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The Provision of Newborn Screening:
A Conjoint Analysis of Women's Preferences

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The Provision of Newborn Screening: A Conjoint Analysis of Women's Preferences

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Thesis submitted to the
Faculty of Graduate and Postdoctoral Studies
In partial fulfillment of the requirements
For the M.Sc. in Epidemiology and Community Medicine

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ABSTRACT

CONTEXT

There has been increasing attention concerning the use of DNA-based genetic tests in health care. Many have argued that the use of genetic technologies should be subject to public debate and scrutiny. However, few in the general population can offer views informed by actual experience with genetic services. Prenatal and newborn screening programs are examples of genetic services that are routinely offered to the general population

OBJECTIVES

i) To determine if conjoint analysis is a useful tool for eliciting user preferences for newborn screening services

METHODS

Discrete choice conjoint analysis (CA)

RESULTS

Counterintuitive results identified issues concerning the validity of the CA instrument that was developed. As a result limitations to the usefulness of aggregate logit regression for the analysis of CA data were identified. Other analytical approaches, such as latent class analysis, merit further examination to determine their validity and the value of the information they may provide.

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LIST OF ABBREVIATIONS

CA	Conjoint Analysis
CH	Congenital Hypothyroidism
CHEO	Children's Hospital of Eastern Ontario
CV	Contingent Valuation
DNA	Deoxyribonucleic Acid
HB	Hierarchical Bayesian
LC	Latent Class
MRS	Marginal Rate of Substitution
OCAPI	Office of Consumer and Public Involvement
OLS	Ordinary Least Squares
OMHLTC	Ontario Mental Health and Long Term Care
PKU	Phenylketonuria
WHO	World Health Organization

INTRODUCTION

Advances in molecular genetics have greatly enhanced our understanding of disease mechanisms and have aided in our understanding of why the clinical course of some common disorders can be so variable (Bell 1998). However, increasing attention is being paid to both the potential limitations as well as the potential benefits of DNA-based genetic tests. Among the limitations, even for "simple" Mendelian disorders, are that the physiological pathway from genotype to phenotype is often unknown. Predicting the clinical importance of a "positive" gene test may therefore be problematic (Hubbard and Lewontin 1996). Furthermore, the tests themselves may not provide the type of information individuals think they do, due to the limited ability to intervene in the progression of some serious diseases and the lack of correlation between test and clinical accuracy (Evans, Skrzynia, and Burke 2001;McPherson 2006). In addition, there are widely expressed concerns about genetic discrimination, lack of confidentiality and use of blood or tissue for DNA testing without informed consent (Ministry of Intergovernmental Affairs 2002). Finally, even just suspecting the existence of a genetic disease challenges the emotional equilibrium of individuals or families resulting in negative psychosocial outcomes (Broadstock et al. 2000;Decruyenaere, Evers-Kiebooms, and Van den Berghe 1993;Michie et al. 1996).

Population based genetic screening programs are an example of genetic tests that are currently in widespread use. Historically, population based genetic screening was directed solely at newborns and the majority of genetic screening programs continue to focus on this population (Drown 2003). According to the criteria for a screening program to benefit society (Table 1), a screening test should be acceptable to the population, therefore public

Table 1: Principles of screening for disease

The condition sought should be an important health problem
There should be an accepted treatment for patients with recognized disease
Facilities for diagnosis and treatment should be available
There should be a recognizable latent or early presymptomatic stage
There should be a suitable test or examination
The test should be acceptable to the population
The natural history of the condition, including development from latent to declared disease, should be adequately understood
There should be an agreed policy on whom to treat as patients
The cost of case findings (including diagnosis and treatment of patients diagnosed) should be economically balanced in relation to possible expenditure on medical care as a whole
Case-finding should be a continuing process and not a "once and for all" project

(Wilson and Jungner, 1968)

engagement concerning decision making with respect to the provision of genetic screening programs is essential (Wilson and Jungner 1968). Furthermore, personal values concerning relatively complex health services are relatively easy to asses even among the lay public because it does not necessarily require a clear understanding of all the technicalities involved in the provision of a given service (Rowe and Frewer 2000). Combined with the unique and potentially great limitations surrounding genetic technologies, one can argue that use of genetic technologies as a health service, such as newborn screening, should be subject to open public debate and scrutiny.

Policy making in health care is an inherently value laden process. There is a widespread assertion that public values must be incorporated along with those of clinicians and decision makers. Arguably, the goals of health policy in relation to genetics should encompass the provision of an effective, efficient service, informed by the values of those who ultimately fund it, and used by a well-informed population which has realistic expectations of what it can deliver. However, there is currently little insight into how values of "appropriateness" vary according to contextual factors (e.g. family experiences or

circumstances) and whether apparently strongly held views are genuinely fixed, or can be "traded off" against other important personal values. Research has already shown that attitudes towards therapeutic cloning appear to differ substantially between the United States and the United Kingdom (Leshner 2003), therefore one can hypothesize that values concerning the provision of a newborn screening service may also differ according to context.

The difficulty in obtaining public preferences for genetics services is that they are a relatively new technology and few in the general public will have had any experience with them. However, newborn screening represents an example where many people have already had direct or indirect experience and where the views of lay people may be important in shaping the organization of changing services. Public engagement in the area of newborn screening is also particularly important given the recent expansion of newborn screening services in Ontario to include diseases for which there are no effective interventions. Some argue that the current consent model where neonatal screening is considered routine care for a newborn child and is administered automatically, without explicit consent from parents, may not apply to the evolving state of newborn services in Ontario. Engaging the public in decisions concerning the organization of newborn screening services may lead to more effective and accepted screening services for newborns in Ontario.

LITERATURE REVIEW

NEWBORN SCREENING

History

Newborn screening is the most widely used form of genetic service and is a universally acknowledged success for reducing the burden of disease (Hiller, Landenburger, and Natowicz 1997). It began with the introduction of the Guthrie test to measure elevated phenylalanine for the detection of phenylketonuria (PKU) in Jamestown, New York in 1961. Upon the introduction of the Guthrie test, there was much doubt about the practicality of testing all newborns for a rare disease and the effectiveness of early dietary intervention for preventing mental retardation (Guthrie 1992). This doubt was fuelled by a published report indicating that the test was not practical for population wide PKU screening (Scheel and Berry 1962). It was not until the manuscript of the methods used for the test, prepared by Guthrie, was finally accepted by a paediatric journal and eventually published that the method began to acquire acceptance within the medical community. Shortly thereafter, Massachusetts became the first state to pass a law requiring that every newborn infant be screened for PKU. Following the success of the Guthrie test, tests for other disorders were discovered and introduced into routine screening including screening for congenital hypothyroidism (CH), which was introduced in 1970.

At present, most jurisdictions recommend newborn screening for diseases for which there are effective interventions which prevent or modify disease progression, and for which funding is available for follow-up and treatment of positive cases. However, the challenge now is to make decisions about screening for diseases where the balance between the benefits and the harms of screening is not so clear. For example, some consider that screening for diseases which have no effective treatment is not appropriate since the

detection of these disorders may lead to constant worry of the child developing the symptoms of the disease which may outweigh any benefit of 'information' in the absence of health benefit. If screening were not performed for such a disease, the child and the parents would be free of worry about the disease until the symptoms began to manifest themselves (Benke 2006;Zellweger and Antonik 1975). However, others would argue that parents have a right to know despite the lack of interventions for such a disorder. Therefore, newborn screening represents a case study for genetics where many would have direct or indirect experience, where the organization of the screening service has not kept up with available technology and where, due to the unique and potentially great limitations surrounding its delivery, many feel the need to engage the public concerning the organization of the service delivery.

Newborn Screening in Canada

Newborn screening in Canada for the detection of hereditary and metabolic diseases was initiated in Prince Edward Island in 1963. By 1969, eight other provinces, including British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick and Nova Scotia, had begun similar programs. The main objective of these screening programs was the detection of diseases for which an effective medical intervention was available. This was, for most provinces, limited to screening for PKU and other hyperphenylalaninemic states. Quebec and Manitoba, however, chose to screen for a broader spectrum of diseases from the commencement of their programs. Quebec's newborn screening program was also expanded to include screening for the purpose of reproductive counseling and for enumeration and surveillance (Haworth, Miller, and Scriver 1974).

Currently all provinces and territories have implemented some form of routine newborn screening program with an estimated coverage of 98% (Spady, Saunders, and

Bamforth 1998). Each province and territory screens for at minimum PKU and CH. However, the number of diseases screened for varies between provinces and territories from three to twenty-eight (Hanley 2005).

Newborn Screening in Ontario

In September 2005, the provincial government announced that it was going to expand the Ontario Newborn Screening program, adding 19 inherited metabolic disorders to complement the 2 existing disorders of PKU and CH. These additional inherited metabolic disorders, represented in Table 2, include organic acid disorders, fatty acid oxidation disorders, and amino acid disorders (Ontario Ministry of Health and Long-Term Care: Backgrounder 2005a).

Following the initial announcement of expanding newborn screening services, 6 blood and endocrine disorders were added, represented in Table 2, to complement the existing expanded list (Ontario Ministry of Health and Long-Term Care: Backgrounder 2005b).

Table 2: New Inherited Metabolic Disorders included in expanded newborn screening, September 2005

Inherited Metabolic Disorders			Blood and Endocrine Disorders	
Organic Acid Disorders	**Fatty Acid Oxidation Disorders**	**Amino Acid Disorders**	**Blood Disorders**	**Endocrine Disorders**
Isovaleric academia	Medium-chain acyl-CoA dehydrogenase	Maple syrup disease	Sickle cell disease	Congenital adrenal hyperplasia
Glutaric Acidemia type 1	Very long-chain acyl-CoA dehydrogenase deficiency	Homocystinuria	Thalassemia	Biotinidase
3-OH 3-CH3 glutaric aciduria	Long-chain L-3-OH acyl-CoA dehydrogenase deficiency	Citrullinemia	Hb S/C disease	Galactosemia
Multiple carboxylase deficiency	Trifunctional protein deficiency	Argininosuccinic acidemia		
Methylmalonic acidemia	Carnitine uptake defect	Tyrosinemia type I		
3-Methylcrotonyl-CoA carboxylase deficiency				
Methlyamalonic acidemia				
Propionic acidemia				
ß-Ketothiolase deficiency				

In order to fund the expansion of newborn screening services, the Ontario government committed $18 million, of which $5 million was to cover the initial purchase of Tandem Mass Spectrometry machines, which permits the screening of many disorders simultaneously from a single blood spot and can screen more than 400 samples per day (Lewis et al. 2006b;Schulze et al. 2003), and other required technology. The remaining $13 million was to be used to cover the ongoing costs of the screening program. The program, which is now run out of the Children's Hospital of Eastern Ontario, began screening in March 2006; however screening for all disorders did not occur before the end of 2006.

CRITERIA FOR A SCREENING PROGRAM TO BENEFIT SOCIETY

In 1968, the World Health Organization (WHO) published guidelines for use in the implementation of a screening program (Wilson and Jungner) (see Table 1). The principles were developed well before the introduction of modern genetic susceptibility screening and were based on a 'linear' disease model in which screening was used primarily for the detection of preclinical or asymptomatic disease. Advancements in medicine have now allowed for screening beyond the traditional disease model to screening for risk factors and susceptibility for disease (Goel 2001). Currently there is increasing pressure from advocates to take advantage of available genetic technologies by expanding existing screening programs or developing new screening. We must now decide which conditions to screen for and how to implement these screening services (Andermann et al. 2005). Although the overall usefulness of the WHO criteria and their robustness over time is widely accepted, the criteria developed in 1968 are not able to deal with the social and medical contexts involved with genetic screening or the large body of knowledge concerning genetic tests (Goel 2001). Many have adapted the criteria over the years for different purposes and work is currently being conducted specifically to bring the Wilson and Jungner criteria into the genomic age (Andermann et al. 2005).

PUBLIC ENGAGEMENT

Definition

The term 'public engagement' causes much confusion in the literature as it is often used as an umbrella term to describe a number of different distinct yet overlapping roles (Weldon 2004). Many different expressions, including 'involvement', 'participation', 'consultation' and 'input' describe processes often labeled as engagement (Simces Z and Associates 2003). According to Philips and Orsini (2002), the term engagement refers to a

"particular type of involvement characterized by an interactive and iterative process of deliberations among citizens and between citizens and government officials." Weldon, however, defines engagement as 'stimulating interest in science and generally raising awareness of science and the issues it raises among the public' (2004).

The 'public' in public engagement refers to "all the individuals or groups who may be interested in or affected by the decision-making body." (Health Canada 2005). Weldon (2004) suggests the need to understand that 'public' does not refer to a homogeneous entity but rather a larger grouping of 'publics' which are not mutually exclusive. In the case of public engagement in genetics, 'public' may refer to populations with specific single gene disorders or individuals with specific conditions and their relatives. Women's views concerning genetic services are also particularly relevant because many programs regarding genetic screening and testing currently target pregnant women (Weldon 2004). Whatever the terms used and interpretation of public engagement made, Weldon emphasizes the need for evidence based approaches which have the power to influence the decision making process.

History

The idea of public engagement is not new, with the movement beginning in the 1960's through its use in urban planning. During the past decade the scientific community and government officials have become increasingly aware of the need for public engagement in health care decision-making processes. However, steps towards achieving this goal in Canada through an intergovernmental agreement were not made until 1999 with the explicit commitment of creating "effective mechanisms for Canadians to participate in developing social priorities and reviewing outcomes."(Social Union Framework Agreement). At that time the government also introduced regulations requiring that that "Canadians [be] consulted, and that they have an opportunity to participate in developing or modifying

regulations and regulatory programs." Along with explicit statements indicating that the government initiate effective public engagement in the decision making process, the government also took a more proactive approach by creating the Office of Consumer and Public Involvement (OCAPI) in 1999 (Health Canada 2005). The purpose of this office was to use public involvement techniques to inform the public, allow the public to provide opinions on public matters and to include the public in the decision making process. According to the OCAPI, the number of issues addressed by public involvement has increased from 9 in 2001-2002 to 52 in 2003-2004. Furthermore, the number of public engagement activities has also increased from 10 in 2001-2002 to 79 in 2003-2004. However, it should be noted that this trend may reflect an improvement in OCAPI's system for reporting public engagement activities (Health Canada 2005).

In 2002 The Royal Commission on the Future of Health Care in Canada made a commitment towards ensuring public engagement in health care through the formation of a national health council to deal with issues concerning the lack of transparency and public accountability in health care (Maxwell et al. 2002). The movement towards public engagement in health care is thought to make up for perceived inadequacies in representative democracy resulting from voter apathy, and the assumption that democracy results in representativeness (Pateman 1970).

Despite acknowledging the need to engage the public in decision making, many professionals (i.e. decision makers and clinicians) question the usefulness of public engagement based on the "deficit model" where the public is considered ignorant of, and lacks interest in, science (Kerr, Cunningham-Burley, and Amos 1998). In fact the convention in health care systems was, until recently, that the scientific and technical aspects of health care delivery should be left to health care professions (Hiller, Landenburger, and

Natowicz 1997). However, a systematic review of literature confirms that patient involvement has led to changes in the delivery of a range of health care services including the development of new or improved information for patients and more accessible services (Crawford et al. 2002).

Along with the scientific community and those involved in making decisions concerning the provision of health care services, the public also feels the need for increased and improved public engagement in the decision making process. The public seems to have lost confidence in their government, agencies, institutions and bureaucracies and in their ability to engage in effective representative democracy. Moreover, they frequently view the actions of decision makers as "unfair" (Eyles 1993). Consequently, the public would like to see a movement towards a more participatory democracy.

There are some in the public, however, who are skeptical that any process to involve them in health care decision making will actually result in future changes (EKOS Research Associates 2002). A review of citizens' views concerning public involvement indicated that certain conditions must be met in order for continued participation. This includes the need for a clear explanation of why their opinions are being sought and how this information could be used in the decision making process. Furthermore, participants feel that the information presented regarding their involvement must be adequate enough for them to meaningfully contribute to the engagement process and that it should be presented to them with clarity, honesty, and with integrity (Abelson et al. 2004).

Public Engagement in Health Care

The stated uses of public engagement in health care include legitimizing the process of health-care decision making, facilitating the process of needs-based planning, and improving health through a sense a self-worth and empowerment (Crawford et al.

2002;Harrison and Mort 1998;Higgens 1999). Although public engagement is thought to play various roles in health care, Health Canada has explicitly stated their mission for public engagement is to "help the people of Canada maintain and improve their health." (2005) However, that public engagement is an integral part of a democratic society allowing the sharing of decision-making should not be overlooked. Health care decision making that is accountable to the public is considered particularly relevant in Canada where health care services are paid for by the public. A review of public engagement in health care suggests a much broader role for the practice of public engagement including (i) democracy and social accountability, (ii) shaping of new health technologies, (iii) engaging in policy formulation, (iv) improving health services, (v) consultation/counseling, (vi) education, (vii) marketing to consumers, and (viii) building trust, generating 'acceptance'.

Methods of Public Engagement

That public involvement should be required for decision making, especially with the resource constraints of a publicly funded health care system, is no longer a common source of debate (Abelson 2001). In fact, there is a large body of literature concerning methods of public engagement in health care. Figure 1 is a representation of various methods for public engagement, identifying differences in the degree of public dialogue or knowledge translation and the potential to impact decision making between methods.

Deliberative Methods

According to Fearon (1998), "deliberation refers either to a particular sort of discussion – one that involves the careful and serious weighing of reasons for and against some proposition – or to an interior process by which an individual weighs reasons for and against courses of action." Deliberative methods in public engagement include citizens' juries, planning cells, deliberative polling, consensus conferences and citizens' panels.

