Attitude to health risk in the Canadian population: a cross-sectional survey

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Abstract

Background: Risk is a ubiquitous part of health care. Understanding how people respond to risks is important for predicting how populations make health decisions. Our objective was to seek preliminary descriptive insights into the attitude to health risk in the Canadian population and factors associated with heterogeneity in risk attitude.

Methods: We used a large market-research panel to survey (in English and French) a representative sample of the Canadian general population that reflected the age, sex and geography of the population. The survey included the Health-Risk Attitude Scale, which predicts how a person resolves risky health decisions related to treatment, prevention of disease and health-related behaviour. In addition, we assessed participants' numeracy and risk understanding, as well as income band and level of education. We summarized the responses, and we explored the independent associations between demographics, numeracy, risk understanding and risk attitude in multivariable models.

Results: Of 6780 respondents, 4949 (73.0%) were averse to health risks; however, but there was considerable heterogeneity in the magnitude of risk aversion. We found significant gradients of risk averse attitudes with increasing age and being female ($p < 0.001$) using the multivariable model. French-speaking participants appeared to be more risk averse than those who were English-speaking ($p < 0.001$), as were individuals scoring higher on the Subjective Numeracy Scale ($p < 0.001$).

Interpretation: In general, Canadians were averse to health risks, but we found that a sizeable, identifiable group of risk takers exists. Heterogeneity in preferences for risk can explain variations in health care utilization in the context of patient-centred care. Understanding risk preference heterogeneity can help guide policy and assist in patient–physician decisions.

Uncertainty is inherent to most health information and evidence. Because decision-making in the presence of uncertain evidence involves the risk of unfavourable outcomes, personal attitude to risk guides many of the health decisions that people make.[1] Some individuals can exhibit risk-seeking health behaviour, such as avoiding an effective but burdensome treatment that can prevent disease progression,[2] whereas others are deterred by even small risks (e.g., avoiding immunization because of the small risk of adverse effects, thus failing to benefit from immunization).[3] Understanding these attitudes can help explain variations in health care utilization,[4] which in turn may enable policies such as public health interventions to be tailored to specific persons. Previous surveys of the general population found that most people tend to be averse to general risks, but there is a small group of people who are risk seeking and some who are risk neutral.[5,6] These studies found associations between attitudes to risk and certain population characteristics. For example, on average, women tend to be more averse to general risks than men,[7] and white people tend to be more risk averse than nonwhite people.[8]

Previous evidence suggested risk attitudes can vary across outcomes and domains, such that someone might be risk averse to financial decisions but risk seeking when it comes to decisions related to health.[9,10] Therefore, we hypothesized that we could not infer from the results of surveys of Canadians' propensity for general[11] and financial risks[12] as being representative of their propensity for health risks. Our objective was to use the Health-Risk Attitude Scale[13] to provide preliminary descriptive insights about the attitude to health risk in the Canadian population, understand the distribution of attitudes and any associations with population characteristics and

describe how the results can be used by policy-makers, health care providers and patients to improve their decision-making.

Methods

Survey and participants

We used data from 2 research projects that sought to understand general population preferences for different health outcomes, which included questions on risk attitudes to explain variation in preferences.[14,15] We prepared web surveys with a range of questions that were available in English or French (Appendix 1, available at www.cmajopen.ca/content/4/2/E284/suppl/DC1). The surveys were tested before launch in 3 focus groups (2 English, 1 French).

Our target population was adults who were representative of the Canadian population. Canadian residents 18 years of age and older were recruited by email through a market research agency from a panel of residents who previously consented to participate in research. Quota sampling was used to ensure the sample represented the general Canadian population in terms of age, sex and geographical distribution. Once respondents had indicated their preferred language, they were presented with the study information and asked to provide consent. The survey collected information on risk attitude, demographic and socioeconomic characteristics, and measures of numeracy and health literacy. Ethical approval for the study was granted by the University of British Columbia Behavioural Research Ethics Board.

