

the maximum-likelihood estimate is not necessarily 0, and it is not appropriate to estimate the standard errors of the parameter estimates by calculating the Fisher information. Instead, the SPERMSEG software inverts the likelihood-ratio test to obtain confidence intervals for the parameter estimates. Confidence intervals obtained by inverting the likelihood-ratio test are generally more accurate than those obtained from the Fisher information, even when the maximum-likelihood estimate is in the interior of the parameter space.

One can perform a  $\chi^2$  goodness-of-fit test to make sure that the model used to analyze the sperm-typing data actually fits the data. However, when some parameters are estimated on the boundary of the parameter space, the appropriate number of df for the  $\chi^2$  test is no longer clear. SPERMSEG has a built-in simulation routine to calculate a *P* value, for the goodness-of-fit test, that will be valid even when some parameters are estimated on the boundary.

In order to make full use of single-sperm typing as a valuable tool for the study of segregation distortion, flexible software must be available to analyze the resulting data. SPERMSEG allows for any number of one- and two-marker data sets from one or more donors. It performs full likelihood analysis of the data, using models of the user's choice. Log-likelihoods are output for use in hypothesis testing, and confidence intervals based on inverting the likelihood-ratio test and simulation-based goodness-of-fit tests are calculated, both of which are reliable even when parameters are estimated on the boundary.

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### Electronic-Database Information

The URL for data in this article is as follows:

SPERMSEG, <http://galton.uchicago.edu/~mcpeek/software/spermseg> (for SPERMSEG software and documentation)

### References

Cui X, Li H, Goradia TM, Lange K, Kazazian HH Jr, Galas D, Arnheim N (1989) Single-sperm typing: determination of genetic distance between the  $\gamma$ -globin and parathyroid hormone loci by using the polymerase chain reaction and allele-specific oligomers. *Proc Natl Acad Sci USA* 86:9389–9393

- Dempster AP, Laird NM, Rubin DB (1977) Maximum likelihood from incomplete data via the EM algorithm. *J R Stat Soc [B]* 39:1–38
- Girardet A, Leeflang EP, McPeck MS, Munier F, Arnheim N, Claustres M, Pellestor F (1998) Analysis of meiotic segregation at the retinoblastoma locus using sperm typing technique. *Am J Hum Genet Suppl* 63:A362
- Goradia TM, Stanton VP Jr, Cui X, Aburatani H, Li H, Lange K, Housman DE, et al (1991) Ordering three DNA polymorphisms on human chromosome 3 by sperm typing. *Genomics* 10:748–755
- Grewal RP, Cancel G, Leeflang EP, Dürr A, McPeck MS, Draghinas D, Xiang Y, et al (1999) French Machado-Joseph disease patients do not exhibit gametic segregation distortion: a sperm typing analysis. *Hum Mol Genet* 8:1779–1784
- Lazzeroni LC, Arnheim N, Schmitt K, Lange K (1994) Multipoint mapping calculations for sperm-typing data. *Am J Hum Genet* 55:431–436
- Leeflang EP, McPeck MS, Arnheim N (1996) Analysis of meiotic segregation, using single-sperm typing: meiotic drive at the myotonic dystrophy locus. *Am J Hum Genet* 59:896–904
- Takiyama Y, Sakoe K, Amaike M, Soutome M, Ogawa T, Nakano I, Nishizawa M (1999) Single sperm analysis of the CAG repeats in the gene for dentatorubral-pallidolusian atrophy (DRPLA): the instability of the CAG repeats in the DRPLA gene is prominent among the CAG repeat diseases. *Hum Mol Genet* 8:453–457
- Takiyama Y, Sakoe K, Soutome M, Namekawa M, Ogawa T, Nakano I, Igarashi S, et al (1997) Single sperm analysis of the CAG repeats in the gene for Machado-Joseph disease (MJD1): evidence for non-Mendelian transmission of the MJD1 gene and for the effect of the intragenic CGG/GGG polymorphism on the intergenerational instability. *Hum Mol Genet* 6:1063–1068
- Williams C, Davies D, Williamson R (1993) Segregation of  $\Delta F508$  and normal CFTR alleles in human sperm. *Hum Mol Genet* 2:445–448