Although they may differ in sampling method, number of participants, and the type of information being sought, they all incorporate a deliberative process. Participants are provided with information concerning an issue and are encouraged to consider the information and the opinions of others and to make recommendations concerning an appropriate course of action (Abelson et al. 2004). Therefore, deliberative methods form the "inform[ed] decision making" methods of public engagement (Figure 1).

Stated Preference Methods

Stated preference methods are a way to obtain behavioural data from consumers (Adamowicz, Louviere, and Swait 1999) and fall under the category of "understanding and thinking" (Figure 1). They include qualitative analysis, contingent valuation and conjoint analysis. These methods allow one to elicit preferences from the perspective of the individual as well as the society. They are a valuable tool for health services research as they allow the collection of preferences from the most relevant people for a given intervention, thereby enabling consumer preferences to dominate the focus of the analysis. Stated preference methods can be used as a tool for improving the intervention under investigation because they do not view the service as a whole, but focus rather on individual attributes of the system. This allows for the comparison of different interventions, and the identification of individual attributes requiring improvement. Finally, many of these methods are strongly based in economic theory, making them conceptually appealing (Bridges 2003). Other advantages of stated choice methods include the ability of the researcher to control the stimuli, increased efficiency and reduced multicollinearity due to control of the design matrix, and more robust models because larger ranges than are found in reality can be used for quantitative methods (Adamowicz, Louviere, and Swait 1999).

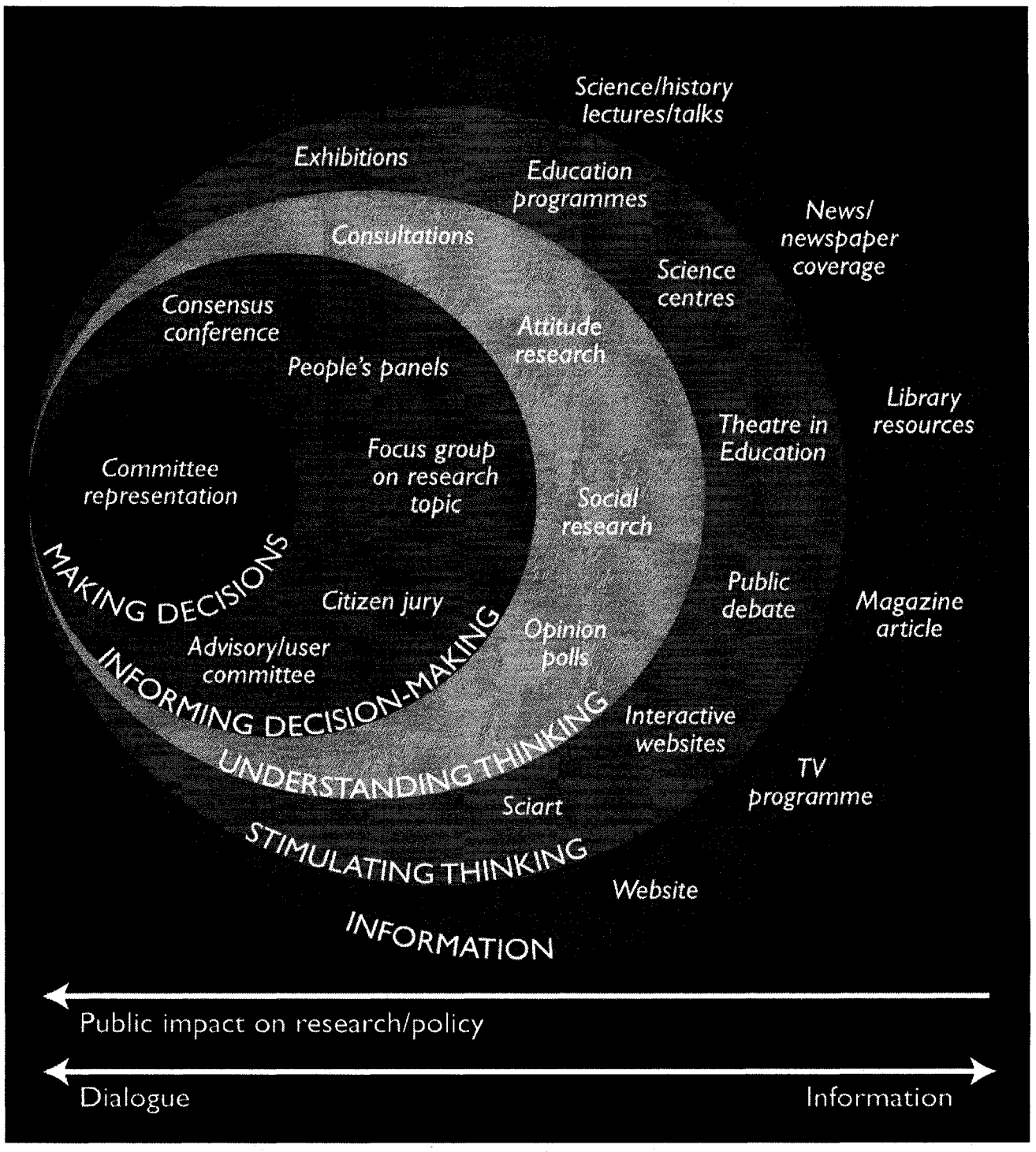

Figure 1: Public Engagement Onion

Qualitative Analysis

Qualitative analysis as a stated preference method involves asking individuals what is valuable or preferable. It applies inductive reasoning, that is, qualitative analysis may be used for the purpose of hypothesis generation and commonly includes the use of focus groups, surveys or interviews, etc (1997). Surveys allow access to the opinions of a potentially more representative sample of individuals than those obtained from focus groups or interviews. Public input from surveys could be used to influence the entire process of design and implementation of genetic services for clinical and population health purposes. Assessing citizens' attitudes would allow researchers to determine the ethical acceptability of a given service prior to its implementation. If a service is ethically acceptable, citizens' concerns could then be used to shape the practice guidelines of the test (Gollust et al. 2005).

Contingent Valuation

Contingent valuation (CV) or willingness to pay involves asking for the absolute valuation of a good or service or the relative valuation in the presence of another good or service. For example, individuals could be presented with a scenario that represents an improvement over the status quo for a given health service. Respondents to a CV exercise would then be asked to indicate, using an open ended question or forced choice, what the maximum value would be that they would be willing to pay to achieve the improvement. The monetary amount serves as a proxy for the value placed on the improvement in the health service (Gibb, Donaldson, and Henshaw 1998). However, this proxy is limited by the fact that two people who place the same value on an improvement may respond different simply due to their ability to pay (Mitchell and Carson 1989). Furthermore, in a recent survey concerning the use of CV in health care, only 48.7% of decision markers and 51.2%

of researchers felt that CV was an appropriate tool for determining willingness to pay (Gunther and Konig 2006).

Conjoint Analysis

CA is a method of eliciting values developed by mathematical psychologists and economists. It is widely used by transport and environmental economists (Opaluch et al. 1993) and is increasingly used in valuing changes in quality of public services, especially in health care settings (Propper 1990;Ratcliffe and Buxton 1999;Ratcliffe 2000;Ratcliffe et al. 2002;Ryan and Hughes 1997;Ryan 1999b;Ryan and Farrar 2000;Ryan et al. 2001;Telser and Zweifel 2002). The techniques applied with CA have been shown to achieve relatively high response rates, high levels of internal consistency, high levels of test-retest reliability, and are theoretically valid. CA techniques are also a relatively quick and easy method for eliciting public preferences (Bryan et al. 2000;Bryan and Parry 2002;Ryan, McIntosh, and Shackley 1998).

CA seeks to establish individual's strength of preferences with respect to different attributes (characteristics or features) in the provision of a good or service (Bryan et al. 2000). It assumes that any service can be defined as a combination of levels (called a profile) of a given set of attributes and the total utility (satisfaction or preference) that an individual derives from that product is determined by the utility to the individual of each of the attributes. Attributes can relate to health outcomes, non-health outcomes (including cost) and process outcomes (i.e. attributes related to service delivery). For example an assisted reproductive service could have attributes such as the probability of taking a baby home (health outcome), follow-up support (non-health outcome) and attitude of staff towards you (process attribute) (Ryan 1999a). The techniques applied with CA can therefore be used to

elicit a variety of information including willingness to trade between attributes, estimates of whether an attribute is important, the relative importance of a given attribute, estimates of the overall utility of one scenario versus another, and estimates of willingness to pay. In the context of this study, CA will identify what attributes of the newborn screening service the mothers' value and the strength of patient preferences over different attributes.

Classical CA approaches use ranking and rating as the methods by which respondents evaluate the profiles. Respondents are asked to provide an explicit (rating) or implicit (ranking) score for each profile. This score is then used to determine the contribution of each attribute to the overall utility score of the profile, assuming that the overall utility is equal to the sum of all the part-worths (i.e. utility of each attribute).

A discrete choice CA exercise involves presenting individuals with a number of hypothetical discrete choices. For each choice the individual is given two potential options (A and B), for example, two hypothetical genetic services with different characteristics. The description of each test covers the same set of attributes but with different levels or descriptions within each attribute. For each discrete choice, individuals are asked to indicate which of these tests they would prefer to be funded within the public health care system. In

effect, individuals are provided with different hypothetical scenarios and allowed to compare the hypothetical scenarios by choosing between them (e.g. Figure 2).

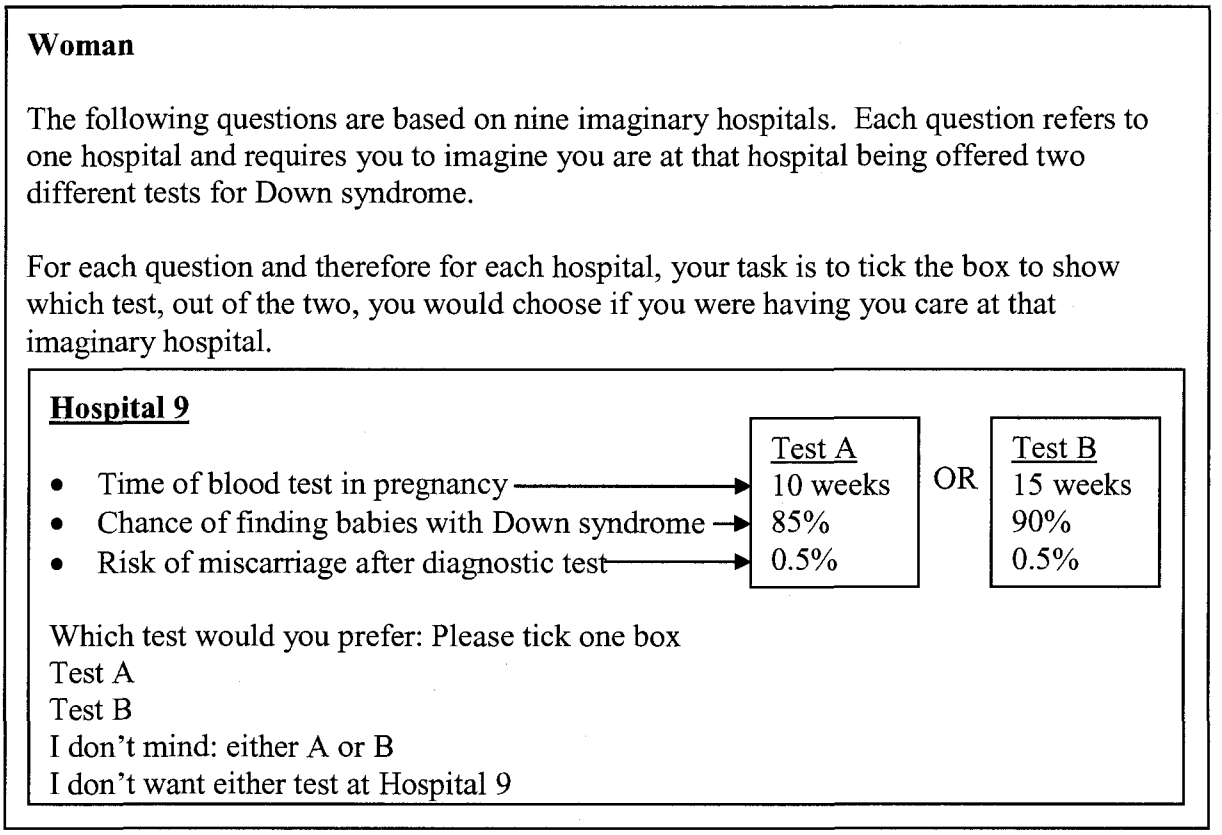

Figure 2: Example of pair wise comparison used in a CA task (Lewis et al. 2006a)

The end product of CA is an estimation of a utility (or satisfaction) function, which specifies the relationship between the service attributes and patient preferences using logit regression analysis. From the coefficients derived, it is possible to identify the relative importance of the different attributes, as well as the average willingness to pay for specific characteristics. Marginal willingness to pay for each can be determined by including out of pocket cost into the scenario, whereas estimates of marginal willingness to pay for the entire service are determined by eliciting the "shadow prices" thereby permitting a total value by the respondent to be calculated (Telser and Zweifel 2002).

Of the three stated preference methods, CA techniques are preferred over contingent valuation and qualitative research in health economics. The benefits of CA over other stated preference methods include that CA is a more cost effective technique for obtaining comparable or higher quality data. Second, it allows research to determine the value placed by consumers on all attributes of a good or service that are presented in the questionnaire. Finally, CA allows for a better characterization of the underlying utility function for a good or service (DeShazo and Fermo 2002). CA may therefore provide robust and detailed information on:

i) the characteristics that typify "appropriate" attributes of a newborn screening program
ii) which characteristics are considered more or less important in judging "appropriateness", and
iii) the extent to which respondents' views on this issue are fixed or flexible.

PURPOSE

The purpose of this particular project is to provide insight into users' preferences regarding the appropriateness of genetic services in the context of a publicly funded health care system such as Canada's and to relate these to current health policy issues in genetics. Furthermore, conjoint analysis (CA) is a technique for which we have little experience within the context of the Canadian Health care system and globally in the area of genetic services. This project will therefore provide an exploration of the type of information that is gained using the technique of conjoint analysis. The insights gained from this project will be useful in identifying relevant questions to ask in other areas of genetics, for example,

testing for late onset disorders. The objectives of the present CA study of women's preferences for genetic services are:

i) To determine, among a sample of mothers of young children, the relative strengths of their preferences for different attributes of a (hypothetical) population-based newborn screening program

ii) To determine whether priming concerning the ethical, legal and social issues of genetic testing has any effect on women's preferences for different attributes of a (hypothetical) population-based newborn screening program

iii) To determine whether CA, using a random effects probit model, is a useful tool for eliciting user preferences for genetic services in Canada

METHODS

CONJOINT ANALYSIS DESIGN (Appendix A)

Identifying the attributes

The design of the CA questions was done according to methods outlined by Ryan and Farrar (2000). The first stage of design consisted of identifying the characteristics of newborn screening which seemed to be most salient in determining their relative preferences for the provision of a genetic service within the Canadian health care system. This process was approached from the perspective of a policy maker. That is, attributes of a screening program were considered based on the information needs of policy makers when making decisions concerning the implementation of a newborn screening service. The design of conjoint surveys are often preceded by a information gathering stage which may include a systematic review of literature, consultation with experts (i.e. researchers and clinicians), or another qualitative or quantitative survey to gather information concerning which attributes of the 'service' may be most salient to include in the conjoint questionnaire. In this particular case, characteristics were identified by taking into consideration relevant literature (e.g. other conjoint analysis concerning genetic technologies), information gained from the Phase II survey of the Women's Perspective on Genetics study, Wilson and Jungner's criteria (1968) and the information needs of policy makers. The most pertinent characteristics were then formulated into attributes through discussion within the team of investigators.

The process of identifying the most salient attributes was an iterative process whereby a list of potential attributes where identified, lengthy discussions within the research committee took place to determine the most salient attributes, and then written definitions were developed to provide sufficient information for respondents to complete the conjoint task. The process of revisiting the potential attributes continued until all members of the

research committee felt that the attributes could be conceptualized from the perspective of a decision maker and were sufficiently well defined that, even with little experience or understanding of the policies and processes surrounding newborn screening, respondents could complete the task.

Attributes 1 & 2: Test Accuracy

The first characteristics of a hypothetical newborn screening service that were considered important were related to test accuracy. The wording of the attribute title and description was carefully chosen to try to ensure a respondent's understanding of the predictive value of the test. The attributes concerning test accuracy were the following:

i) Chance that a positive test result is wrong

ii) Chance that a negative test result is wrong

Rationale

According to Wilson and Jungner's criteria a screening test should be able to detect the disease at an early age (1968). More recent guidelines suggest the need for "a simple, safe, precise and validated screening test" (National Screening Committee 1998). However, in practice tests are rarely 100% accurate resulting in a trade off between optimizing the sensitivity or the specificity of the test. This can be particularly difficult with genetic tests where the test validity and clinical validity may not be the same. In newborn screening when test specificity is generally traded off in favour of test sensitivity (i.e. it is worse to miss a case than to falsely label a healthy child as potentially ill), the following may result:

i) Parents and family may suffer from anxiety because they think that their child has a disease when the child really does not

ii) The child may undergo painful or distressing medical tests before the disease is ruled out

iii) Scarce health care resources may have to unnecessarily be used to pay for early treatment of a disease that the child does not have

If, however, test sensitivity is traded off in favour of maximizing test specificity the following may occur:

i) Parents may ignore early symptoms of disease in their child because they were falsely reassured by the test

ii) Early treatment of the disease may not occur so the child may:

- develop a physical disability and/or
- develop a mental disability and/or
- suffer from a shortened lifespan

iii) Parents and family may suffer from anxiety because they do not understand the cause of their child's poor health

iv) Scarce health care resources may have to be used to pay for treatment of disabilities which occurred because early diagnosis was missed

Attribute 3: Effect of Early Treatment

The third characteristic of a hypothetical newborn screening service that was considered important was related to the effect of early treatment for children diagnosed through newborn screening.

