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Pharmacogenomics research involving race : an analysis of interests and values

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Ce mémoire intitulé :

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Pharmacogenomics seeks a detailed understanding of inherited drug response. Building on earlier studies linking race to differentiated outcome, it is anticipated to provide, through the use of racial classification, substantial therapeutic benefits. However, the reliance on race remains controversial and contested. A survey of the academic literature reveals a broad spectrum of views on the scientific legitimacy, value and import of using the notion of race in genomics research. The purpose of this qualitative inquiry was to identify the views of genomics researchers concerning the use of racial classification in pharmacogenomics research. Thirteen semi-directed interviews were conducted with researchers from the Montreal area who self-identified with minority populations. The researchers were cautiously optimistic about such "doubled-edged" research. They had a favorable view of race-specific therapeutics and believed that pharmacogenomics would improve health outcomes for racial populations in a context of health disparities. Sensitized to racism and potential abuses, they nevertheless felt conflicted by the sensitive nature of racially categorized research results. The findings inform recommendations that have consequences for subjects of research, the professional practice of researchers as well as for efforts to increase reciprocity between researchers and the public.

Keywords: *pharmacogenomics, race, genetic research, research ethics, professional duties, drugs, BiDil*

La pharmacogénomique cherche à comprendre la relation entre la constitution génétique et la réponse à un traitement médicamenteux. Des études ayant associé la race au métabolisme de médicament, l'utilisation de la classification raciale en pharmacogénomique est anticipée d'amener des bénéfices thérapeutiques importants. Toutefois, cette utilisation de la notion de la race en génomique s'avère controversée et contestée. Une revue de la littérature révèle une diversité d'attitudes concernant la légitimité scientifique et les conséquences de telles recherches. Le but de ce projet est d'identifier les attitudes de chercheurs en génomique envers la recherche en pharmacogénomique impliquant la race. Treize entrevues semi-dirigées ont été réalisées auprès de chercheurs montréalais qui s'identifient comme membres de populations minoritaires. Les chercheurs se prononçaient comme optimistes mais prudents vis-à-vis une recherche qu'ils estimaient à « double-tranchant ». Ils avaient des opinions positives de médicaments à prescription raciale et croyaient que ceux-ci amélioreraient la santé de populations raciales. Tout de fois, très conscients du racisme et des sévices potentiels, ils étaient en conflit avec les résultats de recherche de nature impliquant la classification raciale. Ces résultats nous mènent à élaborer des recommandations qui ont des conséquences pour les sujets de recherche, la démarche professionnelle des chercheurs ainsi que les efforts d'augmenter la réciprocité entre la communauté scientifique et le public.

Mots clé *: pharmacogénomique, race, éthique de la recherche, responsabilités professionnelles, recherche en génétique, médicaments, BiDil.*

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

DNA: Deoxyribonucleic acid

FDA: United States Food and Drug Administration

ELSI: ethical, legal and social issues

A-HeFT: African-American Heart Failure Trial

RMGA: Réseau de Médecine Génétique Appliquée

UNESCO : United Nations Educational, Scientific and Cultural Organization

HUGO: Human Genome Organization

WHO: World Health Organization

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INTRODUCTION

Mired in as much fanfare as they are in controversy, advances in the field of genomics provide researchers with new ways of understanding the human organism. Genomics is the scientific discipline that concerns the genome and the entirety of its function.[1] Upon learning that one of these advances was shaping up to be 'personalized' genomic medicine prescribed along racial lines, my first inclination was to want to know why this appealed to scientists. This effort represents the intersection of my interests: the role of genomics professionals, the processes involved in pharmaceutical research and development and issues of social justice as they pertain to bioethics.

Pharmacogenomics seeks a detailed understanding of inherited drug response, i.e. the relation between a patient's individual genetic makeup and her response to medication. Building on earlier studies linking race or ethnicity to differentiated outcome, along with the prevalence of genetic diseases in racial and ethnic populations, pharmacogenomics research involving racial classification is anticipated to provide substantial therapeutic benefits. Such use of the notion of race remains controversial and contested. While current genomics knowledge about human genetic diversity invalidates the biological basis for race as it has been

[1] The term 'genomics' is favoured over 'genetics' to denote the discipline. While the terms are used interchangeably, this thesis subscribes to the view that they are to be differentiated. Genetics studies the transmission and expression of individual genes; genomics is concerned with the functions of the genes of an entire genome and the interactions between them.

historically construed, researchers remain divided on the extent to which the notion of race can instead be rooted in social construction. Concerns surrounding the role of environmental factors in drug response and the poor correlation between racial phenotypes and genetic polymorphisms, among others, have prompted some authors to question the science behind race-based pharmacogenomics. Moreover, the very field of genomic science has emerged as a determining influence in how individuals conceive difference and identity. With these considerations in mind, what ethical, legal, social and cultural issues are raised by pharmacogenomics research involving race?

Pharmacogenomics research has implications for the protection of research subjects, the use and storage of genetic information and clinical practice (Nuffield, 2003). The involvement of racial populations in pharmacogenomics research also raises issues that extend beyond individual harms. While constructive uses of the notion of race in pharmacogenomics research could bring targeted therapies to groups that continue to be excluded from drug discovery and development, the reinforcement of racial categories could lead to further stigma and discrimination (Smart et al., 2004; Foster et al., 1999). With the arrival in 2005 of BiDil, a heart failure drug intended for African-Americans recognized as the first racial prescription drug, the need to reflect on the repercussions of researching race-specific therapeutics becomes apparent. A study on pharmacogenomics research is further pertinent in light of its arguably inextricable association with large-scale genomic databases: as biobank projects gain ground and become a platform to study

drug response, it will remain important to evaluate the benefits and harms within a broader context of population-based genomics research. A survey of the academic literature reveals a broad spectrum of views on the scientific legitimacy, value and import of using the notion of race in genomics research. But although the scholarly treatment has increased in recent years, there is little empirical data on the perceptions of genomics researchers.

Research objectives

The purpose of this master's thesis is to identify the views of genomics researchers concerning the use of racial classification in pharmacogenomics research. This investigation aims to answer the following sub questions:

- What values (moral, social, cultural) shape their perceptions?
- What do they identify as the benefits and risks for racial populations?
- What do they view as the implications of race-specific pharmacogenomics research for their practice?

Because there is not much established knowledge about the views of genomics researchers towards the use of racial classification in pharmacogenomics research, the research objective is to identify and describe a phenomenon. This study is

exploratory and descriptive: the objective is to obtain information from which a range of explanations for the phenomenon can be extracted (Fortin, 1996).

As recommendations derived from ethical principles bring forth new responsibilities for researchers and clinicians, ethical reflection would be enhanced with findings on how practitioners of genomic science view the use of race in pharmacogenomics research. Furthermore, seeking out the perceptions of researchers across racial populations entails taking into account the interests and concerns of individuals likely to be impacted by the use of racial classification in pharmacogenomics research. The dearth of empirical data extending to the views of racial populations vis-à-vis race-specific genomics research reaffirms the need for an investigation that attaches particular importance to group benefits and harms.

Of a qualitative research nature, this study uses the semi-directed interview as a data collection method. The one-on-one interview gives subjects the opportunity to speak, thus allowing for a better understanding of their experiences and the issues they encounter (Doucet, 2002). The exploratory descriptive study recruited genomics researchers and doctor researchers from the greater Montreal area who self-identified with racial populations: a total of thirteen interviews were conducted and analyzed. This investigation on the views of researchers on pharmacogenomics research involving racial classification constitutes a part of a

wider study into the social and ethical implications of population-based genomics research.[2]

The first chapter of this document is devoted to a review of the literature; it surveys pharmacogenomics, racial science, the case of BiDil, large-scale genomic databases and their ensuing significance for researchers. The methodology is detailed in the Chapter Two while the research results are presented in Chapter Three. The analysis of research results and recommendations are incorporated in the discussion, the fourth and final chapter.

[2] "Consulting cultural communities on large-scale genomic databases: an analysis of interests and values". Principal investigator: Beatrice Godard, Université de Montréal.

LITERATURE REVIEW

Pharmacogenomics

As early as the 1950s, researchers have been concerned with genetics, race and metabolic differences in response to medication. Alving et al. observed that around 10% of African-American soldiers serving in World War II developed hemolysis after receiving the antimalarial therapy primaquine, whereas only a very small number of Caucasian solders fell ill (Meyer, 2004). This sensitivity was caused by a deficiency of erythrocyte glucose 6-phosphate dehydrogenase (G6PD), later found to convey a biological advantage in *falciparum* malaria-infested countries (McLeod & Ameyaw, 2002). More recently, it has been observed that some polymorphisms found in Asian populations are responsible for poor metabolism of omeprazole, a drug used to treat ulcer disease (Wood, 2001); that metabolism of thiopurine drugs – widely used in the treatment of leukemia and autoimmune disorders – varies between African, Asian and Caucasian populations (McLeod & Ameyaw, 2002); and that a greater percentage of whites have impaired metabolism of the anticoagulant warfarin (Wood, 2001).

Building on earlier studies linking race to differentiated outcome, pharmacogenomics research involving racial classification is anticipated to provide substantial therapeutic benefits. It proposes to identify which patient populations are

susceptible to respond favourably to specific medication as well as which patients are likely to experience adverse drug reactions. The vast majority of drugs available on the market are believed to be effective for about 30% of patients: physicians, accepting this in practice, prescribe medicines through trial and error (Roses, 2004). More alarmingly, it has been estimated that adverse drug reactions are the fourth leading cause of death in the United States, causing upwards of 106,000 deaths annually (Lazarou et al., 1998). Pharmacogenomics, by facilitating the identification of drug response profiles, would allow physicians to prescribe in a manner that maximizes safety and efficacy. And given that a number of diseases have been associated with genetic polymorphisms more prevalent in particular populations, it has led many to theorize on the foreseeable development of pharmacogenomic drugs targeted to an individual according to race or ethnicity.

Indeed, the "hype" surrounding pharmacogenomics appears most fervent in regards to its purported integration into drug discovery and drug development (William-Jones & Corrigan, 2003). Possibilities include devising smaller, safer, and more efficient drug trials and rescuing so-called orphan drugs abandoned in earlier phases and targeting them to 'good responders' (Smart et al., 2004). The Food and Drug Administration (FDA) now welcomes submission of pharmacogenomic data based on "valid biomarkers" that have been rigorously tested by the scientific community if it explicitly affects how trials for a pharmaceutical product are designed (Katsnelson, 2005).

