Appendix A:

Table A.1. Definitions of Risk Preferences and Risk Perception and Measurements Used in the Paper

Concept	Definition	Measurement in this paper
Monetary Risk preference	The tendency to engage in investment activities or participate in lotteries that involve higher variance in returns [2]	Amount out of a given $100 one is willing to invest in a hypothetical investment experiment, assuming a 50% chance to earn 2.5 times the investment and a 50% chance to lose the entire investment.
Risk preference in health domain	Willingness to take a medical treatment that has uncertain treatment benefits and/or accepting higher or uncertain levels of adverse event risks for potential benefits	Choices made in DCE between two hypothetical preventative treatment profiles or an opt-out option.
Risk perception	Individual's understanding of the risks and benefits associated with alternative courses of action [6]	
Perception of harm caused by smoking	Perceived general risk of getting lung cancer caused by smoking	A 5-point Likert scale (range:1 = strongly disagree, 5 = strongly agree) that measures how much a respondent would agree with the statement that smoking causes lung cancer.
Perception of the individual's risk of getting lung cancer	Individual perceived risk of getting lung cancer	Randomly informed of one of three levels of risk of getting lung cancer: 6%, 10% and 16%.
	Individual perceived relative risk of getting lung cancer.	An ordered categorical variable evaluating relative risk compared with the average smoker in the US (1 = lower than average, 2 = same as the average, 3 = higher than the average, 4 = not sure).
Perception of the risk of preventative treatment	Individual perceived adverse events of the preventative treatment	5-point Likert scale (range: 1 = not concerned at all, 5 = extremely concerned) that measures concern about each of three side effects of the preventative treatment (injection site reaction, severe infection that leads to hospitalization, and risk of death).
Attitude towards the perceived risk	The degree of an individual's inherent preferences over risk given the risk level that one perceives.	

Appendix A2. Latent Class Model and Estimation

The latent-class model is a logit model for a series of discrete choices made by 1 person [30]. A latent-class model estimates preference heterogeneity by classifying respondents into groups (or classes) based on the individual choices in a DCE, with preferences being homogenous within groups and heterogeneous across groups [41]. In other words, the coefficients on the attribute levels and ASC are assumed to be constant within the same class and different across different classes.

The probability of individual i, given that individual i is in class q, choosing alternative j among J_i alternatives in choice set t is:

$$\mathrm{P_{it|q}(j) = Prob(y_{it} = j|class = q)} = \frac{\exp\left(\beta_{ASC} ASC + \beta_q x_{it,j}\right)}{\sum_{j=1}^{J_i} \exp\left(\beta_{ASC} ASC + \beta_q x_{it,j}\right)}.$$

Segmentation is probabilistic instead of deterministic and is a function of observed demographic and socioeconomic characteristics as well as of unobserved variables such as perceptions, experience, and beliefs [42]. For T_i choice sets, individual i's contribution to probability is the product of probability across all choice sets T_i:

$$P_i = \prod_{t=1}^{T_i} P_{it|q}$$

Class assignment is unknown. Class membership is predicted based on demographic information as well as other variables of interest (eg, risk perceptions and monetary risk preference). The prior probability of individual i in class $q - H_{iq}$ is multinomial logit function:

$$H_{iq} = \frac{\exp\left(\theta_q z_i\right)}{\sum_{q=1}^{Q} \exp\left(\theta_q z_i\right)}, q = 1, \ldots, Q, \theta_Q = 0,$$

where z_i is a vector of observable characteristics that predict the class membership. The Q^{th} class is normalized to have all coefficients equal 0.

Segmentation is estimated simultaneously with the preference coefficients. The number of latent classes to include in a latent-class analysis is determined by comparing models that used different numbers of classes prespecified by researchers. Given the number of classes, the share and preferences are estimated for each class. The selection of number of classes is based on the Bayesian information criterion (BIC): $BIC = -2\ln(\hat{L}) + \ln(n) * k$, where k is the number of parameters estimated by the model, n is the sample size, and $\hat{L}$ is the maximized value of the likelihood function of the model. The log-likelihood for the sample can be written as:

$$lnL = \sum_{i=1}^{N} lnP_i = \sum_{i=1}^{N} \ln\left[\sum_{q=1}^{Q} H_{iq}\left(\prod_{t=1}^{T_i} P_{it|q}\right)\right].$$

Estimation can be conducted by simulated maximum likelihood estimation via the expectation maximization algorithm[43].