Rationale

Traditionally, newborn screening has been used to identify babies at risk for diseases where the disease was present at birth and the symptoms of the disease were difficult to detect before irreversible damage was done. If left untreated the disease could result in mental disability, and/or physical disability and/or death, and there is good evidence that early treatment limits or prevents these outcomes. In this scenario, the benefit of prioritizing

sensitivity is clear. However, with advancements in genetic technologies, it is now possible to screen for 'conditions' where the clinical course is not clear or even where the metabolic anomalies might not even represent a disease state. It is also possible to detect very rare disorders for which there are no effective interventions. This means that the balance between benefits and harms of screening are no longer straightforward.

Attribute 4: Method of Consent

The fourth characteristic of a hypothetical newborn screening service that was considered important was related to the method of consent used when implementing a newborn screening program.

Rationale

Implied consent

Newborn screening has historically been presented as routine neonatal care resulting from the fact that early screening was performed for diseases, like PKU and CH, for which early intervention was highly effective in preventing severe disability (Hargreaves, Stewart, and Oliver 2005). For these diseases it was considered practical to infer parental consent from silence because there was no reasonable argument against the appropriateness of the tests. Existing standards of an implied consent strategy whereby consent for newborn screening is inferred from the absence of refusal cause problems in situations were despite their silence, doubt exists about parents' willingness to allow newborn screening for their child. One could also argue that screening is unethical when parents are not informed about risks, benefits and consequences of screening (Jepson et al. 2001).

Informed Consent

Increasingly more diseases have are being added to the list for which newborns are routinely screened. For many of these diseases there is no evidence concerning the effectiveness of early interventions in preventing severe disability. Many argue that the expanded newborn screening service, which now screens for diseases where the balance between the benefit and the harm of screening is not so clear, should require explicit or informed consent. Informed consent strategies require that parents are informed about the tests being provided and the potential follow up should the test indicate a positive result. Parents must also be aware of their authority as a decision maker for their child's care (Downie and Wildeman 2001). Despite the demands for parental choice, informed consent strategies pose their own challenges as they conflict with current newborn screening strategies and may not be appropriate for all diseases being screened for. Furthermore, although information is a key component in informed consent strategies, the quality of the information and the effectiveness of dissemination strategies is often not considered (Jepson et al. 2001). Finally, some argue that the use of informed consent strategies may reduce screening uptake.

Compulsory ('Mandated') Screening

Some states in the US (e.g. California) have a compulsory screening program for diseases such as PKU where the outcome of not screening and missing a diagnosis is considered detrimental. In such cases the state acts to protect the rights of the child, thereby overriding parental autonomy which would be considered with implied or informed consent models.

Whatever method of consent is implemented, it is clear that a balance must be achieved between a parent's autonomy and a child's right to have their health protected.

Attribute 5: Cost of the test

The fifth characteristic of a hypothetical newborn screening service that was considered important was related to the cost of screening if it were not covered by public healthcare funds.

Rationale

In a healthcare system like Canada's, public healthcare funding would usually pay for newborn screening. Consequently, a newborn screening program would consume scarce public healthcare resources. One way to find out how respondents value newborn screening is to measure their willingness to pay for the service if it were no longer covered by public health care.

Assigning levels to the attributes

The second stage of design involved assigning levels to the attributes. The maximum number of levels feasible is 4 or 5 for each characteristic in order to maintain a reasonable number of possible scenarios (e.g: number of possible scenarios = 3^j x 2^k; where k and j are the number of attributes with 2 and 3 levels respectively). Ensuring a maximum of three levels for each attribute allow for a reasonable number of possible combinations of attributes (i.e. scenarios). The attributes and their levels are presented in Table 3.

Table 3: Attributes and levels considered for the current CA task

ATTRIBUTE	Level 1	Level 2	Level 3
Chance that a "positive" test result is wrong	5%	15%	-
Chance that a "negative" test result is wrong	5%	15%	-
Effect of early treatment	Improvement in quality of life AND normal lifespan is NOT restored	Improvement in quality of life AND normal lifespan restored	-
Method of consent	Compulsory Screening (no parental consent sought or required)	Implied Consent ("opt-out")	Informed Consent ("opt-in")
Cost of the test	$30	$60	$90

In order to ensure that the number of pair-wise choices presented in the conjoint task did not result in respondent cognitive exhaustion or disinterest, all other attributes of the service which were not included in the questionnaire, are considered constant. That is, they are the same for each scenario. Since newborn screening can be carried out for a variety of different diseases, including those we for which we can intervene in the natural course of the disease, the newborn screening service of interest in the conjoint task was defined. The service was to screen for a hypothetical disease that, if left untreated, results in moderate disability and reduced lifespan. Moderate disability was defined as resulting in a daily routine of therapy and/or medications, frequent visits to the doctor, and declining health which reduces a person's ability to function independently. The disease also resulting in a reduction in average lifespan to 40 years, compared with an average lifespan of 78 years for people *without* the disease.

Choice of Scenarios

Following the design of attributes and their levels, scenarios to be presented in the pair wise combinations were selected. Due to the high number of possible scenarios, 72, an orthogonal fractional factorial design was implemented using the SPEED 2.1 software

(Hague Consulting Group, 2002). This reduced the number of scenarios presented in the questionnaire to 8, thereby diminishing the risk of cognitive exhaustion or disinterest. Furthermore, orthogonal design is used to ensure that one can estimate the effects of different attributes independently of each other. Therefore parameter estimates would be uncorrelated. Orthogonal design is the most commonly used design strategy in health economics (Carlsson and Martinsson 2003)

Establishing Preferences

Finally, in order to establish preferences, pair wise combinations must be presented from the fraction of possible scenarios that were selected. This was accomplished using the random number generator option from Microsoft Excel. Letters A to H, corresponding to the 16 scenarios selected from the pool of 72 possible scenarios using the SPEED 2.1 fractional factorial option were entered in descending order in column A of an Excel spreadsheet. Using the random number generator option, a random number between 0 and 1 was generated for each scenario. The data were then sorted in descending order by the column containing the randomly generated numbers. Pair wise combinations were formed by joining up the first two consecutive scenarios in the newly sorted list, and then the next two consecutive scenarios, and so on, resulting in 8 pair wise combinations. The CA questionnaire also included a non-random pairing where respondents were given a pair-wise choice in which one scenario was dominant (i.e. one scenario might reasonably be considered "better" than the other). This was used as a measure of internal consistency (Ryan et al., 2001).

Pilot Study

The conjoint analysis questionnaire was piloted on a random sample of 25 women who had participated in the Phase II of the Women's Perspective on Genetics Study and who

indicated their willingness to be contacted to participate in future studies. The pilot conjoint questionnaire (see Appendix 2) included 5 attributes namely i) chance that a positive test result is wrong, ii) chance that a negative test result is wrong, iii) effect of early treatment, iv) method of consent (i.e. issues of consent) and, v) cost of the test.

Of the 25 participants who were mailed the pilot questionnaire, 10 responded. It appeared that the majority (9/10) of the respondents were able to complete the conjoint task. Respondents, however, commented that a more concise explanation of attributes and directions for completing the conjoint task was needed. One participant also questioned why the 5th attribute, cost of the test, would be variable (see Appendix 3). Based on the response from the questionnaire and consensus from the research committee the initial attribute descriptions and directions for completing the conjoint tasks were changed. Cost of the test was also removed as an attribute because consensus was reached among the experts on the research committee that, although salient, respondents would not be able to approach this attribute from the perspective of a decision maker when completing the conjoint task. With only 4 (Table 4) remaining attributes there were now 36 potential scenarios. An orthogonal

Table 4: Attributes and levels in the final CA task

ATTRIBUTE	Level 1	Level 2	Level 3
Chance that a "positive" test result is wrong	5%	15%	-
Chance that a "negative" test result is wrong	5%	15%	-
Effect of early treatment	Improvement in quality of life AND normal lifespan is NOT restored	Improvement in quality of life AND normal lifespan restored	-
Method of consent	Compulsory Screening (no parental consent sought or required)	Implied Consent ("opt-out")	Informed Consent ("opt-in")

fractional factorial design was again employed reducing the number of scenarios presented in the questionnaire to 8. The final questionnaire contained 4 randomly paired scenarios and one non-random pairing where all attributes levels of one scenario were "better" than the other scenario (see Appendix 7).

PARTICIPANTS

Subjects in the study were English-speaking mothers of children aged 10 years or under who received in-patient care at the Children's Hospital of Eastern Ontario (CHEO) during the period 2003-2004, and whose contact details (name and mailing address) were recorded in the hospital's inpatient database. Two groups of subjects were recruited from the sampling unit. The first group consisted of a random sample of mothers from the CHEO database who had not been invited to participate in a previous survey. The second group consisted of mothers who had already participated in a questionnaire survey on attitudes to genetic testing, (Phase II of the Women's Perspective on Genetics Study), and who had indicated their willingness to participate in a future survey. These two groups represented women who had been primed (Group 2) with ethical, legal and social issues surrounding genetic testing by completing the Phase II survey, and women who had not been primed to these issues (Group 1).

SAMPLE SIZE

Conjoint analysis, like other economic analytic techniques, is based within a decision theoretic, rather than a hypothesis testing framework. Thus the appropriate sample size for such analyses cannot be estimated through adoption of standard techniques. Previous work in CA has suggested that, for each predetermined subgroup of the main sample, a sample size of 30-100 is sufficient (Pearmain et al., 1991). One variable was identified which determines two subgroups, namely the source of the participant (i.e. participated in phase II and new

CHEO recruits). Taking a pragmatic approach for this exploratory study, we attempted to recruit all Phase II respondents from the Women's Perspective on Genetics Study who indicated their willingness to participate further (400) and 600 randomly selected English-speaking mothers whose children received inpatient care at CHEO during the period 2003-2004.

DATA COLLECTION

Participants were sent a package containing (a) a letter inviting them to participate in the study, (b) a participant information form describing the purpose of the study, what was involved with their participation and the potential implications of the study, (c) a questionnaire, (d) a form to request study results following the completion of the project and (d) a pre-addressed, postage-paid return envelope (Appendix 5-7). Using unique identifiers, non-respondents were identified and sent a reminder including a second CA questionnaire and a new covering letter after 4 weeks. Non-respondents remaining 4-6 weeks after the first reminder were sent a further copy of the questionnaire with another covering letter. If, after the second reminder package, participants did not return a completed package, they were removed from the mailing list and no further attempts were made to contact them. The data from all of the completed questionnaires were then coded and entered into an SPSS database. Each questionnaire was double entered to ensure accurate data entry.

ANALYSIS

Primary Analysis

A random effects probit model was used because of the repeated measurements of data from the same individuals (Jones 2001). At the time of writing, this was the standard approach to analyzing CA data. The function was estimated in the form,

$$V = \alpha + \beta i Ai + \gamma j + \theta + \varepsilon;$$

where V is a binary variable related to choosing a given scenario (where 1 = choosing a given scenario and 0 = not choosing a given scenario), Ai is the difference in each attribute between option A and B, θ is the error term due to differences amongst observations and ε is the error term due to differences between respondents.

The coefficients in the probit model indicated how much difference a unit change in the independent variable makes in terms of the cumulative normal probability of the dependent variable. Dummy variables were used for categorical attribute levels. Dummy variables are used in regression analysis for categorical variables where different values have no real numerical relationship with each other. For example, it does not make sense to code issues of consent as 1, 2 and 3 for compulsory screening, implied consent, and informed consent respectively, and to assume that informed consent has three times as much information or autonomy compared to compulsory screening. The number of dummy variables that must be created for a given categorical variable is one less than the number of levels for that variable. The coefficient of the dummy variable indicates how much the presence of that particular variable level, compared to the reference level, affects the cumulative probability of the independent variable.

Although logit models are much easier to estimate and the outcome of the regression much more intuitive to interpret they are limited in their usefulness for analyzing discrete choice CA data. This is due to the fact that they do not account for random preference variation over a population, they cannot account for correlation of unobserved factors over responses and they assume independence of irrelevant alternatives. Probit models, however, are able to deal with the limitations of logit models because they model random preference heterogeneity over a population, allow any form of substitution, and allow unobserved components of utility to be correlated as is the case with panel data. Probit models, however,

are also limited in that they assume an underlying normal distribution of errors, which is not the case with categorical variables (Train 2002). Though not ideal, probit models are the best model currently available for use with discrete choice CA data.

Marginal Rates of Substitution (MRS) were then calculated to characterize the intensity of respondents' preferences. MRS are the rate at which consumers are willing to give up units of one good in exchange for more units of another good. With categorical variables it represents what they are willing to give up to have the level of the categorical variable represented by the coefficient in the denominator. They are calculated by dividing the regression coefficient of one attribute (ß1) by the regression coefficient of another attribute (ß2). The corresponding ratio indicates what quantity of the attribute corresponding to ß2 a respondent is willing to given up in order to achieve improvements in the attribute corresponding to ß1.

A Wald test statistic was used to test the statistical significance of the interaction between the sampling group (Group 1 or Group 2) and the attributes of a newborn screening scenario. This was to test the effect of priming the ethical, legal and social issues of genetic testing had on women' preferences. If the coefficient of any of the interaction terms was statistically significant, the random effects probit model was estimated separately for each distinctive level of the categorical variable (i.e. each sampling group)

Secondary Analysis

This same process to test for the significance of interaction terms was performed creating an interaction term between the attributes and respondents' answer to the following survey questions:

i) If you were/are pregnant now, would you want your child to have newborn screening?

ii) If you were/are pregnant now, how would you prefer that newborn screening was offered?

iii) Simple ranking task: attribute ranked most important

ETHICS

An initial joint application was submitted to the CHEO Research Ethics Board for all 3 phases of the Women's Perspective on Genetics Study. Amendments to the application for the Phase III CA were submitted including changes to the participant information sheet and invitation letters and approval for the completed CA survey (see Appendix 4).

RESULTS

RESPONSE RATES

A total of 1000 participants were mailed pencil in hand questionnaires with two reminders if they had not already returned the questionnaire. Six hundred of these participants were randomly drawn from a CHEO sampling unit (Group 1) and the remaining 400 had participated in Phase II of the Women's perspective on genetics study and indicated their willingness to be contact for a future survey (Group 2). After excluding 97 invalid addresses, the overall response rate was 47.1% (Table 5). Group 1 had a lower response rate than group 2.

Table 5: Initial response rates and final sample sizes

	Group 1	Group 2	Combined
Individuals asked to participate (n)	600	400	1000
Returned surveys due to incorrect address (n)	95	2	97
Completed surveys (n)	166	259	425
Response Rate	32.9%	65.1%	47.1%

Of 425 respondents, 61 were removed from the analysis for incorrectly answering the internal consistency question (Figure 3), and 10 were removed for failing to answer any of

	Scenario E	Scenario F
ISSUE # 1: Chance that a "positive" test result is wrong	15% of all positive test results are wrong	5% of all positive test results are wrong
ISSUE # 2: Chance that a "positive" test result is wrong	15% of all negative test results are wrong	5% of all negative test results are wrong
ISSUE # 3: Effect of early treatment	Improvement in quality of life, but normal lifespan *is* not restored	Improvement in quality of life and normal lifespan *is restored*
ISSUE # 4: Issues of Consent	*Implied Consent:* Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it	*Informed Consent:* Full information about the test is given to the parents. The test will not be done unless parents give consent to have it done
Which scenario would you prefer? *(please check one box only)*	❑	❑

Figure 3: Internal consistency questions to determine if respondents understood the CA task. Respondents who chose Scenario F over Scenario E were considered to have correctly answered the question

the 4 remaining pair-wise selections. This resulted in a total of 71 respondents being eliminated from the analysis. The final sample size was 354 including 135 respondents from Group 1 and 219 from Group 2.

SAMPLE DEMOGRAPHICS

Table 6 represents demographic information for respondents included in the analysis, respondents eliminated from the analysis and Group 2 non-respondents. Group 2 non-respondents, respondents included in the final analysis and respondents eliminated from the final analysis had similar demographic characteristics. The majority in each group was married or living with a common law partner and possessed at minimum a secondary school level of education.