Measurement of attitude to health risk

A person's attitude to risk is typically elicited in experimental studies, where lotteries measure risk-taking behaviour by staking real money.[6] A person is risk averse if they prefer a certain outcome over a risky outcome with a higher expected reward. For example, they may prefer $40 rather than take a gamble with a 50% chance of receiving $100 and 50% of receiving nothing (where the expected outcome of the latter option is $50, i.e., $(0.5 \times \$0) + (0.5 \times \$100)$). Unfortunately, such lottery tasks can be cognitively challenging for many to understand,[16] particularly in web surveys where an interviewer is not on hand to explain the questions.[17] However, excluding participants who are unable to complete the task from such surveys can jeopardize the generalizability of the interpretations. In response, scales have been developed that serve as proxies for risk attitude. These scales are simple to administer using web surveys and ask a series of qualitative questions that are easier for people to understand in comparison with lottery-style questions.

Although there are numerous scales that measure general risk attitude, few scales measure health risk attitude specifically. The Domain-Specific Risk-Taking (DOSPERT) scale[11] is the most used instrument for risk attitude measurement. It has a health and safety subscale that focuses on risky behaviour, such as smoking and unprotected sex, rather than aspects of medical treatments. A medical subscale of the DOSPERT has been developed,[18] but it requires administration alongside the main scale; therefore, participants must answer 35 questions in total. We used the Health-Risk Attitude Scale, which has been shown to be internally consistent (Cronbach α = 0.83) and reliable (test–retest intraclass correlation coefficient = 0.86), with good construct and convergent validity.[13] Importantly, the Health-Risk Attitude Scale has only 13 questions and takes less time to complete compared with the DOSPERT scale while providing high completion and response rates.[13] This scale was developed to predict how a person would resolve risky health decisions in the future and features items related to medical treatment, preventative health behaviour and risky health behaviour. Each of the 13 questions (7 are reverse coded) are scored from 1 (agree) to 7 (disagree), which results in a total score that ranges from 13 to 91, where a higher score indicates a more risk-averse attitude. We rescaled this score to between 0 and 100, with a score of 50 indicating risk neutrality.

Additional variables

Participants were members of a market research panel who had agreed to participate in various surveys. We collected information on age, sex, Canadian province or territory, level of education and household income of the panel members who participated in the survey. These variables have been previously found to be associated with aspects of risk-taking behaviour.[5,7,11] We also explored whether aspects of numeracy and health literacy were associated with health risk attitude. These outcomes have been associated with variations in health outcomes and health care utilization,[19] and related concepts associated with general risk-taking behaviour.[16]

We used the Subjective Numeracy Scale[20] to measure respondents' self-assessed ability in mathematical tasks and their preference for information presented numerically or in text.[20] This scale has been validated and found to correlate highly with objective measures of numeracy and is quicker and less burdensome for participants to complete than surveys containing objective numeracy questions.[21] We used additional questions to determine whether individuals could process and understand risk information, such as probabilities. These questions had 2 parts and were adapted from a previous study;[22] respondents were presented with a test of gist and verbatim-type risk knowledge.

In the gist question, a visual representation (100 people) is used to describe the risk of withdrawal for 2 treatments: treatment A (5 out of 100 people will have to stop taking the treatment) and treatment B (10 out of 100 people will have to stop taking the treatment). The respondent was asked to choose if they preferred treatment A, treatment B or were unsure. The verbatim question then asked how much more likely the risk of treatment A/B (irrespective if they answered this correctly) was compared with the risk in treatment B/A by selecting a number between 1 and 10 from a drop down box. A correct answer was considered to be treatment A, followed by 2 times more likely than treatment B.

