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HEALTH AND HUMAN RIGHTS

a reader

edited by

Jonathan M. Mann, Sofia Gruskin,

Michael A. Grodin, George J. Annas

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25. Human Rights and Human Genetic Variation Research

Committee on Human Genetic Diversity,
National Research Council

As science advances, new insights into the methods of science emerge. In human genetic research, one important insight has been the recognition of ethical issues in the design of basic research on human genetic variation. In short, as the scientific community seeks to conduct genetic variation studies with people from an ever-wider variety of populations, it increasingly faces the challenge of respecting the rights and interests of research subjects who participate in the research both as individuals and as representatives of groups.

The research-design questions that this challenge provokes are not new to human biology or peculiar to the study of human genetic variation; they have been encountered many times in the contexts of human population genetics, biologic anthropology, and epidemiology. However, as the scope and depth of genetic variation research expand, the stakes for both individual research subjects and the groups that they represent will increase. Moreover, as representatives of groups, the individuals who provide DNA for genetic variation research are playing a role in science that our individual-oriented norms of research ethics are ill equipped to address. It will be increasingly important for new investigators to appreciate the ethical issues that they encounter and to be able to adapt how they approach such issues to the cultural circumstances in which they would like to work. The goal of this chapter is to address that need by describing the major lessons of the scientific community's experience with ethical issues and the research-design considerations that have emerged from them.

Proposals for human genome diversity research that do not adequately anticipate the issues raised by the proposers' population focus have already proved capable of generating a remarkable amount of public controversy. One prominent call to begin a systematic collection of human genetic

samples for study (Cavalli-Sforza et al. 1991) produced an unprecedented international reaction, including cautionary statements from UNESCO's Bioethics Committee (UNESCO 1995), the UN Commission on Human Rights (UN Commission on Human Rights 1996), the U.S. Human Genome Project (U.S. Congress 1993), and numerous public-advocacy organizations (Amazanga Institute et al. 1996; Mead 1996; RAFI 1993). Because a final statement of the goals and methods of such a project does not exist, it is difficult to determine what concerns are justified and even harder to suggest how the scientific community might resolve them. However, it is not difficult to understand the sources of the concerns; they flow from the convergence of several sets of public experiences that all accentute the risks posed by genetic-variation research.

This suggests an approach for our analysis. Different kinds of genetic-variation research will engage the concerns expressed by the public in different ways and to different degrees. Examining each of the DNA-sampling strategies from the perspectives of the controversies that serve as background to the current debate should allow us to identify the issues that are most likely to be raised by different strategies and to assess the extent of their challenges to the design and conduct of human genetic variation studies.

CONTEXT OF CONCERNS ABOUT STUDYING HUMAN GENETIC VARIATION

Human Genetics and the Misuse of Scientific Information

One of the concerns expressed by public reaction to the call for genetic diversity research is that such research could inadvertently exacerbate, rather than lessen, the habit of assigning people to socially defined ethnic categories for political and economic purposes. This habit, of course, long predates scientific thinking about human genetics. In some forms—such as racism, tribalism, and nationalism—it is likely to continue to flourish even in the absence of any additional research on human genetic variation. But the short history of the scientific study of human biology shows that where science can be interpreted to support socially defined categories, it is often used to give authority to the social policies that the categorization is designed to support (Caplan 1994; Rex and Mason 1988). That is not the intention of the scientists involved. Often, scientists sort people into socially defined groups simply for methodological convenience, using the groups as rough markers of human biologic lineages. Sometimes, they begin with such categories to falsify them by showing that biology belies our social classification of humanity. Most contemporary proponents of human genome-diversity research, in fact, use both of those contradictory rationales (HUGO 1993). Nevertheless, when the research is designed in terms of the problematic social categories, it becomes difficult for investigators to escape the accusation that they have participated in perpetuating, rather than confronting, the social problems that the categorization creates.

The danger is illustrated by an early episode in human population genetics: the 1920–1950 study of genetic variation underlying the global distrib-

ution of human blood types. That research contributed much to our scientific understanding of blood type genetics, but it was framed by many in the scientific community in terms of the taxonomy of human "races" that was influential in U.S. and European cultures at the time. The research was understood by many to provide an objective biological underpinning for the culture's prevalent concept of "races" and scientific support for the variety of discriminatory social policies that had been built on racial classifications (Marks 1996; Schneider 1996). As the history of blood-group genetics suggests, scientific studies that accept and use socially defined human taxonomies as biologically based can give inappropriate substance to those categories and lend credibility to the policies that they suggest (Barkan 1992).