Table 6: Demographic information

		Respondents with incomplete CA Task (n=71)		Respondents included in analysis (n=354)		Group 1 Respondents (n=135)		Group 2 Respondents (n-219)		Group 2 Non-respondents (n=163)	
Mean Age (years) (s.d)		35.6	(5.6)	36.1	(5.3)	35.9	(5.1)	36.2	(5.3)	34.7	(5.0)
Marital Status n (%)	Single	2	(2.8)	15	(4.2)	6	(4.4)	9	(4.1%)	9	(5.5%)
	Married or living with a partner	64	(90.1)	314	(88.7)	120	(88.9)	194	(88.6%)	147	(90.2%)
	Divorced or separated	5	(7.0)	21	(5.9)	7	(5.2)	14	(6.4)	6	(3.7)
	Widowed			3	(0.8)	1	(0.7)	2	(0.9)		
	Missing			1	(0.3)	1	(0.7)			1	(0.6)
Level of Education n (%)	Elementary			4	(1.1)	2	(1.5)	2	(0.9)	2	(1.2)
	Secondary	10	(14.1)	43	(12.1)	15	(11.1)	28	(12.8)	23	(14.1)
	Community college, technical college, or CEGEP	25	(35.2)	111	(31.4)	41	(30.4)	70	(32.0)	57	(35.0)
	University degree - undergraduate	12	(16.9)	91	(25.7)	37	(27.4)	54	(24.7)	36	(22.1)
	Professional degree	8	(11.3)	44	(12.4)	16	(11.9)	28	(12.8)	11	(6.7)
	University degree - graduate or higher	14	(19.7)	57	(16.1)	22	(16.3)	35	(16.0)	32	(19.6)
	Other education or training	2	(2.8)	3	(0.8)	1	(0.7)	2	(0.9)	1	(0.6)
	Missing			1	(0.3)	1	(0.7)			1	(0.6)

PRIMARY ANALYSIS

Conjoint Analysis Task

The frequency of all possible combinations of choices made by respondents who correctly completed the CA task is represented in Table 7. The combination of scenarios selected by respondents with the highest frequency was scenario A (versus scenario B), scenarios D (versus scenarios C), scenario H (versus scenarios G) and scenario I (versus scenarios J), chosen by 26.8% of respondents. This was followed closely by the combination of scenario B (versus scenario A), scenarios D (versus scenarios C), scenario H (versus scenarios G) and scenario I (versus scenarios J) chosen by 22.9% of respondents. There appeared to be quite a bit of heterogeneity in the combinations selected by respondents.

Table 7: Frequency of all possible combinations of responses to the randomly paired choices

All possible combinations of responses the pair wise CA scenarios	n (%)
A,C,G,I	2 (0.56)
A,C,G,J	0 0
A,C,H,I	7 (1.98)
A,C,H,J	0 0
A,D,G,I	19 (5.37)
A,D,H,I	95 (26.84)
A,D,G,J	15 (4.24)
A,D,H,J	55 (15.54)
B,C,G,I	5 (1.41)
B,C,G,J	2 (0.56)
B,C,H,I	24 (6.78)
B,C,H,J	2 (0.56)
B,D,G,I	13 (3.67)
B,D,H,I	81 (22.88)
B,D,G,J	25 (7.06)
B,D,H,J	9 (2.54)

Ranking of attributes on the basis of CA was performed using a random effects probit analysis of the combined data. The attributes issues of consent and effect of early treatment were recoded as dummy variables. The reference level for issues of consent was compulsory screening. For effect of early treatment, improvement in quality of life but lifespan was not restored was assigned as the reference level. The coefficients of the quantitative variables indicate how much a one unit change in the independent variable affects the cumulative probability of the dependent variable.

As shown in Table 8, all of the attributes were significantly associated with the dependent variable, cumulative probability of choosing a given scenario. The chance that a positive test result is wrong was negatively associated with the dependent variable, indicating that as the chance that a positive test result was wrong increased, the cumulative probability of choosing that scenario decreased. All other attributes were positively associated with the dependent variable. The coefficients for categorical variables indicate the effect that the presence of a given level of the categorical variable has on the cumulative probability of choosing a given scenario. For example, the presence of an implied consent strategy versus compulsory screening increased the cumulative normal probability of choosing a given scenario.

Table 8: Summary of random effects probit regression on combined sample

Attribute	Coefficient	Confidence Interval
Chance that a "positive" test result is wrong	-0.05	(-0.59, -0.39)
Chance that a "negative" test result is wrong	0.07	(0.06, 0.75)
Implied Consent Strategy[1]	0.84	(0.72, 0.96)
Informed Consent Strategy[1]	0.70	(0.56, 0.84)
Normal Lifespan Restored[2]	0.61	(0.52, 0.71)

1 versus the reference group of compulsory screening
2 versus the reference group where lifespan is not restored

Marginal rates of substitution (MRS) were also calculated to characterize the intensity of respondents' preferences and are presented in Table 9. By convention, signs are usually removed from the marginal rate of substitution; however they remain for ease of interpretation. The MRS indicate the rate at which respondents are willing to give up levels of one attribute in order to achieve improvements in the level of another attribute. Assuming that the results of the random effects probit regression are valid, respondents were willing to accept an additional risk of 12.85% (0.84/0.07) in the chance that a 'negative' test result is wrong in order to have an implied consent strategy.

Table 9: Marginal rates of substitution for each attribute with respect to all other attributes

ß1*	ß2*				
	Chance that a "positive" test result is wrong	**Chance that a "negative" test result is wrong**	**Implied Consent Strategy1**	**Informed Consent Strategy1**	**Normal lifespan Restored2**
Chance that a "positive" test result is wrong	1.00	-0.75†	-0.06	-0.07	-0.08
Chance that a "negative" test result is wrong	-1.33	1.00	0.08	0.09	0.11
Implied Consent Strategy[1]	-17.11	12.85	1.00	1.20	1.37
Informed Consent Strategy[1]	-14.22	10.68	0.83	1.00	1.14
Normal Lifespan Restored[2]	-12.51	9.40	0.73	0.88	1.00

* MRS = ß1/ ß2
1 versus the reference group of compulsory screening
2 versus the reference group where lifespan is not restored

In order to determine if the response on the CA task was different between the two sampling groups, the regression analysis was performed inserting an interaction term between the covariate group and the hypothetical newborn screening service attributes. If at least one of the interaction terms between the attributes and the covariate of interest was statistically significant, the random effects probit regression was performed separately for each level of the covariate. The relationship between the attributes and the outcome of choosing a given scenario did not depend on the covariate group, therefore no further analyses, grouped by the levels of the covariate sampling group, were performed (Table 10).

Table 10: Summary of analysis of the significance of interaction term between sampling group and the attributes of a hypothetical newborn screening service

Attribute	Wald $\chi 2$ p Value*
Chance that a "positive" test result is wrong	0.33
Chance that a "negative" test result is wrong	0.85
Issues of Consent	0.23
Effect of early treatment	0.43

*Analysis for the significance of an interaction term with the covariate of interest and sampling group. A p value < 0.05 indicates that the interaction term is significant and that the relationship between the independent and dependent variable is modified by the covariate of interest

Simple Ranking Task

Participants were asked to adopt the perspective of policy decision makers to rank the importance of the 4 attributes of a hypothetical newborn screening service. In order to successfully complete the task, respondents had to rank each attribute on a scale of 1 to 4 using each number only once and ranking each attribute once. Of the 354 respondents who were included in the final analysis, 32 respondents did not correctly complete the simple ranking task. The results from the 322 respondents who correctly completed the simple ranking task were that the majority of respondents, 216 (64.5%), ranked the effect of early treatment as the most important attribute followed by issues of consent with 59 (17.6%) respondents ranking it first. The chance that a positive and a negative test result are wrong were ranked most important by 34 (10.1%) and 26 (7.8%) respondents respectively. However, issues of consent was also ranked least important by the largest majority, 176 (53.2%), of the respondents (Figure 4).

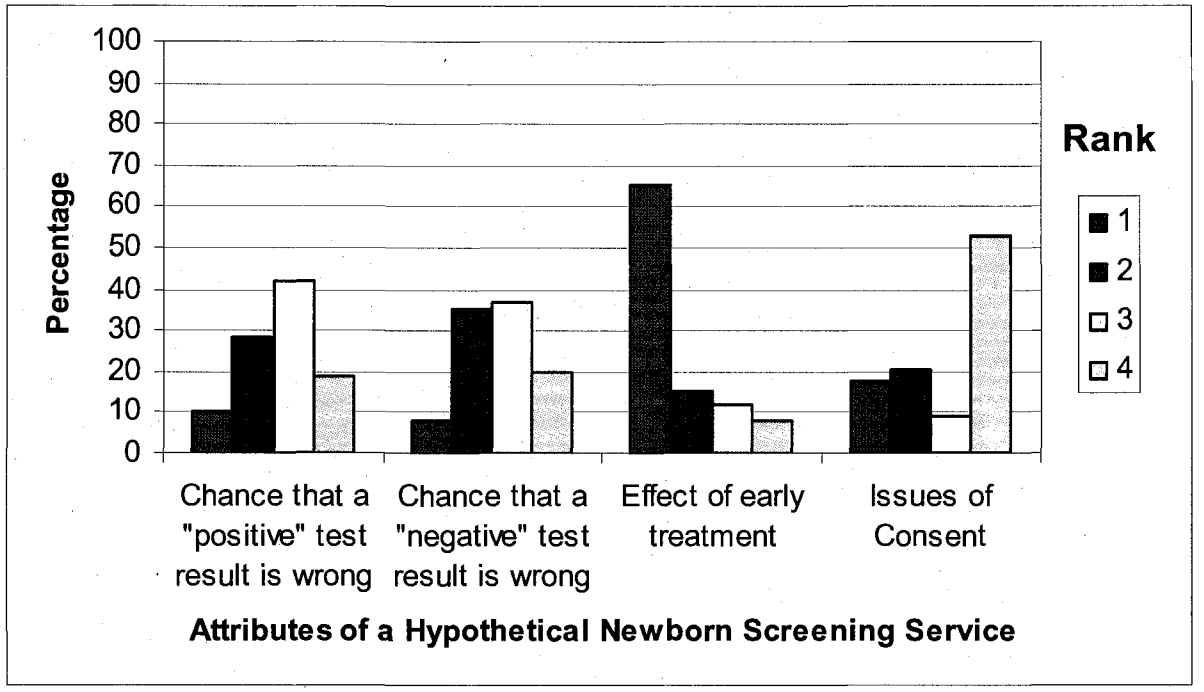

Figure 4: Ranking the importance of attributes for a hypothetical newborn screening service

Another way of conceptualizing the data concerning the simple ranking task is to identify the proportion of respondents who ranked a given attribute higher than another attribute (Table 11). The results are similar to the simple ranking from Figure 4 where the attribute "Effect of Early Treatment" was ranked higher than all other attributes by the largest proportion of respondents. The attribute "Issues of Consent" however, was ranked higher than all other variables by the smallest proportion of respondents. The attributes representing test accuracy were ranked higher than "Effect of Early Treatment" and "Issues of Consent" by a similar proportion of respondents.

Table 11: Proportion of respondents who ranked attribute 1 more important than attribute 2

	Attribute 1			
Attribute 2	Chance that a "positive" test result is wrong	Chance that a "negative" test result is wrong	Effect of early treatment	Issues of Consent
Chance that a "positive" test result is wrong	-	51.87	78.31	37.35
Chance that a "negative" test result is wrong	47.89	-	80.12	40.66
Effect of early treatment	21.39	19.59	-	21.39
Issues of Consent	59.94	59.04	78.31	-

SECONDARY ANALYSIS

In order to determine if the outcome of the CA task was mediated by covariates of interest, the random effects probit regression was performed inserting an interaction term between a covariate and the hypothetical newborn screening service attributes. The covariates of interest included the following:

i) If you were/are pregnant now, would you want your child to have newborn screening?

ii) If you were/are pregnant now, how would you prefer that newborn screening was offered?

iii) Simple ranking task: attribute ranked most important

Covariate: Would you want your child to have newborn screening?

The relationship between the attribute chance that a 'negative' test result is wrong was mediated by respondents' answer to whether, if they were/are pregnant now, they would want their child to have newborn screening (Table 12).

Table 12: Significance of the interaction terms between respondents' answer to the question "would you want your child to have newborn screening" and the attributes of a hypothetical newborn screening service

Attributes	Wald $\chi 2$ p Value*
Chance that a "positive" test result is wrong	0.06
Chance that a "negative" test result is wrong	0.24
Issues of Consent	<0.05
Effect of early treatment	0.10

*Analysis for the significance of an interaction term with the covariate of interest and sampling group. A p value < 0.05 indicates that the interaction term is significant and that the relationship between the independent and dependent variable is modified by the covariate of interest

The random effects probit analysis grouped by respondents' desire to have newborn screening indicated that participants who did not want newborn screening differed in the magnitude of preference for an implied and informed consent strategy over compulsory screening compared to those respondents who would want to have their child screened (Table 13).

Table 13: Summary of random effects probit regression grouped by respondents' answer to the question: "If you were/are pregnant now, would you want your child to have newborn screening?"

	Covariate: Would you want your child to have newborn screening?					
Attributes	Yes		No		Don't Know	
Chance that a "positive" test result is wrong	-0.05	(-0.06, -0.04)	-0.03	(-0.06, 0.002)	-0.02	(-0.08, 0.05)
Chance that a "negative" test result is wrong	0.07	(0.06, 0.08)	0.08	(0.05, 0.12)	0.00	(-0.06, 0.06)
Implied Consent Strategy[1]	0.78	(0.65, 0.92)	1.40	(0.97, 1.83)	0.52	(-0.22, 1.27)
Informed Consent Strategy[1]	0.56	(0.41,0.72)	1.76	(1.26, 2.26)	1.36	(0.46, 2.25)
Normal Lifespan Restored[2]	0.63	(0.52, 0.74)	0.70	(0.37, 1.03)	-0.02	(-0.62, 0.59)

1 versus the reference group of compulsory screening
2 versus the reference group where lifespan is not restored

Covariate: How would you prefer that newborn screening was offered?

The relationship between the attributes chance that a 'negative' test result is wrong and issues of consent were mediated by respondents' answer to whether, if they were/are pregnant now, how would [they] prefer that newborn screening was offered? (Table 14).

Table 14: Significance of the interaction terms between respondents' answer to the question "how would you prefer that newborn screening was offered" and the attributes of a hypothetical newborn screening service

Attributes	Wald $\chi 2$	p Value*
Chance that a "positive" test result is wrong	0.11	
Chance that a "negative" test result is wrong	<0.05	
Issues of Consent	<0.05	
Effect of early treatment	0.32	

*Analysis for the significance of an interaction term with the covariate of interest and sampling group. A p value < 0.05 indicates that the interaction term is significant and that the relationship between the independent and dependent variable is modified by the covariate of interest

The random effects probit analysis grouped by respondents' preference for the offer of newborn screening indicated that respondents who wanted an implied consent strategy preferred a lower chance that a "negative" test result was wrong, whereas those who wanted compulsory screening or informed consent preferred a higher chance that a "negative" test result is wrong (Table 15).

Table 15: Summary of random effects probit regression grouped by respondents' answer to the question: "If you were/are pregnant now, how would you prefer that newborn screening was offered?"

Attributes	Covariate: How would you prefer that newborn screening was offered?					
	Compulsory Screening		Implied Consent		Informed Consent	
Chance that a "positive" test result is wrong	-0.07	(-0.10, -0.03)	-0.07	(-0.88, -0.05)	-0.03	(-0.04, -0.01)
Chance that a "negative" test result is wrong	0.08	(0.05, 0.11)	-0.06	(0.04, 0.07)	0.08	(0.06, 0.10)
Implied Consent Strategy[1]	-0.98	(-1.40, -0.56)	0.91	(0.73, 1.09)	1.28	(1.07, 1.50)
Informed Consent Strategy[1]	-1.00	(-1.48, -0.53)	0.43	(0.23, 0.63)	1.62	(1.37, 1.87)
Normal Lifespan Restored[2]	0.70	(0.36, 1.03)	0.55	(0.41, 0.69)	0.72	(0.55, 0.89)

1 versus the reference group of compulsory screening
2 versus the reference group where lifespan is not restored

Covariate: Simple ranking task (attribute ranked most important)

The relationship between the attribute issues of consent and the outcome of choosing a given scenario was dependent upon respondents' attribute ranked first (Table 16).

Table 16: Significance of the interaction terms between respondents' attribute ranked most important and the attributes of a hypothetical newborn screening service

Attributes	Wald $\chi 2$ p Value*
Chance that a "positive" test result is wrong	0.29
Chance that a "negative" test result is wrong	0.09
Issues of Consent	<0.05
Effect of early treatment	0.17

*Analysis for the significance of an interaction term with the covariate of interest and sampling group. A p value < 0.05 indicates that the interaction term is significant and that the relationship between the independent and dependent variable is modified by the covariate of interest

The random effects probit regression grouped by the attribute that respondents ranked first indicated that respondents' strength of preference for method of consent differed depending on what attribute of the CA task they valued the most (Table 17).

Table 17: Summary of random effects probit regression grouped by the covariate "attribute ranked first"

Attributes	Chance that a "positive" test result is wrong		Chance that a "negative" test result is wrong		Issues of Consent		Effect of Early Treatment	
Chance that a "positive" test result is wrong	-0.08	(-0.11, -0.04)	-0.06	(-0.96, -0.02)	-0.02	(-0.05, 0.001)	-0.05	(-0.07, -0.04)
Chance that a "negative" test result is wrong	0.06	(0.02, 0.09)	0.04	(0.001, 0.07)	0.06	(0.03, 0.09)	0.07	(0.06, 0.08)
Implied Consent Strategy[1]	1.06	(0.65, 1.48)	0.61	(0.15, 1.06)	1.54	(1.18, 1.89)	0.72	(0.56, 0.87)
Informed Consent Strategy[1]	0.54	(0.09, 1.01)	0.55	(0.03, 1.06)	1.71	(1.32,2.11)	0.51	(0.33, 0.69)
Normal Lifespan Restored[2]	0.51	(0.18, 0.83)	0.35	(-0.01, 0.71)	0.48	(0.22, 0.74)	0.70	(0.57, 0.82)

1 versus the reference group of compulsory screening
2 versus the reference group where lifespan is not restored

Difficulty of the CA task

Overall, respondents felt that the CA task was more than moderately difficult to complete, with a mean rating of 6.3 (s.d. = 2.1) on a scale of 1 to 10, where 1 was very easy and 10, very difficult.