Statistical analyses

All analyses were based on respondents who had completed the survey. Sociodemographic information is described using the mean and standard deviation for continuous variables and numbers and percentages for categorical data. Where possi-

Table 1: Participant characteristics compared with the general population of Canada

Characteristic	No. (%) of study participants n = 6780	General population of Canada, %*
Age, yr		
18–29	1550 (22.9)	21
30–39	1283 (18.9)	18
40–49	1320 (19.5)	22
50–59	1494 (22.0)	17
60–69	879 (13.0)	11
70–79	224 (3.3)	7
≥ 80	30 (< 1.0)	4
Sex		
Female	3668 (54.1)	51
Province of residence		
Alberta	646 (9.5)	11
British Columbia	857 (12.6)	13
Manitoba	242 (3.6)	4
New Brunswick	186 (2.73)	2
Newfoundland and Labrador	94 (1.4)	2
Northwest Territories	7 (< 1.0)	–
Nova Scotia	286 (4.2)	3
Nunavut	5 (< 1.0)	–
Ontario	2617 (38.6)	39
Prince Edward Island	38 (1.0)	< 1
Quebec	1641 (24.2)	24
Saskatchewan	157 (2.3)	3
Yukon	4 (< 1.0)	–
Education		
Up to high school level	2936 (43.3)	49
Some postsecondary education	2534 (37.4)	33
Undergraduate/postgraduate level	1310 (19.3)	18
Income, $		
< 15 000	458 (6.7)	6
15 000–30 000	904 (13.3)	13
30 000–50 000	1403 (20.7)	20
50 000–80 000	1650 (24.3)	27
80 000–150 000	1343 (19.8)	34†
≥ 150 000	391 (5.8)	†
Prefer not to answer	631 (9.3)	–
Language		
English	5473 (80.7)	78
French	1307 (19.3)	22
Numeracy		
Preference and good ability for/with numbers	2714 (40.0)	–

*Canadian Community Health Survey (2012).[24]
†Not reported.
‡Participant score of ≥ 4 on the Subjective Numeracy Scale.

ble, we compared demographic data from participants who had completed the survey with those who did not complete the survey to detect response bias. For participants who completed the survey, we then analyzed univariable associations both descriptively and using Cohen's d effect size.[23] Independent associations between risk attitude and respondent demographic characteristics, numeracy and risk understanding were explored using a multivariable ordinary least squares model, with the scaled score (i.e., 0–100) as the dependent variable. All analyses were performed in Stata v8.0.

Results

Participant characteristics
Of 9363 adults who responded to the invitation to participate in the survey, 6780 (72.4%) completed all questions. The majority of participants who did not complete the survey did not progress past the introduction screen, which suggests dropout was not related to the complexity of the questions. The sociodemographic characteristics of respondents compared with the Canadian general population are shown in Table 1.[25,26] Mean age of the respondents was 44 (SD 15) years. In the sample population, 3668 participants (54.1%) were women, 19.3% were Francophones, and all provinces and territories were represented. Overall, the sample was representative of the general adult population in Canada, except for education (adults with less than secondary education were underrepresented) and older age (adults > 70 yr of age were underrepresented).

In the sample population, 2714 (40.0%) participants reported a preference for and a good ability to use numerical information based on the Subjective Numeracy Scale. Overall, 4788 respondents (70.6%) correctly answered the simpler gist risk knowledge question and preferred the option with the smaller risk, whereas 915 (13.5%) were unsure and 1077 (15.9%) answered incorrectly. Of the 4788 respondents who correctly answered the initial question, 3482 (72.7%) correctly answered the more complex verbatim knowledge question (identifying that the larger risk was 2 times higher), 1174 (24.5%) incorrectly described the risk to be between 3 and 10 times higher, and 132 (2.8%) were unsure.

Risk attitude and its associations
Descriptive results for the Health-Risk Attitude Scale are provided in Table 2 and Figure 1. Most respondents were averse to health risks (n = 4949, 73.0%); 13.0% (n = 881) were risk seeking and the remaining 14.0% (n = 949) were risk neutral. The mean score was 58.7 (SD 9.6).

The association between age, sex and risk attitude is described in Figure 2. Across age groups, men were more risk seeking than women ($p < 0.001$). For both sexes, the proportion of respondents who were risk seeking decreased with increasing age ($p = 0.013$ for men and $p < 0.001$ for women). More numerate participants were more averse to health risk ($p < 0.001$) (Figure 3).