The Rio de Janeiro Biodiversity Summit and Genetic Exploitation

A second common theme in the international reaction to calls for human genome-diversity research is concern over potential commercial exploitation of the participating individuals and social groups. The concern is extrapolated from the experiences of indigenous peoples with expatriate pharmaceutical and agricultural research efforts that led to commercially profitable discoveries for the sponsors but not for the peoples whose natural resources were used. The Rio de Janeiro Earth Summit on Biodiversity of 1992 highlighted international public concern over this trend and the resulting development, in many nations, of public policies governing the ownership and control of their indigenous biologic materials (Friedlander 1996). The coincidence between the language of biodiversity in these international public-policy debates and the call for studies of human genome-diversity has now provoked public concern that international efforts to study human genetic variation might result in an analogous commercial exploitation of human genetic "resources" (Friedlander 1996). This concern has been exacerbated recently by international reactions to episodes such as the U.S. government's attempt to patent a cell line from a native of Papua New Guinea (Taube 1995).

The Human Genome Project and Genetic Discrimination

The third important backdrop to the current discussion of human genome-diversity research is the international Human Genome Project itself. In its efforts to anticipate and address the ethical implications of its genetic mapping and sequencing work, the Human Genome Project has succeeded in raising the awareness of both the scientific community and the public of how personal genetic information can be used by social institutions against the interests of individuals and families (Juengst 1994). The Human Genome Project's documentation of the deterministic and reductionistic interpretations of personal genetic information by health professionals, insurers, employers, governments, and the public at large has, for example, already influenced the rules by which genetic research with individuals and families is conducted.

Numerous studies in which large families and linkage analysis were used to isolate and identify human genes have been conducted over the last several decades; they developed relatively seamlessly out of older traditions of Mendelian and medical family-history studies. The accelerated pace of that research and its increasing successes have resulted in increased scrutiny of the standards of practice in genetic family studies because such studies can inadvertently reveal genetic characteristics of individuals who have not given consent in the research. Past genetic family studies often recruited subjects opportunistically and dealt with issues concerning the recording of research data on nonparticipant family members and the publication of identifiable pedigrees only as they arose (Frankel and Teich 1993). Now they are required to address such concerns in advance to ensure that participation of all those affected by a study is voluntary and informed, that families are aware of the full array of possible risks, and that privacy of genetic information is protected (OPRR 1993).

The risks associated with "genetic discrimination" are real enough at the individual and family levels to justify serious consideration of the practices of medical genetics researchers (Geller et al. 1996; Hudson et al. 1995). Risks are likely to be even more substantial at the level of social groups. However, translating the kinds of protections that medical geneticists have adopted for individuals and family-research subjects into protections for entire social groups might require more radical changes in the traditional professional practices of biologic anthropologists and population geneticists than the ones that medical geneticists had to face.

ETHICAL CONSIDERATIONS IN THE DESIGN OF HUMAN GENETIC VARIATION RESEARCH

The extent to which the issues raised above become challenges in research on human genetic variation will depend heavily on the goals of the research and the sampling strategy used to achieve them. However, two basic principles will always be relevant in research involving humans: (1) a scientifically valid research design in which the risks to human subjects are outweighed by the expected benefits is necessary, and (2) for any project that involves collecting DNA samples from individual human beings (as opposed to other sources, such as anonymized blood banks), the free and informed consent of the persons from whom the DNA is collected must be obtained.

There has been some renewed interest in cultural relativism and in requiring researchers to be culturally sensitive in carrying out research in countries and communities other than their own. Such awareness is appropriate, but sensitivity to the specific practices and beliefs of a community cannot be used as a justification for violating universal human rights. These rights must be respected by all researchers, regardless of the research rules or customs in their own countries or the countries in which the research is performed. Fundamental human-rights documents that require respect for the human rights and dignity of all people include the Nuremberg Code (1947), the International Declaration of Human Rights (1948), and the International

Covenant on Civil and Political Rights (1976); these documents support the "equal and inalienable rights of all members of the human family" to choose for themselves whether and how to contribute to scientific knowledge by participating in research (Steiner and Alston 1996).

