Genomics and health: ethical, legal and social implications for developing countries

Chee Heng Leng

The major ethical, legal, and social issues (ELSI) issues that have arisen in the context of developments in genomics and health in developed countries are also of relevance to developing countries. The question before the World Health Organization (WHO) today is: what role can it play vis-à-vis these issues? It must identify its priorities and the responsibilities that it should undertake.

Current major activities, applications, and work in genetics and genomics are extensive. The scope of the debate covers areas like genetic testing and screening for diagnosis, treatment and prevention; genetic reproductive screening that may allow for selection whether on the basis of disease, disability, disorder, or sex, or perhaps in the future, even trait selection; genetic manipulation (both somatic and germ line), for treatment, prevention, or enhancement; and finally, genetic databases and research which results in the production of knowledge and the development of techniques which could be used for reproductive selection, treatment of disease, diagnosis, prevention, or enhancement.

Justice and resource allocation

By far the most frequently raised issue pertains to justice and resource allocation. Foremost among the many aspects here is the relative position of genetics and genomics vs other health care needs: What is the relevance of genomic advances to countries that cannot even afford to provide existing vaccines and essential drugs? In many developing countries, even basic health infrastructure is lacking, and much more could be done to improve health status by providing clean water and sanitation and improving nutrition, rather than providing access to genetics services, or channeling resources toward genomic research. Posed in another way, the question becomes: Why have such vast global resources, both private and public, been channeled to genomic research, when the majority have no access to basic amenities and health care?

The answer to that question lies in the balance of political and economic power, and in the historical development and under-development of economies and societies. Still, it is a useful question to keep in mind when we think about the issue of justice and resource allocation. The overriding fear is that advances in genomic science will increase inequities: the gap between developed and developing countries, and between the haves and the have-nots.

Much has been said of the 10:90 ratio: where only 10% of global health research is on the health problems of 90% of the population. The challenge here to link genomics research to the burden of disease in the developing world, and focus it on the major infectious diseases still causing high mortalities in developing countries — for example, on pathogen genomics of such disease vectors and agents.

Imbalances in equity and access to genetic services exist across countries and between developed and developing countries. Within countries, inequities also exist among different social classes. Also, access to genetic services — or the lack of it — in a society will affect women differently from men. How can we prevent these gaps from widening? Can something be done so that the results of genetics and genomic advances in health benefit those most in need of them?

Since equity and access depend primarily on social structure and economic development, a long-term solution will have to deal with changing social structures and economic power relations. Nevertheless, a minimum objective should be to monitor equity and impact. This will give us an indication of whether or not the new genetics will lead to increasing inequities and access.

It has also been repeatedly emphasised that there is a need to encourage the participation of developing countries in genomic research. When countries are unable to afford the infrastructure and investment, it has been suggested that WHO help to build capacity on a regional basis. This will help increase access, and regional networks could also be built. It is also suggested that WHO could play an advocacy role in advancing genomic research for diseases that constitute major health problems in poor countries. This is a role that WHO is already playing in other areas.

Finally, there is a need to improve the distribution and access to basic genetic services in developing countries. In many cases, this would also help to improve women's reproductive health choices. The impact on gender equity, however, should be monitored, as there could also be situations in which women's position will be affected negatively.

Ownership issues

Closely related to the issue of social justice and resource allocation are the ownership issues. These arise when institutions or companies patent genetic material from research or genetic databases. This controversy has been erupting in the context of a fierce battle over the accessibility of HIV-AIDS drugs in developing countries who are unable to afford the high prices of needed patented drugs. These issues have taken on several facets, of which three are crucial.

First, should living material be patentable? Living material may be ESTs, SNPs, gene sequences, partial gene sequences, cell lines, tissues, organs, microorganisms, plants, or animals. If one agrees to patentability, there is a debate on which kind of patent is appropriate, and whether broad patents covering everything should be allowed.

Those who object to patenting argue that gene sequences and such are discoveries of nature, and not inventions. The

Dr Chee Heng Leng, *hengleng@medic.upm.edu.my.*

basis for objecting to patents on DNA fragments and ESTs is that these are relatively easy to find, and that they constitute tools, rather than an inventive step. HUGO, for example, has opposed patents on ESTs and SNPs on this basis. Some scientists oppose patents as a barrier to the free access to knowledge, impeding research. On the other hand, those who argue for patenting say that insofar as patents protect the rights of patent holders, they encourage the sharing of knowledge.