Results from the multivariable model found significant gradients of an increasingly risk-averse attitude with increasing age, being female, and having higher reported preference and ability

Table 2: Participant results using the Health-Risk Attitude Scale survey (n = 6780)

Question	Likert scale, mean ± SD	No. (%) of participants		
		Risk seeking	Neutral	Risk averse
1. I think I take good care of my body.*	5.1 ± 1.4	1042 (15.4)	1176 (17.3)	4562 (67.3)
2. I don't want to have to consider the consequences for my health in everything that I do.	3.5 ± 1.7	3626 (53.5)	1222 (18.0)	1932 (28.5)
3. It is important to me that I organize my life so that I will later enjoy good health.*	5.4 ± 1.4	700 (10.3)	1011 (14.9)	5069 (74.8)
4. If it concerns my health, then I see myself as someone who avoids risks.*	4.9 ± 1.4	1079 (15.9)	1409 (20.8)	4292 (63.3)
5. Uncertainty about the consequences of a medical intervention is, in general, part of the game.	3.5 ± 1.6	3476 (51.3)	1715 (25.3)	1589 (23.4)
6. My health means everything to me.*	5.4 ± 1.5	822 (12.1)	925 (13.6)	5033 (74.2)
7. When I look back at my past, I think that, in general, I did take risks with my health.	3.3 ± 1.8	3898 (57.5)	1076 (15.9)	1806 (26.6)
8. If the doctor cannot offer me certainty about the possible consequences of a medical intervention, then I would rather not undergo it.*	4.5 ± 1.6	1721 (25.4)	1733 (25.6)	3326 (49.1)
9. Safety first, where my health is concerned.*	5.4 ± 1.4	714 (10.5)	991 (14.6)	5075 (74.9)
10. To enjoy good health now and in the future, I am prepared to forego a lot.*	4.7 ± 1.5	1321 (19.5)	1531 (22.6)	3928 (57.9)
11. People say that I take risks with my health because of my habits.	4.3 ± 1.9	2432 (35.9)	1131 (16.7)	3217 (47.4)
12. I'm not very fussy about my health.	4.6 ±1 .7	1894 (27.9)	1383 (20.4)	3503 (51.7)
13. In general I would estimate that I would not have much of a problem with undergoing a high risk operation.	4.0 ± 1.8	2710 (40.0)	1559 (23.0)	2511 (37.0)
Total	58.7 ± 9.6	881 (13.0)	949 (14.0)	4949 (73.0)

Note: Each question is scored on a 7-point Likert scale, from 1 (agree) to 7 (disagree). The sum of the score for each question provides a total score between 13 and 91, where a higher score indicates a more averse attitude toward risk.
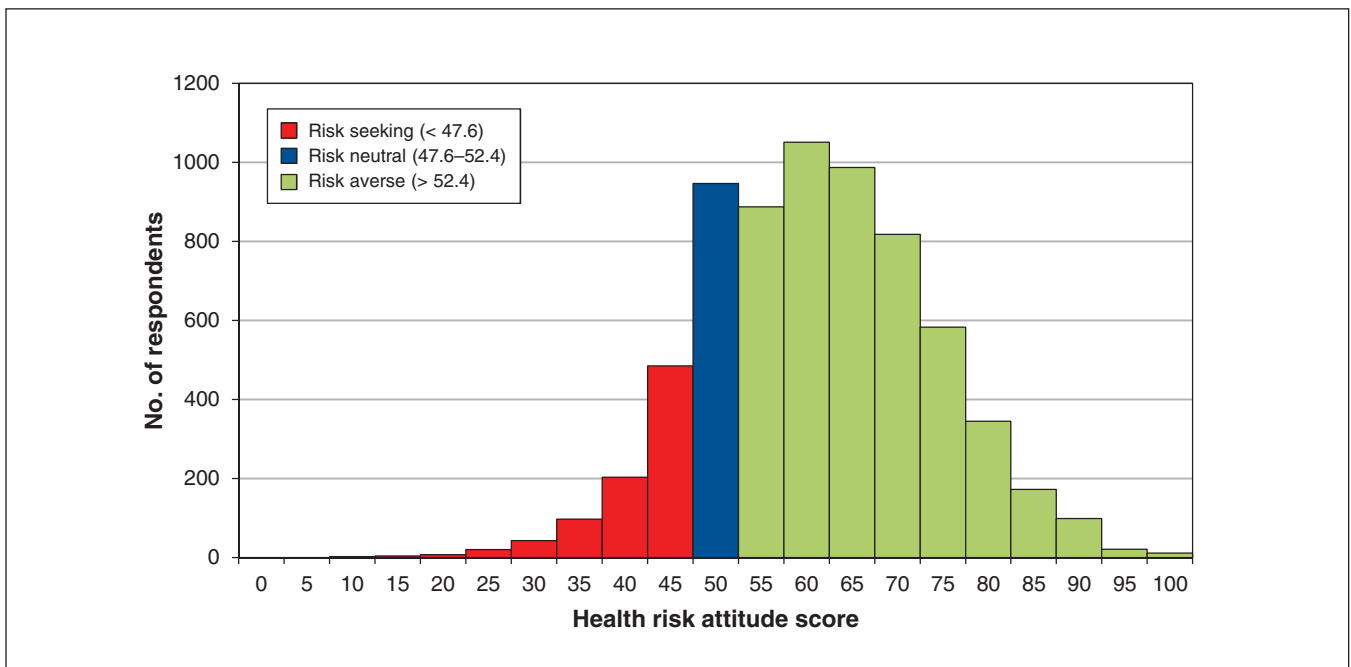*Question is reverse coded.