Those international documents derive the rights that they enumerate from the "inherent dignity of the human person" (Preamble, ICCPR). Not only must people's dignity and welfare be respected, but so must their individual rights. Thus, Article 7 of the International Covenant on Civil and Political Rights specifically provides that "no one shall be subjected without his free consent to medical or scientific experimentation." The requirement to obtain people's informed consent to participate in research ensures that they have enough information about a given project to weigh the benefits and risks associated with becoming involved in the research before they agree to participate. It is a recognized principle of research ethics that research involving risks should not be conducted on populations who will not be able to benefit from the research if it is successful (CIOMS 1993). Consent alone cannot justify research on populations that will not be able to benefit from it because such research violates basic principles of social justice and equality. Research subjects can make a gift to researchers or humanity, but the validity of such a gift in the context of studying genetic diversity, especially of isolated populations, is too problematic to provide the sole justification for the research. Nonetheless, the most important ethical question in research is always whether the research is worth doing. Only after that question and the risk-benefit question are answered favorably is it ethical to approach human subjects to solicit their participation in research.

Therefore, it is crucial to have a complete research protocol for review before the actual consent form and process for obtaining consent can be designed and evaluated. For any specific goal-oriented protocol, it should be possible to anticipate the risks and benefits to the subjects and pursue informed consent accordingly. For projects that are not able to specify goals in sufficient detail to quantify risks and benefits reasonably, the worst-case scenario should be assumed: the benefits will be at the lowest anticipated level, and the risks at the highest. That means that the burden of proof for any DNA-sampling project that does not have a well-defined hypothesis will be high. It also underlines the most basic starting point for all ethical analyses of genetic-variation research, regardless of which model is pursued: defining a hypothesis and determining the benefit of knowing whether it is true.

Studies Involving Geographic, Nonpopulation Sampling

The collection and storage of random samples of human DNA (sampling strategy I) that cannot be linked to identifiable persons, geographical areas, or populations would pose the fewest ethical concerns for genetic-variation research. The absence of identifiers that could be used to associate specific genomic variations with specific human populations avoids the risks of

inappropriately treating socially defined groups as biological lineages and exacerbating existing social problems. By the same token, the collection of samples with this strategy need not be organized in terms of and in consultation with recognized social groups. No identifying correlations would be made, so negotiation of terms of participation with the individuals who are the sources of DNA would also be avoided because no direct benefits or risks to the individuals would flow from their participation. Finally, because no individuals would be identifiable through such a collection, protection of the rights and interests of identified individual human subjects in the later control of sample uses would be obviated.

Studies Involving Geographic-Grid-Based Sampling

Sampling strategy II also avoids the need to address many of the ethical considerations discussed earlier in this chapter. The fact that the samples cannot be linked to identifiable individuals or populations allows researchers to avoid the complexity of human-subject protections and social-group interests that are involved in strategies that require more identification. However, the extent to which these issues can be avoided depends on the size of the grid used. Grids whose resolution makes it possible to isolate individual nations or populations would result in associating the geographic location of a DNA sample's source with a particular people. The ethical and social dynamics of the research would then change considerably, in ways that are best illustrated by considering the next sampling strategy, in which populations are explicitly identified.

Studies Involving Population-Identification-Based Sampling

The ethical challenges of genetic-variation research increase with sampling strategy III and are exacerbated with sampling strategies IV and V. In these sampling strategies, specific human groups are identified as sample sources, and the subjects assume the role of representing the group. The social categories that define them might often be artificial from the biologist's point of view, but social groups are real human entities with both rights and interests to be respected and protected. Two issues of research design are particularly important in this respect: identifying groups to be sampled and obtaining group concurrence and involvement.