Appendix A3. Interpretation of Preference Weights and Conditional Relative Importance

The size of each preference weight (Figure A.1a) for a specific level is interpreted relative to the average preference weight for the attribute. For example, in Class 1 for the attribute "Relative risk reduction over 3 years," the relative preference weight on the level 60% and 10% are 0.63 and -0.79 separately. This implies respondents on average prefer treatment with a 60% relative risk reduction over 3 years over the one with 10% reduction, if all other attributes are the same. Although the preference weights of the effect-coded attribute levels are not comparable across attributes, the relative weight that an average respondent puts on the attribute is, which is the difference between the highest and lowest values of the preference weights within an attribute. For example, for Class 1, the distance between the highest and the lowest values of the preference weight for the attribute "Relative risk reduction over 3 years" is 1.22, and the one for "Risk of death from serious infection over 3 years" is 0.60. These weights imply that the average respondent in Class 1 finds "Relative risk reduction over 3 years" about twice as important as "Risk of death from serious infection over 3 years," given the range of attribute levels presented in the DCE.

Figure A.1b shows the relative importance of each attribute for each class proportionally rescaled based on the sum of the importance of all attributes to show their impact for decision-making. The first class (Class 1; blue; 50.2% of the sample) is labeled the "pro-treatment class" as it has the highest willingness to take the preventative treatment, given the highest and the only positive mean ASC term (3.45; SD, 0.29). The pro-treatment class places the most importance on treatment effectiveness and is also the most sensitive to changes in risk reduction. They would likely accept tradeoffs for increased risks of adverse events to obtain greater efficacy.

The second class (Class 2; red; 29.2% of the sample) is labeled as a “treatment-hesitant class,” as the coefficient on ASC is slightly less than 0 (–0.25; SD, 0.11). On average, this class views the preventative treatment slightly more negatively on its own, given the range of the attribute levels presented, but would potentially accept a preventative treatment if it had a sufficiently good benefit-risk profile. The treatment-hesitant class places the greatest importance on both the effectiveness of the treatment and the risk of death from serious infection over 3 years, with similar weights for both.

The third class (Class 3; dark blue; 20.7% of the sample) is labeled as a “no-treatment class,” with a negative coefficient for the ASC (–4.20; SD, 0.30). On average, this class dislikes the preventative treatment for lung cancer, given the range of the attribute levels presented. This class chooses to opt out of the treatment most of the time, and therefore there is a lack of information on the benefit and risk trade-offs individuals are willing to make and the relative importance of the attributes for their decision-making.

Appendix B.

Table B.1. Additional Summary Statistics

Variable	All respondents (N = 803)
Employment, n (%)	
Employed/homemaker/student	292 (36.4%)
Retired	343 (42.7%)
Unemployed or disabled/unable to work	168 (20.9%)
Annual household income under $30,000 before taxes, n (%)	294 (36.6%)
Has health insurance, n (%)	749 (93.3%)
Has ever had lung cancer screening, n (%)	313 (39.0%)
Has ever had an injection-site reaction, n (%)	222 (27.7%)
Has ever had a serious infection, n (%)	248 (30.9%)
Subjective numeracy total score, [a] mean (SD)	13.1 (3.4)
Answered all 3 comprehension questions correctly, [b] n (%)	373 (46.5%)
Perceived risk of getting lung cancer compared with the average individual who smokes, n (%)	
Smaller than the average individual who smokes	176 (21.9%)
Same as the average individual who smokes	432 (53.8%)
Larger than the average individual who smokes	102 (12.7%)
Didn't know/not sure about perceived risk of getting lung cancer compared with the average individual who smokes	93 (11.6%)
The degree to which one agreed with the statement that smoking causes lung cancer (1 = strongly disagree, 5 = strongly agree), n (%)	
Strongly disagree	9 (1.1%)
Disagree	10 (1.3%)
Neutral or neither disagree nor agree	112 (14.0%)

Variable	All respondents (N = 803)
Agree	193 (24.1%)
Strongly agree	478 (59.6%)

SD = standard deviation.