Figure 1: Distribution of health risk attitudes.

for numerical information (Table 3). French-speaking participants appeared to be more risk averse than those who were English speaking (p = 0.02). Those with incomes of $150 000 and more and those preferring not to answer income questions were significantly more risk averse than those with incomes less than $15 000. No association was found with level of education or the health literacy questions that determine risk comprehension.

Interpretation

Main findings

We surveyed health risk attitude in a representative population of over 6000 Canadians. We found substantial heterogeneity in risk attitude among survey respondents. Although most respondents tended to be averse to health risk, nearly 1 in 8 were willing to take health risks. We found certain characteristics to be associated with varying risk attitudes: willing-

ness to take risks was negatively related to age and high-level numeracy skills, and positively related to being male.

Comparison with existing studies

Our findings align with a survey of over 22 000 participants living in Germany, which used a simpler, 1-item measure of risk attitude but compared responses for general risk to responses with other domains, such as driving a car, financial matters, leisure and sports, career and health.[5] Similar to our findings, the German study found that women were significantly less willing to take health risks than men, and increasing age decreased the probability that a person was willing to take health risks. Another similar finding related to participant level of education, which was not strongly associated with health risk attitude. This differs from the significant negative association reported in the literature regarding increasing level of education and aversion to financial risk.[5]
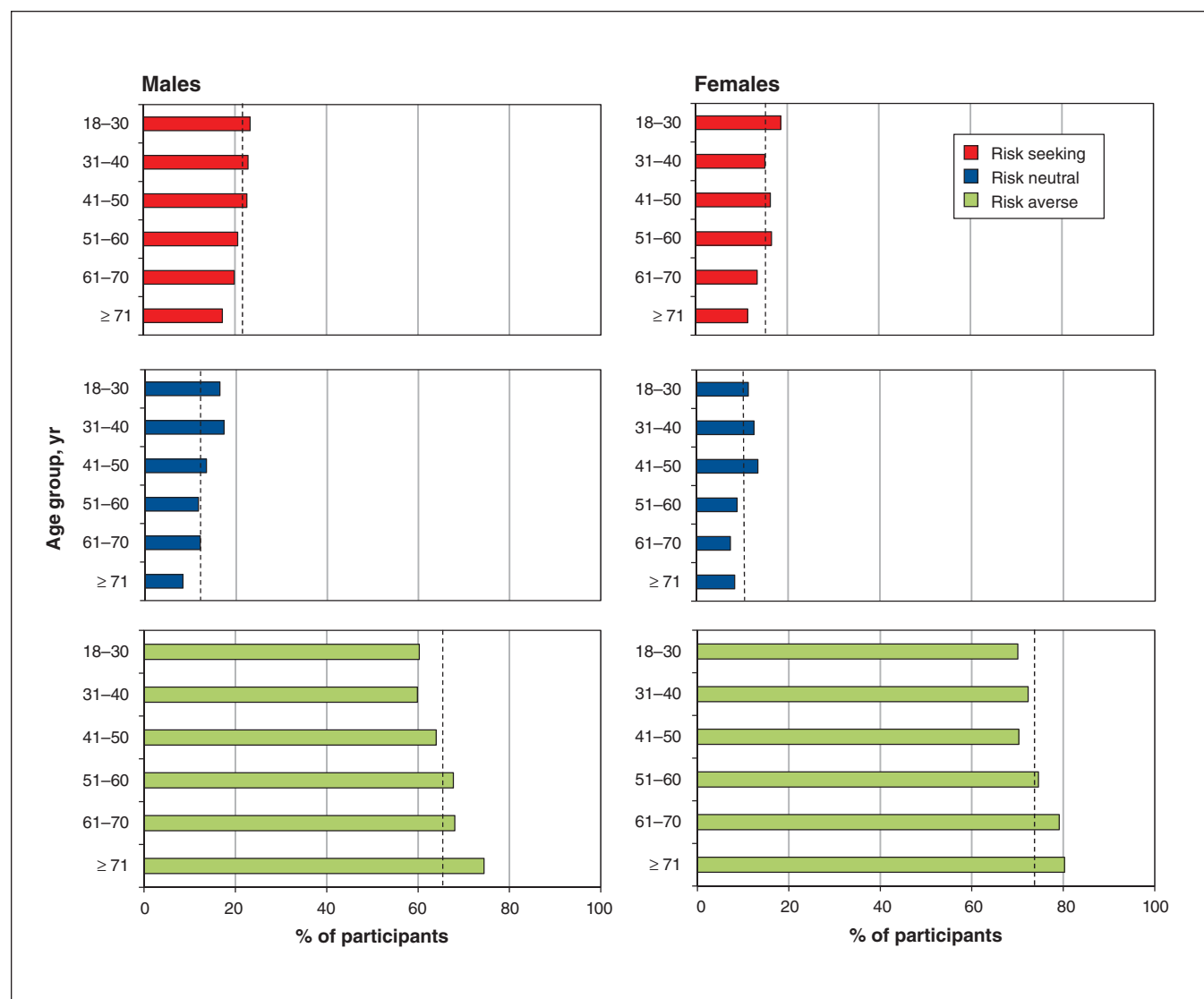

Figure 2: Association between health risk attitude and age and sex. The overall percentages of participants who were risk seeking, risk neutral and risk averse are shown, by sex and within each sex, by age group. Dashed lines on each graph indicate average percentage within each sex that falls into each profile.