Identifying Populations to Be Sampled

Using social identities as the basis for defining populations for the study of genetic variation is probably the most controversial and problematic aspect of genetic-variation research. The reasons are both scientific and political. From a scientific perspective, some genetic variation studies seek populations that function as demes: endogamous (interbreeding) populations that are substantially reproductively isolated from other populations. Intergroup comparisons and intragroup comparisons typically require identifying human populations that function as demes. Many socially defined groups

can satisfy that criterion from small geographically isolated communities to ethnically heterogeneous (but still largely endogamous) nations such as the United States. But many cannot, and identifying them for scientific purposes can be difficult without an adequate understanding of the social and political structures of the areas being studied. Some human demes have fewer internal barriers to gene flow—created by stratification by class, caste, ethnic group, or clan affiliation—within the population than others.

The fact that a group name exists for political purposes can be scientifically misleading. Centralized authorities, whether concerned with the overall unity of a people or with the dominance of a particular group, can affect how humans are grouped despite their biological connections. They can emphasize the homogeneity of the people that they recognize officially as groups. They can discount other claims to "peoplehood" in a country's body politic, or they can foster a particular process of national unification or self-interested differentiation in a country on the basis of hopes for the future more than present (or past) circumstances (Dominguez 1986, 1989; Gladney 1991; Handler 1988). Surveys of self-identified minority groups in given locales typically reveal greater heterogeneity than that recognized by central government authorities unless it benefits the central government to declare that a group of people claiming "peoplehood" is too heterogeneous to be considered a group for political purposes. Regional-level, such as state, governments might give people the name of the administrative center under whose jurisdiction they fall. Or people in a region might be referred to collectively by a name given to them by people with whom they trade. For example, the so-called Nakanai of New Britain were named by the people from the Rabaul area who traded with them; they now refer to themselves as Nakanai. In fact, however, the Nakanai comprise several linguistically distinct groups of villages with different histories. Individuals identify themselves to one another not by cultural or linguistic group names, but by village and clan, the socially important (and not biologically irrelevant) units in their lives. If a sample drawn from an area does not account for language groups, village locations and the clans of the DNA sources, the information essential for both intragroup and intergroup comparisons will be lost.

Another challenge in identifying populations for study is that, as the case of the Nakanai illustrates, the socially defined groups that we use to identify ourselves are always internally differentiated. Investigators will have to decide in advance what level within a given hierarchy of human organization to use to identify groups relevant to a particular study of human genetic variation and by which criteria. Some have suggested that perhaps the fairest and most revealing approach would be to solicit the advice of local populations to identify level of analysis and the group identifications that would make the most sense to them. In theory, that approach could be used to protect the autonomy and interests of self-identified human groups and to avoid the use of distorting labels. However, as the Nakanai example suggests, it is not always a solution for accurately defining groups. Much will depend on from

whom advice is sought on the composition and identification of human social groups. Multiple interviews should be conducted to avoid relying exclusively on one or two sources.

Accurate identification of population units for sampling purposes requires extensive knowledge of the social, political and linguistic composition of the region to be sampled. Published ethnographic studies can provide some of this knowledge, as can anthropologists who work with the peoples. If this information is not available, researchers are advised to study the local situation in consultation with local leaders, experts, and other researchers before designing the sampling strategy.

Group Concurrence and Involvement

Many in the field believe that it is necessary to involve the social group itself in the design and implementation of a local sampling plan. This requirement challenges standard research practices at two distinct stages in the research process. The first stage, which we will call consultation, involves the initial invitation of a potentially participating group. Investigators should involve appropriate commmunity representatives in the design of their sampling strategies, collection methods, and reciprocity agreements before any plan to sample a particular group is considered final or any individual is approached for consent. This process could take different forms with different populations: meeting first with local scientists in one context, with community leaders in another or with lay groups devoted to particular genetic diseases in a third.

The next stage of community involvement is obtaining approval of the group to participate in the study that the first stage of consultation generates. This requires activating the process that the group uses to make collective decisions on issues related to their corporate identity and interests. The process is analogous to the informed consent obtained from the individuals providing samples, and it requires the same forms of information disclosure by the investigators.

The concept of community approval is not well articulated in contemporary research policies, but it is similar to some forms of community consultation already used in some population-level research. The communication processes between the researcher and the group and the community decision-making processes that will be required to achieve group concurrence will necessarily vary from group to group. But to the extent that the research has the potential to affect the social interests of the group as a whole, any research on members of groups or communities (as defined by themselves or the researchers) must develop a protocol for community consultation and a mechanism for community input into how the research is designed, how the research itself will be conducted, and how the results will be used.

