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Public perception of population health risks in Canada: Risk perception beliefs

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A national survey of health risk perception among 1,503 adult Canadians was conducted in 2004 as a follow-up to a previous survey in 1992. Respondents were asked to indicate their personal opinion regarding a range of risk perception belief statements reflecting environmental concern, social concern, genetic concern, dependence on regulators, locus of health risk control (internal, powerful others, chance), risk acceptability and technological enthusiasm. The results indicated considerable concern over the state of the environment in general, however, less concern existed for the environment nearest to the individual. A high degree of concern was expressed over stress in the workplace, and poverty was perceived to represent an important health risk for Canadians. A strong sense of the importance of personal lifestyle factors and personal control over one's health was also observed as were notable increases in trust and dependence on the ability of government and experts to make decisions and regulate health risks in Canada as compared to the previous survey. Belief statements reflecting environmental and social concern correlated with the level of risk perceived for a variety of health hazards and outcomes.

Keywords: risk perception; beliefs; world views; determinants of health; risk acceptability

Introduction

Over the past two decades, a number of studies have sought to examine the factors thought to influence public perceptions of population health risks. These studies have demonstrated that perception of risks not only relates to actual level of risk, but also to the nature of the hazard, such as the extent to which it remains unknown or dreaded (Fischoff *et al.* 1978), as well as demographic characteristics such as age, gender and education (Krewski *et al.* 2006). More recent studies have emphasized individual-level correlates of health risk perception such as personality or belief systems (Bouyer *et al.* 2001, Lee *et al.* 2005). Previously, we examined the role of hazard and demographic characteristics in mapping public perception of risk (Krewski *et al.* 2006). The present article focuses on Canadians' beliefs regarding health risks, their management and how those beliefs have changed over time.

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Since worldviews have been shown to correlate with public perception of risk (Dake 1991), the 1992 Canadian national health risk perception survey included an assessment of various attitudes and beliefs about health risks (Krewski *et al.* 1995a). Canadians were divided as to whether there were environmental health problems where they lived, but agreed that environmental contamination had been increasing in general. The public also displayed a moderate amount of confidence in the regulation of chemical hazards. However, most people disagreed that government regulation meant not having to worry about health problems. About half of the respondents adopted a fatalistic worldview, with responses evenly split with respect to agreement with the statement 'I have very little control over risks to my health.' Most respondents disagreed with the position that health risk decisions should be left to experts and agreed that a high-technology society is important to improve health and social well-being (Slovic *et al.* 1993).

Findings from the 1992 Canadian risk perception survey were recently re-analysed to determine how the above beliefs clustered (Lee *et al.* 2005). A principal components analysis yielded four components: Cancer Dread, Trust in Regulators, Environmental Concern and Personal Agency. While some of these components were relatively straight forward to interpret, others were less straightforward. For example, although Trust in Regulators clearly reflected an unquestioned diffusion of control to authorities, it was not entirely clear whether trust was placed in regulators as a result of felt helplessness over the control of health hazards or due to a genuine support for authority.

Relative to the previous national health risk perception survey, a more detailed assessment of beliefs reflecting control over health risks and public trust was included in the present survey. The current analysis will provide some insight into belief structures underlying public risk perception, emphasizing the importance of distinguishing public trust in authorities from public beliefs about responsibility in control over health risk. Efforts were made to separate aspects of control, such as the extent to which control rests with the individual or with experts, or whether health risks are largely uncontrollable. Moreover, our assessment was not limited to beliefs pertaining to environmental health hazards, but also included beliefs related to hazards of as social and genetic nature. A description of Canadians' beliefs as they relate to the sources, control and regulation of health risk is presented below.

Methods

Survey content

The present survey was designed as a follow-up to the 1992 Canadian national risk perception survey (Krewski *et al.* 1995a,b, Slovic *et al.* 1995). The survey protocol is described in detail elsewhere (Krewski *et al.* 2006). Briefly, the study questionnaire consisted of a number items retained from the 1992 survey, as well as additional items relating to new and emerging health risks and beliefs. The survey was re-designed to capture the broad determinants of population health, including those of a social and behavioral, genetic and biological, and environmental and occupational nature, as well as those associated with health services (Krewski *et al.* 2006). The Research Ethics Board of the University of Ottawa approved the study protocol.