Previous studies found individuals with lower levels of numeracy tend to be more risk averse.[16] Our findings show this also to be true in the health domain. Research has found increasing levels of numeracy are required to facilitate access to care, engagement with medical treatment and informed decision-making.[27] However, most numeracy studies in the health literature focus on associations with risk perception, where the need for numerical understanding is more clear.[28] In terms of its association with risk attitude, research suggests that numeracy is influenced by cognitive skills that may influence the processing of information, thus affecting subsequent decision-making.[29]

Limitations

There are limitations that are important to consider. Further validation of the Health-Risk Attitude Scale will be important, in particular to determine its ability to predict actual risk behaviour. Such a validation exercise is more complex in a health context compared with finance, where investment decisions can be more readily compared. However, correlation between risk attitude and behaviours such as screening uptake and sunscreen use should be expected. As a measure, the Health-Risk Attitude Scale does not include measures of risk perception that previous studies have found to be an important influence of risk-taking behaviour.[30] It would also be useful to compare the Health-Risk Attitude Scale with results from a general risk attitude scale to clarify whether differences are domain specific.

From a sampling perspective, the study included Internet users from a market-research panel. Although these Internet users are representative of the age, sex and geographical location of the Canadian population, they may not be truly representative (e.g., participants in our survey are most likely to be more computer literate than the general population).[31] Our measure of health literacy was limited, because it focussed on participants' risk comprehension but did not measure participants' capacity to obtain, process and understand general health information. This limited our ability to explain the association between health literacy and risk behaviour but did not affect our main findings regarding the extent of heterogeneity in health risk attitude.