In the global spectrum, at one extreme are countries whose patent offices grant patents from ESTs to transgenic organisms. Although human beings have been deemed non-patentable, organs, genes, and other parts of the human body may be patentable. The US Patent and Trademark Office is of course the prime example. At the other extreme are the countries where all parts of the human body, including DNA sequences, genes and cell lines, are deemed non-patentable. Countries that tend toward this end include France, Austria and the Czech Republic. Many other countries have an intermediate position, generally allowing for the patenting of DNA sequences, genes, and cell lines, but not of organs and organisms.

The Organization for African Unity (OAU) has proposed a model law based on the Convention for Biodiversity, which it hopes the World Trade Organization (WTO) will eventually adopt. It has also asked that the Trade Related Aspects of Intellectual Property Rights (TRIPS) Agreement incorporate a general ban on the patenting of living organisms and the natural processes that produce these living organisms.

The second way in which the ownership issue has been framed is the challenge posed by indigenous people's organisations, who argue that living materials such as plants that are sourced by drug companies for useful substances have actually been identified and sometimes even cultured by indigenous peoples for years. They are therefore the repositories of indigenous people's knowledge and intellectual property.

This has been recognised in the formation of a *Committee on Intellectual Property and Genetic Resources, Traditional Knowledge, and Folklore* to study access to genetic resources and benefit sharing. This concept also forms the basis for the *Common System on Access to Genetic Resources*, adopted by Bolivia, Columbia, Ecuador, Peru and Venezuela. Under this system, contracts have to take into account the rights and interests of the suppliers of genetic resources, their derivatives and related intangible components. They must also guarantee the equitable sharing of benefits deriving from the access to genetic resources. Furthermore, in Peru, there is a system of optional registration of the collective knowledge of indigenous people with respect to biological resources, access to which would be subject to authorisation granted by the indigenous people themselves.

Both the 'patent on life' and the 'indigenous people's resources' issues challenge the existing patent system. The ownership issue has also been framed in the 'flexibility' and 'benefit-sharing' approaches, which do not challenge the existing patent system but work within it.

The focus of the 'flexibility' approach is the debate on how patents should be enforced. At the core of this debate is the TRIPS Agreement, 1994, which has clauses allowing for 'parallel imports' (imports of drugs from countries in which they are the cheapest), compulsory licences, and exemptions in certain situations, such as in public health emergencies. The Brazilian victory in the HIV-AIDS drug case is an example of this. In this context, the European Union is now pressing the WTO to be flexible and to take public health into consideration in TRIPS.

The other approach is benefits sharing, which pertains to the ethical conduct of research as well as the setting up of databases. In order to avoid exploitation of indigenous populations and other vulnerable groups, guidelines may specify, for example, that benefit sharing agreements be drawn up before the research or data base is set up.

What is WHO's role regarding this issue? Is it an intermediary or advocacy role? It already has experience negotiating drug prices, and in benefit sharing. Should it expand its role beyond that?

What is WHO's stand on the 'patents on life' issue? Should it take a stand? If it is to promote the interests of developing countries, should it support the OAU's model law?

What is WHO's stand vis-à-vis the indigenous people's resources issue? Should it promote the common system of the five Latin American countries? How should it play a part in WIPO and WTO discussions? Should it have a statement on the review of the TRIPS Agreement, for example?

Stigmatisation and discrimination

Stigmatisation could affect entire communities found to carry a particular genetic disorder, or to individuals. It is more likely to have a greater impact in societies with lower levels of science education, and in particular social contexts; for example, women could be more vulnerable in societies practising arranged marriages.

The issue of genetic discrimination has arisen in two contexts: in employment, and in insurance. Currently genetic testing is rarely done at the workplace, but this may change with the advances in genome mapping as the range of disease and disorders to be identified from genetic testing increases.

Discrimination in employment has happened in the past. In the United States for example, Blacks who tested positive for sickle cell anaemia were denied employment even if they were healthy and may never develop the disease. Workers in countries with weak labour laws, and weak or non-existent labour unions will be particularly vulnerable

Discrimination in health insurance will have a wide impact wherever health care financing is predominantly risk-rated insurance. This has already occurred in the US, and in response, some states have set up legislation prohibiting or restricting the use of genetic tests in insurance. But even in the United Kingdom with the National Health Service, people have been discriminated against for life insurance on the basis of genetic testing. (It was recently reported that the UK government endorsed a ban on genetic testing by insurance companies.)