Respondents were asked to indicate their personal opinion regarding a range of risk perception belief statements. These were chosen to reflect a variety of elements *a priori* including: environmental concern, social concern, genetic concern, dependence on regulators, locus of health risk control (internal, powerful others, chance), risk acceptability and technological enthusiasm. Respondents were asked to indicate the degree to

which they agreed with each statement (1 = disagree strongly, 2 = disagree somewhat, 3 = agree somewhat, or 4 = agree strongly). Respondents could also indicate if they did not know or had no opinion. Respondents were also prompted to indicate the degree to which 30 hazards posed a health risk to the Canadian public as a whole (1 = almost no health risk, 2 = slight health risk, 3 = moderate health risk, 4 = high health risk, or did not know/no opinion), as well as the degree to which five different health hazards (motor vehicles, climate change, recreational physical activity, cellular phone and terrorism) and health outcomes (cancer, long-term disabilities, asthma, heart disease and depression) posed a risk both to the Canadian public as well as to their personal health. A detailed examination of such other survey components is presented separately (Krewski *et al.* 2008).

Survey design and implementation

A total of 1,503 adult Canadians, broadly representative of the Canadian population, were interviewed by telephone between February 22, 2004, and March 25, 2004. Interviews were approximately 30 minutes in length. A random digit dialing procedure was used, stratified by province, plus by age and gender within province according to the 2001 Canadian population. In an attempt to reach potential respondents identified, a maximum of five callbacks were made. The nearest birthday method was used to select the household resident for the survey. Of the total phone numbers dialed (26,223), 5,607 (21.4%) were invalid and 4,944 (18.9%) were unanswered. Refusals, call-backs and ineligible participants due to strata quotas represented 11,646 (44.4%), 1,413 (5.4%) and 1,110 (4.2%) of remaining phone numbers, respectively.

The sample included a similar proportion of males ($n = 721$, 48.0%) and females ($n = 782$, 52.0%). According to age category, 433 (28.8%) respondents were 18 to 34 years of age, 620 (41.2%) were between 35–54 years of age, and 450 (29.9%) were 55 years of age or older. Four hundred and ninety one (32.7%) respondents had at most a high school education, while 1,009 (67.1%) had at least some college education. Three (0.2%) respondents were missing educational status information. The majority of interviews were conducted in English ($n = 1{,}168$, 77.7%). A total of 335 interviews (22.3%) were conducted in French.

The survey questionnaire was translated from English to French. The survey was then verified by a panel of bilingual researchers for linguistic equivalency of terms and concepts, and adjusted where deemed appropriate. Design effects due to the stratified sampling procedure were examined and found to be close to 1 (ranging from 0.93–1.00), suggesting that analysis of the data using the simple random sample variance would be appropriate, although result in conservative inferences.

Results

Agreement with risk perception belief statements

Environmental concern

The majority of participants agreed with the statement: 'the land, air, and water around us are, in general, more contaminated now than ever before' (Table 1). However, participants were almost evenly split with respect to their agreement with the statement: 'there are serious environmental health problems where I live' and 'getting cancer mostly depends on the environment.'

Table 1. Agreement with attitude and opinion statements (percent) ($n = 1{,}503$).