The science of race and genomics

Racial diversity constitutes an increasingly appealing - if not uncircumventable – element of pharmacogenomics research, yet a survey of the literature reveals that such a use of race is the subject of heated criticism and debate. When the first studies involving populations and inherited drug response were taking place starting in the 1950s, very little was known about the genetic basis for interracial differences (Kalow, 2001). It was erroneously believed that the *Homo sapiens* species could be separated into racial taxons: races were thought to be distinct biological species that originated independently with little or no gene flow between them (Witzig, 1996; Tishkoff & Kidd, 2004). As the field of genetics gained prominence, the discovery of overwhelming genetic similarities among humans led to a shift in the way researchers perceived race: the scientific community now widely recognizes that historical factors such as geographic isolation, reproductive insularity and shared lifestyle – rather than inherent taxonomical differences - have brought about patterns of genetic variation between populations (Wood, 2001; Burchard et al., 2003; Tishkoff & Kidd, 2004).

Moreover, influential positions in the social sciences declaring race to be a social construction emerged decades before the findings afforded by DNA sampling and the Human Genome Project. In 1998, the American Anthropological Association updated its position: "With the vast expansion of scientific knowledge

in this century, however, it has become clear that human populations are not unambiguous, clearly demarcated, biologically distinct groups. [...] Any attempt to establish lines of division among biological populations is both arbitrary and subjective" (American Anthropological Association, ¶ 1). The myths of race combine "behavior and physical features together in the public mind, impeding our comprehension of both biological variations and cultural behavior, implying that both are genetically determined" (ibid, ¶ 8). The social dimension of racial classification has thus far been acknowledged by geneticists and genomics researchers, to varying degrees.

But while the authors surveyed generally concede that race is not a *purely* biological notion, they remain divided on whether a modern understanding of race can be rooted in biology. This finding is echoed in the observations of sociologist Ann Morning (2005):

> In 2001 and 2002, I interviewed over 40 university professors in biology and anthropology about their definitions of the term "race". Their views varied widely. Almost 40 percent of these academics took what can be called an "essentialist" view: they described races as groups of people who share certain innate, inherited biological traits. In contrast, over 60 percent held a "constructionist" perspective: they argued that races do no correspond to patterns of human biological variation, but rather that racial groupings are "constructed through social processes that take place in particular historical, political and economic contexts. (¶ 1)

Schwartz (2001) espouses the latter view when he declares race to be "a social construct, not a scientific classification" (p. 1392). Rejecting the biological notion of race, he and others have gone on to argue for the curtailment or elimination of racial categories in genomics research. Confronted with growing criticism of his approach, Francis Collins (2004) has responded:

> Well-intentioned statements over the past few years, some coming from geneticists, might lead one to believe there is no connection whatsoever between self-identified race or ethnicity and the frequency of particular genetic variants[1, 2]. Increasing scientific evidence, however, indicates that genetic variation can be used to make a reasonably accurate prediction of geographic origins of an individual, at least if that individual's grandparents all came from the same part of the world [3]. As those ancestral origins in many cases have a correlation, albeit often imprecise, with self-identified race or ethnicity, it is not strictly true that race or ethnicity has no biological connection. (p. S13)

Some geneticists and genomics researchers have taken a less compromising stance, defending the biological conceptualization of race along with its clinical utility (Burchard et al., 2003; Risch et al., 2002). From what they describe as an 'objective and scientific' (genetic and epidemiologic) perspective, humans can be categorized according to the surrogate scheme of race in the absence of known, specific gene effects. They argue that population genetic studies have reaffirmed the definition of races based on continental ancestry: African, Caucasian (Europe and Middle East),

Asian, Pacific Islander (for example, Australian, New Guinean and Melanesian), and Native American (p. 3).

Given the controversy surrounding race, the term 'ethnicity' has surfaced as an alternate way of characterizing differences between groups (Race, Ethnicity, and Genetics Working Group, 2005). Emphasizing cultural, socioeconomic, religious and political aspects rather than genetic ancestry, ethnicity can encompass language, diet, religion, dress, customs or kinship systems (ibid). However, the use of ethnicity in genomics research also suffers from several shortcomings. Like race, ethnicity is a malleable concept that implies a great degree of uniformity, leaving it susceptible to be misinterpreted by researchers. Individuals may identify with more than one ethnic group or change ethnic group altogether; ethnic groups may also come into existence and later dissipate according to historical or social trends (ibid). An emphasis on the notion of biogeographical ancestry to describe objective genetic relationships between individuals and among populations has in turn been suggested as an alternative to relying on the notion of race. (Bamshad, 2005) Citing studies of human genetic variation showing that genetic ancestry is highly correlated with geographic ancestry while only modest correlation with race, Bamshad suggests that geographic ancestry and explicit genetic information appear to be more accurate predictors of genetic risk factors that influence health.

Concerns surrounding the legitimacy of using race in genomics have prompted many authors to question the science behind race-based

pharmacogenomics research. Recent developments in pharmacogenomics, claim Rahemtulla and Bhopal (2005), renew the emphasis on biology in spite of the fact that historical claims of a biological basis to racial variation have proven to be overstated. Risch (2006) however argues that denying the existence or racial or ethnic differences in gene frequencies is unlikely to benefit minority populations. Furthermore, it has been argued that given the level of admixture in populations, extrapolating data from well-defined racial groups is scientifically problematic (Suarez-Kurtz, 2005). Burchard et al. (2003) take the opposite view, arguing that because of genetic similarities with African, European or Asian racial groups, persons with varying levels of admixture can be particularly useful for genetic–epidemiologic studies. As such, the harms arising from either denying or promoting the notion of race remain a big concern.

Pharmacogenomics and race: ethical issues

With implications for the development of drugs, clinical practice and the use and storage of genetic information, pharmacogenomics research raises ethical, legal and social issues. As pharmacogenomics is incorporated into clinical trials, the protection of subjects in regards to consent, privacy and confidentiality and access to information has been deemed necessary to minimize harms (Nuffield Council, 2003; Reischl et al., 2006). In accordance with guidelines on informed consent, participants should be informed of the risks and able to withdraw at any time (e.g., Declaration of Helsinki, 'Good Clinical Practice', Tri-Council Policy Statement on

Ethical Conduct for Research Involving Humans). The process of obtaining consent would also apply to any researcher using DNA to confirm association between genetic variations and drug response: "testing may become an integral part of the methodology of clinical trials, so that taking part in a trial requires consent to pharmacogenetic testing"(Nuffield, 2003). Given the complex design of clinical trials and the volume of information, there is the risk that patients entering into pharmacogenomics related trials "will not have given careful consideration to all potential risks and benefits of this additional research" (Corrigan, 2005, p.146).

Likewise, the breach of privacy and confidentiality emerges as an important issue in pharmacogenomics research. The greatest degree of anonymity for DNA samples (e.g. identified, coded, double-coded) should be balanced with the ability of researchers to fulfill the objectives of their research, thus emphasizing the need to weight the risks and benefits in each protocol. (Nuffield, 2003; Joly et al., 2005) As pharmacogenomics remains in its infancy, validated and clinically useful data for individuals patients may be unlikely: only in rare instances would pharmacogenomic analysis undertaken at various stages of research (e.g., at the enzyme level, in a heterogeneous patient population) yield information of immediate clinical relevance (Nuffield, 2003). Still, researchers could include in the consent process the opportunity for the research participant to receive individual feedback, if applicable. Communicating the nature of the genetic information and its implications thus raises issues of privacy and confidentiality. The increase of genetic testing that would accompany the integration of pharmacogenomics in clinical practice also raises

ethical issues such as consent in clinical practice, training of professionals in the administration of pharmacogenomic tests, disclosure to family members, and use of genetic information by insurers (ibid).

Pharmacogenomics research involving racial populations also raises issues that extend beyond individual harms. Arguing for an evaluation of research that explores the potential group harms, Davis (2004) argues:

> Research for persons, a pillar of research ethics, requires not only a respect for the individual research subject, but arguably also for the group whose characteristics are the object of the study. Without some measure of respect for the "group", the interests of individuals will not be met. Individuals have interests that they can protect only through group action, and individuals have interests in the well-being of groups with which they identify. (2004, p.47)

This evaluation is particularly relevant in light of the data showing that racial populations have voiced their mistrust of genomics research. As racial populations have been historically subjected to discrimination, stigmatization and eugenics attempts, many individuals are questioning their participation in scientific initiatives. A study by Furr on the attitudes towards genetics research found that African-Americans were more likely to perceive genetics as harmful to society (Furr, 2002). Likewise, individuals from aboriginal populations have expressed wariness about the use of their DNA in research. In the past, research had been carried out without their consent or with the true aims of the investigators being misrepresented (Dalton, 2002). There is concern that genomics research, by reinforcing racial categories,

will lead to discrimination; that members of ethnic and racial communities' access to the benefits of research will be restricted; and that they will lose control over how they wish to define their identity (Foster et al, 1999; Weijer & Miller, 2004).

Smart et al. (2004) contend that the genetic stratification of patients and diseases characteristic of pharmacogenomics facilitates the identification and the use of difference. In the context of pharmacogenomics research involving race, "the very practice of linking [pharmacogenomics] to ethnic and racial groups should be recognized to have associated social risks" (p.336). Concerns have been raised about the use of race as a proxy for genetic similarity in addition to the risk of viewing membership of a racial group as a substitute for a pharmacogenomic test in prescription decisions (Nuffield, 2003; Lee, 2003). Historical accounts suggest that research and clinical decisions based on racial classification have often led to poor or ineffective care (Bhopal, 1998). Racial categorization in pharmacogenomics may reinforce race as a biological notion and undermine the rebuttals of race science (Lee, 2003; Rahemtulla and Bhopal, 2005; Smart et al., 2004). Moreover, entire racial populations could be associated with drug response, leading them to suffer from stigma and discrimination. Resistance to conventional drug therapy, emphasized in advertising for a new race-targeted drug, might convey that a population is biologically weaker or inferior. There is also concern that "singling out" a racial population might conjure up associations with differential health care and might promote generalization of discriminatory attitudes (Bevan et al., 2003).