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### Cultural Difference and the Eugenics Law

*To the Editor:*

Mao recently reported results of a survey of Chinese geneticists' views on ethical issues in genetic testing and screening, which are quite different from those of their Western counterparts (Mao 1998). Although this report provides a welcome opportunity to further illuminate the East-West controversy that surrounds the Chinese

eugenics law, unfortunately the report suffers from some gross factual errors, such as the statement that "sickle cell disease is very common in China" (Mao 1998, p. 690). In addition, Mao's argument that social, economic, and cultural differences "most likely will give rise to a disagreement between China and the West, on the issue of eugenics" (p. 693) is not quite convincing.

Granted, sociocultural differences may indeed account for the difference in views on eugenics, but differences in knowledge may also contribute. In fact, differences in knowledge can confound the explanation, making it extremely difficult to infer which factor is primarily involved, especially when, like Mao, one makes no attempt to assess the magnitude of difference in genetic knowledge between the East and the West.

For various reasons, human genetics research in China lags far behind that in Western nations. This gap unavoidably permeates Chinese geneticists' views on eugenics. No mention is made, in Mao's article, of the credentials of the survey respondents, although the survey does contain ample information of this kind. In fact, there is a noticeable gap in genetic knowledge.

For example, almost all respondents agreed that "an important goal of genetic counseling is to reduce the number of deleterious genes in the population" (Mao 1997, p. 20) and that "carriers of the same defective gene should not marry each other" (Mao 1998, p. 693). In truth, it is well known that discouraging carriers of the same defective gene from mating is not an effective way to reduce the number of deleterious genes responsible for rare recessive diseases (see, for example, Li 1955). Another example: although the issue of whether there is a susceptibility gene for alcoholism is far from settled, 69% of the respondents agreed that genetic tests for predisposition to alcoholism should be done in children.

Mao argues that the eugenics concept in China is somewhat different from the concept in Western nations and portrays the Chinese eugenics law as benign. It may be benign, but the languages of several controversial articles in the Chinese eugenics law are uncomfortably similar to those of, say, the 1920s Idaho eugenics law, which allowed sterilization of "mentally defectives, epileptics, habitual criminals, moral degenerates, and sex perverts" (Russell 1929, p. 259). This is all the more serious given the lack of legal recourse for Chinese couples diagnosed with or suspected to carry a genetic disease, as the law stipulates. There is a clear and real danger that the law can be abused.

Mao (1998) points out, correctly, that the motivation of the law is underscored by the lack of a universal health care program that covers genetic services. This seems to imply that the law, when rigorously enforced, will help to reduce the economic burdens on many people inflicted with diseases perceived to be hereditary. However, this

may prove to be wishful thinking. The truth is, our knowledge base is so minuscule that there is no evidence to support the notion that the law would effectively serve that purpose, especially given that the documentation of genetic diseases is scant in China.

Lastly, the notion that sociocultural differences can justify the eugenics law also is seriously flawed. The traditional Chinese culture favors boys over girls. Does this justify selective abortion and female infanticide? The culture also encourages large families, which is directly at odds with China's one-child policy. If Mao's logic is correct, does that mean that policy should be abandoned altogether?

So far, most defenders of the law in China have been, conspicuously, social scientists and molecular biologists, whose distinctive insight may reflect their vantage points. What seems to have been disregarded completely is that we are dealing here with much more than cultural or social differences. It is imperative that a law concerning genetic aspects of health and population is based on principles of population genetics and genetic epidemiology.

Different people may have various ways to interpret the difference in views on the Chinese eugenics law. The point, however, is to change the grave reality: that there are >50 million disabled people in China. But this will require hard science and solid data. It is simply counterproductive to defend post hoc an ill-conceived law that apparently was not drafted with the best knowledge and utmost care.