	Disagree strongly (1)	Disagree somewhat (2)	Agree somewhat (3)	Agree strongly (4)	Don't know/no opinion (0)
Environmental concern					
The land, air, and water around us are, in general, more contaminated now than ever before	3.2	11.2	28.5	56.4	0.6
There are serious environmental health problems where I live	24.0	31.4	29.3	14.1	1.2
Getting cancer mostly depends on the environment	16.8	35.8	35.1	10.1	2.2
Social concern					
Getting cancer mostly depends on lifestyle	14.9	30.2	38.0	15.8	1.1
Work-related stress is a more serious problem than ever before	1.9	5.5	29.8	62.3	0.6
Poverty is the single most important determinant of health	13.8	26.6	35.8	23.0	0.9
Genetic concern					
Getting cancer mostly depends on genetic makeup	15.4	34.3	37.5	10.2	2.7
Genetic screening has benefits for the health of Canadians	7.2	12.3	48.2	27.2	5.2
Most diseases depend on genetic makeup	15.6	34.9	38.0	8.9	2.6
Dependence on regulators—trust					
When there is a really serious health problem, the government will regulate it	15.4	25.2	44.2	13.4	1.7
Experts are able to make accurate estimates of health risks	6.6	18.2	57.0	17.3	0.9
Government agencies are well qualified to regulate health risks	16.1	25.8	45.8	10.6	1.7
Internal locus of health risk control					
People can offset health risks by improving their individual lifestyle, such as exercising and eating properly	0.5	1.0	12.1	86.2	0.2
The main thing that determines my exposure to health risks is what I myself do	4.9	10.6	45.0	39.1	0.3
I feel I have very little control over risks to my health	25.6	35.0	27.7	11.2	0.5
Powerful others locus of health risk control					
Decisions about health risks should be left to the experts	16.8	25.6	33.0	23.6	1.0
Government agencies are responsible for controlling my exposure to health risks	16.7	28.9	38.0	15.9	0.5
Health professionals are responsible for keeping me healthy	29.4	31.7	27.0	11.8	0.1

(*continued*)

Table 1. (*Continued*).

	Disagree strongly (1)	Disagree somewhat (2)	Agree somewhat (3)	Agree strongly (4)	Don't know/no opinion (0)
Chance locus of health risk control					
No matter what I do, I'm likely to be exposed to health risks	5.6	8.2	42.0	43.6	0.5
My exposure to most health risks is accidental	18.4	32.4	34.1	13.8	1.3
When I become ill, it's a matter of fate	45.2	29.9	17.5	6.3	1.0
Risk acceptability					
Canadian society is becoming too concerned about small health risks	16.0	33.0	32.6	15.8	2.5
Government agencies should decide what health risks are acceptable	25.2	26.2	35.9	11.9	0.9
I believe that a risk-free environment is an attainable goal in Canada	26.0	28.3	29.8	14.9	1.0
Technological enthusiasm					
A high technology society is important for improving our health and social well-being	9.0	18.2	44.6	27.0	1.1

Agreement with the assertion that 'the land, air, and water around us are, in general, more contaminated now than ever before' was seen to decline from the previous survey in 1992; both in terms of percent agreement as well as mean score (Table 2) ($p < 0.0001$). In 1992, 93.4% of respondents agreed that that the land, air and water are more contaminated now than ever before (as compared to 84.9% in 2004). The mean agreement score (but not percent agreement) was also seen to decline significantly between 1992 and 2004 for the statement that serious environmental health problems exist where the respondents live ($p < 0.05$).

Social concern

A majority of participants agreed strongly with the statement: 'work-related stress is a more serious problem than ever before.' Participants also tended to agree that 'poverty is the single most important determinant of health.' Responses were less definitive for the statement: 'getting cancer mostly depends on lifestyle.'

Genetic concern

Participants were fairly evenly split as to the importance that genetic makeup plays in the development of 'most diseases' and 'cancer.' However, most participants agreed that 'genetic screening has benefits for the health of Canadians.'

Dependence on regulators—trust

Respondents indicated a moderate to high degree of trust in regulators. The majority of respondents agreed that 'experts are able to make accurate estimates of health risks.' There

Table 2. Mean ratings (95% confidence interval [CI]) of agreement with belief statements evaluated in 1992 and 2004.

Opinion statements	Mean 1992 (95% CI)	Mean 2004 (95% CI)
Environmental concern		
The land, air, and water around us are, in general, more contaminated now than ever before	3.65 (3.62, 3.68)	3.39 (3.35, 3.43)*
There are serious environmental health problems where I live	2.43 (2.38, 2.48)	2.34 (2.29, 2.39)†
Dependence on regulators—trust		
Experts are able to make accurate estimates of health risks	2.65 (2.60, 2.69)	2.86 (2.82, 2.90)*
When there is a really serious health problem, the government will regulate it	1.80 (1.75, 1.84)	2.57 (2.52, 2.61)*
Internal locus of health risk control		
People can offset health risks by improving their individual lifestyle, such as exercising and eating properly	3.48 (3.44, 3.52)	3.84 (3.82, 3.86)*
I feel I have very little control over risks to my health	2.46 (2.41, 2.51)	2.25 (2.20, 2.29)*
Powerful others locus of health risk control		
Decisions about health risks should be left to the experts	2.24 (2.19, 2.29)	2.64 (2.59, 2.69)*
Risk acceptability		
Canadian society is becoming too concerned about small health risks	2.31 (2.26, 2.36)	2.49 (2.45, 2.54)*
I believe that a risk-free environment is an attainable goal in Canada	2.73 (2.68, 2.78)	2.34 (2.29, 2.39)*
Technological enthusiasm		
A high technology society is important for improving our health and social well-being	2.95 (2.90, 2.99)	2.91 (2.86, 2.95)