On the positive side, the use of race in pharmacogenomics could bring targeted therapies to population groups that have been historically excluded from the drug discovery and development process (Smart et al., 2004). Failure to make appropriate use of difference – not using race in pharmacogenomics research to benefit racial populations – would amount to an injustice. Pharmacogenomics could also bring savings of up to 60% in drug research and development and translate into a decrease in the price of drugs available to racial populations (Tollman et al, 2001) .This calculation was obtained through the use of a model elaborated by a management consulting firm which analyzed the processes involved in drug discovery. It remains to be seen whether pharmaceutical companies will exploit the notion of race in the targeting marketing of pharmacogenomic products (Lee, 2003).

On the negative side, inequalities in drug development could lead to racial populations having limited access to the benefits of pharmacogenomics research. It has been argued that emphasis on 'good responders' in the drug discovery stage or during clinical trials could lead to the creation of therapeutic orphan populations (Rothstein & Epps, 2001). An orphan drug refers to a treatment for a rare disease affecting relatively few people: the U.S. Orphan Drug Act puts this number at 200 000 people or alternatively, for a disease affecting more than 200 000 "for which there is no reasonable expectation that the cost of developing and making available in the United States a drug for such disease or condition will recovered from sales in

the United States of such drug" (Orphan Drug Act, SEC. 526 [360bb], (2), 1983). Rothstein and Epps argue that similar therapeutic orphans could emerge as pharmacogenomic frames lower prevalence in terms of drug response rather than disease and facilitates the identification of populations that do not respond to drugs in research trials. There is concern that orphan populations may come to reflect existing patterns of inequality: pharmaceutical companies may face a financial disincentive in developing products for socially marginalized minority groups (Smart et al., 2004). Several authors anticipate that eventual pharmacogenomic drugs will be expensive, therefore making them inaccessible to already marginalized and impoverished populations (Rothstein & Epps, 2001; Smart et al., 2004).

There may be further implications for existing health disparities between racial populations. The use of racial categorization in pharmacogenomics occurs in a broader social context of discrimination and inequality based on racism (ibid). Lee (2003) cautions that the emphasis on genetics in drug response may undermine other explanatory mechanisms such as the features of the social and political environment that lead to ill health. Decisions about resource allocation and priority setting in research raise issues of justice: funding pharmacogenomics research may move spending away from studying and tackling known socioeconomic determinants of health (e.g. access to health care, diet, housing) and could in turn exacerbate inequalities between racial populations. In a context of limited funds for research, the emergence of public health genomics along with the call by some researchers for increased research into how best integrate pharmacogenomics into regular care has

others asserting that public health ethics would argue against the use of public funds to provide genomic technologies that have not been appropriately evaluated (Thomas et al., 2005). In regards to distributive justice, the Declaration of Helsinki requires that populations benefit from research and that the risks and benefits of research are distributed fairly to both individual participants and to the communities to which they belong (World Medical Association, 2000). This could involve inclusion in research trials, drug subsidies, access to alternative treatment, and investment in future research, thus accounting for both the short and long-term. The tension between inclusion in research and exclusivity for racial populations complicates the assessment of pharmacogenomics research's impact on social justice (Lee, 2003).

The case of BiDil

The approval of BiDil as the first racial prescription drug in 2005 provoked a debate on the implications of race-based therapeutics, causing ethicists, researchers and clinicians to question the pervasiveness of race in biomedical research (Bloche, 2004; Kahn, 2004; Rahemtulla and Bhopal, 2005; Duster, 2005). Their analysis of the study design, commercialization, marketing and public response can thus serve to enrich the ethical reflection on the use of racial categorization in pharmacogenomics. More importantly, the BiDil case continues to provide an example of what future pharmacogenomics research involving race may entail.

Numerous studies suggest that African Americans suffer heart failure and die from heart failure at a disproportionate rate when compared to other populations. Citing this research, and building on the investigators' observations that the BiDil combination of isosorbide dinitrate (a blood-pressure drug) and hydralazine (a chest pain medication) had benefited the black subjects in previous studies despite not receiving FDA approval due to scant conclusive evidence, Nitromed Inc. initiated the African-American Heart Failure trial to determine BiDil's efficacy (Kahn, 2004). Clinical findings from A-HeFT indicated that BiDil reduced death rates at a rate of 43% (Nitromed Inc., 2004). Upon its release, BiDil was heralded by many prominent physicians including Malcolm Taylor, Chair of the Association of Black Cardiologists who co-sponsored A-HeFT, as a landmark for the treatment of African Americans and "a significant step forward in addressing [health] disparities (Vardese, 2005).

The investigators' claim of a different pathophysiology for African Americans necessitating different treatment remains controversial. Several authors have noted that testing BiDil exclusively on African American patients does not demonstrate greater efficacy for African Americans than for other groups (Lee, 2003; Kahn, 2004; Bloche, 2004). The trial investigators themselves concede that BiDil will work in people regardless of race (Kahn, 2005). Genetic variability within racial groups would also mean that BiDil may not necessarily work for all African American individuals (Balakrishnan, 2004). "The only responsible claim that can be made on the basis of these trials", writes Kahn (2005), "is that BiDil

works in *some people who have heart failure* – period." There is also the concern that health care providers will not prescribe BiDil to other populations while insurance carriers may be reticent to reimburse such off-label uses (ibid). Further considerations to justice are raised in light of the claim that Nitromed is profiting from merely combining two drugs available separately in generic formulations at an approximate cost of 44 cents per dose (Bloche, 2004). Nitromed's second BiDil patent for use in African Americans (the first ever granted for race-specific use) effectively pushes back market entry for generics to 2020 (ibid). Nitromed has since introduced a program to subsidize the cost of BiDil for low-income patients (Nitromed Inc., 2005).

Kahn goes on to argue that marketing a race-specific drug such as disease can lead to a misallocation of health care resources; it can also contribute to the perception that health disparities are caused by an absence of "Black" drugs rather than an array of environmental, social and economic factors as well as the discrimination African Americans experience in the U.S. health care system (2005). Although BiDil is not a product of pharmacogenomics research, it appropriates notions of genetics by suggesting innate causes for drug response in patients who self-identified as Black (Bloche, 2004). Other pharmaceutical companies may stand to gain from using the notion of race without fully appreciating the ethical implications.

Large-scale genomic databases

The ethical, social, legal and cultural issues surrounding the participation of racial groups in pharmacogenomics research are further complicated by the prominent role that will play large-scale genomic databases. Although they appear to usher in an era of 'personalized medicine', advances in pharmacogenomics research remain unattainable without population-based approaches. Indeed, "in the absence of cost-effective, ubiquitous genome scanning tests, it may be more accurate to describe the next wave of genomic medicine as population-based rather than one focused on individual differences" (Lee, 2003).

A large-scale genomic database (or biobank) contains biological samples as well as personal information of a genetic, medical, genealogical and sociological nature. Focusing on a population, it aims to identify genetic characteristics of an entire society (Commission de l'éthique de la science et de la technologie, 2004). Large groups of selected individuals are asked to volunteer DNA samples for genetic analysis and to fill out questionnaires. The CART@GENE project will recruit 60 000 adult volunteers in Quebec whereas the Icelandic Health Sector Database, UK biobank and the Estonian Genome Project have set recruitment targets of 270 000, 500 000 and 1 605 000 samples respectively (RMGA, 2005; Cambon-Thomsen, 2004).

By their scale, format and scope, genomic databases represent "a novel, high-risk initiative that has the potential to produce breakthroughs in genomics" of clinical usefulness (Guttmacher & Collins, 2002). But as the organizers of large-scale genomic databases have proposed a recruitment unbiased with regards to disease or race yet at the same time representative of population density, there has been growing concern surrounding the ethical implications of biobanks for racial populations (Godard et al., 2004; Joly & Knoppers, 2006). In 2003, Howard University announced plans to build the first 'racial' population DNA database from samples obtained from African-Americans (Cambon-Thomsen, 2004). Large-scale genomic databases raise issues about human identity, protection of personal data as well as fears of stigmatization and discrimination (Godard et al., 2007). Once the research results of such initiatives are made public, individuals of a certain age or of a certain lifestyle could become associated with diseases of a genetic nature; similarly, a person could be viewed as susceptible to disease simply because of his place of residence or birth. There is also the risk that stored data could be used for ends other than the proposed research (e.g. genetic information divulged to government authorities or employers) (ibid).

Implications for researchers

The use of racial classification in genomics and pharmacogenomics research holds far-reaching implications for researchers. Recommendations such as the creation of incentives to develop new drugs for subpopulations, tighter monitoring of

pharmacogenomics trials, improved controls on genetic testing and data, and anti-discrimination measures necessarily bring forth new responsibilities for researchers and clinicians (Smart et al., 2005). Lee contends that some researchers view their work on human genetic variation as untainted by social ideas and values; consequently, they feel little pressure to be explicit about the meaning and significance of race in framing their research hypotheses (2005). Investigators that identify and use racial distinctions, in addition to having a clearly defined and testable hypothesis, should provide a scientifically valid definition of the population under study (Schwartz, 2001). Moreover, studies involving genomics and self-identified race should be rigorous, well designed, large-scale and long-term, as well as undertaken in multiple populations (Collins, 2004).

Pharmacogenomics research involving race also provides a new context for understanding the duties of researchers as outlined in normative texts. Principlism has emerged as the predominant normative framework in genomics research. The fundamental bioethical principles of respect for the individual, beneficence, non-maleficence and justice have been recognized in statements of principles on genetics research issued by the United Nations Educational Scientific and Cultural Organisation's International Bioethics Committee (UNESCO, 1995), the Human Genome Organization (HUGO, 1996), the World Health Organisation (WHO, 1997) and Quebec's *Réseau de Médecine Génétique Appliquée* (RMGA, 2003). An analysis of the benefits and risks of the use of race in pharmacogenomics research entails identifying how these ethical principles may be fostered or threatened.

Seeking out the perceptions of researchers can provide insight into how ethical principles – and the research recommendations from which they are derived – are interpreted and experienced by genomics researchers. The principle of respect for communities figures prominently in both normative texts and the surveyed ELSI literature. Weijer et al. suggest that it "confers on the researcher an obligation to respect the values and interests of the community in research and, wherever possible, to protect the community from harm" (Weijer et al., 1999, p.275). The use of race in pharmacogenomics research thus has implications for researchers that involve thinking of group and community harms associated with the use of race.

