

# Subjective Assessment of COVID-19 Risks in Japan: A Cross-Sectional Study

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# Research purposes

- Gain insights into public perceptions of COVID-19 infection and fatality risks in the post-pandemic period
- Examine how individual attributes affect the way people perceive COVID-19 risks

# What we do

- We conduct a large-scale survey to investigate the subjective assessments of COVID-19 risks in Japan.
- We compare perceived risks with actual ones and evaluate the extent of overestimation or underestimation.
- We uncover the factors associated with the overestimation or underestimation of COVID-19 risks through multivariate logistic regression analysis.

# Key results

- Many Japanese people tend to overestimate the risk of infection and fatality risks.
  - Specifically, at the end of February 2023:
    - 33.3% of respondents perceived infection risk as 10% or higher (actual rate: 0.20%)
    - 29.8% perceived fatality risk as 5% or higher (actual rate: 0.24%)
  - Findings are robust to alternative ways of eliciting subjective risks.
- A non-negligible portion of respondents underestimated the infection and fatality risks.
  - 17.7% (27.1%) of respondents perceived infection (fatality) risk as less than 0.001%

# Key results: Infection Risk

- People aged 60 or older are less (or more) likely to have a very high (or very low) assessment of infection risk than others.
- People who have previously contracted COVID-19 are more (or less) likely to have a very high (or very low) assessment of infection risk.
- People without pre-existing chronic diseases are less likely to report a very high infection risk.

# Key results: Fatality Risk

- People without pre-existing chronic diseases are less (or more) likely to report a very high (or very low) fatality risk.
- Less educated and low-income individuals are more likely to report a very high fatality risk.
- People who have contracted COVID-19 are less likely to perceive their fatality risk as very high.

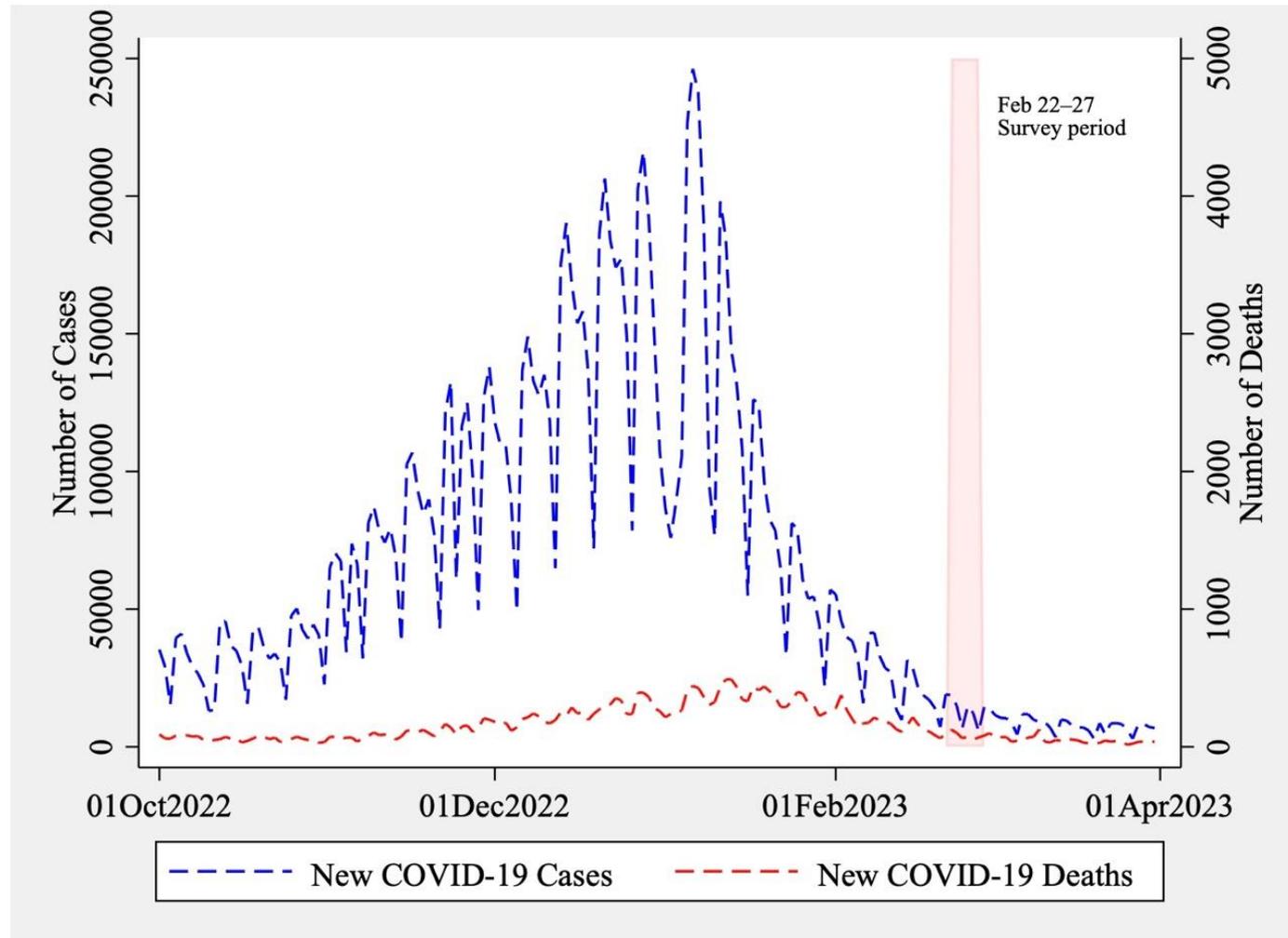
# Literature

- COVID-19 risk perceptions
  - Japan: Adachi et al. (2022), Sato et al. (2023)
  - Other countries: Cipolletta et al. (2022), Dryhurst et al. (2020), Dyer et al. (2022), Wise et al. (2020), etc.
- Risk perception and COVID-19 preventive behavior
  - Bruine De Bruin & Bennett (2020), Bundorf et al. (2023); Garfin et al. (2021); Savadori & Lauriola (2022)
- Few studies compare the perceived and actual risks
  - Abel et al. (2021), Akesson et al. (2022), Graso (2022)
- Scarcity of research on subjective risk assessment in the post-COVID era

# Design of the survey

- Country: Japan
- Period: February 22 to February 27, 2023.
- Target: Men and women aged 20 and older nationwide
- Number of valid responses: 40,000
- Nationally representative: Distributions in age, gender, and place of residence was matched to those in the 2020 Population Census
- Ethics approval number (University of Tokyo): 22-388

# COVID-19 infections in Japan and the timing of our survey



# Calculation of actual risks

- Data sources:
  - Population of Japan – Statistics Bureau of Japan
  - Newly confirmed and death cases – Ministry of Health, Labour and Welfare
- Actual risks:
  - Infection risk: 0.20% (Period: February 24 – March 23, 2023)
  - Fatality risk: 0.24% (Period: November 1, 2022 – February 28, 2023 (eighth wave of COVID-19))

# Survey questions - Perception of COVID-19 risks

- We inquired about:
  - Subjective probability of contracting COVID-19 within the next month
  - Subjective probability of fatality if infected within the next month
  - Response options: (1) less than 0.001%, (2) 0.001% – 0.01%, (3) 0.01% – 0.1%, (4) 0.1% – 1%, (5) 1% – 5%, (6) 5% – 10%, (7) 10% – 20%, (8) 20% – 50%, and (9) 50% or higher
- Potential concern: Respondents may favor the middle option
  - We implement a supplemental survey for robustness verification

# Supplemental survey

- Timing: April 2023
- Number of valid responses: 10,010
- Distributions in age, gender was matched to those in the 2020 Population Census
- Ethics approval number (University of Tokyo): 23-33
- Participants were divided into five groups, each receiving different answer options for questions on subjective risk assessments.
  - “Choice A”: same as in the original survey
  - “Choice B”: (1) less than 0.001%, (2) 0.001% – 0.01%, (3) 0.01% – 0.1%, (4) 0.1% – 1%, (5) 1% – 5%, (6) 5% – 10%, and (7) 10% or higher
  - “Choice C”: (1) less than 0.1%, (2) 0.1% – 1%, (3) 1% – 5%, (4) 5% – 10%, (5) 10% – 20%, (6) 20% – 50%, and (7) 50% or higher
  - “Choice D”: (1) less than 0.01%, (2) 0.01% – 0.1%, (3) 0.1% – 1%, (4) 1% – 5%, (5) 5% – 10%, (6) 10% – 20%, and (7) 20% or higher
  - “Choice E”: participants input the specific number (in %)

# Self-reported COVID-19 risks in main and supplemental survey—Overestimation—

	Original Survey in February 2023	Supplemental Survey in April 2023				
		Choice A	Choice B	Choice C	Choice D	Choice E
<b>Panel A. Infection Risk</b> (Actual infection risk as of February 2023: 0.20%)						
<b>More than 10%</b>	33.3%	29.3%	11.9%	28.0%	17.8%	54.4%
<b>More than 5%</b>	50.2%	46.8%	26.5%	47.2%	32.8%	69.9%
<b>More than 1%</b>	69.4%	69.0%	50.9%	68.5%	57.3%	79.2%
<b>Panel B. Fatality Risk</b> (Actual fatality risk as of February 2023: 0.24%)						
<b>More than 10%</b>	19.9%	16.7%	7.2%	16.6%	10.4%	29.6%
<b>More than 5%</b>	29.8%	27.0%	14.7%	28.6%	18.9%	42.6%
<b>More than 1%</b>	46.5%	44.0%	27.5%	46.6%	33.9%	65.6%
<b>Number of Observations</b>	40,000	2,002	2,002	2,002	2,002	2,002