*t-test significant ($p < 0.0001$).
†t-test significant ($p < 0.05$).

was also a tendency for respondents to agree that 'when a really serious health problem exists, the government would regulate it' and 'government agencies are well qualified to regulate health risks.'

In fact, dependence on regulators was observed to increase greatly from the 1992 survey (both in terms of percent agreement and mean score, $p < 0.0001$). In 1992, only 60.8% of respondents agreed that 'experts are able to make accurate estimates of health risks' (as compared to 74.3% in 2004), with 13.4% strongly agreeing. An even greater increase in agreement was observed for the statement: 'when a really serious health problem exists, the government will regulate it,' with only 20.3% agreeing in 1992 (as compared to 57.6% in 2004).

Internal locus of health risk control

Virtually all respondents agreed with the statement: 'people can offset health risks by improving their individual lifestyle, such as exercising and eating properly.' The percentage of respondents agreeing with this statement was also observed to increase significantly from 1992 ($p < 0.0001$), when 90.3% agreed (and 61.5% strongly agreed) as compared to 98.3% in agreement in 2004.

Over 84% of respondents agreed that the main factor that determines their exposure to health risks is their own actions. The majority of respondents also tended

to disagree with the statement: 'I feel I have very little control over risks to my health.' Disagreement with this statement was observed to increase significantly from the 1992 survey ($p < 0.0001$), when only 50.7% were found to disagree (as compared to 60.6% in 2004).

Powerful others locus of health risk control

The majority of respondents tended to disagree with the statement that health professionals are responsible for keeping them healthy. However, there was a tendency to assign responsibility to control health risks to experts and government such that respondents agreed with the statements 'decisions about health risks should be left to the experts' and 'government agencies are responsible for controlling my exposure to health risks.' There was a large increase in agreement with the statement 'decisions about health risks should be left to the experts' from 1992, when only 37.8% of respondents agreed with this assertion ($p < 0.0001$), compared to 56.6% in 2004.

Chance locus of health risk control

Although participants overwhelmingly agreed that they are likely to be subject to health risks no matter what they do, responses to the statement: 'my exposure to most health risks is accidental' were nearly evenly split. Participants also widely disagreed that when they become ill, it is a matter of fate.

Risk acceptability

Results for belief statements about risk acceptability have shifted significantly since 1992 and now appear to reflect a double standard. Respondents were almost evenly divided in their views on the statements 'Canadian society is becoming too concerned about small health risks' and 'government agencies should decide what health risks are acceptable.' Participants were in slight disagreement with the statement that 'a risk-free environment is an attainable goal in Canada.'

Agreement with the statement that 'Canadian society is becoming too concerned about small health risks' increased significantly ($p < 0.0001$) since 1992, when only 40.5% of respondents agreed with this view (compared to 48.4% in 2004). The perception that a risk-free environment is an attainable goal in Canada was observed to decrease significantly from 1992, when 60.9% of respondents were in agreement (24.4% in strong agreement) relative to 44.7% in 2004 ($p < 0.0001$).

Technological enthusiasm

Respondents displayed a moderate degree of enthusiasm for technological development, with many agreeing with the position that 'a high technology society is important for improving our health and social well-being.' No significant change in agreement was observed between 1992 and 2004 ($p > 0.05$).