Several authors calling for a "greater institutional oversight of race-based scientific claims" (Lee, 2005) in pharmacogenomics, however, argue that it should extend beyond proposed study protocols and also involve an assessment of how the very notion of race is used in the scientific community. Misleading or counterproductive uses by researchers must be remedied (Collins, 2004). Schwartz suggests that from the very beginning, instruction in medical genetics should emphasize the fallacy of race as a scientific concept. Researchers, maintain Sankar et al. (2004), should not overstate the role of genetics in explaining health disparities between racial populations; they should remain focused on addressing the known social causes (Fine, 2005). Rather than rely on race as proxies or flawed surrogates, genomics researchers should be required to pursue additional research to explicate underlying mechanisms (Lee, 2005). Above all, professionals dealing with

pharmacogenomics research results involving race need to take an open minded but critical stance (Rahemtulla and Bhopal, 2005).

Although there have been a growing number of articles contributing to the scholarly treatment of pharmacogenomics and race, little empirical research has been done into how the practitioners of genomic science perceive theses ethical concerns, or into how they view their own roles in pharmacogenomics research involve racial classification. At least three studies have investigated the attitudes of lay people towards race-based therapeutics. In a study on direct-to-consumer marketing, Bates et al. conducted focus groups to examine the reaction of participants to advertisements for a fictional race-based medication (2004). While the participants resisted the message that African Americans are different from other races and may need a particular medication for a common disease, there were differences of interpretations along self-identified racial lines: African-Americans were more likely to fear racial discrimination and a substantial minority believed such a drug indicated a changing medical environment. Bevan et al. found that participants, suspicious of race-based prescription, preferred individual genetic testing as an option for prescription because it provided individualized attention (2003). The results of a telephone survey on the attitudes of individuals towards pharmacogenomics highlight interest in pharmacogenomic research and willingness to participate in it, but also continued concerns over who gets access to genetic data (Rothstein & Hornung, 2003).

Meanwhile, no similar studies have been conducted with respect to the views and attitudes of professionals. A review of the literature has not uncovered any study on the perceptions of researchers towards the use of racial classification in genomics or in biomedical science. Several empirical studies have been undertaken in regards to the perceptions of genomics researchers spanning a myriad of issues including genetic engineering (Rabino, 1991), comparisons between European and American researchers (Rabino, 1994), commercialization (Rabino, 1998; 2001), data withholding (Blumenthal, 1996), and science policy (Matthews et al., 2005)[3]. In Quebec, a recent study consisted of interviews with genomics researchers with the aim of identifying their professional responsibilities (Boutin-Ganache, 2006). Although an increasing number of commentaries and opinion pieces written by researchers on pharmacogenomics research involving race are being published in academic journals, the dearth of empirical data reaffirms the relevance of the present study.

[3] These references were obtained from a literature review compiled by Isabelle Boutin-Ganache for her doctoral dissertation *Recherche en santé humaine, génétique et génomique au Québec – Les normativités implicites de la communauté scientifique et l'élargissement de l'éthique au Québéc* (2006).

METHODOLOGY

Data collection

This investigation on the views of researchers on pharmacogenomics research involving racial classification constituted a part of a wider study. "Consulting cultural communities on large-scale genomic databases: an analysis of interests and values", for which Beatrice Godard is the principal investigator, was a study into the social and ethical implications of population-specific genomics research. Large-scale genomic databases would enable to researchers to uncover the breadth of genetic diversity and the extent of genetic similarity within populations, including racially identified ones. They would similarly prove to be indispensable to future pharmacogenomics research as the data collected in biobanks would serve as a platform to study drug response. Interviews that incorporate views on large-scale genomic databases and human genetic variation thus provided a fitting context for understanding the implications of pharmacogenomic research involving race.

Godard et al.'s exploratory descriptive study among insiders and outsiders sought to interview researchers, clinicians, political leaders and spiritual leaders from nine populations in the greater Montreal area: 1) Aboriginal; 2) Chinese; 3) Greek; 4) Haitian; 5) Hispanic-Canadian; 6) Indo-Pakistani; 7) Italian; 8) Jewish and 9) Moroccan. The selection of populations, which reflect some of the racial

categories often used in biomedical research, has been done according to the ethnocultural portrait from the 2001 census by Statistics Canada. Since some diseases occur more frequent – though not exclusively – in a defined population, such as Tay-Sachs in Jewish Ashkenazi, thalassemia in Italian and Greek, and sickle cell anemia in Haitian, members of these populations were deemed likely to be solicited and involved in genomic databases projects. The Master's study is situated in the broader research project as having a specific focus on the ethical issues surrounding pharmacogenomics research and race. The overlaps are the data collection instrument and the data sample, with the genomics researchers interviewed for this Master's study part of the larger sample. The data pertaining to the political leaders and spiritual leaders is not subjected to treatment in this work. The research findings from Godard et al.'s study, which differ from those of this thesis, are also not presented here.

This Master's study's contribution to the larger study design was the inclusion of questions pertaining to pharmacogenomics. The interview guide touched upon large-scale genomic databases, genomics research, pharmacogenomics research and community concerns. It was designed to favour an exchange with the interviewer about issues and perceptions identified by doctors and researchers in genetics or genomics, anticipated to have insight into the selected populations, and engage them in a discussion of how they perceive their role in the scientific discourse surrounding research, difference and identity. The types of questions ranged from questions about the researchers' perceptions, with an emphasis on their

personal experiences (*Est-ce que vous participeriez à un projet de biobanque si l'information recueillie servait à la recherche et au développement de médicaments*?; *Croyez-vous qu'un tel produit pharmacogénomique aura des aspects positifs/négatifs (sociaux et médicaux) sur votre communauté?*) to questions incorporating noteworthy cases (the HapMap project, BiDil, the breast cancer drug Herceptin) (See Appendices under « Research Questionnaire »). The study protocol and consent form were reviewed and approved by the research ethics committee of the Faculty of Medicine of the University of Montreal.

Genomic scientists from academic or institutional research centers, doctor researchers and clinicians were recruited for in-depth, semi-structured interviews. The recruitment of respondents was done in collaboration with two partners, l' Institut Interculturel de Montréal and Direction de Santé Publique de Montréal. Having gained a wide experience in ethnocultural and intercultural investigation, their understanding of the realities of specific groups, communities and the nature of their interactions enabled the identification of key organizations and informants. A snowball recruitment technique was employed. After e-mail and telephone contact requesting participation was established, study staff responded to questions and scheduled the interview with interested individuals. Study respondents later referred the investigators to potential participants. Participants were not compensated for agreeing to take part in the study.

Godard et al.'s qualitative study involved a nonprobablistic, purposive sample of 24 interviews. Specifically, a random sample was interviewed with a view to identifying prevailing attitudes. The size of the sample was established inductively and sampling was continued until data saturation occurred, i.e. until the point in data collection when new information produced little or no change, to get a reliable sense of thematic exhaustion and variability within our data set (Guest et al., 2006). Data saturation was achieved after interviews with 13 researchers (9 laboratory researchers and 4 clinician researchers). Thirteen interviews is the sample size for this thesis project. The researchers were representative of the following populations: Aboriginal, Chinese, Greek, Haitian, Hispanic-Canadian, Indo-Pakistani (2), Italian, Jewish, and Moroccan. While the researchers were of different racial categories, they were selected on the basis of identification with the populations identified for Godard et al.'s study. Of the nine laboratory researchers, one's work consisted of work in pharmacogenomics while the rest worked in genomics (molecular Immunology (2), pediatrics, cardiac diseases (2), reproduction, neuroscience, and oncology). The clinician researchers were from the fields of reproduction (2), pediatrics and psychiatry.

Data analysis

The interviews were digitally recorded and transcribed. The digital audio files of the interviews were later destroyed. A thematic analysis of interview transcripts was undertaken following recognized academic and ethical standards for

qualitative research, to ensure the quality and validity of findings and the protection of research participants (Mays & Pope, 1995; Malterud, 2001). This qualitative method serves to extract consistent themes. Themes from respondents' accounts are identified by bringing together components of fragments of ideas or complete ideas, which often fail to convey meaning when viewed in isolation. At the end of the analysis, themes that emerge from the respondents' accounts are pieced together to form a comprehensive picture of their collective experience. This process allows us to identify, compare and contrast the interests, values and concerns of each respondent and rank them according to their subjective importance (Graves et al., 1998; Kletter et al., 1998).

The analysis of the data collected for the study "Consulting cultural communities on large-scale genomic databases: an analysis of interests and values" was performed using the program Atlas.ti. For the purpose of this Master's project on the researchers' attitudes towards pharmacogenomics research involving race, the data was analyzed without the use of Atlas.ti software. I proceeded to do a thematic analysis adopting the framework for qualitative data analysis developed by Miles and Huberman (1994). Throughout the course of the analysis, I sought to identify patterns and common themes; atypical responses and deviations from these patterns; and interesting facts emerging from the interview transcripts.

The thirteen interview transcripts were read in their entirety to ensure familiarity with the data. The data was then condensed and made manageable by

retaining the passages that were of relevance to the research questions and setting aside the data that weren't. Data reduction refers to the process of selecting, focusing, simplifying, abstracting, and transforming the data that makes up the transcribed material (Miles & Huberman, 1994). This process of reduction was first informed by the research questions, with the material deemed redundant being extraneous or tangential. For instance, anecdotes – albeit interesting ones – that veered off-topic were excluded from the coding process. The data was preserved in its original format as thirteen documents in interview questions and answers. For example, mentions of particular diseases were identified separately: diabetes (Code: mal.dia), thalassemia (Code: mal.thala), sickle cell anemia (Code: mal.anem), etc. They came to be grouped under a metacode category of citations dealing with the health of populations and communities (Metacode: SANTE), which included codes on distinctive initiatives related to health along with their perceived impacts (see Appendices under "CODES").

Afterwards, the data was subjected to coding. A fundamental part of data reduction, coding involves naming, classifying and noting regularities in the material (Miles & Huberman, 1994). The unit of analysis chosen for the coding was the sentence. A preliminary analysis of the interview questionnaire and the theoretical framework was used to identify theme categories. During further readings of the interview data, codes belonging to the theme categories as well as additional ones were used to inform the coding process. Afterwards, the codes were refined as more data were analyzed; metacodes denoting themes were added.