DISCUSSION

SIMPLE RANKING EXERCISES

Although simple ranking exercises are considered relatively easy to implement, the usefulness of the results that are generated remains questionable. This was clearly illustrated with the results of the current simple ranking task where the effect of early treatment was ranked as the most important attribute by the largest majority of respondents followed by issues of consent. However, issues of consent was also ranked as the least important attribute by the largest majority of respondents, making it difficult to interpret respondents' preference based on these results. A health technology assessment report published in 2001 (Ryan et al.) identified that simple ranking techniques were difficult to interpret due to the fact that they are on an ordinal scale in which the ratios between any two intervals are unknown. The ordinal nature of ranked data allows for more than one decision making rule to be applied to the output, resulting in different conclusions depending on the rule applied. However it is statistically incorrect to simply add up the ranking scores to determine a mean given that the spacing between the ranks is unknown (Maxwell and Bart 1995).

Furthermore, simple ranking exercises often do not consider the marginal context involved in decision making. For example, one might hypothesize that the ranking that respondents apply to the attributes of a hypothetical newborn screening scenario may be different for diseases such as PKU and CH where the benefits of screening clearly outweigh the harms, compared with a disease for which there is currently no available intervention. Finally, simple ranking exercises are unable to provide an estimate of strength of preference (Ryan et al. 2001). Therefore, an attempt at using a theoretically based, quantitative method

for eliciting user preferences, namely conjoint analysis, was employed to investigate its usefulness for health care in the Canadian context.

VALIDITY OF THE CONJOINT ANALYSIS EXERCISE

The methods used for the current study were consistent with those methods widely used in the health literature concerning the design and analysis of conjoint studies. On the face of it, it appears that respondents were able to complete the conjoint task. However, the sample was biased due to the low response rate and we cannot be sure that non-respondents would also have been able to complete the task or that their preference structure would have been similar to that of the study respondents. Overall, the confidence intervals of the random effects probit regression suggest that each attribute (including all levels for categorical attributes) significantly affected a respondent's cumulative probability of choosing a given scenario. Consistent with the simple ranking task, research conducted by Hosli and colleagues (2006) found, using focus group discussions, that "assuming the availability of effective early medical treatment, almost 100 percent [of participants in their study] were willing to participate in a screening programme." However, information concerning the direction of the effect of attributes on the cumulative probability of choosing a given scenario is over and above the information gained from the simple ranking task in this study or the focus group used by Hosli and colleagues.

An analysis was also performed inserting an interaction term between sampling group and each of the CA attributes to investigate the effect of priming on respondents' preference structure. To our knowledge, this is the first study to investigate the effect of 'priming' concerning the ethical, legal and social issues of genetic services on women's preference for the provision of a genetic service. The non-significance of the interaction terms suggests that

priming had no effect on respondents' preference structure or the time period between priming and the administration of the CA task was too long, thereby washing out any effect.

The overall preference structure appears to be reasonable with the exception of the coefficient for the attribute "chance that a negative test result is wrong". Assuming that the results of the conjoint task analysis are valid, the coefficient suggests that, all other things being equal, respondents appeared to prefer a higher chance that a negative test result was wrong (i.e. a preference for lower negative predictive value). There are a number of possible explanations for the counterintuitive result achieved from this conjoint exercise. One could hypothesize that i) this represents the true preference structure or ii) despite our attempt to carefully describe the attributes respondents misinterpreted the attributes of test accuracy. In the latter case, it could be a complete misunderstanding, and therefore the results are invalid. It is also possible that respondents might have interpreted the terms 'positive' and 'negative' in a manner that is not consistent with their use in testing for the presence of disease. That is, respondents may have erroneously associated 'positive' with 'good news' (e.g. 'baby healthy') rather than 'test indicates the disease is present' and erroneously associated 'negative' with 'bad news' (e.g. 'baby unhealthy') rather than 'test indicates the disease is absent'. If this is the case, then the description of attributes in the CA task was not sufficient for participants to understand the concepts of a positive and negative test result with respect to test performance. Since the respondents rated the conjoint task as fairly difficult (6.3 out of 10), the more conservative assumption is that there was at least some misunderstanding by respondents, and therefore it would be unsafe to assume that the results are valid. It is of some concern that, had the responses to the CA questions have been in line with the investigators' expectations, the results would probably have been assumed to be valid and

the conclusion would have been reached that CA was indeed a feasible method for examining public preferences.

Furthermore, that the frequency of possible responses was so variable and that any of the interaction terms between the covariates of interest and the attributes of a hypothetical newborn screening service were statistically significant calls into question the assumption of homogeneity of preferences between respondent required for aggregate analysis. However, additional analysis to determine the validity of the exercise and confirm the presence of preference structure heterogeneity is beyond the scope of this master's thesis. These findings prompted a review of alternative approaches to analysis of CA data reported in marketing and economics literature, in order to inform further exploration of the data.

AGGREGATE CHOICE MODELS

The convention in health care research is to use a random effects probit model for the analysis of choice based conjoint tasks (Ryan and Farrar 2000). The random effects probit choice model is based on the assumption that individuals will chose the scenario which maximizes their utility. Scenarios are given a share proportional to the individual's utility for each scenario and random errors are allowed for when translating the utilities into choice. In other words, each coefficient is comprised of a fixed and random component and the random component of the estimation captures the non-observable individual effects. While this type of aggregate level analysis is simple because the number of parameters being estimated tends to be small, it does not allow heterogeneity in preference structures between individual respondents. This is due to the fact that it assumes the coefficients are the same for all respondents. While the use of aggregate models for the analysis of choice based conjoint tasks may appear meaningful, when the resultant conclusions are counterintuitive, one begins

to question whether all respondents share the same preference structure or if there are subgroups with different preference structures.

Aggregate analyses also assume the use of a compensatory decision rule by respondents where deficits in a particular attribute of a good or service can be compensated by excesses in another attribute (Bradlow 2005). However behavioural research suggests that, in practice, many do not behave this way but rather use simplifying heuristics. Louviere argues that conventional methods for the analysis of conjoint data are "devoid of behavioural theory", focusing on fitting statistical models rather than relying on conceptual and behavioural frameworks (2006).

INDIVIDUAL CHOICE MODELS

Although the convention in health economics is to fit one regression model (i.e. a random effects probit model) providing conclusions based on aggregate level data, this assumes homogeneity of preferences among individual respondents. However, advancements in statistical methods now allow conjoint models to be estimated separately for each individual respondent using Hierarchical Bayesian (HB) analysis, thereby improving on conventional aggregate models.

The term hierarchical in HB models refers to the different levels of estimation associated with the analysis. An individual's parameters are described by a multivariable normal distribution consisting of a mean vector and variance-covariance matrix. Given an individual's parameter estimates, their probability of selecting a given profile is determined by the mathematical regression model chosen to analyze the data (e.g. probit, logit, etc) (Orme 2000). Therefore, HB analysis takes into consideration both aggregate level and individual level data in producing parameter estimates for individual respondents. If a respondent's preference structure fits well with the average preference structure, their

individual responses have the greatest influence on their parameter estimates. However, when an individual's preference structure deviates from the average, their individual parameter estimates are influenced primarily by the average estimates. This circumvents the difficulty of making reasonable individual estimates based on small individual sample sizes (i.e. the number of pair-wise scenarios presented in the conjoint task) (Johnson 2000). In other words, HB analysis approximates parameter estimates for each respondent by using information from the rest of the sample to stabilize the individual estimates (Orme 2000). HB estimators have been shown to be superior to ordinary least squares (OLS) estimates and can be used where OLS estimates fail due to insufficient data (Lenk et al. 1996;Judge et al. 1985;Lenk et al. 1996).

Although modeling individual preference structures may seem more appropriate than using aggregate choice models and assuming homogeneity of preference structures, is not without problems. HB analysis is extremely computationally demanding, taking many hours to many days to complete depending on the processing speed of the computer. This results from the issue of iteration specification. Following such an analysis, it is easy to see if convergence was achieved; however, knowing *a priori* how many iterations to specify in order to achieve convergence is difficult. To ensure convergence it is best to specify a high number of iterations, however this is computationally very intensive thereby significantly increasing the time it takes to complete the analysis (Johnson 2000;Orme 2000).

HB analysis also suffers from a significant methodological issue, namely enforcing order constraints. Order constraints refer to the fact that conjoint analysis is more successful when attribute levels are ordered such that they follow a "more is better" ordering. However, HB analysis does not have a theoretically sound approach to enforcing these order constraints (Johnson 2000).

Finally, the use of HB to model individual choice preferences may not be practical for choice based conjoint methods because the design results in little available data for each respondent making estimation of individual utilities difficult (Johnson 1996).

LATENT CLASS MODELS

Both aggregate and individual choice models are variable-centered approaches which emphasize the relationship between the attributes of the good or service. Recent advancements in marketing literature concerning choice modeling with conjoint data have led to the use of Latent Class (LC) models which allow the data to determine the classes or groups instead of defining groups *a priori*. These classes or groups, also known as segments, represent respondents who share a similar preference structure thereby avoiding the false assumption of homogeneity of preferences with aggregate choice modeling, and the onerous task of estimating coefficients for each respondent using HB analysis (Muthen 2001).

LC modeling is based on the conditional independence assumption where the segments account for the association between the independent variables (i.e. attributes) and the dependent variable (choice a given scenario). Conceptually this means that parameter estimates can differ across segments and potentially even the model. For the purpose of the binary outcomes used in choice based conjoint analysis, the probability of choosing a given profile changes across segments. The purpose of LC analysis is to i) identify variables that dictate segments, ii) estimate segment probabilities, iii) relate segment probabilities to covariates and iv) classify respondents into segments. Therefore LC analysis can be used to identify segment membership, thereby allowing for the preference structure to be estimated independently for each segment (Muthen 2001).

CA has garnered much attention internationally as a method for eliciting public preferences concerning different health care services (Phillips, Maddala, and Johnson

2002;Ratcliffe and Buxton 1999;Lewis et al. 2006b). However, obtaining valid results is extremely important given its potential use in the health care decision making process. Using random probit effects models for analysis of CA data was the convention at the time of the current CA survey design; however, LC analysis appears to be emerging in marketing literature as the most useful and widely accepted method for the analysis of CA data (Muthen 2001).

LIMITATIONS OF THE CURRENT CA TASK

Several limitations of this study need to be acknowledged. First only four attributes of a hypothetical newborn screening service were included in the conjoint task, of which 2 were categorical variables (i.e. effect of early treatment and issues of consent). Interpretation of the coefficient for categorical variables, such as issues of consent, can be difficult due to the fact that they contain a large amount of information. For the categorical variable effect of early treatment, the coefficient represents the effect that restoring a normal lifespan has on the cumulative probability of a respondent choosing a given scenario. However, for the categorical variable issues of consent, the coefficient represents the effect that the presence of an implied or informed consent strategy (versus compulsory screening) has on the cumulative probability of a respondent choosing a given scenario. For this categorical attribute we are unable to determine if the coefficients are reflective of an increase in the amount of information provided, an increase in parental autonomy, or some combination of the two. Future attempts to include this information rich attribute within a conjoint task may consider survey questions prior to or following the conjoint task to determine whether information, autonomy, or a specific combination of the two is most important when considering issues of consent.

Second, order constraints whereby attribute levels follow a "more is better" ordering were not enforced. Order constraints are not stressed in health literature concerning the design of conjoint tasks and the importance of having attributes that follow this rule may not be intuitive. However, when an attempt was made to interpret the calculated MRS for the attribute levels in the current conjoint task, it quickly became apparent that failing to follow order constraints compounded by the presence of counterintuitive coefficient estimates for the accuracy attributes resulted in MRS estimates that were difficult to interpret. Many of the MRS did not represent situations where sacrifices were made in the levels of one attribute in order to achieve increases in another.

CONCLUSION

This study suggests that mothers of young children are generally willing to participate in research designed to inform policy decision making around newborn screening issues. However, if policy decision makers wish to engage 'publics', they must do so in ways which provide valid information and which are feasible and economically sustainable. Conjoint analysis may be a useful, theoretically based method for eliciting user preferences concerning the provision of health care services (Ryan and Hughes 1997;Phillips, Maddala, and Johnson 2002;Ryan and Farrar 2000;Ryan 1999b), but this study shows that care must be taken in design, analysis and interpretation. As in all self-report surveys, the validity of the instrument depends on whether respondents actually understand the questions, as well as other factors. This is especially important in complex surveys such as conjoint analysis. Also, limitations to the usefulness of probit analysis have been identified. Other analytical approaches, such as latent class analysis, merit further examination to determine their validity and the value of the information they may provide.

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APPENDICES 1-8

Appendix 1: Introductory Letter for Pilot

uOttawa

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September 20, 2007

Ms. [First Name] [Last Name]
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[Postal Code]

Dear Ms. [Last Name]

Thank you very much for helping with our research by completing the Women's Perspective on Genetics Questionnaire. We are now in the final phase of our three-part project. I am contacting you because you indicated that you were interested in possibly participating in future studies. We are in the process of completing the design of the final questionnaire survey, and would like your feedback to help us make improvements to the questionnaire before it is sent out to the larger group. A lot of work has already gone in to the design of the questionnaire, but we need to know whether people have any problems understanding and filling it in. Participation in this portion of the study is completely anonymous.

I hope that you will agree that this stage of the project is worthwhile, and consider assisting us by filling in the survey and providing your feedback. If you are willing to help, please complete the enclosed questionnaire and then provide your feedback in the last section. It might also be helpful to write any comments you have on the actual questionnaire while you are filling it in. All of the information you need to complete the task is included in the enclosed survey. Many thanks for your help.

Yours sincerely,

Dr. Brenda J. Wilson
Principal Investigator

Appendix 2: Pilot Conjoint Analysis Survey

Newborn Screening Questionnaire

GENESENS

DE LA DÉCOUVERTE À LA SANTÉ

TRANSLATING DISCOVERIES INTO HEALTH

This questionnaire is about newborn screening for genetic and metabolic diseases. This questionnaire is *not* being used to evaluate any screening your child might have had.

All your responses will be kept confidential. Your name is not on the questionnaire. We would like you to try to answer all the questions if you can.

This survey is set up in two sections. The first section covers some of the issues that decision makers have to deal with when designing a screening service. We have provided some background information on these issues so that you are well prepared to answer the questions that follow. **We would like you to think about these questions as if you were making decisions about Canada's health care.**

The second section covers questions about you and your experiences with newborn screening.

Taking into consideration all of these issues when designing a screening program is a difficult task for decision makers. You may also find these issues challenging, so please do not feel discouraged if it requires some thought and effort to complete. Our experience shows that most people are able to answer the questions in Section 2.

If you have any questions or concerns, please contact Beth Potter or Julia Frei at:

SECTION 1

Background Information & Instructions

CHALLENGES FACED BY DECISION MAKERS

Up until now, newborn screening has been fairly straightforward because it has been used to identify babies who are risk for diseases where:

- The disease is present at birth
- The symptoms of the disease are difficult to detect at an early age
- If left untreated, the disease can result in:
    - mental disability *and/or*
    - physical disability *and/or*
    - death
- Early treatment of the disease can reduce the negative effects of the disease

The challenge now is to make decisions about screening for diseases where the balance between the benefit and the harm of screening *is not so clear*. We wish to use a hypothetical disease to explore some of these issues.

HYPOTHETICAL DISEASE

For this study we are interested in newborn screening for a hypothetical disease that, if left untreated, results in:

- moderate disability

AND

- reduced lifespan

Moderate Disability

People with a moderate disability may live fairly independent lives. They may have jobs, relationships and families. They may also have:

- a daily routine of therapy and/or medications
- frequent visits to the doctor
- declining health which reduces their ability to function independently

Reduced lifespan

The average lifespan for people *with* the disease is 40 years. However, the average lifespan for people *without* the disease is 78 years.

ISSUE # 1

There is a chance that a "positive" test result is wrong

A "positive" test result means a result suggesting that the person *has* the disease. However, tests are never perfect. A positive test result can wrongly label a child as *having* a disease when they *do not*. The unfavourable consequences of having a positive test result that is wrong include the following:

1. Parents and family may suffer from anxiety because they think that their child *has* a disease when the child really *does not*
2. The child may undergo painful or distressing medical tests before the disease is ruled out
3. Scarce healthcare resources may have to unnecessarily be used to pay for early treatment of a disease that the child *does not have*

We present two levels for the chance that a positive test result might be wrong:

- 5% of all positive test results are wrong
- 15% of all positive test results are wrong

ISSUE # 2

There is a chance that a "negative" test result is wrong

A "negative" test result means a result suggesting that the person *does not have* the disease. However, tests are never prefect. A negative test result can wrongly label a child as *not having* a disease when they really *do*. The unfavourable consequences of having a negative test result that is wrong include the following:

1. Early treatment of the disease may not occur so the child may:
   - develop a physical disability *and/or*
   - develop a mental disability *and/or*
   - suffer from a shortened lifespan
2. Parents and family may suffer from anxiety because they do not understand the cause of their child's poor health
3. Scarce healthcare resources may have to be used to pay for treatment of disabilities which occurred because early diagnosis was missed

We present two levels for the chance that a negative test result might be wrong:

- 5% of all negative test results are wrong
- 15% of all negative test results are wrong

ISSUE # 3

The effect of early treatment on the disease

The outcome following early treatment refers to the impact of a treatment for babies with the disease. The treatment could be to improve the quality of life of the child and to try to ensure a normal lifespan. We present two levels that the effect of early treatment might be:

- Improvement in quality of life *and normal lifespan is restored*
- Improvement in quality of life, *but normal lifespan is not restored*

ISSUE # 4

Issues of Consent

There is a delicate balance between the need to protect a parent's right to manage their child's care and the need to ensure that the best interest of the child is always protected.