The issues of stigmatisation and discrimination raise the corresponding issues of privacy and confidentiality. Who will determine the principles, bases and limits of privacy and confidentiality when handling an individual's genetic information? If the principles have been laid, who will ensure that the principles are adhered to in practice? And how will this be done?

There is a need for international guidelines to address issues related to genetic testing in employment and insurance. There is already a lot of discussion (for example, by the European Group on Ethics, Nuffield Council) on this. WHO has also issued the Proposed International Guidelines on Ethical Issues in Medical Genetics and Genetic Services (1998). Nonetheless, it need not stop at developing international guidelines. It could also play an advocacy role vis-à-vis governments, and help build the institutional capacity to address problems of discrimination that arise.

Informed consent

The issue of informed consent follows closely from our discussion of genetic discrimination and stigmatisation. The importance of free and informed consent cannot be overstated whether it is in relation to genetic testing, research or databases.

The difficulty here lies in obtaining genuinely free and informed consent in societies where there is no such tradition, or among communities unfamiliar with western scientific practices. The requirements and process of informed consent are different for testing in clinical settings and for research. In testing for disorders, genetic counseling could be very important, especially when preventive interventions or abortions are not accessible.

In research, special consideration will have to be given to obtaining consent, avoiding manipulation or coercion of vulnerable persons (for example of women in communities where men make decisions), ensuring that the population adequately understands the research, etc.

In addition to the consent from individual participants, the need for community agreement – and the method of achieving this – may have to be ascertained. People should also be informed about the potential future uses of their genetic material.

In the collection of databases, the appropriate process for informed consent needs to be identified. For example, will it be an opt-in or an opt-out consent procedure? Further, when studying databases or genetic material in existing repositories, can genetic material be used for purposes other than that for which informed consent was given in the first place?

What is WHO's role? Definitely, international guidelines are required for the introduction of testing or screening programmes, for the informed consent process in testing and screening, for research, and for databases. The 1998 Proposed International Guidelines are an initiative in this direction. Other organisations have also developed guidelines. Does WHO need to develop its own guidelines? Or should it review existing guidelines with a view to endorsing them?

Sex selection

Although sex selection is in a way a discrimination issue, it is discussed separately here to give it particular prominence. Sex selection is a reality in some developing countries where female infanticide and foeticide are carried out. There is a real danger that prenatal genetic screening will lead to an increase in this practice.

Developing countries are more often than not strongly patriarchal. Sex selection occurs in an entrenched culture of son preference and women's subordination where having daughters is considered to be an economical disadvantage. Still, state policies can worsen the situation in the context of an existing cultural bias. In China for example, the one-child policy has resulted in a distortion of the sex ratio in certain geographical areas.

Discrimination, stigmatisation and sex selection in society occur in the context of entrenched values, interests, and cultural beliefs and practices. Their eradication requires investment in long-term strategies of economic and social development and educational and cultural upliftment. What should WHO do to convince national governments to invest seriously in these long-term strategies?

Eugenics

Eugenics, the science of improving the human population through controlled breeding, encompasses the elimination of disease, disorder, or undesirable traits, on the one hand, and genetic enhancement on the other. It is pursued by nations through state policies and programmes. The Nazi state in Germany in the mid-20th century, for example, used mass extermination. Other state means are forced sterilisation, selective immigration policies, and population control policies.

Eugenics is a current danger in dictatorial and authoritarian states. It was not too long ago that one particularly technocratic and authoritarian state instituted incentives and disincentives for eugenic purposes. With advances in genomics, eugenics becomes possible through techniques of somatic genetic manipulation, and possibly in the future, even germ-line manipulation.

It has been argued that though state eugenic policies, which inevitably involve coercion, are objectionable, eugenic decisions by individual parents constitute a free and informed choice and therefore should not meet with censure. This view is debatable given that most societies, in particular developing countries, do not have structures supporting disabled persons. Moreover, women's reproductive decision-making processes are constrained and influenced by the social and economic environment, as well as by current norms in medical practice, practices such as directive counseling, and also by social pressure. Indeed, while preventing serious disabilities, it is important to ensure that we respect diversity and reaffirm the tolerance of difference.