[a] Subjective Numeracy Scale (SNS-3) [44] measures respondents' self-evaluation of numeracy. It includes 3 items. Each item asks respondents to self-evaluate ability with numerical calculation using a Likert scale (1-6). The total score across 3 items is calculated, with higher scores reflecting higher subjective numeracy.

[b] Three comprehension questions were included in the survey to evaluate respondents' comprehension of the presentation of lung cancer risk reduction and nonfatal and fatal serious infection. After each comprehension question, the respondent was provided with the correct response to reinforce the material.

Table B. 2. Three-Class Latent-Class Model Membership Prediction

Covariate	Class 1 (pro-treatment) (50.2%)	Class 2 (tradeoff) (29.0%)	Class 3 (no treatment) (20.8%)
Age	Reference	0.022 (0.32)	0.051* (0.03)
Male	Class	1.267 (0.46)	1.233 (0.53)
Interaction between age and male		−0.022 (0.42)	−0.023 (0.46)
Education (ref: some college/technical school/associate's degree)			
College degree or above		0.292 (0.26)	−0.244 (0.40)
High school graduate or lower		0.075 (0.76)	−0.281 (0.28)
Race/ethnicity (ref: African American or Black)			
Self-identified as Alaska Native, American Indian, Native American		−0.407 (0.33)	0.201 (0.69)
Self-identified as Asian		−0.474 (0.33)	−0.384 (0.56)
Self-identified as Hispanic, Latin American, or Latinx		−0.239 (0.53)	0.506 (0.25)
Self-identified as only White		0.025 (0.93)	1.020** (<0.01)
Baseline risk of developing lung cancer (ref: 6%)			
Respondent was informed of 10% risk of developing lung cancer		−0.089 (0.72)	0.251 (0.33)
Respondent was informed of 16% risk of developing lung cancer		−0.098 (0.68)	−0.203 (0.45)
Has blood relatives who have history of lung cancer		−0.362 (0.08)	−0.349 (0.13)

Covariate	Class 1 (pro-treatment) (50.2%)	Class 2 (tradeoff) (29.0%)	Class 3 (no treatment) (20.8%)
Number of correct answers for comprehension questions		−0.243* (0.02)	−0.181 (0.10)
Subjective evaluation of numeracy		−0.072* (0.02)	0.0046 (0.90)
Has personal risk factors for lung cancer		0.703** (<0.01)	0.006 (0.98)
Annual household income < $30,000		−0.114 (0.61)	−0.052 (0.83)
Employment (ref: employed/homemaker/student)			
Retired		−0.229 (0.42)	−0.044 (0.88)
Unemployed		0.120 (0.68)	0.671* (0.04)
Has medical insurance		−0.057 (0.89)	−0.620 (0.13)
Perceived risk of getting lung cancer compared with the average individual who smokes (ref: smaller)			
about the same		−0.285 (0.27)	−0.394 (0.14)
higher		0.056 (0.87)	−0.713 (0.10)
Don’t know or not sure		−0.611 (0.14)	0.256 (0.48)
Total concern scores of 3 side effects (0-15)		0.056 (0.12)	0.262** (<0.01)
The degree to which one agreed with the statement that smoking causes lung cancer (ref: strongly disagree)			

Covariate	Class 1 (pro-treatment) (50.2%)	Class 2 (tradeoff) (29.0%)	Class 3 (no treatment) (20.8%)
Disagree		2.907 (0.07)	1.721 (0.34)
neutral		0.696 (0.46)	0.538 (0.65)
Agree		0.323 (0.73)	−0.572 (0.63)
Strongly agree		0.155 (0.87)	−0.682 (0.56)
The amount from a given $100 that one was willing to invest (ref: 0)			
$1-$45		−0.821 (0.17)	−1.093* (0.05)
$46-$55		−0.825 (0.14)	−1.570** (<0.01)
$56-$99		−0.848 (0.13)	−1.766** (<0.01)
$100		−1.650** (<0.01)	−1.556** (<0.01)
Constant		−0.010 (1.00)	−4.245* (0.03)
Observations		19,239	
Number of groups		6,413	
Number of classes		3	
Log-likelihood		−4,921.0	
AIC		10,030	
BIC		10,666	
F-test		1.45e-08	

AIC = Akaike information criterion; BIC = Bayesian information criterion; US = United States.