We present three levels of balance between respecting parents' rights and the need to ensure the best interest of the child is protected:

- **Compulsory**: Every child must be screened, and parents have no choice
- **Implied Consent**: Information about the test is given to the parents. The test will be done *automatically* unless the parents indicate they *do not* want it
- **Informed Consent**: Full information about the test is given to the parents. The test will *not* be done unless parents *give consent* to have it done

	Advantages	Disadvantages
Compulsory	Best chance that all children with the disease will be identified early	Most difficult to ensure that parents are informed about screening Greatest chance that parents will feel that their rights are ignored
Implied Consent	More likely that parents are well informed about screening More likely that parents will feel that their rights are respected	Small chance that children with the disease will *not* be diagnosed
Informed Consent	Best chance that parents are well informed about screening Greatest chance that parents will feel that their rights are respected	Greatest chance that children with the disease will *not* be diagnosed

ISSUE # 5

Scarce healthcare resources

In a healthcare system like Canada's, public healthcare funding would usually pay for newborn screening. Consequently, a newborn screening program would consume scarce public healthcare resources. One way to find out how much you value newborn screening is to find out how much you would be willing to pay if the service were no longer covered by public health care. We present three levels that the cost of the test might be:

- $30
- $60
- $90

Questions about preferences

If you were a decision maker, how important would the following factors be in deciding what an appropriate newborn screening test is. We would like you to rank these factors in order of importance using a scale of 1-5 (mark 1 for most important, 2 for second most important, etc.).

Characteristic of Newborn Screening Service	**Rank**
• Chance that a Positive Test Result is Wrong	☐
• Chance that a Negative Test Result is Wrong	☐
• Effect of Early Treatment	☐
• Issues of Consent	☐
• Cost of the Test	☐

We would now like you to choose between the different possible newborn screening scenarios.

- Please look at each scenario and tick (✓) the scenario that, if you were a decision maker, you would *prefer* was offered
- Please keep in mind that there are no right or wrong answers; we are interested in your opinion
- You may wish to refer back to the BLUE sheets to help you answer the following questions

	Scenario A	Scenario B
ISSUE #1: Chance that a "positive" test result is wrong	5% of all positive test results are wrong	15% of all positive test results are wrong
ISSUE #2: Chance that a "negative" test result is wrong	15% of all negative test results are wrong	15% of all negative test results are wrong
ISSUE #3: Effect of early treatment	Improvement in quality of life *and normal lifespan is restored*	Improvement in quality of life, *but normal lifespan is not restored*
ISSUE #4: Issues of Consent	*Compulsory*: every child must be screened, and parents have no choice	*Implied Consent*: Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it
ISSUE #5: Cost of the test	$30	$60

Which test would you prefer? ❑ ❑
(Please check one box only)

	Scenario C	Scenario D
ISSUE #1: Chance that a "positive" test result is wrong	5% of all positive test results are wrong	5% of all positive test results are wrong
ISSUE #2: Chance that a "negative" test result is wrong	5% of all negative test results are wrong	15% of all negative test results are wrong
ISSUE #3: Effect of early treatment	Improvement in quality of life, *but normal lifespan is not restored*	Improvement in quality of life *and normal lifespan is restored*
ISSUE #4: Issues of consent	*Implied Consent*: Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it	*Informed Consent*: Full information about the test is given to the parents. The test will not be done unless parents give consent to have it done
ISSUE #5: Cost of the test	$30	$90

Which test would you prefer? ❑ ❑
(Please check one box only)

	Scenario E	Scenario F
ISSUE #1: Chance that a "positive" test result is wrong	15% of all positive test results are wrong	15% of all positive test results are wrong
ISSUE #2: Chance that a "negative" test result is wrong	15% of all negative test results are wrong	5% of all negative test results are wrong
ISSUE #3: Effect of early treatment	Improvement in quality of life, *but normal lifespan is not restored*	Improvement in quality of life *and normal lifespan is restored*
ISSUE #4: Issues of consent	*Implied Consent*: Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it	*Informed Consent*: Full information about the test is given to the parents. The test will not be done unless parents give consent to have it done
ISSUE #5: Cost of the test	$30	$30

Which test would you prefer? ❑ ❑
(Please check one box only)

	Scenario G	Scenario H
ISSUE #1: Chance that a "positive" test result is wrong	15% of all positive test results are wrong	5% of all positive test results are wrong
ISSUE #2: Chance that a "negative" test result is wrong	15% of all negative test results are wrong	5% of all negative test results are wrong
ISSUE #3: Effect of early treatment	Improvement in quality of life, *but normal lifespan is not restored*	Improvement in quality of life, *but normal lifespan is not restored*
ISSUE #4: Issues of consent	*Compulsory*: Every child must be screened, and parents have no choice	*Implied Consent*: Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it
ISSUE #5: Cost of the test	$90	$90

Which test would you prefer? ❑ ❑
(Please check one box only)

	Scenario I	Scenario J
ISSUE #1: Chance that a "positive" test result is wrong	15% of all positive test results are wrong	5% of all positive test results are wrong
ISSUE #2: Chance that a "negative" test result is wrong	15% of all negative test results are wrong	5% of all negative test results are wrong
ISSUE #3: Effect of early treatment	Improvement in quality of life, *but normal lifespan is not restored*	Improvement in quality of life *and normal lifespan is restored*
ISSUE #4: Issues of consent	*Implied Consent*: Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it	*Informed Consent*: Full information about the test is given to the parents. The test will not be done unless parents give consent to have it done
ISSUE #5: Cost of the test	$90	$30

Which test would you prefer? ❑ ❑
(Please check one box only)

	Scenario K	Scenario L
ISSUE #1: Chance that a "positive" test result is wrong	5% of all positive test results are wrong	15% of all positive test results are wrong
ISSUE #2: Chance that a "negative" test result is wrong	15% of all negative test results are wrong	5% of all negative test results are wrong
ISSUE #3: Effect of early treatment	Improvement in quality of life *and normal lifespan is restored*	Improvement in quality of life *and normal lifespan is restored*
ISSUE #4: Issues of consent	*Implied Consent*: Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it	*Compulsory*: Every child must be screened, and parents have no choice
ISSUE #5: Cost of the test	$30	$60

Which test would you prefer?
(Please check one box only) ❑ ❑

	Scenario M	Scenario N
ISSUE #1: Chance that a "positive" test result is wrong	15% of all positive test results are wrong	15% of all positive test results are wrong
ISSUE #2: Chance that a "negative" test result is wrong	5% of all negative test results are wrong	5% of all negative test results are wrong
ISSUE #3: Effect of early treatment	Improvement in quality of life *and normal lifespan is restored*	Improvement in quality of life *and normal lifespan is restored*
ISSUE #4: Issues of consent	*Implied Consent*: Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it	*Implied Consent*: Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it
ISSUE #5: Cost of the test	$30	$90

Which test would you prefer?
(Please check one box only) ❑ ❑

	Scenario O	Scenario P
ISSUE #1: Chance that a "positive" test result is wrong	5% of all positive test results are wrong	5% of all positive test results are wrong
ISSUE #2: Chance that a "negative" test result is wrong	15% of all negative test results are wrong	5% of all negative test results are wrong
ISSUE #3: Effect of early treatment	Improvement in quality of life *and normal lifespan is restored*	Improvement in quality of life, *but normal lifespan is not restored*
ISSUE #4: Issues of consent	*Implied Consent*: Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it	*Compulsory:* Every child must be screened, and parents have no choice
ISSUE #5: Cost of the test	$60	$30

Which test would you prefer? ❑ ❑
(Please check one box only)

	Scenario Q	Scenario R
ISSUE #1: Chance that a "positive" test result is wrong	5% of all positive test results are wrong	15% of all positive test results are wrong
ISSUE #2: Chance that a "negative" test result is wrong	5% of all negative test results are wrong	15% of all negative test results are wrong
ISSUE #3: Effect of early treatment	Improvement in quality of life, *but normal lifespan is not restored*	Improvement in quality of life, *but normal lifespan is not restored*
ISSUE #4: Issues of consent	*Informed Consent*: Full information about the test is given to the parents. The test will not be done unless parents give consent to have it done	*Informed Consent*: Full information about the test is given to the parents. The test will not be done unless parents give consent to have it done
ISSUE #5: Cost of the test	$60	$30

Which test would you prefer? ❑ ❑
(Please check one box only)

1. How difficult/easy did you find the last 9 questions on choice of newborn screening? (*please circle*)

Very Easy				**Moderate**					**Very Difficult**
1	2	3	4	5	6	7	8	9	10

Questionnaire Feedback

We would like to know how easy or difficult it was for you to fill out this questionnaire. It will help us work out how much we should change it before we distribute it more widely.

1. Roughly how long did it take you to complete this questionnaire? _____

2. Overall, did you find the survey clear and easy to understand?

   ❑ Yes

   ❑ No

3. Were any words or questions confusing or unclear?

   ❑ Yes

   If yes, which ones? (*please specify*) _____

   _____

   _____

   _____

   ❑ No

4. Do you think any questions should be changed or reworded?

   ❑ Yes

   If yes, which ones? (*please specify*) _____

   _____

   _____

   _____

   ❑ No

5. How do you feel about the length of the questionnaire? (*please specify*) _____

_____

_____

_____

6. Did you have any problems reading or understanding the directions?

❑ Yes

If yes, which ones? (*please specify*) _____

_____

_____

_____

❑ No

7. Do you have any additional comments or suggestions as to how we can improve any questions or the survey as a whole? (*please specify*) _____

_____

_____

_____

_____

_____

_____

Thank you for your participation. Please return the questionnaire in the envelope provided

Appendix 3 Comments from Pilot Questionnaire

1. Roughly how long did it take you to complete this questionnaire?

→10 minutes
→15 minutes
→15-20 minutes
→25 minutes
→30 minutes
→35 minutes
→45 minutes (3)

2. Overall, did you find the survey clear and easy to understand?

→Yes (10)

→No (0)

3. Were any words or questions confusing or unclear?

→Yes (4)

If yes, which ones? (please specify)
→ "Scenario M and N, Issues # 1,2,3, and 4 are all the same; however, Issue 5: Cost of the test is different what would cause this difference? "
→ "The first 9 questions were confusing but then I went back to the characteristics of NSS"
→ "The first part of the questionnaire was very repetitive and dragged on to long! "
→ "Consent questions did become a little confusing"

→No (6)

4. Do you think any questions should be changed or reworded?

→Yes (2)

If yes, which ones? (please specify)
→ "The fist 9 questions, maybe make it clear & shorter?"
→ "The whole first part regarding scenario's – make it simple and straight to the point"

→No (8)

5. How do you feel about the length of the questionnaire? (please specify)

→ "Its not a long time to finish"
→ "The length of the questionnaire is suitable given the importance of the decisions"
→ "The length is fair, the info needed is obtained and is not asking for a great deal of time from those participating, thus no excuse not to do it!"
→ "Its ok"
→ "Good"
→ "Okay, fast to answer"
→ "Kind of short..."
→ "Did not take too long. The length is fair"
→ "Good"

6. Did you have any problems reading or understanding the directions?

→Yes (3)

If yes, which ones? (please specify)
→ "The characteristic of newborn screening service, wasn't sure if you were to use the 1-5 #'s once of if you could use the same numbers"
→ "Upon reading the instructions for the first time, I initially thought I was to tick either scenario A or scenario B for each individual issue and not just the bottom box. After further readings, it occurred to me that we are to pick only one column and not the individual boxes. From my personal perspective, it would have helped me to have the words "the box below the scenario" added. It would have some time deciphering the instructions."
→ "A bit confusing at first but come together with practice and knowing your decisions on choices."

→No (7)

7. Do you have any additional comments or suggestions as to how we can improve any questions or the survey as a whole? (please specify)

→ "Direct, clear, shorter"
→ "I found it stupid, you asked the same questions over and over – where I gave up answering them. My main concern is for parent's to have some say in there childs life. These test's should be the parent's decision no matter what."
→ "No, not really"
→ "It is hard to turn of your 'parent brain' and think of the 'greatergood

Appendix 4: Ethics Approval

Annual Renewal Report

PLEASE ATTACH THE FOLLOWING:

- Revised documents with all changes highlighted (with any and all changes appearing in bolded text).
- Revised documents printed on original letterhead (two copies required).

FOR ONGOING RESEARCH PROJECTS, ANNUAL RENEWAL REPORTS MUST BE SUBMITTED TO THE RESEARCH ETHICS BOARD ON AN ANNUAL BASIS. TO ENSURE TIMELY RENEWAL, PLEASE ENSURE THAT YOUR DOCUMENTATION IS SUBMITTED TO THE REB 60 DAYS PRIOR TO REQUIRED RENEWAL.

Signature of CHEO Site Investigator:	Date:
	7-Mar 06

Please forward to:

Mrs. Sharon Haig, Ethics Coordinator
Research Ethics Board, Children's Hospital of Eastern Ontario
Room R250F, 401 Smyth Road, Ottawa, Ontario, K1H 5N1
Telephone: (613) 737-7600, ext. 3272

CHEO Research Ethics Board - APPROVAL

Chair's Signature: _____

Date: May 15, 2006

Université d'Ottawa · University of Ottawa

Faculté de médecine
Épidémiologie et médecine sociale

Faculty of Medicine
Epidemiology and Community Medicine

(613) 562-5800 extension 8261•bwilson@uottawa.ca

November 17, 2005

Dr. Carole Gentile
Chair, Research Ethics Board
CHEO Research Institute
401 Smyth Rd, room 230
Ottawa, ON K1H 8L1

Dear Dr. Gentile,

Re: Protocol #04/37E – Women's Perspectives on Genetics: Knowledge, Values, and Priorities

Please find enclosed the questionnaire for phase 3.

A willingness to pay question was added to section 2, the final section of the survey, which includes questions about demographics and personal experiences with newborn screening. The questionnaire for phase 3 was pilot tested on women who completed the phase II survey and indicated that they were interested in being contacted for future studies. The pilot included a similar cost question that was incorporated as an attribute in the conjoint analysis section. We did not receive any feedback indicating the cost element of the questionnaire was intrusive, offensive, or distressing.

I trust that the above information is helpful in reviewing the amended documents. If you have any outstanding questions please do not hesitate to contact me.

Yours truly,

CHEO Research Ethics Board
APPROVAL
Chair's Signature. _____
Date: November 18, 2005

Dr. Brenda Wilson MB ChB, MSc MRCP(UK), FFPH
Associate Professor

451, ch. Smyth
Ottawa (Ontario) K1H 8M5 Canada

451 Smyth Rd.
Ottawa, Ontario K1H 8M5 Canada

(613) 562-5410 • Téléc./Fax (613) 562-5465

RECEIVED MAR 0 8 2006

Research Ethics Board

Annual Renewal Report

REB Protocol Number:	#04/37E	Sponsor's Protocol Number:	
Protocol Title:	Women's Perspectives on Genetics: Knowledge, Values and Priorities		
CHEO Study Investigator:	Mario Cappelli	**Telephone:** (613) 737-7600 ext. 2492 (**Email:** cappelli@cheo.on.ca	

CHEO Co-Investigators:

Name:	Division or Dept:	Telephone:	Email:
Brenda Wilson	University of Ottawa	613) 562-5800 ext. 8261	bwilson@uottawa.ca
Doug Coyle	University of Ottawa	(613) 562-5800 ext. 8690	dcoyle@uottawa.ca
Ian Graham	Ottawa Health Research Institute	(613) 798-5555 ext. 18173	igraham@ohri.ca
Mark Walker	Ottawa Health Research Institute	(613) 739-6655	mwalker@ohri.ca

Have any of the co-investigators been added or removed since the last approval? ☐ Yes ☒No

If new investigators have been added, include a letter and a copy of the signature page for the coinvestigator

Last approval or renewal date:	March 23, 2005
Number of subjects recruited locally since last approval:	740
Number of local withdrawals since last approval:	6
Total number of subjects recruited at this site since the beginning of the study:	740
Total number of withdrawals at this site since the beginning of the study:	6

Main Reason for withdrawals: Participants do not have time to complete the questionnaire and the Phase III Conjoint Analysis survey is more complex than the Phase II survey

Projected date of study completion: August 2006

Has there been any departure from the approved protocol procedures (please describe below):

- Inclusion/Exclusion Criteria ☐ Yes ☒No
- Source of subject (patient) population? ☐ Yes ☒No
- Other?

Please describe:

401 Smyth Road, Ottawa, ON K1H 8L1, Canada
Tel: (613) 737-7600 www.cheo.on.ca

401, chemin Smyth, Ottawa (ON) K1H 8L1, Canada
Tél.: (613) 737-7600 www.cheo.on.ca

Annual Renewal Report

Has an amendment form been submitted to the REB for review of these changes?

☐ Yes ☐No If yes, date approved:

Has the consent form been modified since last approval? ☐ Yes ☒No

Has the REB been informed of these changes? ☐ Yes ☐No If yes, indicate date approved:

Has any unexpected side effects, adverse events, or findings beennoted since last approval? ☐ Yes ☒No

Has the REB been informed of these? ☐ Yes ☐No If yes, indicate date approved:

Has any information appeared in the literature, or evolved from this or other similar ongoing studies (including interim analyses), since the date of last approval that might affect the perception of the risks and benefits of the study? ☐ Yes ☒No

If yes, provide this information and your assessment of it in the section on progress of the study). Has the REB been informed of these? ☐ Yes ☐No If yes, indicated date submitted:

IN THE SPACE BELOW, BRIEFLY DESCRIBE THE PROGRESS OF THE STUDY TO DATE. Renewals cannot be considered if this section is not complete. PLEASE TYPE OR PRINT CLEARLY.