Conclusion

From a policy-making perspective, our findings might explain some of the observed differences in health care utilization among Canadians. For example, an intervention with a risk of an adverse effect may be less appealing to older women than to younger men. Beyond the equity issues this raises for the funding of treatments and technologies, this understanding can allow policies to be tailored to certain groups. From a health professional perspective, in an era of demand for patient-centred care, it is important to provide care that aligns with patient values and preferences.[32] Just as a financial advisor would ask their client to answer questions about their attitudes toward financial risks, a short health risk attitude questionnaire could be embedded in patient decision aids, thus enabling doctors to make more value-congruent decisions with their patients about treatment options that involve risks. From a patient perspective, facilitating understanding of their own attitude to risk in comparison with others can help explain different health behaviours and treatment preferences. This might bring reassurance or help people explain to others the reason for their decisions.
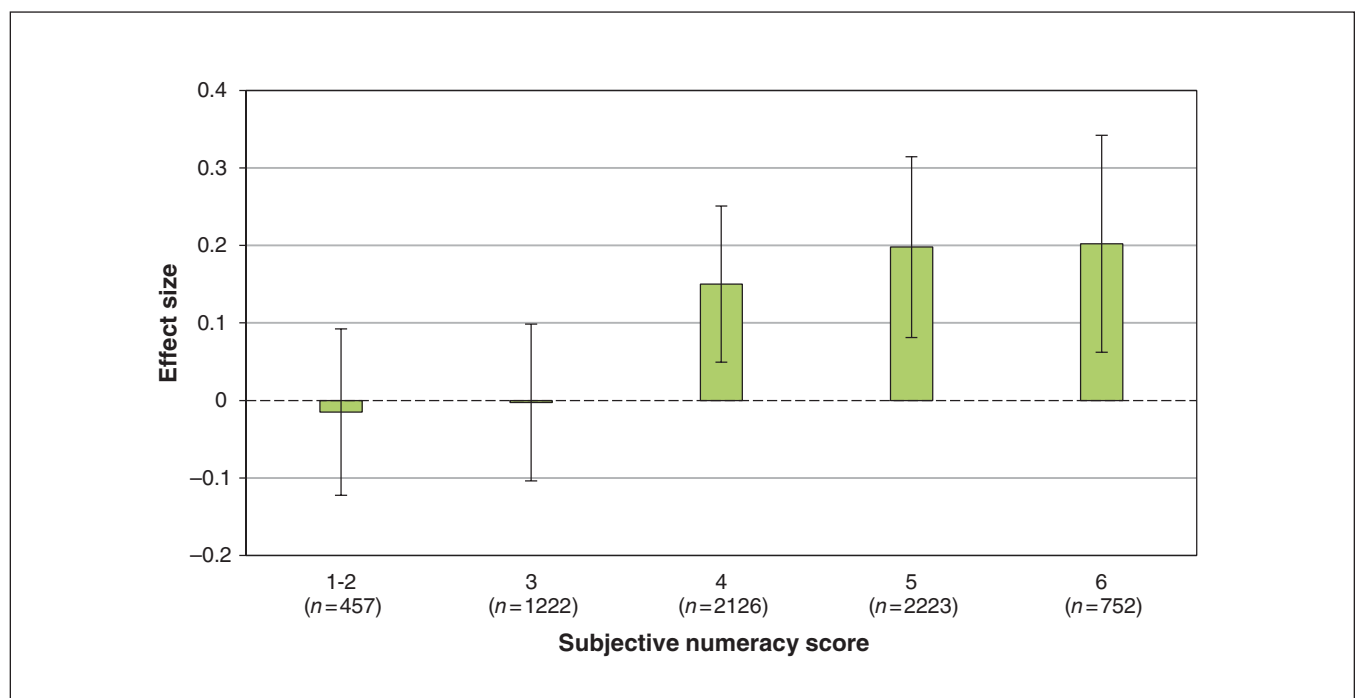

Figure 3: Association between preference and ability for numerical information and risk attitude among participants. Note: Effect size measured using Cohen's d (d = 0.2 is considered a small effect size, d = 0.5 is considered a medium effect size and d = 0.8 is considered a large effect size).