The concept of group approval has limits. Recently, the World Health Organization and the Council for International Organizations of Medical Sciences updated their International Ethical Guidelines for Biomedical

Research Involving Human Subjects (1993). Those guidelines, which are based on the Nuremberg Code (1947), the World Medical Association's Declaration of Helsinki (1964), the Universal Declaration (1948), and the International Covenants (1976), articulate specific requirements. Even when community consent is obtained as a prerequisite for conducting research with group members, investigators must obtain the informed consent of individual prospective subjects (guideline 1). The information needed to obtain informed consent must be conveyed by the investigator in language that the subject is capable of understanding, including the research, its duration, reasonably expected benefits, foreseeable risks, alternative procedures, the extent of confidentiality, the availability of compensation, and the facts that participation is voluntary and that the subject may withdraw at any time without penalty (guideline 2). If the investigator has difficulty in communicating with the prospective subjects "to make prospective subjects sufficiently aware of the implications of participation to give adequately informed consent, the decision of each prospective subject on whether to consent should be elicited through a reliable intermediary such as a trusted community leader." However consent is obtained, all prospective subjects must be clearly informed that their participation is entirely voluntary and that they are free to refuse to participate or to cease to participate at any time without loss of any entitlement (commentary on guideline 8). In locations where women's rights to self-determination are not recognized (and thus their informed consent not possible), "women should not normally be involved in the research" (commentary on guideline 11 of the International Ethical Guidelines for Biomedical Research Involving Human Subjects), because it is likely that they will not have the freedom and power to choose whether to participate. While it is obviously wrong to exclude women from participation in a study that could lead to results from which they could benefit, it is equally important to insist on informed consent that is freely given.

Current international policy does not address whether a community should be able to veto the voluntary participation of individual members in legitimate research. If the group has decided not to participate, should individual volunteers who identify themselves as group members continue to be recruited and enrolled as representatives of the group? This conflict is particularly likely to occur in situations in which, for example, expatriate or immigrant communities of some social group's location have caused it to think about participation in research in a different way from members of their group who live elsewhere. We think that it too extreme a position to require both group and individual consent to DNA collection for genetic variation research. Nonetheless, researchers will have to make sure that their participants understand both the objections of their community and the rationale for them as part of the informed consent process and, when doing research that is opposed by a specific community, will also have to take into account the possible impact of doing such research on the likelihood that other communities will cooperate with other genetic variation researchers in the future.

Individually Identified DNA Sampling

Any sampling strategy that collects enough phenotypic, genealogical, or other ethnographic data to identify individual human sources of the DNA has the potential to put individual subjects and families at risk for confusion, intrafamilial disruption, stigmatization, and discrimination (Juengst 1996). That reinforces the need to have both individuals and families participate actively in the consent process and gives them rights and interests in controlling the use of their DNA samples and results that should override the claims of their communities or groups. Consequently, agreements regarding the research to be conducted on individually identified and population-representative samples should be negotiatd at three levels: community, familial and individual. At each successive level, potential research participants should be afforded the right to decline or further qualify their participation in the study, within the limits of the agreements established by the larger groups that they represent. The potential for individual and familial identification has other implications that are not as important in other sampling strategies.

First, adequate confidentiality protections must be ensured. Studies that simply collect group-identification data about their sample sources cannot reasonably promise to protect the confidentiality of their findings about the group if group identification is integral to the point of the study, and they should not attempt to do so. However, when information about individuals and families is collected, a promise of confidentiality is important to offer and honor. Steps must be taken to ensure that other individuals do not learn of the information derived from the sample if the sample can be linked to an identifiable individual. That is a basic concept in all genetics research, and it requires strict data management, oversight of data storage, rules for coding and disclosing data, rules regarding redisclosure and basic data security and monitoring. It is especially important to institute measures that will prevent unauthorized access to individually identifiable genetic information, so as to protect individual research participants from stigmatization and discrimination. That will require a continuing monitoring mechanism to prevent breaches of confidentiality and to permit appropriate action to be taken against those who participate in such breaches. The degree of potential breaches of confidentiality and invasion of privacy might be so high that ethical conduct of such research will be impossible unless only DNA samples that cannot be linked to identifiable individuals are stored.