# Self-reported COVID-19 risks in main and supplemental survey—Underestimation—

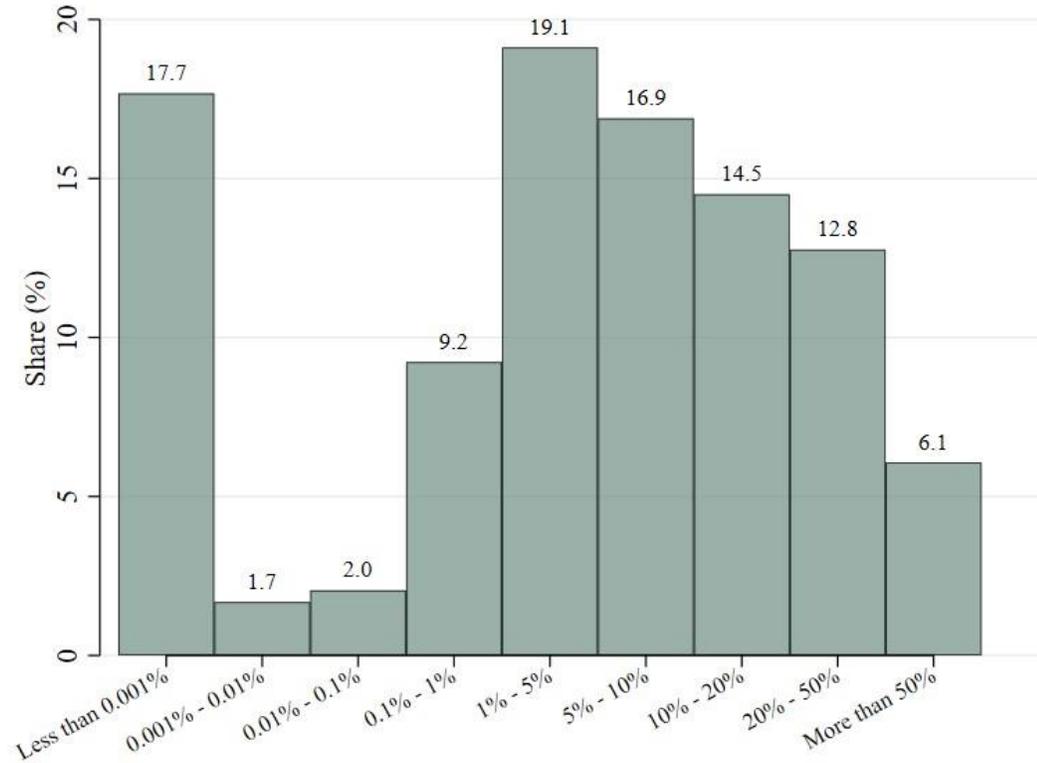
	Original Survey in February 2023	Supplemental Survey in April 2023				
		Choice A	Choice B	Choice C	Choice D	Choice E
<b>Panel A. Infection Risk</b> (Actual infection risk as of February 2023: 0.20%)						
Less than 0.001%	17.7%	14.6%	19.9%	-	-	19.9%
Less than 0.01%	19.4%	16.6%	24.1%	-	21.6%	19.9%
Less than 0.1%	21.4%	19.6%	30.4%	20.8%	27.2%	20.2%
<b>Panel B. Fatality Risk</b> (Actual fatality risk as of February 2023: 0.24%)						
Less than 0.001%	27.1%	25.9%	34.4%	-	-	30.2%
Less than 0.01%	32.6%	32.2%	42.7%	-	38.9%	30.8%
Less than 0.1%	39.5%	40.1%	52.3%	35.4%	49.7%	32.0%
<b>Number of Observations</b>	40,000	2,002	2,002	2,002	2,002	2,002

# Survey questions (cont.) – Individual characteristics

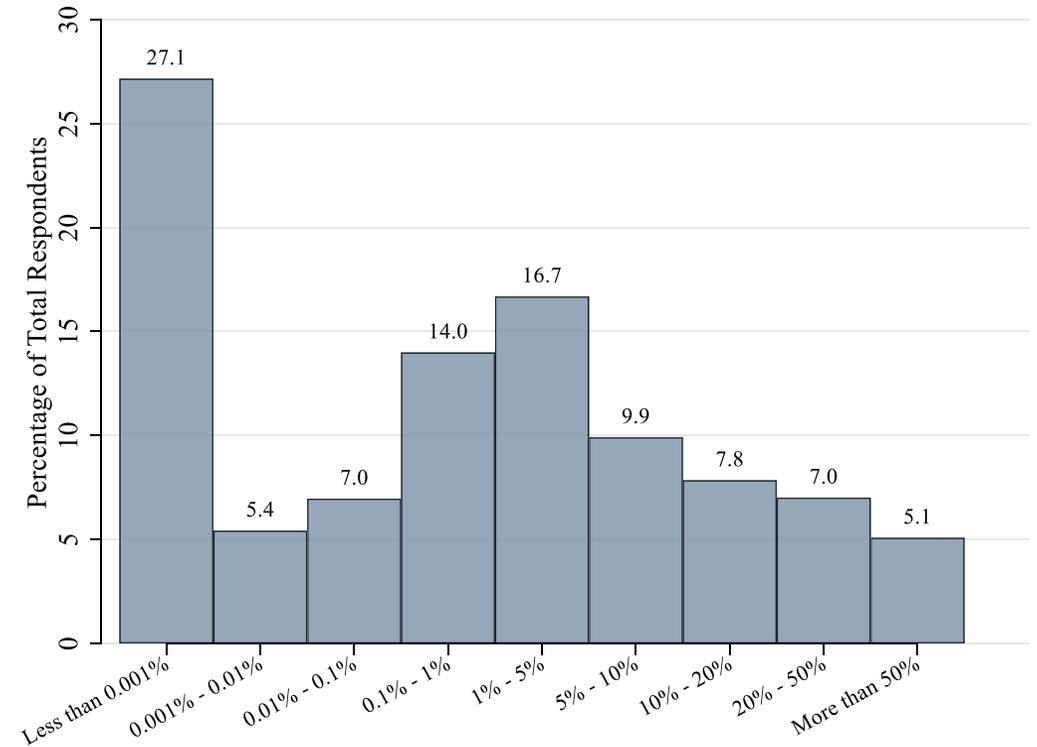
- Basic information: age, gender, place of residence, education level, income class
- Attributions:
  - Male: 48.0%, Female: 52.0%;
  - Age groups: 20s-30s: 24.4%, 40s-50s: 33.5%, Over 60s: 42.1%
- Household structure (living arrangement with spouse/partner, elderly members, children)
- Health situation: smoking habits, medical history of chronic diseases
- COVID-19-related experiences: vaccination status, number of past infections, acquaintances' COVID-19-related deaths
- Primary media source (e.g., television, newspaper, internet, SNS, or others)

# Risk perception toward COVID-19 in February 2023

## Infection Risk



## Fatality Risk



Note: N(Full Sample) =40,000.

# Infection risk perception by age group: Overestimation

Age Group	N	Actual Infection Rate	Subjective Infection Rate		
			Over 5%	Over 10%	Over 20%
20s - 30s	9,762	0.261%	55.4%	40.0%	24.3%
40s - 50s	13,388	0.209%	53.1%	36.3%	21.3%
Over 60s	16,850	0.148%	45.0%	27.1%	13.7%

# Infection risk perception by age group: Underestimation

Age Group	N	Actual Infection Rate	Subjective Infection Rate	
			Less than 0.001%	Less than 0.01%
20s - 30s	9,762	0.261%	17.8%	19.7%
40s - 50s	13,388	0.209%	17.8%	19.3%
Over 60s	16,850	0.148%	17.5%	19.2%

# Fatality risk perception by age group: Overestimation

Subjective Fatality Rate					
Age Group	N	Actual Fatality Rate	Over 5%	Over 10%	Over 20%
20s - 30s	9,762	0.002%	24.6%	15.7%	9.1%
40s - 50s	13,388	0.015%	26.7%	17.8%	10.7%
Over 60s	16,850	0.997%	35.3%	24.0%	14.8%

# Fatality risk perception by age group: Underestimation

Age Group	N	Actual Fatality Rate	Subjective Fatality Rate	
			Less than 0.001%	Less than 0.01%
20s - 30s	9,762	0.002%	32.1%	N/A
40s - 50s	13,388	0.015%	30.3%	36.0%
Over 60s	16,850	0.997%	21.7%	26.2%