An organized assembly of information that permits conclusion drawing and data display provides a new way of arranging and thinking about the data (Miles & Huberman, 1994). The coding being done manually, the data display was done in text form: for each respondent were listed the categories that emerged during the coding process. A 'within-case' or 'vertical' method of analysis was used: each interview was analysed individually in order to extract a profile or general portrait of the subject. Thereafter, the attitudes and views attributed to each subject were compared to those of the other study participants. This was favoured over 'cross-case' analysis, in which the interview text is broken down by subject to reveal relations between variables, because as an inductive method it is best suited to an exploratory study.

RESULTS

The interviews uncovered a richness of views and attitudes among genomics researchers. The topics discussed during the interviews included: the impact of large-scale genomic databases for pharmacogenomics research, DNA sampling and storage, genetic diseases, commercialization, intellectual property, genetics research in developing countries, attitudes towards genetics research, spiritual values and genetics, and historical scientific theories on race. The central themes that emerged are the following: the scientific study of difference; the benefits for pharmacogenomics research; the repercussions of undertaking race-specific research, the use of information; and the need for ethical oversight. These themes will be elaborated below.

Interest in studying difference

The researchers shared the perception that scientific investigation involving genomics and racial classification could best be understood as a study into difference. The science of genomics, they emphasized, focuses on inherent biological differences. While sensitized to the negative connotations of research involving race, they said they were very interested in the study of diversity; they did not feel that the "stigma" or "taboo" should constitute an obstacle to furthering

scientific knowledge. The researchers perceived their interest into race and genomics to be motivated by intellectual curiosity.

When asked to elaborate on this self-proclaimed "need to know", the participants delved into scientific explanations: differences between races exist at the genetic level, and these in turn justify the need for pharmacogenomics research involving racial classification. They conceded that humans share the same genetic code but that variations differ in frequency between Black populations (the intended consumers of BiDil) and other populations. The researchers went on to explain that given the occurrence of genetic variations between populations, separating study subjects along racial lines allowed for greater accuracy in genomics studies. At the same time however, several respondents noted that the level of genetic variation was "minimal".

> "There's just a whole range of variation. It's not just a set of genes for Black people: it's a whole range of variation and a lot of those genes are shared between races. The number of genes that actually cause races to look different is very small. Most of the genes are very, very similar; it's just a few genes that cause the differences."

Three of the researchers opted to draw a distinction between the biological and social connotations of race. Emphasizing the importance of relying on genetic makeup in biomedical research, one of them commented:

> "There are two aspects: the social and the genetic. The social connotation that is pervasive is based on your skin colour, where you

> come from, where your parents come from: that's completely different than your genetic makeup, than your race, where your ancestors came from. The bloodline, the lineage. I think that's two different topics and I think it's important to keep them separate."

They acknowledged that this interplay between biological and social notions renders it more difficult to clearly delineate between populations. According to another respondent, admixture between so-called racial populations adds to the complexity of studying difference.

> "Races are so mixed that it's hard to subscribe to this [notion of race]. We already have to deal with mixed, intermixed populations for which we can no longer apply anything. If we talk of the skin colour of a Black person as being dominant while the other colour is a recessive trait, and if in that case someone is of lighter skin colour ... are we really dealing with a Black population?"

The researchers felt very strongly that research into the genetic differences between racial groups needed to be scientifically legitimate. And though they described the field of genomics as evolving rapidly and urged more research, they did not call into question the legitimacy of earlier studies – predating the Human Genome Project – linking race with inherent biological difference. They said they were motivated to undertake studies involving racial groups because these reflect the diversity of Quebec's and Canada's society. Indeed, the researchers said they were encouraged by the rise of studies aimed at discovering the genetic particularities of populations long ignored by the research establishment.

"Scientists primarily want to know. They are concerned with finding knowledge. Of course, being such a diverse community of genomics researchers means that people are more aware of the kind of uses. If you go to any lab today, you will find people from all over the world, a real United Nations! That's why it would be difficult to imagine a researcher wanting to purposefully harm someone who is in the same research unit, or in the same building. Researchers ultimately want to do good. They want to use genetic information from populations to help cure or prevent diseases. "

Enthusiasm for the benefits

Almost all the researchers said they were very enthusiastic about current pharmacogenomics research and its future implications for both genomics research into disease and drug development. They were adamant: pharmacogenomics research involving race will lead to better health-care outcomes. The respondents, discussing the potential benefits, elaborated on differential drug response and prescription decisions by physicians.

"The way I see it, it's a good thing because if there is a variation in the genome associated with drug response and this variation occurs more frequently among Europeans, for example, we give a bigger or smaller dose according to response. It's going to amount to a more effective treatment."

"Before, with people suffering from diseases, doctors came in and gave everybody the same medicine. [...] If we have such information, if I get

> sick and go see the doctor, I have the information on which medication for me is best and which is of no use. I can get a quicker and better treatment."
>
> "There hasn't been enough breakdown into looking at specificity: we are all different. As I said, our lineage comes from different places and along the travels of these lineages, mutations have occurred. That maybe makes us better drug metabolizers or worse drug metabolizers. I don't think there has been enough study to determine how we can benefit from knowing the differences according to race."

The benefits for racial populations, they anticipated, would be substantial. In addition to benefiting from a more specialized administration of currently prescribed drugs, individuals could have access to targeted drug interventions for the rare diseases more prevalent in racial populations. One researcher – perhaps wary of unfettered enthusiasm – emphasized the need for a serious commitment to research:

> "We've often seen scientists get enthusiastic about new technologies without them having the expected results or applications. Especially considering that there will be important social impacts. [...] Right now, pharmacogenetics, pharmacogenomics is considered "hot". My perception is that before we can say that such outcomes will happen, there needs to be more research. "

The case of BiDil provided the respondents with the opportunity to weigh in on the benefits of having a race-specific prescription drug available on the market. They generally shared the opinion that a heart failure drug that could improve the health of African-Americans was a "good thing" and a significant step towards

personalized medicine. However, they did not foresee that pharmacogenomics research involving race would bring about pharmaceutical products resembling BiDil but rather modifications in prescription and dosage, and the development of new therapies made possible through the identification of specific genes. In their understanding, these benefits would invariably be spread out among all racial populations. A majority of the respondents were surprised to learn that BiDil was only intended for Black patients.

> "I'd be surprised if only African-Americans can take it. There's no clear dividing line in genetics, a lot of diseases are shared between races. African-Americans might be more subjected to certain things but it's not 0% for White people. There are also a percentage of them that will be susceptible to it so this drug is probably good for non African-Americans or African-Canadians."

One researcher, perplexed by the scientific claims behind BiDil, expressed the following thought:

> "It's worrying that race and drug are conflated in this way. If there are drugs based on a misconception, ultimately, we won't see an effect. These days, patents are huge business. That's not productive science. They, the companies, go for business. If they want to sell a drug for two years, they don't care it's pulled off: they made their money. I hope it's not hurting people."

In contrast, another researcher offered a more positive view:

> "I think that if it had the approval of the FDA, it means that it is resting on solid scientific data. Meaning that effectively, if we administer this drug to African-Americans, we know that it works and that it works better than other things. In this light, this does not pose a problem."

Above all, the researchers' main preoccupation with a race-specific drug remained the existence of tangible therapeutic benefits. Pharmaceutical products derived from pharmacogenomics research, with their many foreseeable advantages, would in their view eliminate the need for drugs developed in the manner of BiDil.

Concerns for potential harms

A major concern for the respondents was the potential misuse of research results by insurance companies, employers and governments. It was feared that linking a population with the need for a particular drug could lead to instances of institutional stigmatisation and discrimination.

> "Canada is a country of immigrants. [...] Let's suppose that tomorrow we discover that the Haitian population has a genetic profile. 'We are uneasy because in terms of health and our overburdened health care system, they will develop medical problems. We will likely recruit immigrants from populations that are genetically 'unsoiled''. These are the kinds of deviations. How will this information be used?"

Concerns also arose over the use of the personal information of the individuals who would contribute DNA used in pharmacogenomics studies, as well as of those

participating in drug trials. One respondent surmised those risks could discourage individuals from participating in genomics research.

The researchers felt that financial incentives for the pharmaceutical industry, which they portrayed as being motivated first and foremost by profits and its financial bottom line, would emerge as the deciding factor in the research and development of pharmacogenomics. While some decried this business model, others reasoned that the industry's concern with financial return was justified seeing as drug development was lengthy, risky, complex and prohibitively expensive. Companies were not perceived as being willing to invest in drugs intended for racial populations if the market for a drug was too small given a population's purchasing power or the rarity of a medical condition. This presented an ethical dilemma for the respondents; this scenario conflicted with their belief that research should not penalize or exclude individuals because of race or socio-economic status. Governments and charitable foundations were cited as alternative sources of pharmacogenomics research funding.

In addition to the absence of financial incentives, the researchers acknowledged that racial inequality could lead to Black patients being deprived of the benefits of pharmacogenomics. For at least two researchers, racial stratification for the purposes of drug development evoked memories of past injustices, such as the Tuskegee study and the export of drugs with dangerous side effects to developing countries.

> "That's the kind of suspicion I would have towards a drug destined exclusively for a minority whose economic power is fairly weak. I wonder ... not necessarily if this drug is beneficial but rather has testing been done? Are they going to put in the same energy and do the tests with the same rigor to ensure the identification of side effects, in the long term – just like with a drug destined for sale on a wider scale?"

They expressed concerns that Black patients could become guinea pigs and receive unrefined treatments before they are improved and made available to White patients.

Furthermore, preoccupations arose surrounding the Quebec government's willingness to subsidize the cost of drugs destined for minority populations through its drug insurance scheme. Some wondered whether political decisions on drug reimbursements would be made at the expense of the health of Black individuals or others. The respondents were united in their belief that the more specialized treatments made possible by pharmacogenomics would constitute a challenge to Quebec's attempts at a universal health care system.