Second, studies that collect individually identifiable DNA must include mechanisms for follow-up about the results of the studies conducted on collected samples. In initial consultations with the communities to be sampled, investigators should agree on what information and follow-up services will be available to individuals or families who are found to have specific illnesses or a genetic predisposition to specific illnesses. In most cases of medically relevant genetic findings, arrangements involve a comprehensive protocol for the genetic screening and counseling of individuals, including mechanisms for dealing with findings, such as misidentified pater-

nity, ambiguous or uncertain results, and the reproductive-risk implications of the information collected.

CONTROL

The extent of continuing involvement in the research by the group being sampled must be addressed. This includes whether groups or group spokespersons will be involved in monitoring the research conducted on DNA samples taken from their people, in granting permission for new uses of those samples if they are identifiable, in determining whether the group can withdraw from the research and in determining how to share financial or other benefits.

With a DNA-databank research resource, the responsibility of the collection managers to monitor research conducted by external investigators is especially strong. Systems should be in place that aid the collection managers in anticipating the social consequences of particular research findings and help the public and the groups involved to prepare for those consequences. The collection manager in effect, must assume the role of the genetic counselor for the participating groups, and administrators must be prepared to disclose the results of the testing in a responsible manner. To be consistent with practice in other fields of human genetics, the disclosure of the results of the research to the general public through scientific publications should be negotiated with the representatives of the donor groups (Powers 1993).

It is not ethically or legally acceptable to ask research participants to "consent" to future but as-yet-unknown uses of their identifiable DNA samples. Consent in such a case is a waiver of rights, and such waivers are explicitly prohibited by federal research regulations.

People have the right to withdraw their consent to research at any time, including the right to have identifiable samples destroyed or withdrawn. But how does that work on the community level? Should the population itself be able to withdraw from the project? The answer might be that "community withdrawal" is not possible; if that is the case, it should be spelled out in both the protocol and the individual consent processes, as well as in the discussion of the protocol with community representatives. In general, consent and withdrawal are rights of individual research subjects and should not depend on the approval or disapproval of government authorities, however defined. Some studies of American Indians have used the relevant tribal council both to give approval of proposed research and to review and have right of refusal to publish all research findings. That procedural protection might seem extreme to scientists, but such agreements are reported to have worked well in a variety of medical research projects. It is a way for genetic variation projects to respond to the legitimate interests of subjects and groups in the research.

COMMERCIALIZATION AND RECIPROCITY AGREEMENTS

Some proponents of human genetic-variation research argue that it will be essential to negotiate arrangements regarding possible commercial benefits

with the subject groups in advance of research, to make the participating groups "partners" with scientists in the research (North American Committee). Such a partnership implies that the subject groups will be given some role in determining the uses to which research results will be put.

Arrangements regarding financial interests in the products or outcomes of the research should be negotiated as part of the original project review and informed-consent process. In addition, a monitoring and enforcement mechanism, with representation of the affected groups, should be in place. One of the major lessons from the Rio de Janeiro Biodiversity Summit is the importance of economic and political considerations in negotiating research participation with identified human groups. That should not be surprising, inasmuch as social groups are usually created and sustained as a means of pursuing their members' economic and political interests. However, this adds a dimension to informed consent negotiations that is foreign to most social and biomedical scientists: negotiating over what the participating group receives in return for participation.

Perhaps the most contentious issue in the short history of human genetic diversity research is the growing practice of patenting cell lines and gene sequences. Some indigenous populations are so averse to patenting that many researchers not only state that they will refuse commercial funding for genetic diversity research, but also explicitly promise not to patent or profit from any potentially profitable discoveries that might be made. Of course, researchers can speak only for themselves. As long as it is legal to patent human genes and gene sequences, others might obtain patents on them. Prohibiting the patenting of genes and gene sequences would require an international agreement binding at least all the major industrialized countries. Debate on this issue continues in Europe; only France has explicitly stated it will not permit patenting of genes and gene sequences. Nonetheless, much or most of the international controversy over collecting genes to study human genetic variation would disappear if the patenting of genes and gene sequences was outlawed.