Risk perception beliefs and level of perceived risk

A number of risk perception belief statements were found to correlate with the level of risk perceived for a variety of health hazards and outcomes. However, the strength of these

correlations tended to be weak. All correlation coefficients presented below are significant at the $p < 0.0001$ level. Belief statements reflecting environmental concern tended to be frequently correlated with perceived risk for both environmental and non-environmental risks. Specifically, responses for the statement that 'the land, air, and water around us are, in general, more contaminated now than ever before' were found to be positively correlated with perceived risk to Canadians (r_c) for tap water ($r_c = 0.24$), air pollution ($r_c = 0.21$), fast food ($r_c = 0.18$), genetically modified foods ($r_c = 0.17$), climate change ($r_c = 0.18$), suntanning ($r_c = 0.16$) and unprotected sex ($r_c = 0.15$). Responses to the statement 'there are serious environmental health problems where I live' were also found to be positively correlated with perceived risk for tap water ($r_c = 0.24$), air pollution ($r_c = 0.23$), climate change ($r_c = 0.18$) and personal risk ($r_i = 0.20$), genetically modified foods ($r_c = 0.18$), nuclear power plants ($r_c = 0.16$), stress ($r_c = 0.16$), poverty ($r_c = 0.15$) and asthma ($r_c = 0.15$).

Belief statements reflecting social concern also tended to be frequently correlated with levels of perceived risk for hazards related with both the social and non-social environment. Responses to the statement 'work-related stress is a more serious problem than ever before' were found to be positively correlated with risk perceived for stress ($r_c = 0.31$), depression ($r_c = 0.27$, $r_i = 0.15$), air pollution ($r_c = 0.22$), asthma ($r_c = 0.18$), heart disease ($r_c = 0.18$), pesticides ($r_c = 0.18$), cancer ($r_c = 0.18$), poverty ($r_c = 0.17$), obesity ($r_c = 0.17$), unemployment ($r_c = 0.17$), genetically modified foods ($r_c = 0.17$), tap water ($r_c = 0.17$), waiting lists for health care ($r_c = 0.16$), suntanning ($r_c = 0.16$), street crime ($r_c = 0.16$), terrorism ($r_c = 0.16$), fast food ($r_c = 0.15$) and motor vehicles ($r_c = 0.15$). Responses to the statement 'poverty is the single most important determinant of health' were positively correlated most strongly with the level of health risk perceived for poverty ($r_c = 0.26$), unemployment ($r_c = 0.23$), homelessness ($r_c = 0.19$), climate change ($r_c = 0.19$, $r_i = 0.17$), air pollution ($r_c = 0.18$), breast implants ($r_c = 0.18$), long-term disabilities ($r_c = 0.17$), street crime ($r_c = 0.17$), asthma ($r_c = 0.16$) and tap water ($r_c = 0.15$).

Other notable correlations were found between perceived risk of blood transfusions ($r_c = 0.20$), tap water ($r_c = 0.18$), West Nile virus ($r_c = 0.17$), high voltage power lines ($r_c = 0.16$), vaccines ($r_c = 0.16$) and drinking alcohol ($r_c = 0.16$) and responses to the statement that 'a risk-free environment is an attainable goal in Canada.' Responses for 'Canadian society is becoming too concerned about small health risks' was negatively correlated with perceived risk for fast food ($r_c = -0.15$). The level of risk perceived for physical inactivity ($r_c = 0.21$) and obesity ($r_c = 0.20$) were also positively correlated with responses to the statement that 'people can offset health risks by improving their individual lifestyle, such as exercising and eating properly.' Perceived risk of tap water was related with 'getting cancer mostly depends on the environment' ($r_c = 0.17$), and 'government agencies are responsible for controlling my exposure to health risks' ($r_c = 0.16$). 'I feel I have very little control over risks to my health' was weakly related to the perceived risk of some hazards, including physical inactivity ($r_c = -0.15$). The remaining correlation coefficients were less than 0.15.

Discussion

The results of this study demonstrate that, although decreasing, there exists considerable concern over the state of the environment in general. However, less concern was seen to exist for the environment nearest to the individual. Although this finding may relate to respondents' tendency to live in areas where less pollution and environmental health

problems exist, it may also relate to their tendency to first consider environmental problems occurring elsewhere, receiving widespread media attention. It may also be reflective of an optimistic bias among respondents, characterized by the tendency to perceive greater levels of risk to Canadian society as a whole as compared to oneself (Weinstein 1980).