Awareness of the implications of research involving race

The researchers acknowledged that although much remains to be discovered in pharmacogenomics and differentiated drug response between racial groups, racism is an undeniable reality. By far the most worrying repercussion of this

research, in their view, is that it could be used to rationalize racism. In spite of the ambiguity and confusion surrounding the scientific study of race, research results could be used to support genetic reductionism, i.e. the definition of individuals' identities based on their DNA.

> "I study evolution, I study genetics, how things change through time, why some things go this way versus that way in different parts of the world. So I think it's really interesting. Yet, a person who is interested in other things can just take that information and say, "Now we know what constitutes a pure Han Chinese or whatever". For me, that's the dangerous part."

The respondents were concerned that researchers with racist views could manipulate their study designs or research results. One researcher spoke of the strong convictions that drive researchers while another cautioned about the far reach of conclusions drawn from race-related research.

> "I think researchers are driven by their own needs. They get this idea in their head, they get this bee in their bonnet and they just have to do it. Now, I think most researchers have actually quite pure motives but I think some are subverted. Remember, the worst racists in the world have been doctors. Raskovic, the Serbian leader who was into ethnic cleansing: he's a psychiatrist."

> "Suppose I have an *a priori* that Blacks are intellectually inferior. And that in the research uncovers differences in the genome. [...] A link is going to be established ... do you see the deviations in this case? That's why, in my opinion, this has to be handled with a humanist and human

> approach. Comprehensively. We have to be extremely careful as soon as subdivided people into ethnic subgroups or genetic subgroups. We have to be careful of that and also of how it's going to be used. Human beings are not solely a genetic code. They also are a wide number of things we can objectivate."

The respondents had very strong misgivings about research linking genes and intelligence. They felt that using racial data in the discovery of medical treatments was invaluable whereas investigations linking race with behavioural and other traits were not warranted – and in some instances even morally reprehensible.

The legitimization of genetic reductionism also proved to be of interest to the respondents because of its implications for the understanding of disease. One respondent spoke of the implications of the genetic paradigm:

> "It brings us to reflect on our very conception of medicine and care. 80% of the world's population is far from thinking of genetics: that is the conception coming from the West. This brings up ethical questions. Chinese medicine, which is 5000 years old to Western medicine's 2000 years, has clearly different approaches. Is genetics going to overthrow all of that? In Africa, there are particular aetiologies that take into account traditions and the treatments reflect that. We have to take this into account. Or are we doing research for care destined exclusively for the West, are we heading towards this alone?"

They emphasized that genomics research was increasingly devoted to the study of multi-factorial diseases such as diabetes, heart disease and cancer: it would be wrong

to suggest that the incidence of disease in racial populations is essentially tied to genes.

> "There is complexity of the human organism; the complexity of disease; the complexity of genes. When we speak of a disease, it involves susceptibility, infection, environment, poverty ... there are multiple factors. It's not simple."

The respondents stressed the need for greater collaboration between genomics researchers and other scientists. This would benefit research by improving the understanding of the gene-environment interactions. Researchers from disciplines other than the biological sciences were similarly deemed crucial to the understanding of the social determinants of health.

Respondents spoke at length about the challenges of disseminating research results to the general public. Without a firm grasp of the science behind genomics, individuals are likely to infer genetic reductionism and misunderstand the notion of genetic risk. When asked if their perceptions might differ from those of individuals in their community or in their general public, they believed their work as scientists made them see the issues differently:

> "I think I'm probably in the minority in that I'm Greek but also a geneticist, a scientist. I have a unique perspective that most of Greeks in the community don't have because I study this for a living. I think my views probably wouldn't be shared by the majority of Greeks."

> "If you have a good example and can explain well, most Chinese people will be interested in the research. Now, I'm a researcher, I'm a scientist: I understand what you do and the importance but not like usual people. The people working in a bank or in a restaurant may not have this basic knowledge. If Chinese people could explain in the local language, that would be great."

They felt that the level of misinformation surrounding genomics and race is alarming: consequently, the public may misinterpret research results. Public understanding of pharmacogenomics research involving race thus stood out as a priority for the respondents. Among the methods suggested: developing scientific literacy at an early age, popularization in the media (television, newspapers, radio, internet), public debates, etc. Almost all the respondents commented that scientific terms would need to be made clearer, abstract concepts made more accessible. One respondent singled out politicians as having influence on the public and needing to be educated. For the most part, the researchers believed that a better understanding of genomics would lead to greater public acceptance of their research. Still, researchers saw their role in this process as limited. They saw themselves as being responsible for providing raw scientific data.

Need for ethical oversight

The respondents spoke of the importance of ethics in regulating pharmacogenomics research involving race. In their view, reflection on ethical

issues by genomics researchers was generally seen as something exterior to the practice of research.

> "Yes, many see that as one administrative step that has to be done in order to do the research. That's unfortunate, there's not that concern for the repercussions of the research."

In the words of one doctor researcher:

> "Right, it's like every doctor-patient encounter that you have is an ethics consult. There's always ethics involved there. You can't have a doctor patient interaction without there being an ethical interplay. It's certainly true on a larger level when you're dealing with populations: you can't have a science-population interaction without ethical repercussions. I think the problem with many scientists is that they pretend that they can."

They identified an extensive mandate for ethicists and research ethics committees. Ethics committees would oversee research protocols and ensure that poorly designed studies involving race would not be approved. They would pay close attention to the needs of racial populations. Ethicists would also be charged with elaborating measures for the protection of the genetic information of research subjects; they could also play an important role in ensuring that the harms done to racial populations once research results are published are minimal. Some respondents suggested that ethicists could play a role in ensuring the just distribution of pharmacogenomics products, by weighing on the decision to include racial populations in research and by lobbying to make these products affordable. Most

importantly, ethicists would bridge the gap between the researchers, decision-makers and the general public.

DISCUSSION

The interviews offer a complex portrait of what could be coined the "doubled-edged" nature of pharmacogenomics research involving racial classification. This expression was indeed used by a majority of the respondents, who said it captured the cautious optimism they felt was warranted by such research. Sensitized to racism and potential abuses, they felt conflicted by the sensitive nature of racially categorized research results. They sought to reconcile the scientific legitimacy of pharmacogenomics research involving race with a construct of race also rooted in a social and political context. However, we documented a great variability in the researchers' understanding of their own roles in potentially reinforcing genetic reductionism. The ambiguity surrounding the notion of race threatens the practice of good science: how can we ascertain and interpret differential drug response by race when its very definition remains imprecise, fluid and time dependent?

This study of researchers' views provides information that enriches the existing ELSI literature. Although the respondents demonstrated an awareness of the benefits and risks associated with genomics research, they were on the whole less familiar with the ethical concerns surrounding the scientific legitimization of the notion of race. Their views on genetic differences between populations having implications for the prediction of disease, response to treatment and health care

outcomes reflect those of authors who argue in favour of using racial classification in genomics research (Burchard et al., 2003; Risch et al., 2002). The detailed explanations for these differences suggest an understanding of human genetic variation rooted in the distributions of alleles in populations according to geographical ancestry (Bamshad, 2005). They spoke of their concerns with using race as a flawed surrogate for complex genetic and environmental factors, especially considering the level of admixture between populations.

Consistent with the characterization of genomics researchers offered by others, the researchers nevertheless place a lot of emphasis on racial variation. In ascribing legitimacy to the use of racial classification in pharmacogenomics research, the researchers interviewed accept race as a significant scientific variable. An unintended consequence of this attitude towards the study of difference could be the reification of race in science and the reinscription of race as a biological notion (Duster, 2005; Lee, 2003). Many respondents had difficulty appreciating how their views appeared to invalidate their assertions that race is a social construction. Genomics researchers often invoke the social constructivism of race in their writings while at the same time emphasizing its biological meaningfulness (Reardon et al., 2005). Our data highlights how this seeming incongruence in the remarks of researchers complexifies our understanding of their stance on the use of race in drug research.

This is illustrated by the fact that we did not anticipate that the researchers in our study would have a largely favourable opinion of the drug BiDil. In contrast to the criticisms levelled at the researchers and regulators who contributed to its deployment on the U.S. market, the issue of clinical utility dominates the study participants' appraisal much like it does for the researchers who put forth a defence of BiDil (Cohn, 2002; Franciosa et al., 2002). It should be noted that we did not expect the researchers to make a thorough scientific assessment of BiDil, which they conceded they could not provide without reviewing study protocols and regulatory documents pertaining to the drug. One possible explanation for this positive view lies in the fundamental and speculative nature of genomics research: as the researchers themselves expressed, a pharmaceutical treatment that can benefit patients represents a fitting culmination to years of work.

In addition, our findings shed light on the proposed relationship between researchers' views on human genetic variation and their belief that a racial drug such as BiDil is warranted to improve health outcomes for racial populations. Current literature contends that promoting race-driven pharmacogenomics leads researchers to deemphasize the non-genetic and non-biological factors that contribute to health disparities (Fine, 2005; Lee, 2005). However, the researchers described themselves as mindful of accounting for the influences of culture, diet, socioeconomic status, and education, which they said were reflected in their own research. Another contrast emerges between the literature and the research results on the subject of whether racial pharmacogenomics will mitigate health disparities. Many

respondents believed that pharmacogenomics research involving race will help rectify inequalities by providing drugs targeted to subpopulations whereas ethicists and public health experts have argued the opposite (Fine, 2005; Lee, 2005). While they identified ethical issues related to access to drugs, the researchers were much less inclined to question whether devoting resources to pharmacogenomics research is ethically justified.

We also found that the researchers were well versed in the risks and harms associated with genomics research. Individually, they identified many ethical issues that have been raised in the literature. The collective focus on potential racial discrimination and stigmatization suggests an awareness of the particularities of genomics research involving populations. It may be the case that genomics scientists have grown familiar with the implications for racial populations given the efforts by professional bodies to address them specifically. For instance, the *Réseau de Médecine Génétique Appliquée* released its 'Statement of Principles on the Ethical Conduct of Human Research Involving Populations', intended to shape the way in which genomics scientists conduct their research within Quebec's universities and institutions (RMGA, 2003). Perhaps surprisingly, the respondents singled out the fellow researchers as possible instigators of racism. An important insight from such remarks is that genomics researchers are privy to views, attitudes and practices within their community; as key informants, the uncomfortable truths they speak may be more likely to resonate than if they were spoken by non-genomics researchers.