Note: Class 1 (pro-treatment class) is used as the reference. Means and P values (in parentheses) of the class membership prediction coefficients estimates for Class 2 and 3 are reported relative to the reference class. ** and * stand for 1% and 5% significance, respectively.

Table B.3. Odds Ratio of the Associations Between Risk Preference in the Monetary Domain and Other Preventative Care Measures

Dependent variable	Specification 1	Specification 2
	OR (P value)	OR (P value)
Experience with screening tests		
1. Mammogram to check for breast cancer	1.006 (0.18)	1.007 (0.15)
2. Pap smear to test for cervical cancer	1.004 (0.35)	1.005 (0.25)
3. PSA test to test for prostate cancer	1.005 (0.22)	1.004 (0.34)
4. Colonoscopy or other colon screening test	1.002 (0.43)	1.002 (0.45)
5. Exam to check for skin cancer or precancerous moles	1.005 (0.07)	1.004 (0.14)
6. Experience with any of the above measures (items 1-5)	1.005 (0.21)	1.004 (0.35)
Experience with preventative treatments to reduce the risk of getting an illness or health problem		
7. Flu shot	1.005 (0.06)	1.004 (0.14)
8. Shingles vaccine	1.001 (0.69)	1.001 (0.70)
9. Medicine to reduce the risk of cancer taken before cancer develops [a]	1.023 (0.08)	1.020 (0.13)
10. Surgery to remove the ovaries or breasts (prophylactic mastectomy or oophorectomy) to prevent cancer from developing	1.005 (0.32)	1.004 (0.43)
11. Medicine to reduce risk of heart problems, high blood pressure, or high cholesterol	1.007** (0.01)	1.005 (0.07)

Dependent variable	Specification 1	Specification 2
	OR (P value)	OR (P value)
12. Experience with any of the above treatments (items 7-11)	1.009** (0.01)	1.008* (0.03)
Precautionary measures one has ever taken to protect family and self from getting COVID-19		
13. Take COVID-19 vaccine	1.006* (0.03)	1.006* (0.03)
14. Always wear masks indoors when outside of home	1.004 (0.10)	1.003 (0.22)
15. Minimize socializing in person	1.001 (0.68)	1.001 (0.69)
16. Wash hands as often as possible	1.004 (0.15)	1.003 (0.29)
17. Disinfect contact surfaces as often as possible	1.005* (0.04)	1.005* (0.04)
18. Experience with any of the above measures (items 13-17)	1.013** (0.01)	1.012** (0.01)

COVID-19 = coronavirus 2019; OR = odds ratio; PSA = prostate-specific antigen.

Notes: The table shows the odds ratios of associations between risk preference in the financial domain and whether the respondent reported receiving different preventative care measures. The question on mammograms, pap smears, and surgery to remove the ovaries or breasts was only asked of the 495 female-identifying participants. The question on PSA tests was only asked to the 308 male-identifying participants. Specification 1 controls demographic characteristics only, while specification 2 controls other health status besides the demographic characteristics included in Specification 1. Levels of statistical significance are reported as P values in parentheses and labelled at 1% (**) and 5% (*) significance.

[a] None of the 66 respondents who identified as Native American have previously taken a preventative medicine to reduce the risk of cancer. Those who identified as Native American are omitted due to multicollinearity.