# Multivariate Analysis

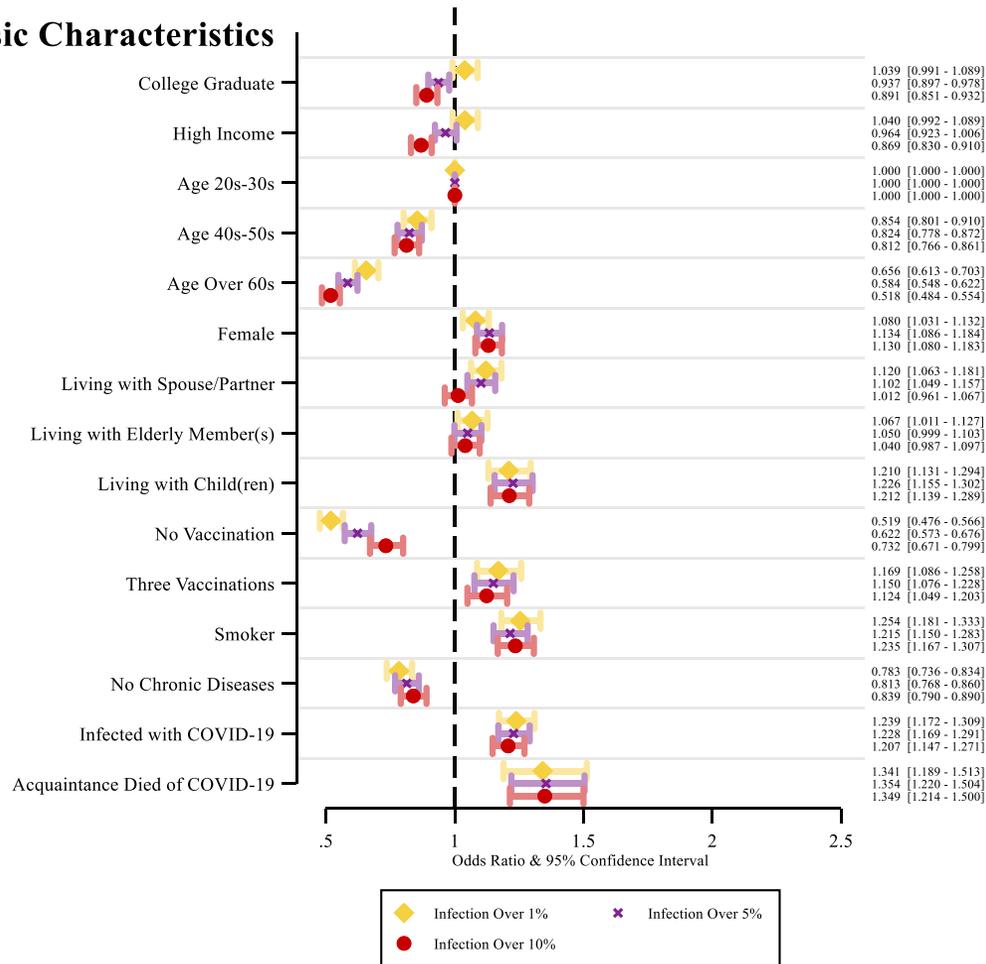
- Model: Logistic regression
- Outcome variables:
  - *Infection (Fatality) Over 1%, 5%, 10%*: equals 1 if the subjective risk of infection (fatality) is equal to or higher than 1%, 5% or 10%.
  - *Infection (Fatality) Under 0.001%, 0.01%, 0.1%*: equals 1 if the subjective risk of infection (fatality) is less than 0.001%, 0.01%, or 0.1%.
- Independent variables:
  - *College Graduate*: equals 1 if the person has a bachelor's degree or higher
  - *High Income*: equals 1 if the person has the income in 2022 from 4 million yen or more
  - Demographic factors (age group, gender, household structure)
  - Vaccination status, health situation
  - Proxies for COVID-19 related experiences (*Infected with COVID-19* and *Acquaintances Died of COVID-19*)
- Covariates:
  - Primary media source
  - Prefecture fixed effects

# Determinants of risk overestimation – Logistic regression

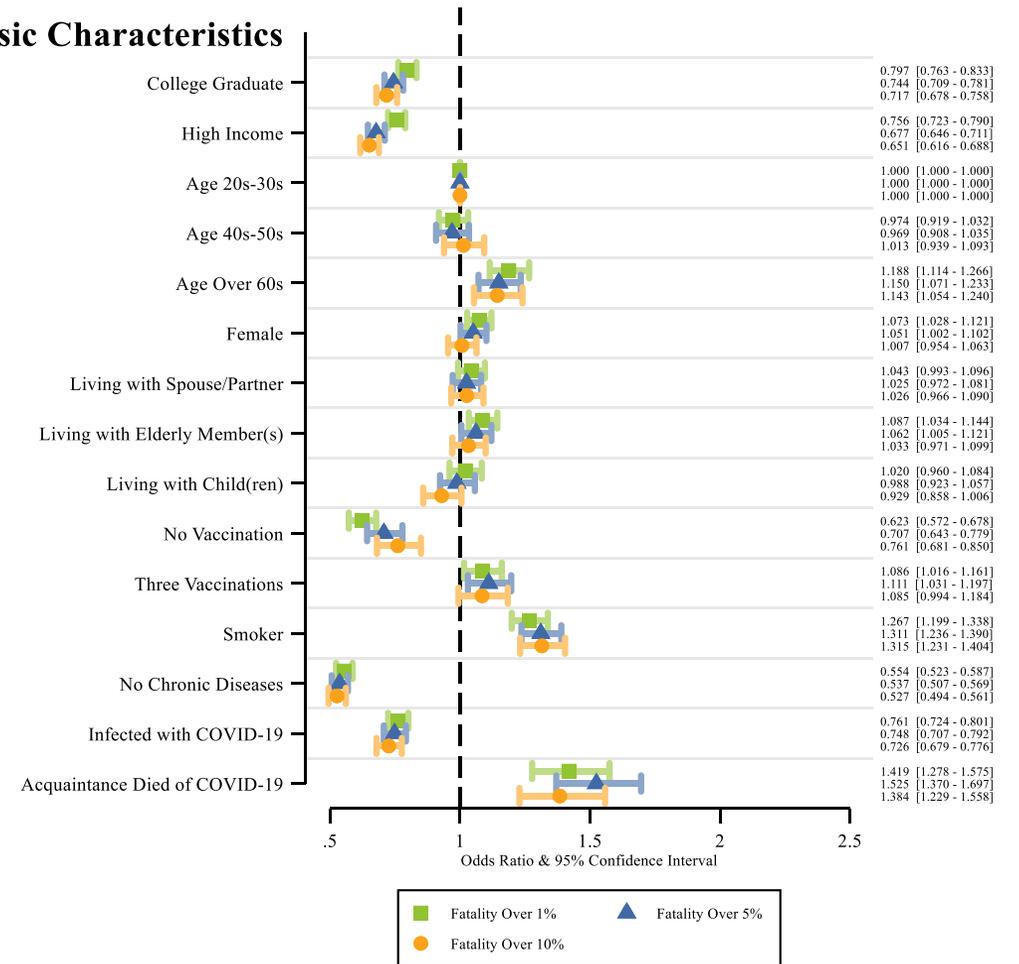
## Infection Risk

## Fatality Risk

### Basic Characteristics



### Basic Characteristics

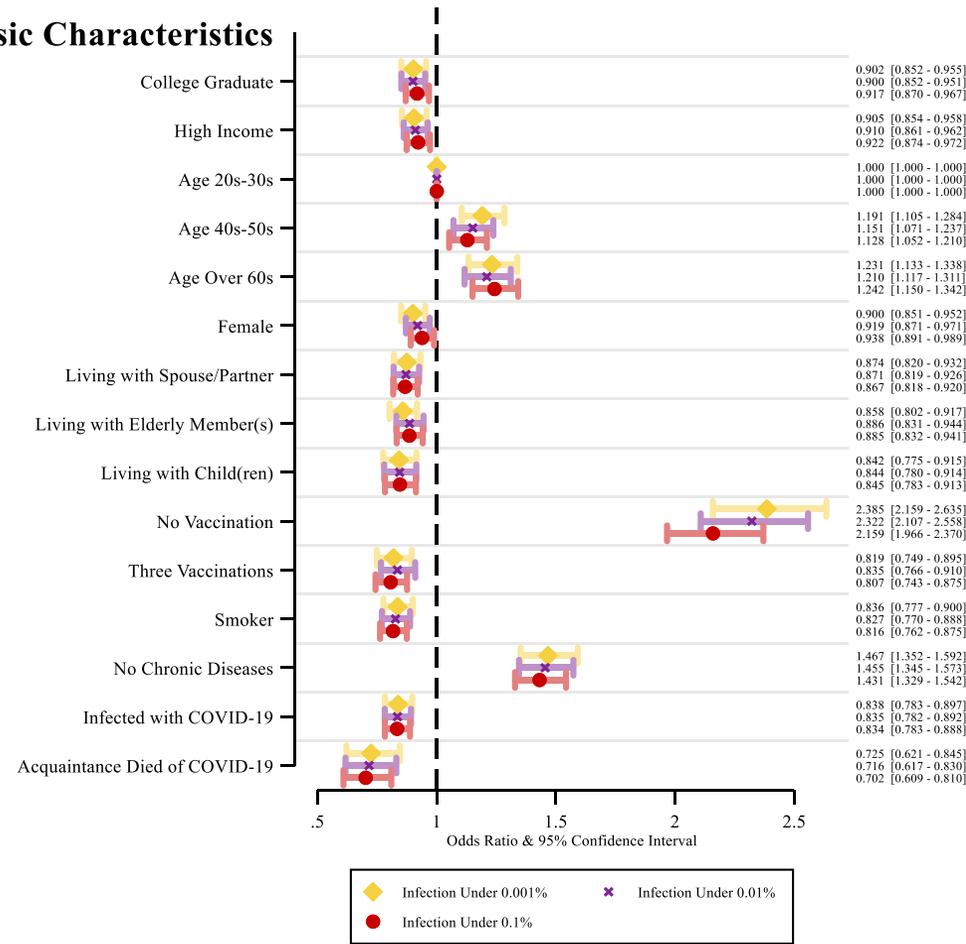


Note: N = 40,000. In the regressions, we also control for the media source and prefecture fixed effects.