The high degree of concern expressed over stress in the workplace is consistent with findings from a recent survey on work–life conflict in Canada (Duxbury and Higgins 2003). In 2001, 58% of employees reported high levels of role overload, an 11% increase from 1991. Increases in the amount of time spent at work were also observed. Findings from the General Social Survey conducted in 1998 revealed that nearly one-third of respondents considered themselves to be workaholics (Statistics Canada 1999). Increases in the proportion of respondents reporting severe time-stress since 1992 were also observed. It is clear that programs designed to improve coping or facilitate work–life balance are required in order to maintain the health of the workforce in Canada.

As discussed in a companion article (Krewski *et al.* 2006), poverty represented an important health risk for Canadians. Despite the difficult uptake of this empirical finding in scientific and political circles, the social environment has been consistently identified as an important health determinant in theoretical frameworks of population health (Mustard and Frank 1991, Evans *et al.* 1994).

Belief statements reflecting environmental and social concern were also found to correlate with levels of perceived risk of a number of environmental, social and other health hazards (including behavioral, biological, and those related to health services), as well as a number of health outcomes. Belief statements reflecting environmental concern were correlated ($r = 0.13$–0.20) with ratings of perceived risk in the 1992 survey (Krewski *et al.* 1995a). In another study, the 11-item New Environmental Paradigm scale, an index of environmental concern, was positively related to perceived risk associated with five environmental risk scenarios (Kuhn 2000). Although belief statements reflecting social concern were not evaluated in the 1992 survey, that and other studies have found general worldviews such as egalitarianism or fatalism (which reflect socio-political attitudes) to be correlated with risk perceptions (Dake 1991, Krewski *et al.* 1995a, Slovic 1999, Sjöberg 2000). Beliefs reflecting environmental and social concern may therefore represent important factors that shape public perception of risks, or conversely underlying factors of and measured by risk perception scales (Sjöberg 2000).

Although agreement with the role that genetics plays in the development of disease was inconclusive, genetic screening was generally seen to be a beneficial service for Canadians. Indeed, genetic screening or counseling may offer a number of benefits both to the individual and the community as a whole, including: improved health outcomes through the initiation of treatment of preventative strategies, improved psychological outcomes (such as reduced anxiety), and improved understanding of the genetic determinants of health (Butow *et al.* 2003, Hodge 2004). However, genetic screening remains a controversial issue, as there exists considerable debate surrounding screening practices and ethical issues such as privacy, confidentiality and informed consent (Anderlik and Rothstein 2001, Freedman *et al.* 2003, Duncan 2004, Thomas 2004). Other population-based studies have reported high levels of personal interest in genetic screening for heart disease and certain cancers (de Silva *et al.* 1995, Lerman and Croyle 1995, Graham *et al.* 1998, Doukas and Li 2004, Sanderson *et al.* 2004); however, interest was seen to vary with the provision of information on testing accuracy and on the level of risk to the population (Graham *et al.* 1998). Taken together, the observed tendency of Canadians to accept genetic screening as a beneficial service supports the notion that education programs may

be needed in order to properly inform the public about genetic screening and its implications (Graham *et al.* 1998, Sanderson *et al.* 2004).

A strong sense of the importance of personal lifestyle factors and personal control over one's health was found in this survey. Findings presented in a companion paper also underscored the perceived importance of behavioral hazards such as physical inactivity, obesity and cigarette smoking as risks to the health of Canadians (Krewski *et al.* 2006). The importance placed on lifestyle and personal control was found to increase from that observed in the previous survey in 1992. Despite this trend, rates of obesity have increased greatly in the Canadian population over the past decade (Statistics Canada 2002). Although reasons for this finding are likely to be complex, and cannot be elucidated through the present survey, a possible explanation may be that Canadians are adopting unhealthy lifestyle behaviors, regardless of knowledge of the importance of physical activity and healthy body weight in the maintenance of good health. For instance, group and individual interviews conducted for a companion project revealed that eating habits and level of physical activity were the most frequent lifestyle factors that respondents identified as behaviors they felt they ought to modify (or further improve) but were not doing so (Dallaire *et al.* 2005). At the same time, people are taking responsibility for this choice, thus perceiving that they are in control over risks to their health. It is clear that the public recognizes the importance of lifestyle in maintaining good health. Programs designed to promote healthy lifestyles must now support and guide action as opposed to simply communicating the associated health benefits.