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### References

- Li CC (1955) First course in population genetics. Reprinted with corrections, 1978. Boxwood Press, Pacific Grove, CA
- Mao X (1997) Ethics and genetics in China: an inside story. *Nat Genet* 17:20
- (1998) Chinese geneticists' views of ethical issues in genetic testing and screening: evidence for eugenics in China. *Am J Hum Genet* 63:688–695
- Russell B (1929) Marriage and morals. Reprinted as a paperback edition, 1970. Liveright Publishing Co., New York

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### Chinese Geneticists Are Far from Eugenics Movement

*To the Editor:*

The article by Dr. Xin Mao (1998), published in the September 1998 issue of the *Journal*, came to our attention just recently. Unfortunately, it misrepresented in many ways the real attitudes of many of the medical geneticists in China. We feel that it is necessary to speak out for ourselves. For instance, sickle cell anemia is as rare among Chinese as it is among whites. The statement that “sickle cell disease is very common in China” (Mao 1998, p. 690) is incorrect. Hence, there is no reason to require newborn screening for sickle cell disease in China (Mao 1998, table 1). Cystic fibrosis is also very rare in China. Hence, there is also no need to perform newborn screening for this disease (Mao 1998, p. 690). Population screening for defective alleles of the  $\alpha$ -antitrypsin gene (i.e., the PiZ and PiS alleles) has revealed none in China, with the exception of one case with the genotype of M1S. Therefore, it will be meaningless to conduct genetic testing for  $\alpha$ -antitrypsin deficiency among workers in very dirty workplaces (Mao 1998, p. 689). Actually, it will be very difficult to define “very dirty workplace.” Mao also stated that “almost all respondents said that the goal of human genetics was ‘improvement of the population quality, decrease of the population quantity, and furtherance of eugenic principles’ and agreed that ‘an important goal of genetic counseling is to reduce the number of deleterious genes in the population’” (pp. 692–693). We wonder whether any knowledgeable human geneticists will believe that human genetics can decrease the population quantity. We also doubt that the number of deleterious genes—especially “recessive genes”—in the population can be readily reduced. As for the term “eugenics,” one should be very careful not to equate it with “you sheng” in Chinese, which means “to give birth to a healthy baby.” There are many other controversial points in Mao’s article. For example, his table 4 asks whether the country should have laws to prohibit disability discrimination. The original questionnaire, however, asked whether the country has or does not have laws to prohibit disability discrimination. The percentage given in table 4 will lead readers to the conclusion that Chinese medical geneticists do not favor

the enactment of such laws! This letter will be too long if we try to list all of the controversial points in Mao’s article. We are fully aware that, because of differences in culture, value systems, customs, religion, and demographic and economic situations, our viewpoints on many ethical issues may be different than those of our Western colleagues. This stresses the importance of dialogues between us to promote mutual understanding. All constructive suggestions will be heartily welcome, and we will be most grateful for all of them.

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### References

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Mao X (1998) Chinese geneticists’ views of ethical issues in genetic testing and screening: evidence for eugenics in China. *Am J Hum Genet* 63:688–695

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### Reply to Guo and to Chen et al.

*To the Editor:*

Ethical, legal, and social issues in human genetics are hot—but also complicated—topics in developed countries. Since my article (Mao 1998a) about Chinese geneticists’ views on ethical issues in genetic testing and screening was published, it has attracted attention from the international scientific community and the media. Many gave positive comments on the article (Mao 1998b, 1998c; Coghlan 1998; Knoppers 1998), but others, such as Guo (1999 [in this issue]) and Chen et al. (1999 [in this issue]), expressed different views.

Ethical, legal, and social issues in human genetics are very sensitive inside China (as well as elsewhere), and there have been few Chinese scientists, either in genetics or in the social sciences, willing to investigate these subjects. For example, Chinese geneticists were invited to