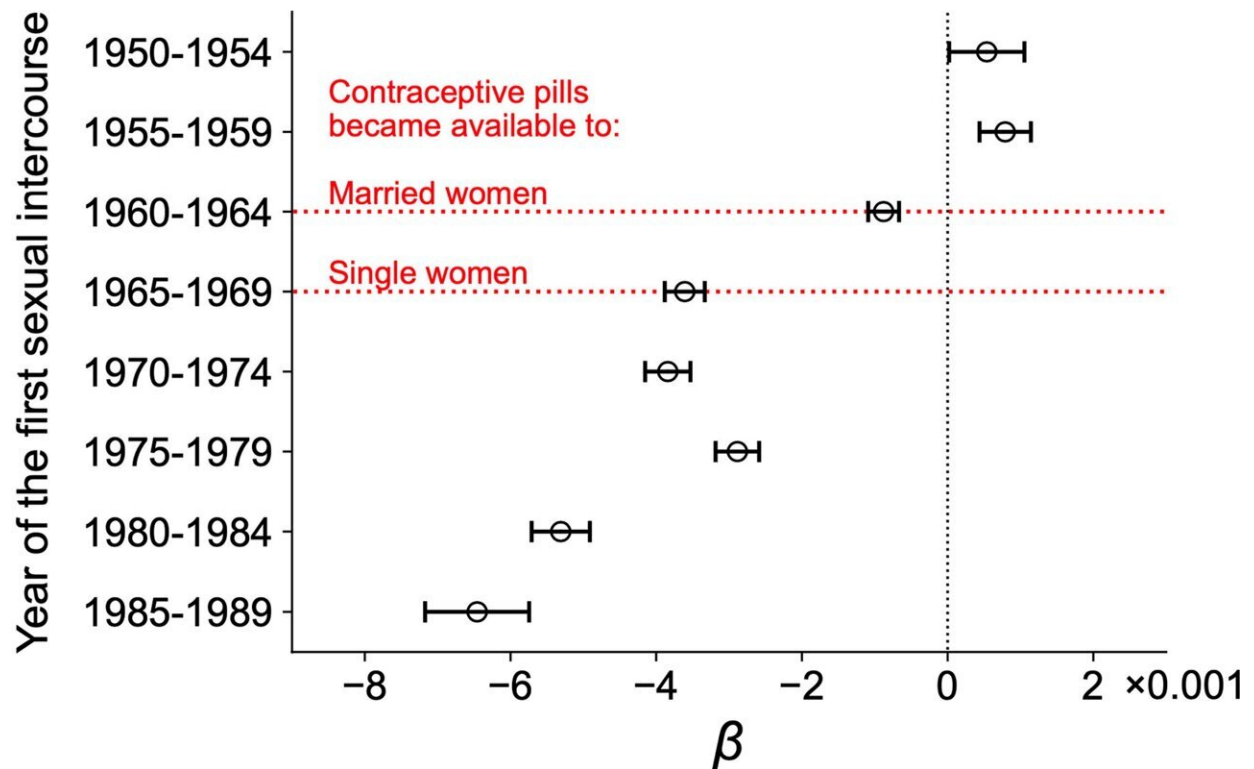


Contraception, evolution and the genetic maintenance of same-sex sexual behavior

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Phenotypic effect (β) of the number of sexual partners on the number of children in OSB individuals in each of the eight 5-y cohorts. Error bar represents the SE. Credit: *Proceedings of the National Academy of Sciences* (2023). DOI: 10.1073/pnas.2303418120

Evolution depends on genes being passed down through the generations via reproduction, and same-sex sexual behavior does not result in

offspring.

So why haven't the many [genes](#) associated with same-sex [sexual behavior](#), known as SSB-associated genes, been purged from the human genome over time? It's a question that has perplexed scientists for decades, one that's explored anew in a Brief Report published in *Proceedings of the National Academy of Sciences* by two University of Michigan biologists.

One possible explanation for the persistence of SSB-associated genes is that they have more than one function, a concept called pleiotropy. Perhaps SSB-associated genes are advantageous to heterosexuals in some way, helping them to have more children.

Support for this idea includes a 2021 *Nature Human Behaviour* study by University of Queensland biologist Brendan Zietsch and colleagues. They presented evidence that heterosexuals carrying SSB-associated genes have more [sexual partners](#) than those not carrying the genes. This could confer an [evolutionary advantage](#), because more sexual partners could translate into more children, according to the Zietsch et al study.

"We were very intrigued by Zietsch et al's paper and immediately thought that the mechanism they proposed is unlikely to work in modern societies due to contraception," said Jianzhi Zhang, a professor in the U-M Department of Ecology and Evolutionary Biology.

In the Brief Report published online May 15 in *PNAS*, Zhang and U-M graduate student Siliang Song conclude that the mechanism for SSB's genetic maintenance proposed by Zietsch and others has been lost in modern societies.

Since the widespread availability of oral contraceptives in the 1960s, having more sexual partners no longer predicts that an individual will have more offspring, according to the analysis by Zhang and Song.

In fact, the U-M researchers—using data from more than 300,000 individuals of European ancestry in the United Kingdom's Biobank database of genetic and health information—found the opposite to be true.

Since the 1960s, the correlation between the number of sexual partners and the number of children in heterosexuals switched from positive to negative. That means same sex-associated genes, formally known as SSB-associated alleles, are now linked to fewer children rather than more children, according to the study.

"If the primary mechanism responsible for the past evolutionary maintenance of human SSB-associated alleles was their offering of reproductive benefits to OSB [opposite-sex sexual behavior] individuals via boosting their number of sexual partners, this mechanism is no longer at work in modern societies and probably has been gone for at least a half century due to the widespread use of contraception," the authors wrote.

"We were awed by the drastic impact of technological advancement on human evolution itself," Zhang said. "We were surprised by the clear reversion in the sign of the correlation before and after the wide availability of oral contraceptives in the U.K."

Zhang and Song suggest that SSB-associated genes—past studies showed that the behavior is influenced by many genes, each with a small effect—will gradually decline in frequency, unless a new mechanism arises to maintain them in the [human genome](#).

But the authors stress that they're talking exclusively about the genetic variants associated with same-sex sexual behavior and not the behavior itself, which is affected by both genetic and environmental factors.

In fact, the proportion of U.K. Biobank participants reporting same-sex sexual behavior has been on the rise in recent decades, likely due to growing societal openness toward it, according to the authors.

The scientific and statistical techniques used in the study by Song and Zhang include genome-wide association analysis, genetic correlation and phenotypic regression.

A substantial increase in contraception took place in the U.K. after oral contraceptives became available to married and unmarried women in 1961 and 1967, respectively. To more specifically evaluate the potential role of contraception in their findings, U-M researchers divided the Biobank data into subgroups based on the self-reported year in which each participant first had sex.

They found a positive correlation between SSB-associated genes and the number of children in the sub-group from 1950 to 1959, supporting the previously proposed mechanism for the maintenance of those genes prior to the widespread use of oral contraceptives. But the genetic correlation between SSB-associated genes and the number of children turned negative in the 1960s, according to the authors.

"SSB-associated alleles are overall reproductively detrimental in the contemporary British population and have a combined effect of lowering the number of [children](#)," Song said.

The authors caution that their results are based on British people of European ancestry and may not represent a general pattern across populations with diverse cultural, social, economic and/or political environments.

More information: Siliang Song et al, Contraception ends the genetic maintenance of human same-sex sexual behavior, *Proceedings of the*

National Academy of Sciences (2023). [DOI: 10.1073/pnas.2303418120](https://doi.org/10.1073/pnas.2303418120)

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