Improvement of science literacy among the public was viewed as crucial to dispelling fallacies and misconceptions pertaining to race. The perception held by the researchers that the level of scientific knowledge and understanding by the public is inadequate confirm the findings presented in several studies (National Science Board, 2002, 2004). Moreover, individuals who hold prejudices were seen as susceptible to believe racist interpretations of research results. Similarly to the data compiled by Matthews et al. (2005), the researchers welcome the public's involvement in discussions of the implications of genomics. In contrast to this same study however, the researchers say they do want ethicists to make pronouncements about or have a bearing on what research can and cannot be conducted. The positive view they have of ethicists is reflected in the extensive list of duties the researchers delegate to them. While their role in overseeing research protocols and elaborating measures for the protection of research subjects is well defined, it is less clear how they would wield their influence to ensure the just distribution of pharmaceutical products destined for racial populations. Researchers remain sceptical of their own roles vis-à-vis ethics; trusting ethicists is seen as a way to remedy this shortfall.

Further distinctions – albeit subtle – were revealed between genomics researchers and doctor researchers in their perceptions of the implications for patients. The researchers who were practicing physicians claimed that their contact with patients made them aware of the challenges in applying genomic discoveries to benefit patient health. This underscores the differences between values underlying

the obligations of a genomics researcher and the obligations of a doctor to a patient, distinctions which have been reflected in the academic division of research ethics and clinical ethics.

Recommendations

These data are a starting point in a reconsideration of the ethical framework applying to pharmacogenomics research involving race. As we move towards elaborating norms and guidelines, incorporating the realities of genomics researchers can inform the relationships between researchers and stakeholders necessary for their successful implementation. When considering the manner in which the fundamental principles elaborated in normative texts (e.g., respect for autonomy, non-maleficence and justice) should guide pharmacogenomics research, it will be important not to deny the saliency of race. Notwithstanding the debate between researchers surrounding its role in genomics, race remains a notion with tremendous social import. Further inclusion of racial populations would ensure that a wide range of viewpoints is taken into account. In addition to being consistent with the principles of reciprocity and accountability, this would allow researchers to engage in a dialogue likely to enrich their understanding of the ramifications of their work.

In light of the complexity inherent to the interpretation of differential drug response, researchers must be careful not to overstate the benefits of race-specific pharmacogenomics. Researchers are indispensable to scientific literacy initiatives

yet must anticipate that members of the general public might not share their enthusiasm. Properly informing individuals while minimizing bias is thus necessary to preserve the integrity of pharmacogenomics research. Moreover, transparency on the part of the researchers can take on many forms including making explicit the scientific basis for using racial populations and communicating results in a timely manner. The researchers interviewed were insistent on the responsibility of researchers to contribute to the greater good and improve the health of the public. Consequently, research into 'individualized medicine' should be made to benefit all populations, and complement health research in other disciplines. Finally, our findings highlight the importance of evaluating researchers' values and interests as well as the context in which pharmacogenomics research is practiced.

Limitations

The present study's most significant limitation was the number of researchers interviewed. The smaller sample that is characteristic of qualitative research was not intended to be representative of the views of all genomics researchers; the results cannot be generalized. At the same, it is uncertain whether a greater number of respondents would have allowed for a more sophisticated insight into the views on pharmacogenomics and race. In a study on data saturation, Guest et al. posit that the sample size of Godard et al's qualitative study suffices in relation with the research objectives (Guest et al., 2006). In all likelihood, interviews with researchers from populations other than the nine selected (e.g., researchers of French Canadian origin)

would have uncovered different preoccupations. It is to be expected that the views expressed by the respondents differed from those held by non-respondents. Members of the former group, as opposed to those who were solicited for participation but declined, may have been more aware of ethical implications or more likely to hold strong views about genomics researchers and their responsibilities to the broader community.

Still, the ability to capitalize on the experiences of genomics researchers is a strength of qualitative research. A number of researchers expressed the opinion that their identification with a minority population afforded them a unique perspective on the topics discussed during the interview. The interview transcripts revealed situations in which the tensions of the use of race categorization in research were shared by all researchers irrespective of their self-identified race. Some issues, such as the connotations of a racial prescription drug and the dissemination of race-specific research results to the greater public, were magnified or different for the researchers. They were nevertheless adamant in affirming their distinct status as scientists. In their view, their level of education, profession and awareness of the issues set them apart from members of their respective cultural communities. The fact that their views are admittedly shaped by their identity as genomics researchers suggests a communitarian dimension to values.

CONCLUSION

This study explored the ethical issues surrounding the use of racial classification in pharmacogenomics research. The purpose of this master's thesis is to identify the views of genomics researchers concerning the use of racial classification in pharmacogenomics research.

This descriptive exploratory study provides depth and detail regarding the views of genomics researchers regarding the ethical implications of pharmacogenomics research involving race. The findings can be summarized as follows: the researchers were cautiously optimistic about such "doubled-edged" research. While placing a lot of emphasis on variation between racial populations, which they characterized as misunderstood by individuals and scientists alike, they demonstrated interest in understanding and studying human genetic variation. They had a favourable view of race-specific therapeutics and believed that pharmacogenomics would improve health outcomes for racial populations in a context of health disparities. Sensitized to racism and potential abuses, they nevertheless felt conflicted by the sensitive nature of racially categorized research results.

The recommendations formulated in this study have consequences for subjects of research, the professional practice of researchers as well as for efforts to

increase reciprocity between researchers and the public. Further inclusion of racial populations will be necessary to evaluate whether ethical principles as they have been applied in existing guidelines respond to the challenges arising from the use of race. The importance of not denying the saliency of race emerges as a manifestation of non-maleficence: researchers must be careful not to overstate the benefits of race-specific pharmacogenomics. The study by genomics researchers into inherited drug response would also benefit from interdisciplinary research. The contribution of social scientists could help our understanding how the notion of race is impacted by pharmacogenomics research involving race, just as the work of medical historians can help situate current developments within a historical context; meanwhile, research in the fields of pharmacology and pharmacoepidemiology remains essential for the delivery of real world effectiveness and positive health outcomes. The contribution of scientists to scientific literacy initiatives would ensure that the public is properly informed, along with a commitment to transparency in genomics research.

The views of researchers are likely to be fundamentally necessary in addressing the pervasiveness of race in genomics and other biomedical research. However, our understanding of how to situate these views within a society-wide discourse needs to be enriched. Describing genomics researchers' views on how they conceive of their role in the process by which race is either accepted or discarded as a biological notion provides an important area of future research. Because ethical norms and guidelines remain inextricable from the work of

researchers, we must continue to examine the perceptions of researchers towards research ethics. Research into the views on pharmacogenomics research involving race of other researchers, particularly epidemiologists and public health experts, would prove a fitting complement to the insights gained from interviewing genomics researchers.

Most importantly, thinking critically about the about the implications of racial research requires sustained investigation into the views of the public. In light of our findings that identification with a cultural community or racial population informs perceptions, it will be revelatory to seek out the interests and concerns of minority populations. Finding out what they think about research involving race can generate knowledge helpful to the conduct of research (e.g., research needs, recruitment initiatives) as well as to the elaboration of health policy (e.g., technology assessments, public funding of prescription drugs). And as the researchers interviewed held strong views about the public, it will be similarly important to engage individuals in a discussion of their perceptions of genomics researchers and of the scientific community. In sum, on the issue of race in genomics and pharmacogenomics research, bioethical enquiry should forge ahead with strong theoretical work that is informed by the realities of stakeholders.

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RESEARCH QUESTIONNAIRE

LA CONSULTATION DE COMMUNAUTÉS CULTURELLES ENVERS LA CRÉATION DE BANQUES DE DONNÉES GÉNOMIQUES À GRANDE ÉCHELLE : UNE ANALYSE DES INTÉRÊTS ET DES VALEURS

Introduction

Tel qu'expliqué dans la lettre d'invitation qu'on vous a envoyée, le Groupe de recherche en éthique biomédicale de l'Université de Montréal vous propose de participer à un projet de recherche visant à consulter diverses communautés culturelles envers la création de banques de données génomiques/génétiques à grande échelle (biobanques). Ce projet se fait en collaboration avec l'Institut interculturel de Montréal et l'équipe Culture et migration de la Direction de santé publique de Montréal.

Actuellement, on assiste à la création de plusieurs biobanques, telles le projet CARTaGENE, l'*Initiative sur la santé des Canadiens à tous les stades de la vie* (ISCVS), ou l'*Enquête canadienne sur les mesures de la santé* (ECMS) de Statistique Canada. Ces biobanques nécessitent de recruter de larges cohortes d'individus : 50 000 Québécois pour le projet CARTaGENE, 50 000 Canadiens pour l'ISCVS, et 5 000 Canadiens pour l'ECMS. Un tel recrutement demande des connaissances approfondies sur les représentations sociales de ces projets et de leur approche. Par exemple, quels sont les risques perçus par le public? Les perceptions sont-elles les mêmes dans tous les groupes de la société, ou pour ce qui nous intéresse ici, dans les diverses communautés culturelles?

Une étude des intérêts et des valeurs est primordiale afin de développer des approches scientifiques valides et pertinentes tenant compte de divers enjeux éthiques sociaux et culturels de notre société.

Biobanques

Donc, quelle est votre perception de ces projets de biobanques?

Au Québec ou au Canada, croyez-vous qu'une banque de données génomiques ou génétiques à l'échelle de la population aura des aspects positifs/négatifs sur votre communauté?

Participation

Vous-même, est-ce vous participeriez à un tel projet? Selon-vous, est-ce que les membres de votre communauté y participeraient également?

Qu'est ce qui vous inciterait à (ne pas) y participer (Vérifier en plus de l'importance scientifique : utilisation spécifique, retour d'information, anonymat, destruction possible, utilisation par MD, famille...)?
Et les membres de votre communauté?

Collecte et stockage d'échantillons

Est-ce que vous seriez prêt à donner un échantillon de sang? Selon-vous, est-ce que les membres de votre communauté seraient à l'aise avec le processus de prélèvement? Quelles mesures de protection devraient être mise en place?

Est-ce que vous consentiriez à ce que vos données génétiques soient conservées pour plusieurs années? Et les membres de votre communauté? Pour quelles raisons?

Quels bénéfices attendriez-vous de votre participation à une biobanque? Et votre communauté?