What is WHO's role in this? Could there be international guidelines or even international conventions, addressing eugenic state policies and practices? Guidelines already exist for somatic and germ-line manipulation. Does WHO

need to look into the relevance of these for developing countries? Could there be guidelines for individual reproductive decision-making that would safeguard men's and women's reproductive rights while also guard against eugenic practices?

Ideology and genetics

The general ideological context is important to understand how genetics can be misunderstood and give rise to incorrect suppositions of the genetic basis of racial differences, notions of superior and inferior genes, and of how genes determine traits and behaviour. The existence of social classes and hierarchical relationships, the dominance of reductionist science, an emphasis on rote learning rather than critical thinking in educational systems, are examples of social structure and processes in society that do not enable an individual to easily understand the complexities of the interactions of genes, environment, and culture.

It is important to raise the level and quality of scientific education in general. Specifically, it is important to provide adequate and accurate genetic information, knowledge and education. Such efforts would aid in countering genetic deterministic ways of understanding the role of genes, and of genetic tests and interventions. It would also counter 'gene hype', or unrealistic expectations of the potential applications resulting from the genomic revolution.

WHO may have a role to play in identifying the educational needs of international agencies, national governments including policy makers, and health care professionals. At the national level, it could possibly also advocate on this need, and provide the tools for identifying the educational needs at the level of the public, community and schools. There is also a role in capacity building for genetics education, and in developing and disseminating appropriate genetic educational materials.

Nevertheless, other international bodies, such as UNESCO, might have genetic education initiatives; efforts should be coordinated rather than to duplicated. WHO might concentrate, for example, on the educational needs concerning the delivery of genetic and medical services, or in medical and health education.

The risks and hazards of genomics

In human genomics, there are risks to the individual inherent in genetic therapy and manipulation. Germ-line intervention constitutes a special srisk of irreversible changes to human beings. Is a moratorium on germ-line intervention sufficient, or should there be a permanent prohibition? How could a moratorium or prohibition be monitored? There is also a danger of errant states using human genomics to develop biological weapons for warfare.

Non-human genomics faces threats from genetically modified organisms and transgenic organisms, to the safety of the environment and the ecosystem. There are also trends toward antibody resistance in pathogens, a reduction in diversity, and an increasing reliance on and dominance of transnational corporations.

WHO can play a role in quality assurance in genetic services, by providing benchmark or 'best practice' models. Is there a role for WHO as well, to monitor risks and hazards and to disseminate the information? Is there a need for international guidelines and declarations on risks and hazards, providing for moratoriums or prohibitions, for example, and is there a role for WHO in this?

Conclusion

The purpose of this paper is to raise questions to stimulate discussion and debate. It would be most helpful to focus on what WHO's role should be. As a global health organisation, how can it most effectively play a leadership role in debates on the impact of genomic science on human ethics and society? What direction should it forge that is consistent with its mandate of 'health for all'? Does it need to play the role of convenor, coordinator, and mediator? WHO will have to set its priorities and develop the concrete ways in which it can intervene in the global processes to improve health in developing countries and in the interest of equity in health.

This paper was presented at the Thai Health Research Forum — WHO Multi-Regional Consultative Meeting on Genomics and Health, 23-25th July 2001, Sofitel Central Plaza Hotel, Bangkok, Thailand.

About capitation fee colleges...

In the field of education, if money can reach further than brains, it is not only a disgrace to humanity but also an unpardonable act of inhumanity. No right-thinking person can allow medical and engineering seats to be chased and purchased. They should be merited by intellectual excellence and not grabbed either by political affluence or financial affluence…

An economically backward student depends on his mental capability. Hence how can a rich student be allowed to supercede him just because he enjoys monetary superiority? If we do so, apart from being unfair, we make the divide between the rich and the poor wider….

If money can make engineers and doctors, what else will they be motivated to do except to make money and spread acrimony and disharmony?…

There is no denying the fact that the concept of payment seats and donation seats has been conceived mainly to give financial support to the private professional colleges. But what is the use of building colleges when virtues and values are shaken up and even given up? …

Extracted from: S Devaraj. Axe at the roots of justice: Payment and donation seats. *The Hindu*, June 26, 2001.

Sent by Dr Shedde Prabhakar Rao, Ratna Krupa, Shivabagh Road, Kadri, Mangalore, 575 002.