Outlawing the patenting of human genes and gene sequences would solve one immediate problem, but it would not address the controversy over patenting human cell lines. The committee heard testimony from John Moore, whose spleen was used as a source of a cell line that was immortalized and patented without his knowledge or permission. When Moore discovered what had occurred, he sued his physician and the biotechnology companies that obtained the patent for his cell line. The California Supreme Court ultimately ruled that other people and companies could own John Moore's cell line and could patent it but that he himself could not assert an ownership interest in his own cells (*Moore v. Regents* 1990). The court stated that that result was necessary to protect the biotechnology industry, which might falter if individual ownership of cells (and DNA) were permitted (Annas 1993; Knoppers et al. 1996). After Moore briefed the committee, another witness, Abadio Green Stocel, from a Colombian group, said "If this can happen to a U.S. businessman, what chance do we have?" These

arguments raised a second possible approach that assumes at least some patenting will continue; the committee considered this argument in its deliberations.

A less comprehensive, mutually agreeable strategy would be to require that all such patent applications include an agreement to share a set proportion of the resulting net proceeds or profits with the person whose body was the source of the DNA or, at that person's election, with the community of which he or she is a member. Or such "royalty" payments could be made to an international body such as UNESCO or WHO, for the benefit of the participating populations (Knoppers et al. 1996).

A more sophisticated and more-complicated approach would be to form an international organization to serve as a trustee and fundholder for all the sampled populations. Patents would be issued in the name of this trustee organization, which would license anyone who signs an agreement to share a portion of the net proceeds from products made from any patented gene, gene sequences, or cell line with the trustee organization. The trustee organization, in turn, would be required to ensure that the revenue benefited the participating populations, which would be represented in the trustee organization. Such an organization not only could ensure that financial fairness is observed in genetic diversity research but also could develop, monitor and enforce universal rules for protocol review and informed consent in such research.

CONCLUSION

Collecting biological samples from specific individuals and families to extrapolate information about the social groups to which they belong is not a new scientific practice. However, as one research team put it, "The day of informal donations of DNA samples is past" (Hannig et al. 1993). The confluence of several sets of ethical considerations gives that practice greater risks that human genetic-variation researchers must recognize. Continued use of outmoded social categories to structure biomedical research (Osborne and Feit 1992), emerging possibilities for commercializing biomedical knowledge, and heightened awareness of the stigmatizing potential of genetic information all increase public concern about human genetic-variation research. To the extent that human genetic-variation research must continue to rely on socially defined human groups as surrogates for human demes (until technology to infer deme membership exists), the process of managing any coordinated effort to survey human diversity will be increasingly complex. For each socially identified set of samples, protocols for group consultation, consent and control will have to be negotiated and balanced against the researchers' fundamental ethical obligations to protect the freedom, privacy, and welfare of the individuals involved, including the right not to participate in a study.

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PART VI

How to Proceed From Concept to Action

The field of health and human rights was developed in the context of advocacy and action. If the field is to flourish, it must continue to grapple with not only the conceptual framework of the health and human rights interplay but also with their practical and effective application to the real world. The final section is devoted to such advocacy and action.

The first chapter, "Common Strategies for Health and Human Rights: Moving from Theory to Practice," by Stephen Marks, comes from the Second International Conference on Health and Human Rights. It focuses on the five major partners working for health and human rights: health professionals and the human rights community, public institutions, nongovernmental organizations, intergovernmental organizations, and the public citizen. Ways must be found for these partners to work together. Marks identifies points of entry for a common strategy that includes the political process, norm-setting environments, service delivery areas, the research arena, and the education system. Finally, Marks focuses on planning and funding strategies to bring these transformative strategies into reality.

The Marks' chapter is followed by chapters that focus on the work of health and human rights nongovernmental organizations (NGOs). The first of these chapters describes Physicians for Human Rights. This organization mobilizes health professionals to work toward human rights. Activities include investigation and documentation of human rights abuses, medical assistance, legislative action, advocacy education and training. While much of the work of Physicians for Human Rights has been reactive to abuses, this chapter also considers ways for the organization to protect and promote health and human rights before the abuses occur.

The chapter by Renée Fox focuses on the link between medical humanitarianism and human rights actions within the context of a structured