# Determinants of risk underestimation – Logistic regression

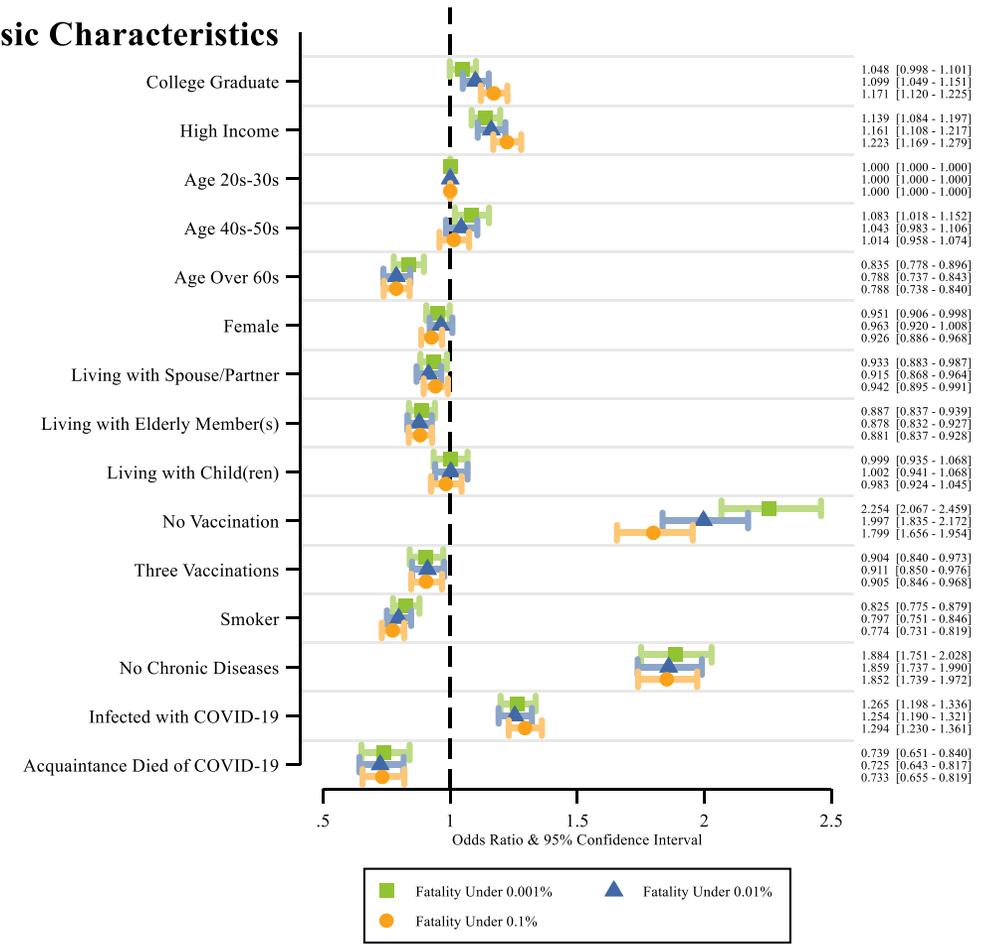
## Infection Risk

### Basic Characteristics



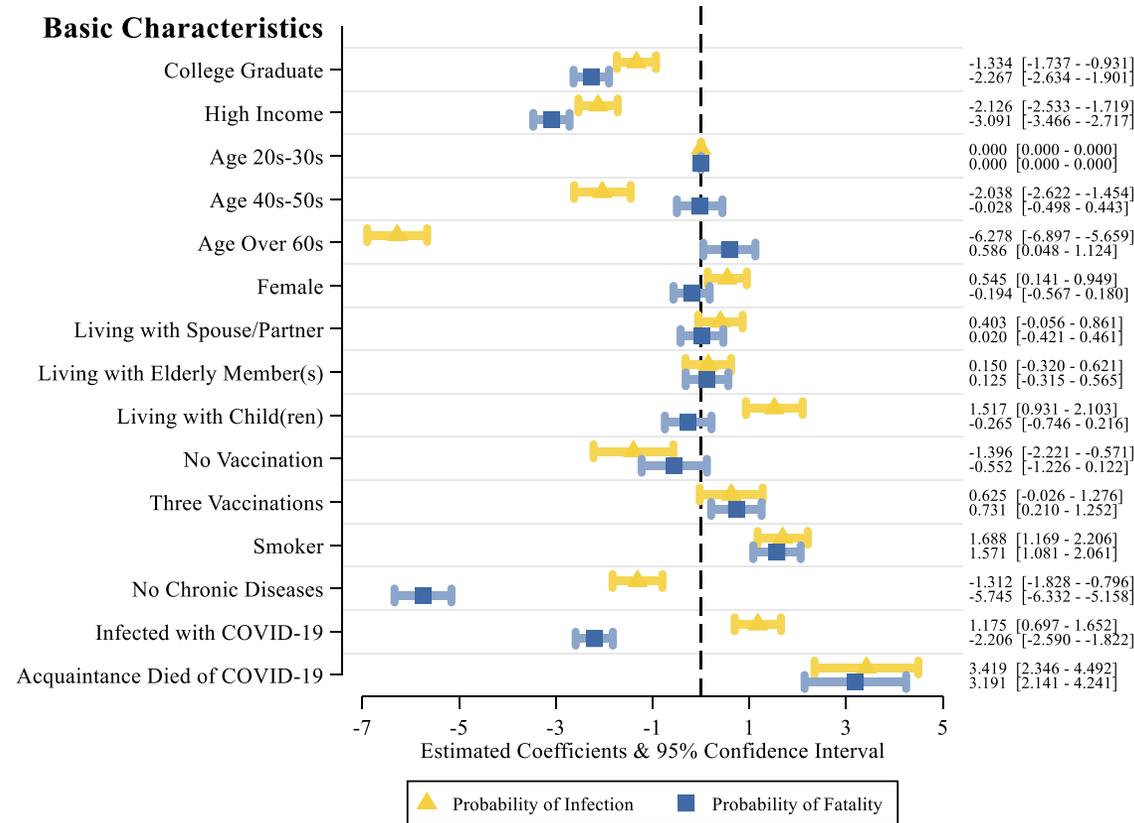
## Fatality Risk

### Basic Characteristics



Note: N = 40,000. In the regressions, we also control for the media source and prefecture fixed effects.

# Robustness - Linear regression



Note: The outcome variables are continuous.