This study found health risk attitudes can vary considerably. We identified that most participants tended to be averse to health risks and tended to have common characteristics. These results can be used by policy-makers, health professionals and patients to understand individual health decisions, help design better interventions that can target specific populations with different risk tolerances and improve shared decision-making for health decisions involving risks.

Table 3: Univariable and multivariable regression analysis results

Participant characteristic	Univariable analysis			Multivariable analysis		
	B	p	95% CI	B	p	95% CI
Age category, yr						
18–29	Ref			Ref		
30–39	0.159	0.7	−0.549 to 0.868	0.205	0.6	−0.499 to 0.909
40–49	−0.034	0.9	−0.737 to 0.669	−0.017	1.0	−0.716 to 0.681
50–59	0.969	0.005	0.289 to 1.649	1.001	0.004‡	0.323 to 1.680
60–69	1.424	< 0.001	0.631 to 2.216	1.469	< 0.001‡	0.681 to 2.257
70–79	2.312	0.001	0.971 to 3.653	2.448	< 0.001‡	1.117 to 3.779
≥ 80	3.796	0.03	0.338 to 7.255	4.457	0.01‡	1.032 to 7.881
Sex						
Female	Ref			Ref		
Male	−2.034	< 0.001	−2.490 to −1.579	−2.363	< 0.001‡	−2.825 to −1.900
Education						
Up to high school level	Ref			Ref		
Some postsecondary school	0.372	0.1	−0.138 to 0.882	0.301	0.2	−0.211 to 0.813
Undergraduate/postgraduate level	0.570	0.07	−0.054 to 1.195	0.581	0.08	−0.073 to 1.235
Income, $						
< 15 000	Ref			Ref		
15 000–30 000	0.739	0.2	−0.338 to 1.817	0.456	0.4	−0.613 to 1.524
30 000–50 000	0.668	0.2	−0.343 to 1.678	0.294	0.6	−0.713 to 1.300
50 000–80 000	0.839	0.1	−0.153 to 1.832	0.486	0.3	−0.508 to 1.479
80 000–150 000	0.911	0.08	−0.105 to 1.928	0.666	0.2	−0.362 to 1.693
≥ 150 000 or more	1.729	0.009	0.435 to 3.022	1.258	0.06	−0.030 to 2.547
Prefer not to answer	2.028	0.001	0.875 to 3.182	1.940	0.001‡	0.788 to 3.092
Language						
English	Ref			Ref		
French	0.703	0.02	0.124 to 1.281	1.307	0.0‡	0.703 to 1.912
Subjective numeracy	1.271	< 0.001	0.812 to 1.731	0.858	< 0.001	0.630 to 1.085
Risk gist knowledge*						
Incorrect	Ref			Ref		
Correct	0.298	0.4	−0.336 to 0.932	0.168	0.7	−0.599 to 0.935
Unsure	−0.148	0.7	−0.994 to 0.697	−0.321	0.4	−1.158 to 0.516
Risk verbatim knowledge†						
Incorrect	Ref			Ref		
Correct	0.384	0.233	−0.073 to 0.841	−0.305	0.3	−0.929 to 0.320
Constant				54.632	0.0	53.243 to 56.020

Note: B = beta coefficient, CI = confidence interval.
*In the gist question, a visual representation (100 people) is used to describe the risk of withdrawal for 2 treatments, treatment A (5 out of 100 people will have to stop taking the treatment) and treatment B (10 out of 100 people will have to stop taking the treatment). The respondent was asked to choose if they preferred treatment A, treatment B or were unsure.
†The verbatim question then asked how much more likely the risk of treatment A/B (irrespective if they answered this correctly) was compared with the risk in treatment B/A by selecting a number between 1 and 10 from a drop down box. A correct answer was considered to be treatment A, followed by 2 times more likely than treatment B.

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