The statement 'I feel that I have very little control over risks to my health,' which reflects a fatalistic sentiment, was found to be correlated with perceived risk for many hazards in the 1992 survey, notably foodborne and bacterial hazards (Krewski *et al.* 1995a). In the present survey, fewer correlations with this statement were noted, with the strongest observed for physical inactivity ($r_c = -0.15$). Although a sense of personal control and personal responsibility over one's health was seen to increase notably since 1992, trust and dependence on the ability of government and experts to make decisions and regulate health risks in Canada also increased greatly since the time of the previous survey. While this finding may reflect a changing political climate in Canada over the study period from 1992 to 2004, it may also reflect an increased importance placed on the role of government in the wake of a variety of recent public health failures in Canada such as the tragedy in Walkerton, Ontario, in which 7 people died from pathogenic *E. coli* O157 through the inadvertent entry into the municipal drinking water supply (Krewski *et al.* 2004), or perhaps increased concerns related to security in the new millennium. It may also reflect an increased reliance on the government to make public health decisions about health risks that are complex and characterized by high levels of uncertainty (e.g. Creutzfeldt-Jacob Disease). Indeed, results from the companion interview project demonstrated that participants felt that the government should intervene on behalf of the public when the ability of the individual to control risks to their personal health may be limited (Dallaire *et al.* 2005). At the same time, it is clear that trust in government is fragile and can easily disappear.

Alternatively, the public may have tended in part to trust and rely on government and experts due to their perception that experts are able to make accurate estimates of health risks. This would suggest that the public may not easily understand the uncertainties inherent in risk science, and efforts to further communicate these uncertainties effectively are warranted. Indeed, findings from other studies suggested that trust in the integrity and transparency of authorities may be an important factor in risk communication (Lee and Lemyre 2004).

We also observed an increasing sentiment that a risk-free environment is not an attainable goal and that Canadian society is becoming overly concerned about small health risks. This latter finding represents a major shift in our society. It may be related to observations that Canadians have become increasingly concerned about health risks as a consequence of many successful and continuing public health efforts to reduce population health risks (Slovic 1999) or that they balance the costs and opportunities (Kahneman and Tversky 1979). Indeed, the public may better accept expenditures on health risks deemed of importance as opposed to those perceived as inconsequential. Respondents also displayed a high degree of technological enthusiasm and, as such, efforts to balance the technological needs of society with both the perceived and real environmental and social impacts are clear.

Prior to concluding, some study limitations should be acknowledged. Although random digit dialing allows for access to over 98% of Canadian households (Statistics Canada 2006), selection bias due to non-response or refusal to participate must be considered. Unfortunately, the extent of such bias is difficult to assess since no data was collected on non-participants. It should be noted that the number of the company administering the survey was not blocked in an effort to avoid having the calls ignored by respondents with caller identification.

Finally, the themes around which the various beliefs were organized remain hypothetical and thereby require further evaluation. As a next step, we plan to pursue our analyses using multivariate techniques. We expect to find support for the hypothesized themes of environmental, social and genetic concern as well as dependence on regulators. Given the prominence of multidimensional conceptualizations of health locus of control in current health research (Rock *et al*. 1987, Chaplin *et al*. 2001), we also expect that several dimensions will underlie beliefs reflecting the locus of control over health risks which could help clarify the nature of belief statements reflecting dependence on regulators. However, the possibility that other themes may underlie these data is acknowledged.

Overall, the present study reveals a number of key findings involving specific beliefs and health risk perceptions. Canadians expressed high levels of concern related to both environmental and social factors. These belief statements were also found to correlate with level of risk perceived for a variety of health hazards and outcomes. Perhaps the most notable change in Canadians' beliefs over the past decade was the greater importance placed on personal lifestyle factors in health and a heightened sense of personal control over health. At the same time, however, trust and dependence on the ability of experts and government to make decisions and regulate health risks also increased, possibly in relation to the occurrence of a variety of recent public health crises for which Canadians have had to rely on government. Undoubtedly, health risk beliefs are dynamic, constantly evolving in the face of scientific advances and world events. Further surveys tracking risk perceptions, attitudes and beliefs as they evolve over time are key to achieving an improved, contextualized understanding of the public's views regarding health risks and their management.

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