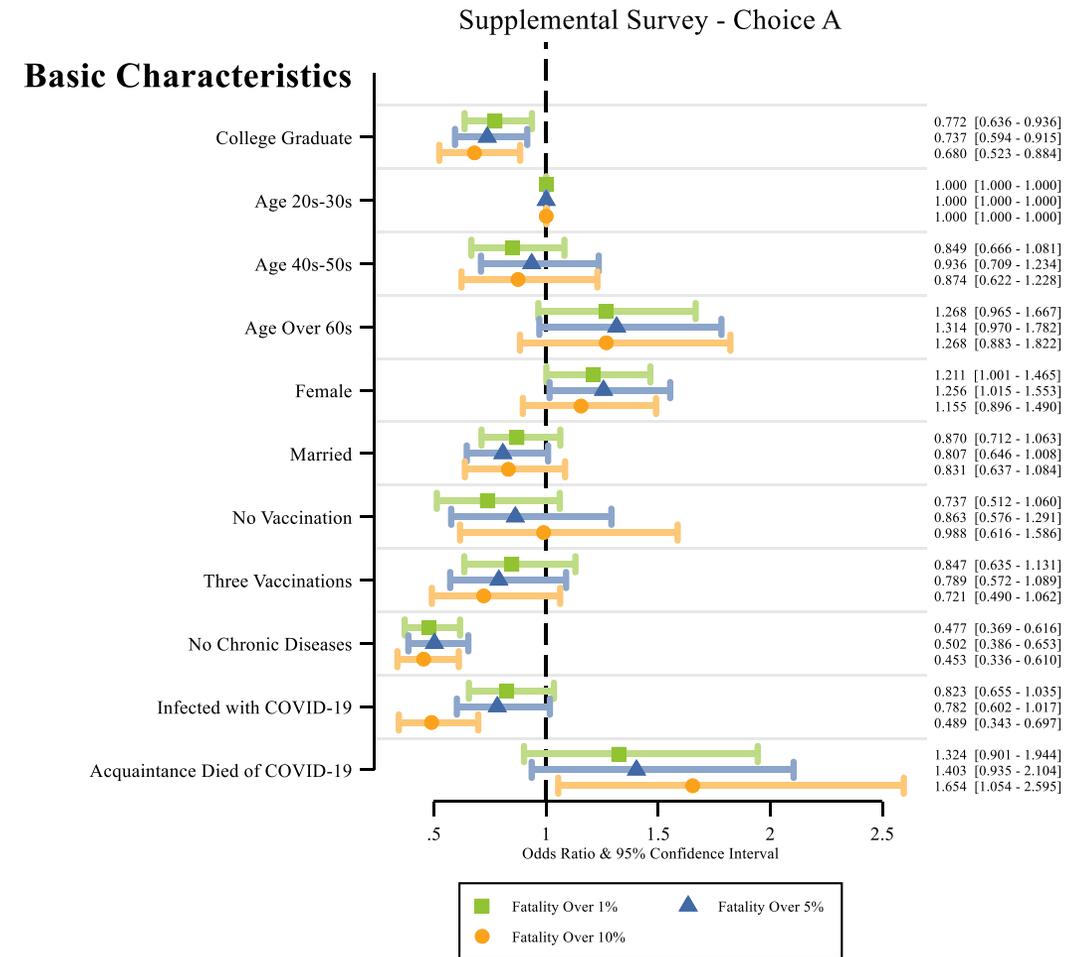
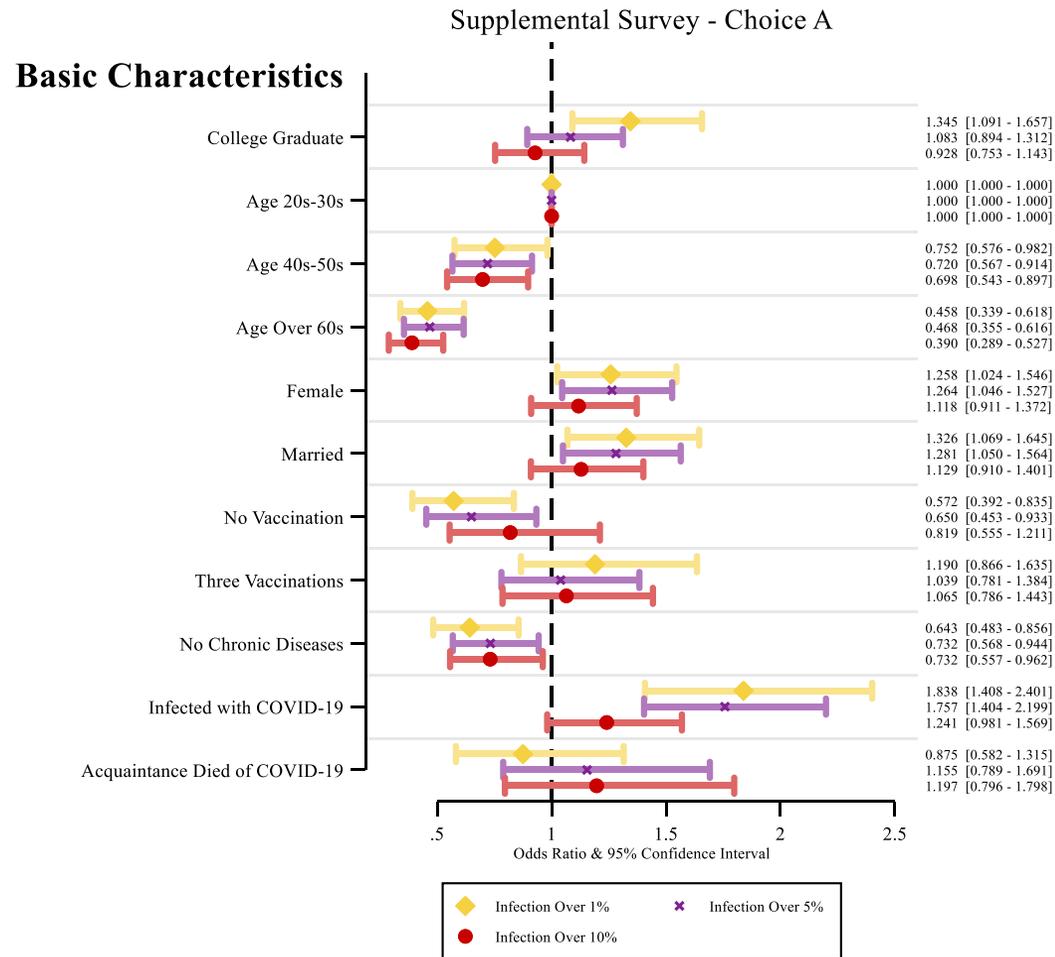
- *Probability of Infection (or Fatality)*: the midpoints in responses about subjective risks.
- Example: A participant rated the infection risk to be 50% or higher → the *Probability of Infection* would be 75%.
- In the regressions, we also control for the media source and prefecture fixed effects.

# Robustness – Determinants of risk overestimation

## Supplemental Survey – Group “Choice A”

### Infection Risk

### Fatality Risk



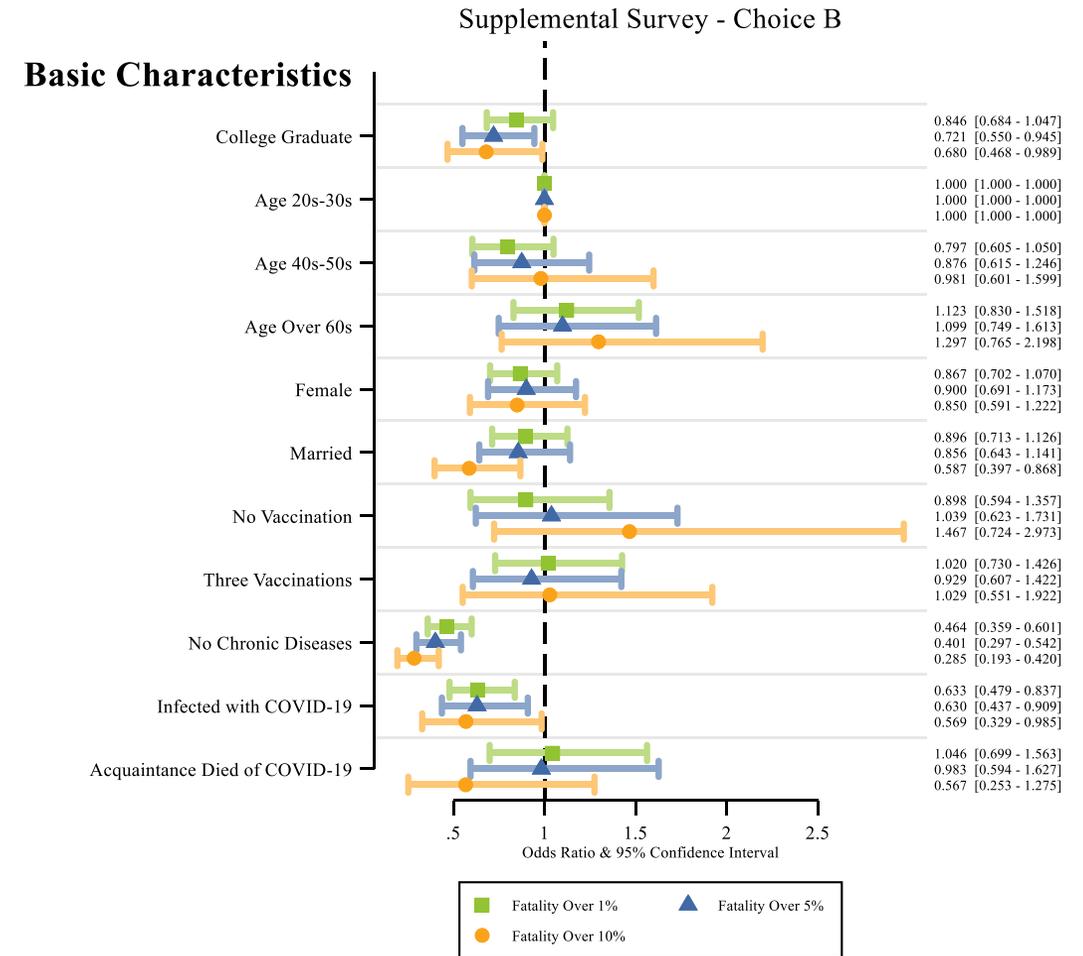
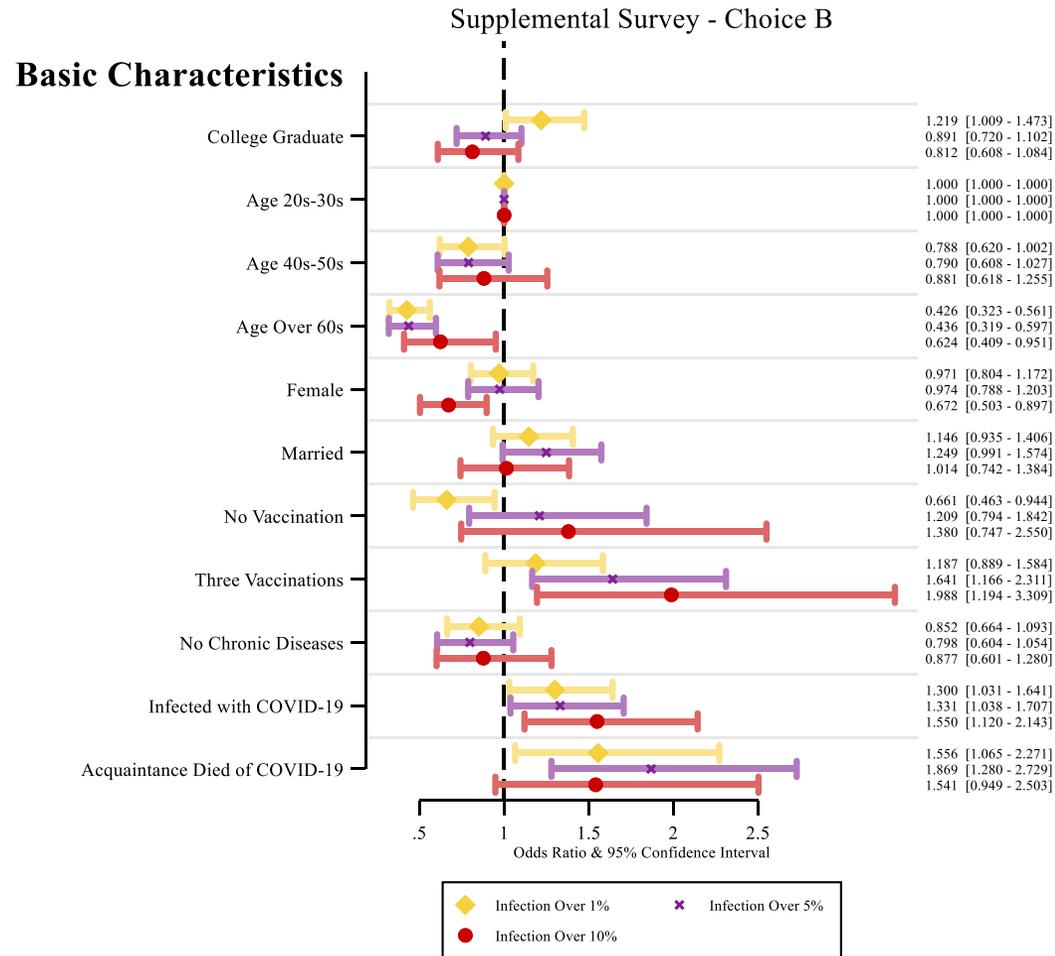
Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.