In August of 2005, 1600 randomly selected mothers, whose children aged 10 years or younger received inpatient care at CHEO during 2003-2004, were mailed a package inviting them to participate in the Phase II questionnaire survey. Two reminder packages were sent for those mothers who had not yet returned a questionnaire or who had not indicated their desire to be removed from the study participant list. Of the 1600 mothers who were invited to participate, 563 returned a completed questionnaire. Participants were also given the opportunity to participate in the Phase III Conjoint Analysis survey of women's preferences for newborn screening. 400 of the 562 participants who returned a completed questionnaire indicated their willingness to participate in future studies.

The phase III questionnaire consisted of two distinct groups. The first was 600 randomly selected mothers from CHEO sampling, who were not sampled for participation in Phase II. The second group consisted of all participants who completed the Phase II questionnaire survey and indicated their willingness to participate in future studies. Similar to the protocol in Phase II, a package was mailed on January 24th, 2006 inviting the mothers to participate in the Phase III survey. The first reminder package was mailed on February 20th, 2006. A final reminder will be mailed in March or April of 2006.

Appendix 5: Introductory Letters and Information Sheet for Group 1 (i.e. new CHEO recruits)

Voluntary Participation and Withdrawing from the Study
You are under no obligation to participate in this study. Your decision to participate or not in this study will not affect the care you receive at CHEO. You are free to withdraw from the study at any time and there will be no penalty to you or your child.

Expenses
There are no expenses provided for taking part in this study.

Confidentiality
Your personal information will be kept confidential. You will not be identified to the investigators or in any publication or presentation of this study. Any personal information about you that leaves the hospital will be coded so that you cannot be identified by name.

If you choose to participate, when your questionnaire is received, your replies will be entered onto a computer database for analysis. Since the questionnaire is coded, your name, or other identifying information, will not appear on the computerized data. The questionnaires will be kept in a secure location, only accessible to the investigators and their research team. Once the study is complete, and no further analyses are required, the codes will be permanently removed from computerised data so that they cannot be linked with the individual participants.

Questions
If you have any questions or would like to speak to the investigators of this study, you are free to call Dr. Brenda Wilson at (613) 562 5800 ext 8261, or Dr. Mario Cappelli at (613) 737-7600 ext 2492. They will be happy to talk to you without any obligation on your part.

The Research Ethics Board (REB) is a group of people from scientific and non-scientific backgrounds that reviews research studies. Its goal is to ensure the protection of the rights and welfare of people involved in research. You may contact the Chair of the REB for information regarding patients' rights in research studies at 737-7600 ext 3272, although this person cannot provide any health-related information about the study.

A form entitled "Request for Study Results" is included with this package. If you would like to know the results of this study, print your name and address on the form and return it to us with the completed questionnaire. A summary of the results will be mailed to you at the conclusion of the study.

Children's Hospital of Eastern Ontario
Centre hospitalier pour enfants de l'est de l'Ontario

CHEO Research Ethics Board
APPROVAL
Chair's Signature: _____
Date: November 8, 2005

[date]

[name of potential participant]
[address of potential participant]
[city, province, postal code]

Dear [name of potential participant],

I am writing to you as the Chief of the Division of Pediatric Medicine to tell you about a research study based at the Children's Hospital of Eastern Ontario (CHEO). The project is about women's views on genetic testing, and it has been approved by the CHEO Research Ethics Board. The research team running this study is led by Dr. Brenda Wilson of the University of Ottawa. Dr. Mario Cappelli of CHEO is one of the investigators along with colleagues at the Ottawa Health Research Institute.

The research team is interested in the views on genetic testing of mothers of young children. They have worked with CHEO to find a way of identifying such a group. CHEO's administrative staff has used the hospital database to produce a list of names of mothers of children aged 10 years or younger who received inpatient care in 2003 or 2004. This is how you have been identified. The list contains your name and address only. At no point during the study will the CHEO staff give your name to the investigators. No access to any information whatsoever on your child (even whether you have a son or daughter) was requested by, or given to, the investigators.

The study consists of a questionnaire survey. Included with this letter are a questionnaire, and a Participant Information Form which gives more detailed information on the project. Please read the Participant Information Form before deciding whether or not to take part.

If you decide that you would like to take part, please fill in the questionnaire and return it to Julia Frei (who is the project coordinator) in the postage-paid envelope provided. Please keep the Participant Information Form.

We understand that you may prefer not to take part. If this is the case, you may do one of the following things:

1. Return a blank questionnaire in the postage-paid envelope provided – the CHEO staff will immediately remove you from the mailing list for this study.

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2. Leave a voicemail message for Julia Frei at (- the CHEO staff will immediately remove you from the mailing list for this study. We will need your study ID number to do this. Your ID number is located on the front page of your questionnaire in the bottom right hand corner.

3. Ignore this letter and the reminders that follow. We send up to two repeat letters to try to get as many responses as possible, as this helps the investigators be more confident of the results they get from the study. If you ignore all three letters the CHEO staff will remove you from the mailing list for this study.

Even if you decline to take part, please keep the Participant Information Form.

Whatever you decide to do, you are under no obligation to the Children's Hospital of Eastern Ontario, the Ottawa Health Research Institute, or the University of Ottawa. I appreciate the time you have taken to read this letter.

Yours truly,

Dr. W. James King MD MSc FRCPC
Chief, Division of Pediatric Medicine
Children's Hospital of Eastern Ontario

CHEO Children's Hospital of Eastern Ontario
Centre hospitalier pour enfants de l'est de l'Ontario

CHEO Research Ethics Board
APPROVAL
Chair's Signature: _____
Date: December 8, 2005

[date]

[name of potential participant]
[address of potential participant]

Dear [name of potential participant],

I am writing to follow up on a letter I sent to you a few weeks ago about a research study based at the Children's Hospital of Eastern Ontario (CHEO). You may remember that I referred to a project about women's views on genetic testing which had been approved by the CHEO Research Ethics Board. The research team which is running this study is led by Dr. Brenda Wilson of the University of Ottawa and Dr. Mario Cappelli of CHEO is one of the investigators.

With help from CHEO, the research team identified a random group of women whose children received inpatient care at CHEO in 2003 or 2004. This is how you were selected for the study, and I can confirm that they have no information whatsoever on your child.

This is a questionnaire survey, and I include another copy of the questionnaire and Participant Information Form. If you are still considering whether or not to take part, please read the Participant Information Form first. If you decide to participate, please fill in the questionnaire and return it to Julia Frei (who is the Project Coordinator) in the postage-paid envelope provided, and keep the Participant Information Form.

If you have decided not to take part, you may do one of the following things:

1. Return a blank questionnaire in the postage-paid envelope provided – the CHEO staff will immediately remove you from the mailing list for this study.

2. Leave a voicemail message for Julia Frei at - the CHEO staff will immediately remove you from the mailing list for this study. We will need your study ID number to do this. Your ID number is located on the front page of your questionnaire in the bottom right hand corner.

3. Ignore this letter and the final reminder that may follow. We send reminders to try to get as many responses as possible, as this helps the investigators be more confident of the results they get from the study. If you ignore this and the next letter, you will be removed from the mailing list for this study.

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Yours truly,

Dr. W. James King MD MSc FRCPC
Chief, Division of Pediatric Medicine
Children's Hospital of Eastern Ontario

Children's Hospital of Eastern Ontario
Centre hospitalier pour enfants de l'est de l'Ontario

CHEO Research Ethics Board
APPROVAL
Chair's Signature: _____
Date: November 8, 2005

[date]

[name of potential participant]
[address of potential participant]

Dear [name of potential participant],

This letter is a follow up to remind you about a research study based at the Children's Hospital of Eastern Ontario (CHEO). You may remember it; it is a project about women's views on genetic testing. The study has been approved by the CHEO Research Ethics Board and the research team is led by Dr. Brenda Wilson of the University of Ottawa. Dr. Mario Cappelli of CHEO is also one of the investigators.

CHEO helped the research team identify mothers of young children, the group in whose views they are most interested. CHEO's administrative staff identified mothers of children who received inpatient care at CHEO in 2003 or 2004. No information about you or details of your child was given to the research team.

The study takes the form of a questionnaire survey, and I enclose a copy along with a Participant Information Form which provides more detail. If you think you might like to take part in the study, please read the Participant Information Form first. To participate, please fill in the questionnaire and return it to Julia Frei (who is the Project Coordinator) in the postage-paid envelope provided, and keep the Participant Information Form.

If you decide not to take part, please ignore this letter and dispose of the questionnaire. Your name will be removed from the mailing list for this study and you can expect no further contact from us. I thank you for taking the time to read this letter, and wish you and your family well for the future. I suggest that you keep the Participant Information Form for future reference.

I would like to emphasize that responding to this letter places you under no obligation to the Children's Hospital of Eastern Ontario, the Ottawa Health Research Institute, or the University of Ottawa.

Yours truly,

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APPROVAL
Chair's Signature. _____
Date: December 8, 2005

Women's Perspectives on Genetics: Knowledge, Values and Priorities

CONJOINT ANALYSIS STUDY

PARTICIPANT INFORMATION FORM

You are invited to participate in a research project. This information form describes the study and outlines what will be asked of you as a participant.

Purpose of this Research Study
This study is part of a large project which assesses what women understand about genetics and genetic tests, their views on the importance of testing, and their opinions of what tests should or should not be made available in a publicly-funded health service. The findings from this part of the study will provide us with information on how women might make choices between different features of newborn screening tests. The information will also help us decide on ways of obtaining the opinions of people who use Canada's healthcare services. This is important for decision makers planning the provision of services. When the overall project is complete, we will have rich information about women's understanding, views and judgements on genetic testing in Canada.

We are approaching you to take part in this study because we believe that mothers of young families, like yourself, are more likely than most to have thought about genetic tests. This is because women who have been pregnant in the last few years have usually been offered prenatal or newborn screening tests to check for serious conditions which can affect developing babies. At present, these tests, such as integrated prenatal screening (IPS), amniocentesis, and newborn screening for PKU and congenital hypothyroidism are the closest thing we have to routine genetic tests in the health service. We are not offering genetic tests, and you do not need to have had a genetic test to take part.

Participants
We are asking women whose child(ren), aged 10 years or younger, received inpatient care at CHEO during 2003 and 2004 to complete the questionnaire.

Procedures
The questionnaire is included with this package and should take no longer than 30 minutes to complete. If you would like to participate, please fill in the questionnaire by yourself and return it in the postage-paid envelope provided. If you do not wish to participate, simply return the blank questionnaire in the envelope provided. By doing this, we will know to not contact you further for this study.

Risks and Benefits of Participating in the Research
There are no risks to your participation in this study.

There are no benefits to you participating in this study. However, the knowledge we gain from this study will be provided to those who make decisions in health care policy, particularly in relation to genetics services and maternity care. It may help these individuals to make better decisions about which genetic tests should be provided in a healthcare system like Canada's and how these tests should be provided.

Appendix 6: Introductory Letters and Information Sheet for Group 2 (Phase II participants)

Expenses
There are no expenses provided for taking part in this study.

Confidentiality
Your personal information will be kept confidential. You will not be identified to the investigators or in any publication or presentation of this study. Any personal information about you that leaves the hospital will be coded so that you cannot be identified by name.

If you choose to participate, when your questionnaire is received, your replies will be entered onto a computer database for analysis. Since the questionnaire is coded, your name, or other identifying information, will not appear on the computerized data. The questionnaires will be kept in a secure location, only accessible to the investigators and their research team. Once the study is complete, and no further analyses are required, the codes will be permanently removed from computerised data so that they cannot be linked with the individual participants.

Questions
If you have any questions or would like to speak to the investigators of this study, you are free to call Dr. Brenda Wilson at (613) 562 5800 ext 8261, or Dr. Mario Cappelli at (613) 737-7600 ext 2492. They will be happy to talk to you without any obligation on your part.

The Research Ethics Board (REB) is a group of people from scientific and non-scientific backgrounds that reviews research studies. Its goal is to ensure the protection of the rights and welfare of people involved in research. You may contact the Chair of the REB for information regarding patients' rights in research studies at 737-7600 ext 3272, although this person cannot provide any health-related information about the study.

A form entitled "Request for Study Results" is included with this package. If you would like to know the results of this study, print your name and address on the form and return it to us with the completed questionnaire. A summary of the results will be mailed to you at the conclusion of the study.

Université d'Ottawa · University of Ottawa

Faculté de médecine
Épidémiologie et médecine sociale

Faculty of Medicine
Epidemiology and Community Medicine

(613) 562-5800 ext. 8261 – bwilson@uottawa.ca

[date]

CHEO Research Ethics Board
APPROVAL
Chair's Signature. _____
Date: November 8, 2005

[name of potential participant]
[address of potential participant]

Dear [potential participant]

I am writing to you as Principal Investigator of the project called 'Women's views on genetic testing'. I would like to thank you for returning the questionnaire sent by Dr. James King. We are now in the final phase of our three-part project. I am contacting you because you provided us with your name and address and indicated you might be willing to take part in a second survey. This letter is to provide you with further information and invite you to take part.

The final phase of our study consists of a questionnaire survey about what types of newborn screening tests are appropriate in a healthcare system like Canada's. Included with this letter are a questionnaire, and a Participant Information Form which gives more detailed information on the project. Please read the Participant Information Form before deciding whether or not to take part.

If you decide that you would like to take part, please fill in the questionnaire and return it to Julia Frei (who is the project coordinator) in the postage-paid envelope provided. Please keep the Participant Information Form.

We understand that you may prefer not to take part. If this is the case, you may do one of the following things:

1. Return a blank questionnaire in the postage-paid envelope provided – we will immediately remove you from the mailing list for this study.

2. Leave a voicemail message for Julia Frei at – we will immediately remove you from the mailing list for this study.

3. Ignore this letter and the reminders that follow. We send up to two repeat letters to try to get as many responses as possible, as this helps the investigators be more confident of the results they get from the study. If you ignore all three letters you will be removed from the mailing list for this study.

451, ch. Smyth
Ottawa (Ontario) K1H 8M5 Canada

451 Smyth Rd.
Ottawa, Ontario K1H 8M5 Canada

(613) 562-5410 • Téléc./Fax (613) 562-5465

Even if you decline to take part, please keep the Participant Information Form.

I hope that you will agree that this project is worthwhile and consider assisting us by filling in the survey. If we can bring about a successful project, we believe the results will help in developing future genetic services in a way, which most benefits patients and their families. Whatever you decide to do, you are under no obligation to the Children's Hospital of Eastern Ontario, the Ottawa Health Research Institute, or the University of Ottawa. As the leader of this research team, I am very grateful for your participation so far and appreciate the time you have taken to read this letter.

Yours truly,

Dr. Brenda J. Wilson MB ChB, MSc MRCP(UK), FFPH
Associate Professor
University of Ottawa

Université d'Ottawa · University of Ottawa

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Faculty of Medicine
Epidemiology and Community Medicine

(613) 562-5800 ext. 8261 – bwilson@uottawa.ca

[date]

CHEO Research Ethics Board
APPROVAL
Chair's Signature: _____
Date: November 8, 2005

[name of potential participant]
[address of potential participant]

Dear [name of potential participant],

I am writing to you as Principal Investigator to follow up on a letter I sent to you a few weeks ago about a research study called 'Women's views on genetic testing.' In the questionnaire sent to you by Dr. James King, you provided us with your name and address and indicated you might be willing to take part in a second survey. This letter is to provide you with further information and invite you to take part.

This study also consists of a questionnaire survey, and I include another copy of the questionnaire and Participant Information Form. If you are still considering whether or not to take part, please read the Participant Information Form first. If you decide to participate, please fill in the questionnaire and return it to Julia Frei (who is the Project Coordinator) in the postage-paid envelope provided, and keep the Participant Information Form.

If you have decided not to take part, you may do one of the following things:

1. Return a blank questionnaire in the postage-paid envelope provided – we will immediately remove you from the mailing list for this study.

2. Leave a voicemail message for Julia Frei at [redacted] – we will immediately remove you from the mailing list for this study.

3. Ignore this letter and the reminders that follow. We send up to two repeat letters to try to get as many responses as possible, as this helps us be more confident of the results we get from the study. If you ignore all three letters you will be removed from the mailing list for this study.

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Even if you decline to take part, please keep the Participant Information Form.

Taking part in research is voluntary, and responding to this letter places you under no obligation to the Children's Hospital of Eastern Ontario, the Ottawa Health Research Institute, or the University of Ottawa. As the leader of this research team, I am very grateful for your participation so far and appreciate the time you have taken to read this letter.

Yours truly,

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(613) 562-5800 ext. 8261 – bwilson@uottawa.ca

[date]

CHEO Research Ethics Board
APPROVAL
Chair's Signature. _____
Date: November 8, 2005

[name of potential participant]
[address of potential participant]

Dear [name of potential participant],

This letter is a follow up to remind you about a research study called 'Women's views on genetic testing'. I have been contacting you because in the questionnaire sent to you by Dr. James King, you provided us with your name and address and indicated you might be willing to take part in a second survey. This letter is to provide you with further information and invite you to take part.

This study also takes the form of a questionnaire survey, and I enclose a copy along with a Participant Information Form which provides more detail. If you think you might like to take part in the study, please read the Participant Information Form first. To participate, please fill in the questionnaire and return it to Julia Frei (who is the Project Coordinator) in the postage-paid envelope provided, and keep the Participant Information Form.