Enjeux éthiques et sociaux

Un autre projet international de biobanque, le projet HapMap, a montré grâce à l'étude des échantillons d'ADN, qu'il y avait très peu de différences génétiques (0,1%) entre les Africains et les Nord-Américains ou entre ces derniers et les Asiatiques.
Si vous participiez à un projet de biobanque, quel impact l'information génétique issue de votre échantillon et des échantillons de vos concitoyens pourrait-elle avoir sur la façon dont l'origine et l'histoire de votre communauté est définie?

Croyez-vous que les résultats de recherche provenant de biobanques pourraient avoir un impact sur la stigmatisation ou la discrimination envers votre communauté? Dans quel sens?

Y-a-t-il des maladies ou des conditions héréditaires (d'ordre génétique) qui touchent votre communauté en particulier?

L'existence de ces conditions héréditaires a-t-elle engendré des problèmes de discrimination ou de stigmatisation pour votre communauté? D'autres problèmes (ex : eugénisme)?

Au contraire, croyez-vous que votre communauté bénéficie actuellement de traitements médicaux ou d'interventions particulières grâce aux recherches en génétique?

Race et ethnicité

Selon vous, quelle importance la race/ethnicité occupent-elles dans la manière dont votre communauté se perçoit et se définit?

Quel rôle joue la génétique dans votre conception de race/ethnicité?

Religion

Croyez-vous que vos croyances religieuses ou spirituelles influencent vos attitudes envers la génétique?

Quel rôle occuperait la religion ou la spiritualité dans votre décision de participer ou non à un projet de biobanque?

Pharmacogénomique

Est-ce que vous participeriez à un projet de biobanque si l'information recueillie servait à la recherche et au développement de médicaments?

BiDil, dont la vente aux Etats-Unis a été autorisée en juin 2005, est le premier médicament à prescription raciale. Il a été conçu pour traiter les insufficances cardiaques spécifiquement chez les afro-américains.
Est-ce que vous seriez disposé à prendre un médicament conçu pour traiter _____ (condition génétique identifiée par répondant) si ce produit était destiné «spécifiquement» pour votre communauté?

Croyez-vous qu'un tel produit pharmacogénomique aura des aspects positifs/négatifs (sociaux et médicaux) sur votre communauté?

Herceptin est un médicament derivé de la pharmacogénomique destiné au 15%-30% des patientes atteintes d'un type de cancer du sein aggressif : un test génétique sert à identifier les femmes qui en bénificieront. Au Québec, on a longtemps hésité à offrir *Herceptin* à toutes les femmes éligibles parce qu'il coûte très cher ($50 000).
Croyez-vous que le gouvernement serait prêt à subventionner le coût de produits pharmacogénomiques destinés spécifiquement à votre communauté? Croyez-vous que l'industrie pharmaceutique serait prête à investir dans la recherche et le développement de tels médicaments?

Culture

En conclusion, pensez-vous que votre opinion reflète généralement celle de votre communauté?

Croyez-vous que vos perceptions de la génétique témoignent de valeurs propres à votre communauté?

Quels sont les éléments qui rendent votre communauté distincte des autres?

Par quels moyens pouvez-vous, ainsi que vos concitoyens, être plus informés et impliqués dans un projet de biobanque?

CODES

BIOBANQUES – PERCEPTIONS GÉNÉRALES

BIOBANQUES

BIO-pos
BIO-neg
BIO-neutre
BIO-partagé

EFFETS SUR COMMUNAUTÉ

BIO-com.pos
BIO-com.neg
BIO-com.neutre
BIO-com.partagé

EFFETS SUR POPULATION

BIO-pop.pos
BIO-pop.neg
BIO-pop.neutre
BIO-pop.partagé

EFFETS SUR INDIVIDUS

BIO-indi.pos
BIO-indi.neg
BIO-indi.neutre
BIO-indi.partagé

BIOBANQUES – MODALITÉS DE PARTICIPATION

PARTICIPATION

PART-oui
PART-non
PART-nsp
PART-cond

PARTICIPATION DE COMMUNAUTÉ

PART-com.oui

PART-com.non
PART-com.nsp
PART-com.cond
PART-com.partagé

DON D'ÉCHANTILLON

PART-don.oui
PART-don.non
PART-don.nsp
PART-don.cond

DON D'ÉCHANTILLON DE COMMUNAUTÉ

PART-doncom.oui
PART-doncom.non
PART-doncom.nsp
PART-doncom.cond

CARACTÈRE À LONG TERME

PART-long.oui
PART-long.non
PART-long.nsp
PART-long.cond

CARACTÈRE À LONG TERME selon COMMUNAUTÉ

PART-longcom.oui
PART-longcom.non
PART-longcom.nsp
PART-longcom.cond

MESURES DE PROTECTION

PART-mes.profes
PART-mes.confid
PART-mes.info
PART-mes.fami

PARTICIPATION SI RECHERCHE PHARMACEUTIQUE

PART-pharma.oui
PART-pharma.non
PART-pharma.neutre
PART-pharma.cond

PARTICIPATION – ATTENTE DE BÉNÉFICES

PART-ben.oui
PART-ben.non
PART-ben.nsp

IDENTITÉ

IMPORTANT DANS LA CONCEPTION DE COMMUNAUTÉ

IDEN-race
IDEN-ethni
IDEN-cult
IDEN-lieu
IDEN-relig
IDEN-géné
IDEN-fami
IDEN-hist

SANTÉ DE LA COMMUNAUTÉ

MALADIES

SANTÉ-mal.dia
SANTÉ-mal.thala
SANTÉ-mal.aném
SANTÉ-mal.tays
SANTÉ-mal.cancer
SANTÉ-mal.lupus
SANTÉ-mal.autres

INITIATIVES PARTICULIÈRES

SANTÉ-rech
SANTÉ-depis
SANTÉ-educ

IMPACTS SUR STIGMATISATION

SANTÉ-stig.oui
SANTÉ-stig.non
SANTÉ-stig.nsp

IMPACTS SUR DISCRIMINATION

SANTÉ-disc.oui
SANTÉ-disc.non
SANTÉ-disc.nsp

AUTRES IMPACTS

SANTÉ-impact

RELIGION

APPARTENANCE

RELI-app.oui
RELI-app.non
RELI-app.partagé

INFLUENCE ATTITUDE ENVERS LA GÉNÉTIQUE

RELI-gen.oui
RELI-gen.non

INFLUENCE DÉCISION DE PARTICIPER

RELI-part.oui
RELI-part.non

PHARMACOGÉNOMIQUE– PERCEPTIONS

BIDIL

PHARMA-bidil.pos
PHARMA-bidil.neg
PHARMA-bidil.neutre
PHARMA-bidil.partagé

PHARMACOGÉNOMIQUE

PHARMA– pos
PHARMA– neg
PHARMA– neutre
PHARMA– partagé
PHARMA– question
PHARMA– incompréhension

CONSOMMATION DE PRODUITS DESTINÉS À RACE

PHARMA-conso.oui
PHARMA-conso.non
PHARMA-conso.nsp
PHARMA-conso.cond

EFFETS SUR COMMUNAUTÉ

PHARMA-com.pos
PHARMA-com.neg
PHARMA-com.nsp
PHARMA-com.part

EFFETS SUR POPULATION

PHARMA-pop.pos
PHARMA-pop.neg
PHARMA-pop.nsp
PHARMA-pop.partagé

EFFETS SUR INDIVIDU

PHARMA-indi.pos

PHARMA-indi.neg
PHARMA-indi.nsp
PHARMA-indi.partagé

SUBVENTION DE PRODUITS PHARMACOGÉNOMIQUES SUR LE MARCHÉ

PHARMA-subvgouv.oui
PHARMA-subvgouv.non
PHARMA-subvgouv.nsp
PHARMA-subvcies.oui
PHARMA-subvcies.non
PHARMA-subvcies.nsp

INVESTISSEMENT DANS RECHERCHE PAR COMPAGNIES PHARMACEUTIQUES

PHARMA-invcies.oui
PHARMA-invcies.non
PHARMA-invcies.nsp
PHARMA-invgouv.oui
PHARMA-invgouv.non
PHARMA-invgouv.nsp

INTERVENTION GOUVERNEMENTALE SUR OFFRE ET DEMANDE

PHARMA-presgouv
PHARMA-prescom
PHARMA-presgroup

COMMUNAUTÉ

OPINION REFLÈTE CELLE DE COMMUNAUTÉ

COM-opin.oui
COM-opin.non
COM-opin.nsp
COM-opin.partagé

VALEURS PROPRES, DISTINCTES À LA COMMUNAUTÉ

COM-valeur.famille
COM-valeur.santé
COM-valeur.intérêtsci
COM-valeur.communautarisme
COM-valeur.coopération
COM-valeur.religieux
COM-valeur.morale
COM-valeur.spiritualite

MOYENS D'IMPLICATIONS

COM-impli.media
COM-impli.politi
COM-impli.relig
COM-impli.citoy

COM-impli.général
COM-impli.commu
COM-impli.info
COM-impli.jeunes

Méfiance
santé
recherche
jeunes
savoir
forensique
innovation pharmaceutique
intérêt sci
devoirreligieux
devoircitoyen

vulgarisation
protection
utilisation
gestion
exclusion
investissement
stigmatisation
discrimination
crainte
racisme
eugénisme
exploitation

comportement
facteurs sociaux
facteurs enviro
déterminisme

usages futures
commercialisation
assurance
emploi

cadre éthique
cadre légal
cadre long terme
enjeux éthiques
inquiétude
enjeux sociaux
information

instruction
importance bio
raisons familiales
qualité santé
universalité
préjugé
bien être

GRANDES CATÉGORIES ABORDÉES:

- Biobanques – perceptions générales
- Biobanques – modalités de participation
- Identité
- Santé de la communauté
- Religion
- Pharmacogénomique – perceptions générales
- Communauté

REGROUPEMENTS:

INFORMATION: vulgarisation, protection, utilisation, gestion
RÔLE DE LA GÉNÉTIQUE: gène = comportement, facteurs sociaux, facteurs environnementaux, déterminisme
REGLÉMENTATION : cadre éthique, cadre légal, cadre long terme
GOUVERNEMENT : assurance, immigration, intervention sur cies pharmaceutiques