# Robustness – Determinants of risk overestimation

## Supplemental Survey – Group “Choice B”

### Infection Risk

### Fatality Risk



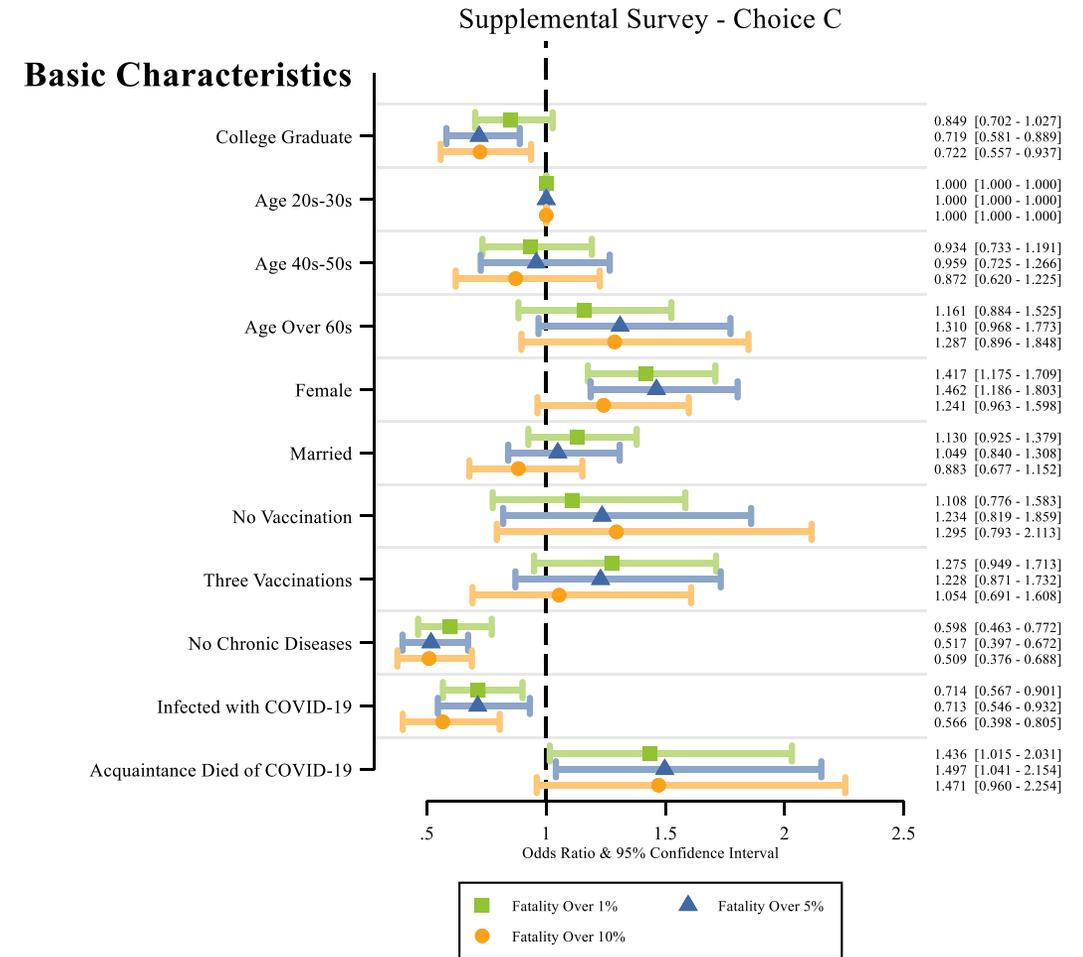
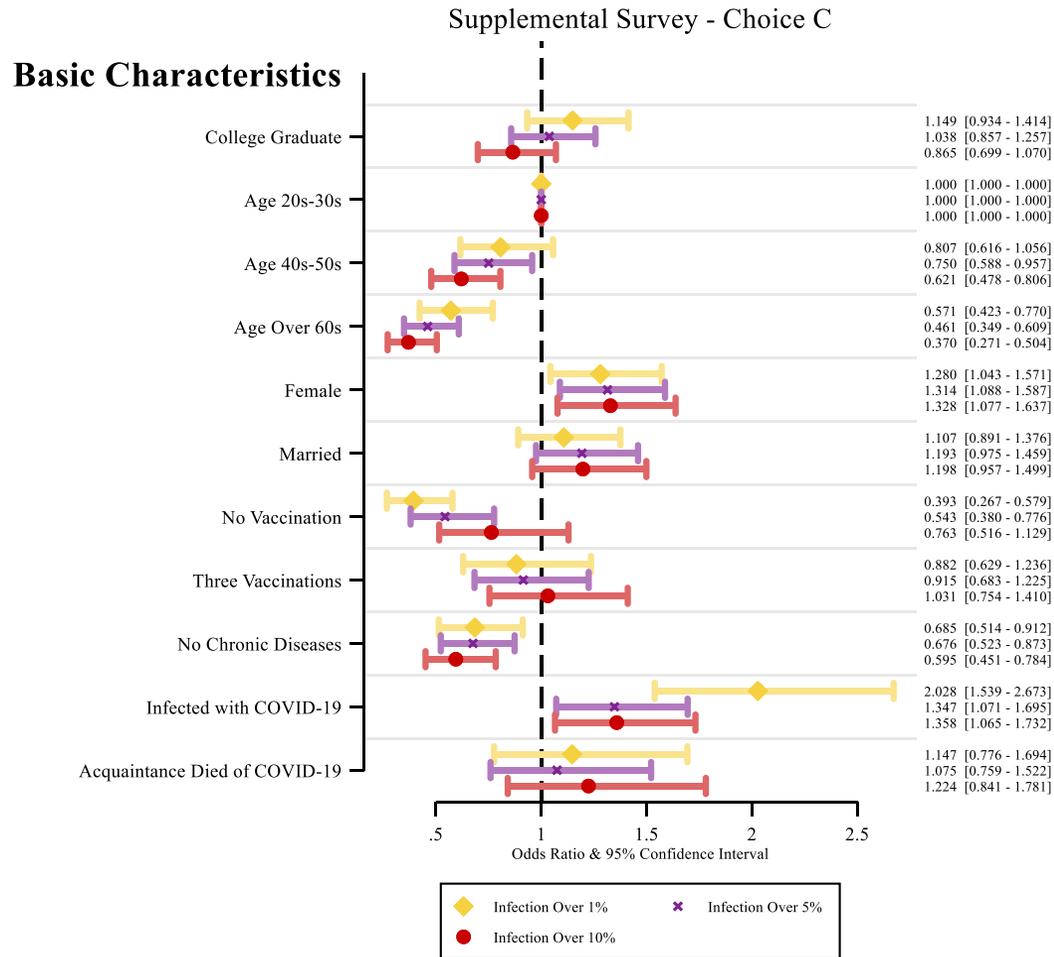
Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.