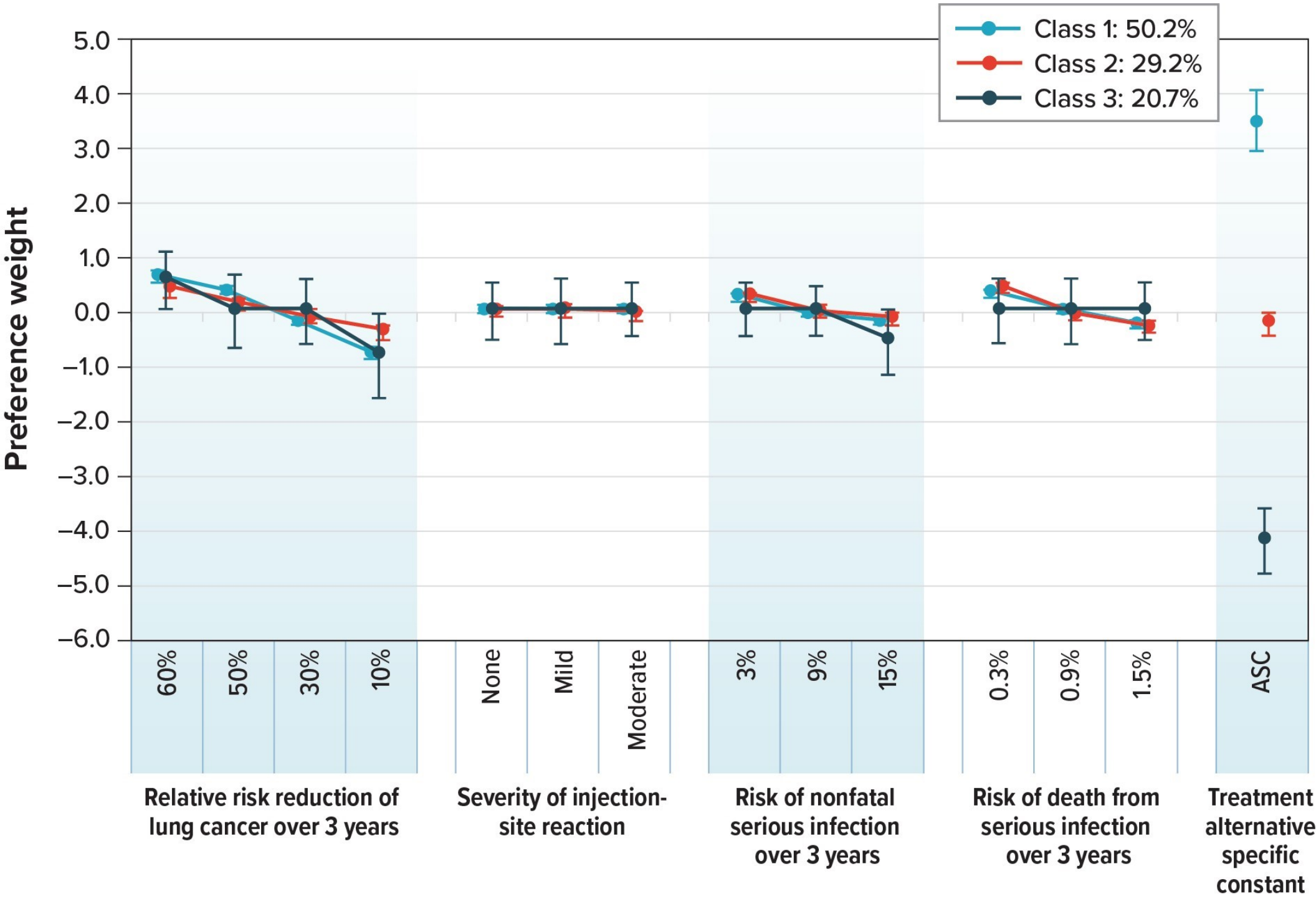
Class 1: 50.2%
Class 2: 29.2%
Class 3: 20.7%
Preference weight
5.0
4.0
3.0
2.0
1.0
0.0
−1.0
−2.0
−3.0
−4.0
−5.0
−6.0
60%
50%
30%
10%
None
Mild
Moderate
3%
9%
15%
0.3%
0.9%
1.5%
ASC
Relative risk reduction of lung cancer over 3 years
Severity of injection-site reaction
Risk of nonfatal serious infection over 3 years
Risk of death from serious infection over 3 years
Treatment alternative specific constant

Figure A. 1a. Preference Weights by Class from the Latent-Class Model

Note: ASC = alternative specific constant. The y-axis on the left displays the range for preference weight for each attribute level, and the y-axis on the right displays the range for the ASC. The estimated preference weights for each class reflect the average preference level for respondents of the corresponding class who select the preventive treatment in at least 1 DCE question. The vertical bars surrounding each mean preference weight denote the 95% CI of the point estimate.