If you decide not to take part, please ignore this letter and dispose of the questionnaire. Your name will be removed from the mailing list for this study and you can expect no further contact from us. I thank you for taking the time to read this letter, and wish you and your family well for the future. I suggest that you keep the Participant Information Form for future reference.

I would like to emphasize that responding to this letter places you under no obligation to the Children's Hospital of Eastern Ontario, the Ottawa Health Research Institute, or the University of Ottawa. As the leader of this research team, I am very grateful for your participation so far and appreciate the time you have taken to read this letter.

Yours truly,

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Children's Hospital of Eastern Ontario
Centre hospitalier pour enfants de l'est de l'Ontario

Women's Perspectives on Genetics: Knowledge, Values and Priorities

Conjoint Analysis Study

CHEO Research Ethics Board
APPROVAL
Chair's Signature:
Date: November 8, 2005

PARTICIPANT INFORMATION FORM

You are invited to participate in a research project. This information form describes the study and outlines what is involved with your participation.

Purpose of this Research Study
This study is part of a large project which assesses what women understand about genetics and genetic tests, their views on the value of testing, and their judgments about what tests should or should not be made available in a publicly-funded health service. The findings from this part of the study will provide us with information on how women might make choices between different features of newborn screening tests. The information will also help us decide on effective ways of obtaining the opinions of people who use Canada's healthcare services. This is important for decision makers planning the provision of services. When the overall project is complete, we will have rich information about women's understanding, views and judgements on genetic testing in Canada.

We are approaching you to take part in this study because you recently took part in our first questionnaire survey, and indicated you would be willing to fill in a second questionnaire. This special survey is the final part of our larger study regarding women's views of genetic tests.

Participants
We are asking women whose child(ren), aged 10 years or younger, received inpatient care at CHEO during 2003 and 2004 to complete the questionnaire.

Procedures
This survey will again take the form of a questionnaire, included with this package, which should take no longer than 30 minutes to complete. If you would like to participate, please fill in the questionnaire by yourself, and return it in the postage-paid envelope provided. If you do not wish to participate, simply return the blank questionnaire in the envelope provided. By doing this, we will know to not contact you further for this study.

Risks and Benefits of Participating in the Research
There are no risks to your participation in this study.

There are no benefits to you participating in this study. However, the knowledge we gain from this study will be provided to those who make decisions in health care policy, particularly in relation to genetics services and maternity care. It may help these individuals to make better decisions about which genetic tests should be provided in a healthcare system like Canada's and how these tests should be provided.

Voluntary Participation and Withdrawing from the Study
You are under no obligation to participate in this study. Your decision to participate or not in this study will not affect the care you receive at CHEO. You are free to withdraw from the study at any time and there will be no penalty to you or your child.

Appendix 7: Form for respondents to request study results Request for Study Results

Thank you for answering this questionnaire.

The study overall is expected to take about two years. Your name has not been released to the researchers for this study. Therefore, if you think you would like to know the results of this study, please check **YES** in the space provided below and cite your name and address to indicate your wishes. A summary of the results will be mailed to you at the conclusion of the study.

If you do not want to know the results of this study, please check **NO** in the space provided below. We do not have your name or address unless you choose to give it to us. You will not receive any further mailings from us for this study.

Whatever your decision, we appreciate your participation in the present survey.

Request for study results

Please ✓ (check) one box

☐ **NO**, I do not wish to receive the results of this study.

☐ **YES**, I would like to receive the results of this study, and have **given my name and address** below to confirm this. Please send me the results when the study has ended.

_____

Name

_____

Street Address

_____

City Province

_____

Postal code

Appendix 8: Final Conjoint Analysis Questionnaire

Newborn Screening Questionnaire

GENESENS

DE LA DÉCOUVERTE À LA SANTÉ

TRANSLATING DISCOVERIES INTO HEALTH

This questionnaire is about newborn screening for genetic and metabolic diseases. It is *not* being used to evaluate any screening your child might have had.

This survey is set up in two sections. The first section covers some of the issues that decision makers have to deal with when designing a screening service. We have provided some background information on these issues so that you are well prepared to answer the questions that follow. **We would like you to think about these questions as if you were making decisions about Canada's health care.**

The second section covers questions about you and your experiences with newborn screening.

Taking into consideration all of these issues when designing a screening program is a difficult task for decision makers. You may also find these issues challenging, so please do not feel discouraged if it requires some thought and effort to complete. Our experience shows that most people are able to answer the questions in Section 1.

All your responses will be kept confidential. Your name is not on the questionnaire. We would like you to try to answer all the questions if you can.

If you have any questions or concerns, please contact Julia Frei at:

CHALLENGES FACED BY DECISION MAKERS

Newborn screening consists of analyzing blood taken by pricking an infant's heel. Up until now, newborn screening has been fairly straightforward because it has been used to identify babies who are at risk for diseases where:

- The disease is present at birth
- The symptoms of the disease are difficult to detect at an early age
- If left untreated, the disease can result in:
    - mental disability *and/or*
    - physical disability *and/or*
    - death
- Early treatment can reduce the negative effects of the disease

The challenge now is to make decisions about screening for diseases where the balance between the benefit and the harm of screening *is not so clear*. We wish to use a hypothetical disease to explore some of these issues.

HYPOTHETICAL DISEASE

For this study we are interested in newborn screening for a hypothetical disease that, if left untreated, results in:

- moderate disability

AND

- reduced lifespan

Moderate Disability

People with a moderate disability may live fairly independent lives. They may have jobs, relationships and families. They may also have:

- a daily routine of therapy and/or medications
- frequent visits to the doctor
- declining health which reduces their ability to function independently

Reduced lifespan

The average lifespan for people *with* the disease is 40 years. However, the average lifespan for people *without* the disease is 78 years.

A "positive" test result means a result suggesting that the person *has* the disease. However, tests are never perfect. A positive test result can wrongly label a child as *having* a disease when they *do not*. The unfavourable consequences of having a positive test result that is wrong include the following:

1. Parents and family may suffer from anxiety because they think that their child *has* a disease when the child really *does not*
2. The child may undergo painful or distressing medical tests before the disease is ruled out
3. Scarce healthcare resources may have to unnecessarily be used to pay for early treatment of a disease that the child *does not have*

We present two levels for the chance that a positive test result might be wrong:

- 5% of all positive test results are wrong
- 15% of all positive test results are wrong

A "negative" test result means a result suggesting that the person *does not have* the disease. However, tests are never prefect. A negative test result can wrongly label a child as *not having* a disease when they really *do*. The unfavourable consequences of having a negative test result that is wrong include the following:

1. Early treatment of the disease may not occur so the child may:
   - develop a physical disability *and/or*
   - develop a mental disability *and/or*
   - suffer from a shortened lifespan

2. Parents and family may suffer from anxiety because they do not understand the cause of their child's poor health

3. Scarce healthcare resources may have to be used to pay for treatment of disabilities which occurred because early diagnosis was missed

We present two levels for the chance that a negative test result might be wrong:

- 5% of all negative test results are wrong
- 15% of all negative test results are wrong

The outcome following early treatment refers to the impact of a treatment for babies with the disease. The treatment could be to improve the quality of life of the child and to try to ensure a normal lifespan. We present two levels that the effect of early treatment might be:

- Improvement in quality of life and normal lifespan *is* restored
- Improvement in quality of life, but normal lifespan *is not* restored

There is a delicate balance between the need to protect a parent's right to manage their child's care and the need to ensure that the best interest of the child is always protected.

We present three levels of balance between respecting parents' rights and the need to ensure the best interest of the child is protected:

- **Compulsory**: Every child must be screened, and parents have no choice
- **Implied Consent**: Information about the test is given to the parents. The test will be done *automatically* unless the parents indicate they *do not* want it
- **Informed Consent**: Full information about the test is given to the parents. The test will *not* be done unless parents *give consent* to have it done

	Advantages	Disadvantages
Compulsory	Greatest chance that all children with the disease will be identified early	Most difficult to ensure that parents are informed about screening Greatest chance that parents will feel that their rights are ignored
Implied Consent	More likely that parents are well informed about screening More likely that parents will feel that their rights are respected	Small chance that children with the disease will *not* be diagnosed
Informed Consent	Greatest chance that parents are well informed about screening Greatest chance that parents will feel that their rights are respected	Greatest chance that children with the disease will *not* be diagnosed

Questions about preferences

If you were a decision maker, how important would the following factors be in deciding what an appropriate newborn screening test is. We would like you to rank these factors in order of importance using a scale of 1-4 (mark 1 for most important, 2 for second most important, etc.). *Please use each number only once.*

Characteristic of Newborn Screening Service	**Rank**
• Chance that a Positive Test Result is Wrong	☐
• Chance that a Negative Test Result is Wrong	☐
• Effect of Early Treatment	☐
• Issues of Consent	☐

We would now like you to choose between the different possible newborn screening scenarios.

- Please look at each scenario and tick (✓) the box below the overall scenario that, **if you were a decision maker**, you would *prefer* was offered
- Please keep in mind that there are no right or wrong answers; we are interested in your opinion
- You may wish to refer back to the pages with a **BLUE** border to help you answer the following questions

	Scenario A	**Scenario B**
ISSUE #1: Chance that a "positive" test result is wrong	15% of all positive test results are wrong	5% of all positive test results are wrong
ISSUE #2: Chance that a "negative" test result is wrong	15% of all negative test results are wrong	15% of all negative test results are wrong
ISSUE #3: Effect of early treatment	Improvement in quality of life, but normal lifespan *is not restored*	Improvement in quality of life, but normal lifespan *is not restored*
ISSUE #4: Issues of Consent	*Implied Consent:* Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it	*Compulsory:* Every child must be screened, and parents have no choice

Which scenario would you prefer? ❑ ❑
(Please check one box only)

	Scenario C	Scenario D
ISSUE #1: Chance that a "positive" test result is wrong	15% of all positive test results are wrong	5% of all positive test results are wrong
ISSUE #2: Chance that a "negative" test result is wrong	5% of all negative test results are wrong	5% of all negative test results are wrong
ISSUE #3: Effect of early treatment	Improvement in quality of life and normal lifespan *is restored*	Improvement in quality of life and normal lifespan *is restored*
ISSUE #4: Issues of consent	*Compulsory*: Every child must be screened, and parents have no choice	*Implied Consent*: Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it

Which scenario would you prefer? ❑ ❑
(Please check one box only)

	Scenario E	Scenario F
ISSUE #1: Chance that a "positive" test result is wrong	15% of all positive test results are wrong	5% of all positive test results are wrong
ISSUE #2: Chance that a "negative" test result is wrong	15% of all negative test results are wrong	5% of all negative test results are wrong
ISSUE #3: Effect of early treatment	Improvement in quality of life, but normal lifespan *is not restored*	Improvement in quality of life and normal lifespan *is restored*
ISSUE #4: Issues of consent	*Implied Consent*: Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it	*Informed Consent*: Full information about the test is given to the parents. The test will not be done unless parents give consent to have it done

Which scenario would you prefer? ❑ ❑
(Please check one box only)

	Scenario G	Scenario H
ISSUE #1: Chance that a "positive" test result is wrong	15% of all positive test results are wrong	15% of all positive test results are wrong
ISSUE #2: Chance that a "negative" test result is wrong	5% of all negative test results are wrong	15% of all negative test results are wrong
ISSUE #3: Effect of early treatment	Improvement in quality of life, but normal lifespan *is not restored*	Improvement in quality of life and normal lifespan *is restored*
ISSUE #4: Issues of consent	*Implied Consent*: Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it	*Informed Consent*: Full information about the test is given to the parents. The test will not be done unless parents give consent to have it done

Which scenario would you prefer? ❑ ❑
(Please check one box only)

	Scenario I	Scenario J
ISSUE #1: Chance that a "positive" test result is wrong	5% of all positive test results are wrong	5% of all positive test results are wrong
ISSUE #2: Chance that a "negative" test result is wrong	15% of all negative test results are wrong	5% of all negative test results are wrong
ISSUE #3: Effect of early treatment	Improvement in quality of life and normal lifespan *is restored*	Improvement in quality of life, but normal lifespan *is not restored*
ISSUE #4: Issues of consent	*Implied Consent*: Information about the test is given to the parents. The test will be done automatically unless the parents indicate they do not want it	*Informed Consent*: Full information about the test is given to the parents. The test will not be done unless parents give consent to have it done

Which scenario would you prefer? ❑ ❑
(Please check one box only)

1. How difficult/easy did you find the last 5 questions on choice of newborn screening? (*please circle*)

Very Easy				**Moderate**					**Very Difficult**
1	2	3	4	5	6	7	8	9	10

Questions about you and your newborn screening experiences

2. How many children do you have? _____

3. Do you think you will have more children?

   - ❑ Yes
   - ❑ No
   - ❑ Unsure

If all of your children are adopted, please check the following box ❑ and skip to Question 11

3. In what year was your most recent pregnancy? _____

4. Thinking back to your most recent pregnancy, where did you deliver your child?

   - ❑ Home
   - ❑ Hospital
   - ❑ Other (*please specify*) _____

5. Thinking back to your most recent pregnancy, where did you get most of your newborn screening related information? (*Please check all that apply AND place a star beside the most informative source*)

- ❑ Family physician/general practitioner
- ❑ Obstetrician/gynecologist or other specialist physician
- ❑ Midwife
- ❑ Other mothers (family members, friends, co-workers)
- ❑ Fathers (family members, friends, co-workers)
- ❑ Media/Internet
- ❑ Pamphlets or other written information from a health organization
- ❑ Pregnancy books
- ❑ Previous pregnancies
- ❑ Other (*please specify*): _____

6. Thinking back to your most recent pregnancy, were you offered newborn screening for your child?

- ❑ YES

  If yes, which of the following best describes the outcome after the offer of screening?

  - ❑ I *chose* to have screening performed, and my child *was* screened
  - ❑ I *chose* to have screening performed, but my child *was not* screened
  - ❑ I *chose not* to have screening performed, and my child *was not* screened
  - ❑ I *chose not* to have screening performed, but my child was screened
  - ❑ Unsure

- ❑ NO
- ❑ DON'T KNOW

  If no OR don't know, did your child still receive newborn screening?

  - ❑ Yes
  - ❑ No
  - ❑ Don't know

7. Were you aware at the time that newborn screening is used to check for genetic and metabolic disorders such as congenital hypothyroidism and phenylketonuria (PKU)?

- ❑ Yes
- ❑ No
- ❑ Don't know

8. If you were/are pregnant now, would you want your child to have newborn screening?

- ❑ YES

  If yes, what would be your main reasons for wanting newborn screening? *(please check all that apply AND place a star beside the most important reason)*

  - ❑ There is a hereditary condition in my family, and I would want to check that it was not passed on to my baby
  - ❑ There are no hereditary conditions in my family, but I would be worried about my baby having a possible health condition
  - ❑ I would not be worried about my baby having a health condition, but I would like to be reassured that my baby was healthy
  - ❑ I would accept any test my doctor or nurse recommended
  - ❑ Other (*please tell us more below*)

  _____

  _____

  _____

- ❑ NO

  If no, what would be your main reasons for not wanting newborn screening? *(please check all that apply AND place a star beside the most important reason)*

  - ❑ I think the screening is unnecessary
  - ❑ I do not feel that the screening would give accurate enough information
  - ❑ I would not expect my baby to be at enough risk of having a health condition
  - ❑ Other (*please tell us more below*)

  _____

  _____

  _____

- ❑ DON'T KNOW

9. In a healthcare system like Canada's, public healthcare funding would usually pay for newborn screening. Consequently, a newborn screening program would consume scarce public healthcare resources. If you were/are pregnant now, would you be willing to pay the full cost ($60) of newborn screening if it was no longer covered by public healthcare?

- ❑ YES
- ❑ NO
- ❑ UNSURE

If no OR unsure, would you be willing to pay a portion of the cost ($5-$30) of newborn screening?

- ❑ Yes
- ❑ No
- ❑ Unsure

10. If you were/are pregnant now, how would you prefer that newborn screening was offered? (*please check one box only*)

- ❑ Compulsory: Every child must be screened, and parents have no choice
- ❑ Implied Consent: Information about the test is given to the parents. The test will be done *automatically* unless the parents indicate they *do not* want it
- ❑ Informed Consent: Full information about the test is given to the parents. The test will *not* be done unless parents *give consent* to have it done

11. What is your age in years? _____

12. What is your current marital status?

- ❑ Single
- ❑ Married or living with a partner
- ❑ Divorced or separated
- ❑ Widowed

13. To which ethnic or cultural group(s) did your ancestors belong *(check all that apply)*

- ❑ Canadian
- ❑ French
- ❑ English
- ❑ German
- ❑ Scottish
- ❑ Irish
- ❑ Italian
- ❑ Ukrainian
- ❑ Dutch (Netherlands)
- ❑ Chinese
- ❑ Jewish
- ❑ Polish
- ❑ Portuguese
- ❑ South Asian (East Indian, Pakistani, Punjabi, Sri Lankan, ect.)
- ❑ Black
- ❑ North American Indian
- ❑ Métis
- ❑ Inuit/Eskimo
- ❑ Other (*please specify*) _____

14. What is the highest level of education that you have completed?

- ❑ None
- ❑ Elementary
- ❑ Secondary
- ❑ Community college, technical college, or CEGEP
- ❑ University degree – undergraduate
- ❑ Professional degree (e.g. education)
- ❑ University degree – graduate or higher
- ❑ Other education or training (*please specify*):

_____

15. What is your postal code? ___ ___ ___ ___ ___ ___

Thank you for your participation. Please return the questionnaire in the postage-paid envelope provided.