# Robustness – Determinants of risk overestimation

## Supplemental Survey – Group “Choice C”

### Infection Risk

### Fatality Risk



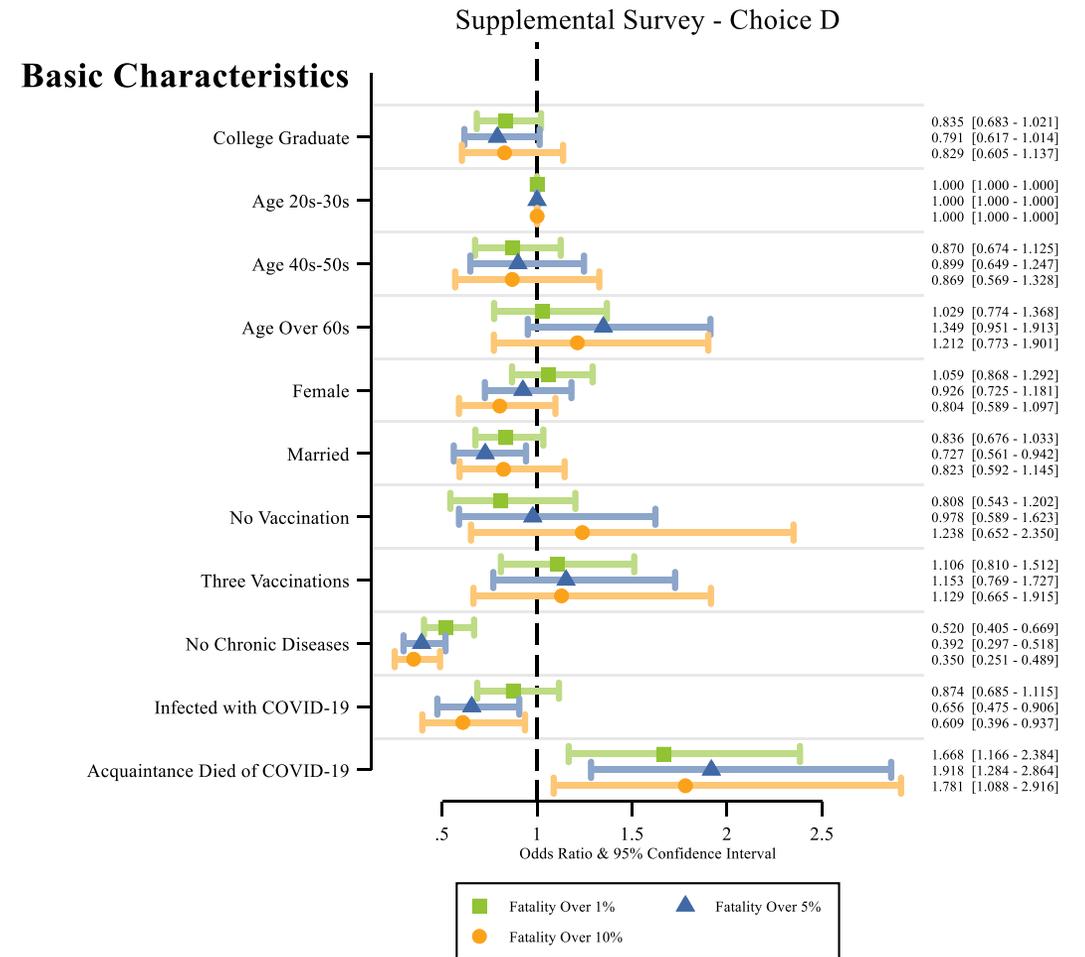
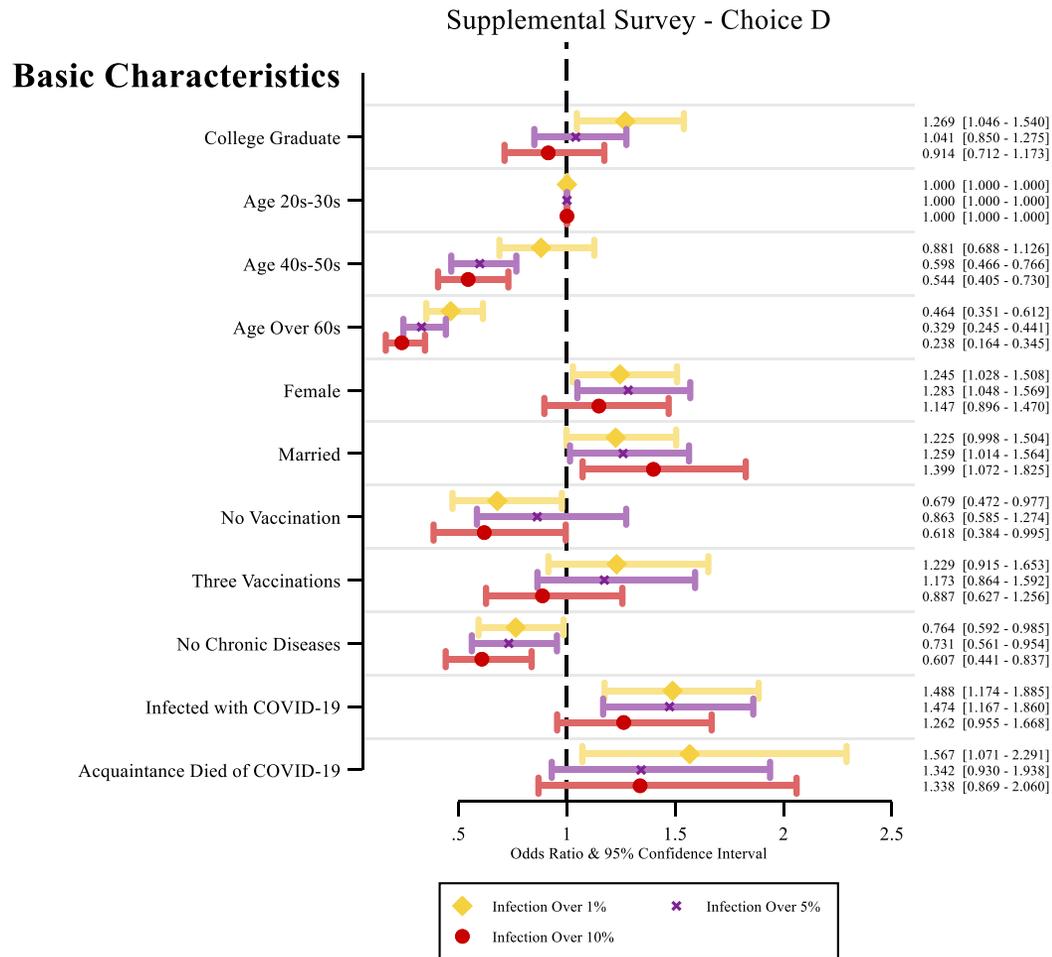
Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.

# Robustness – Determinants of risk overestimation

## Supplemental Survey – Group “Choice D”

### Infection Risk

### Fatality Risk



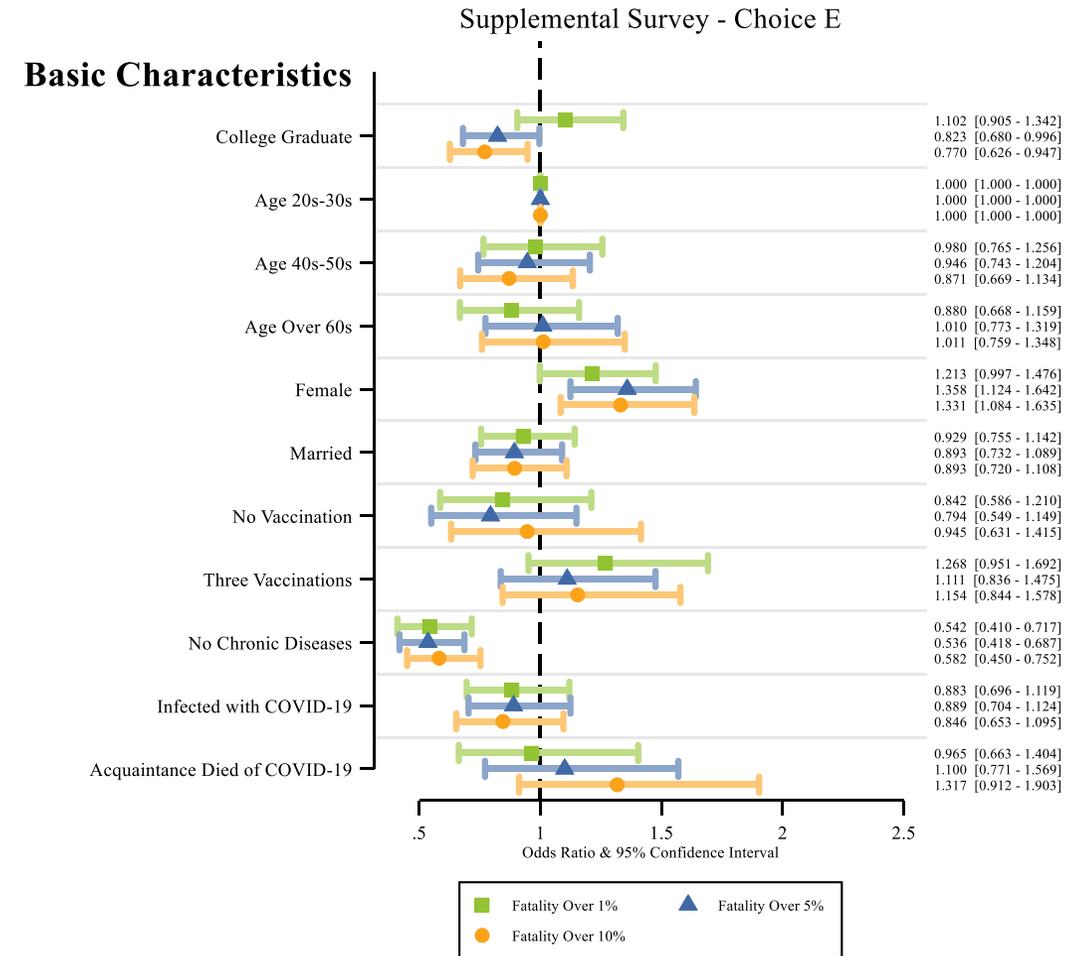
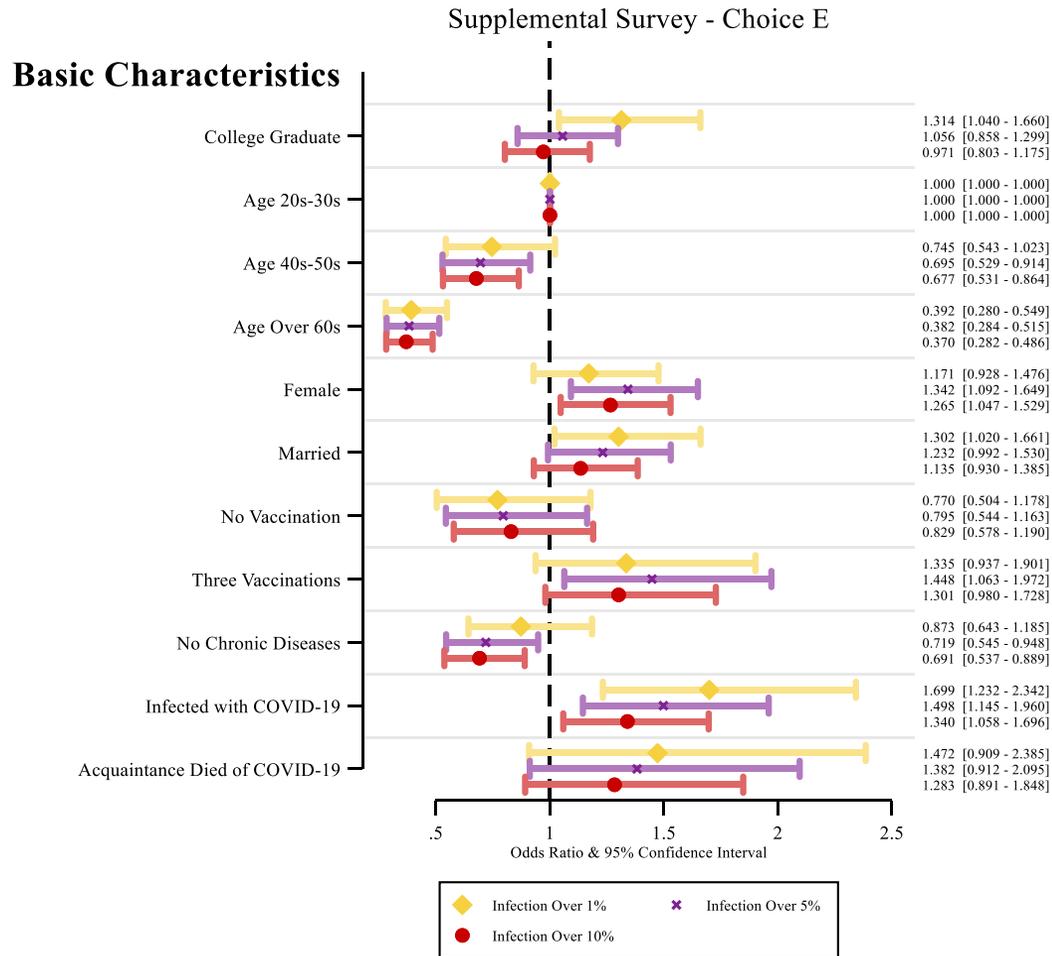
Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.