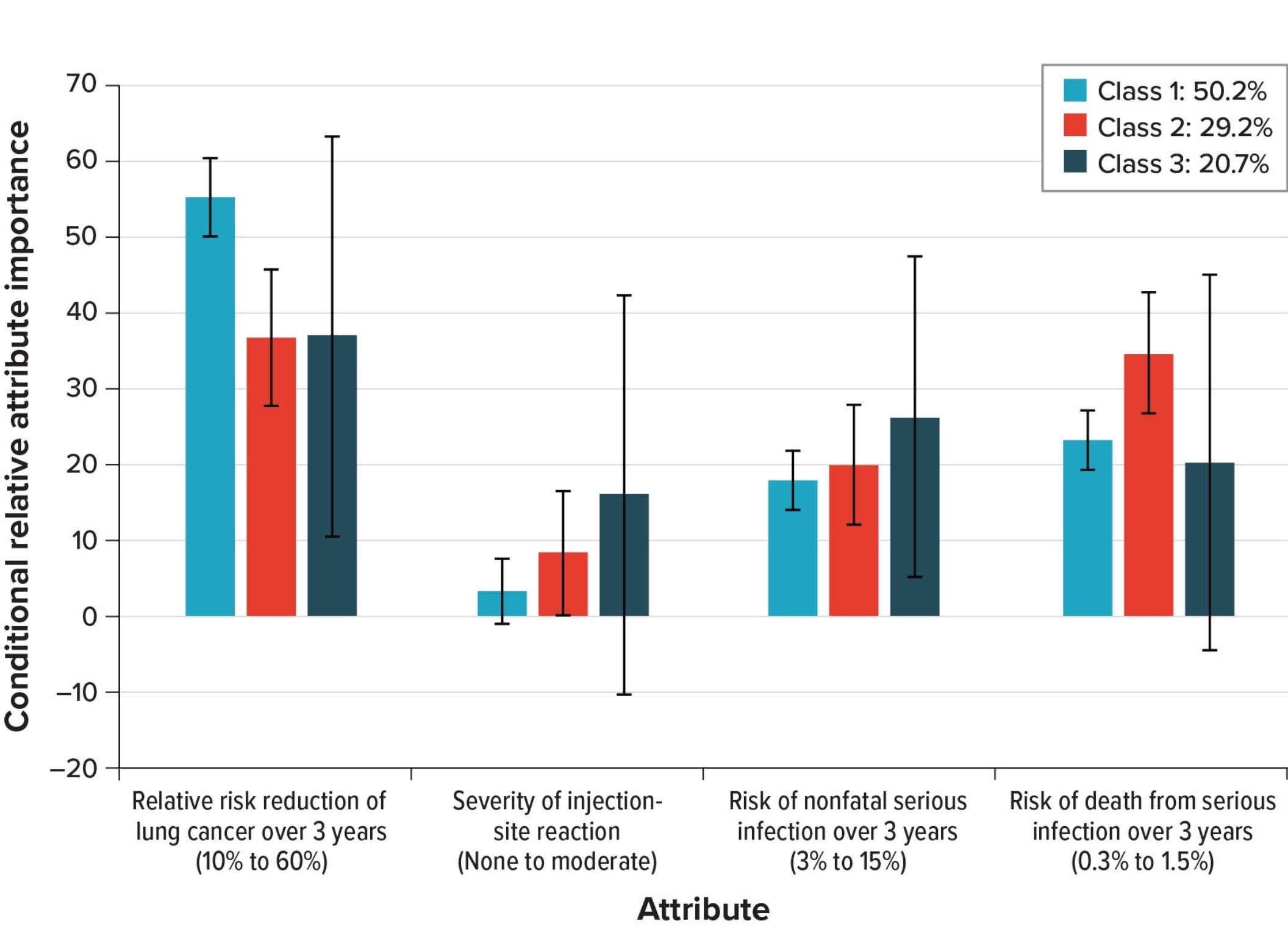
Class 1: 50.2%
Class 2: 29.2%
Class 3: 20.7%
Conditional relative attribute importance
70
60
50
40
30
20
10
0
−10
−20
Relative risk reduction of lung cancer over 3 years (10% to 60%)
Severity of injection-site reaction (None to moderate)
Risk of nonfatal serious infection over 3 years (3% to 15%)
Risk of death from serious infection over 3 years (0.3% to 1.5%)
Attribute

Figure A. 1b. Conditional Relative Importance by Classes

Note: The conditional relative importance is the difference between the preference weights on the most-preferred level and the least-preferred attribute level. These differences are summed across attributes and the sum is scaled to 100, for each class separately. The conditional importance of each attribute is a percentage of this total. The vertical bars surrounding each relative importance weight estimate denote the 95% confidence interval.