# Robustness – Determinants of risk overestimation

## Supplemental Survey – Group “Choice E”

### Infection Risk

### Fatality Risk

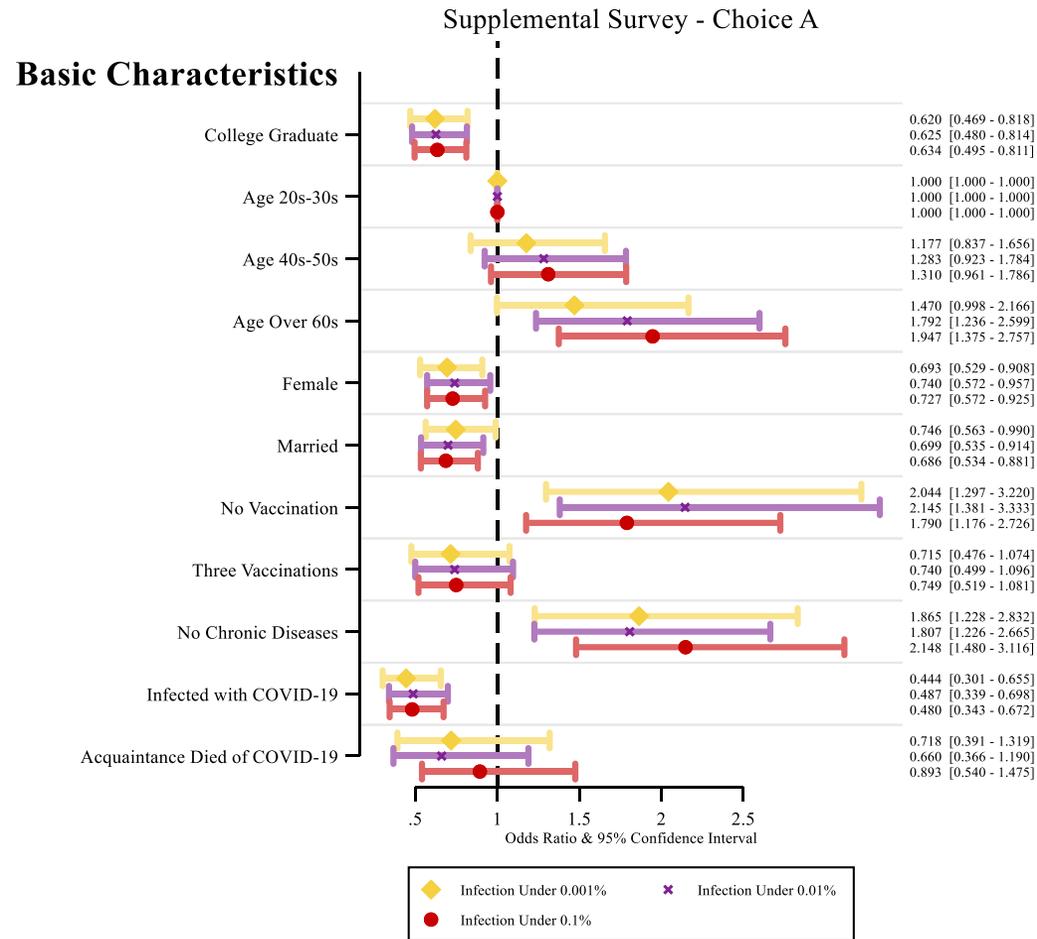


Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.

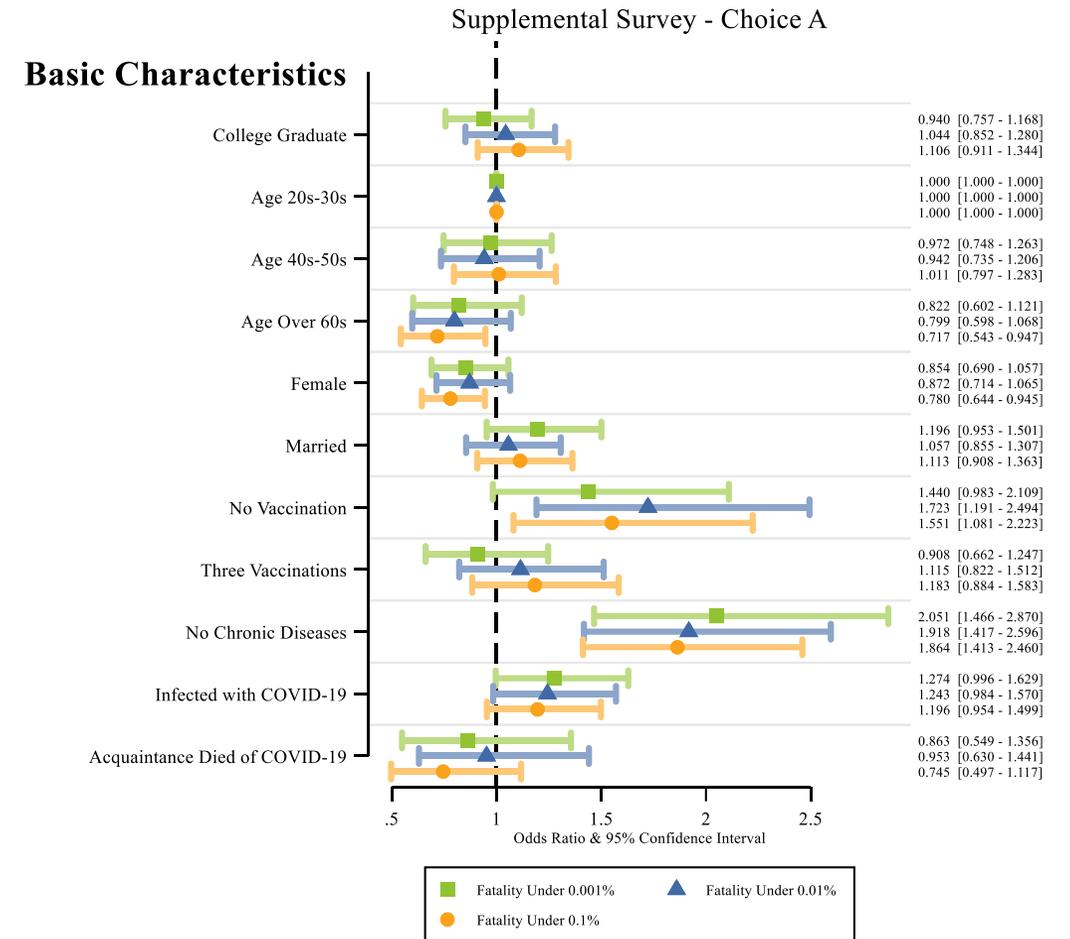
# Robustness – Determinants of risk underestimation

## Supplemental Survey – Group “Choice A”

### Infection Risk



### Fatality Risk



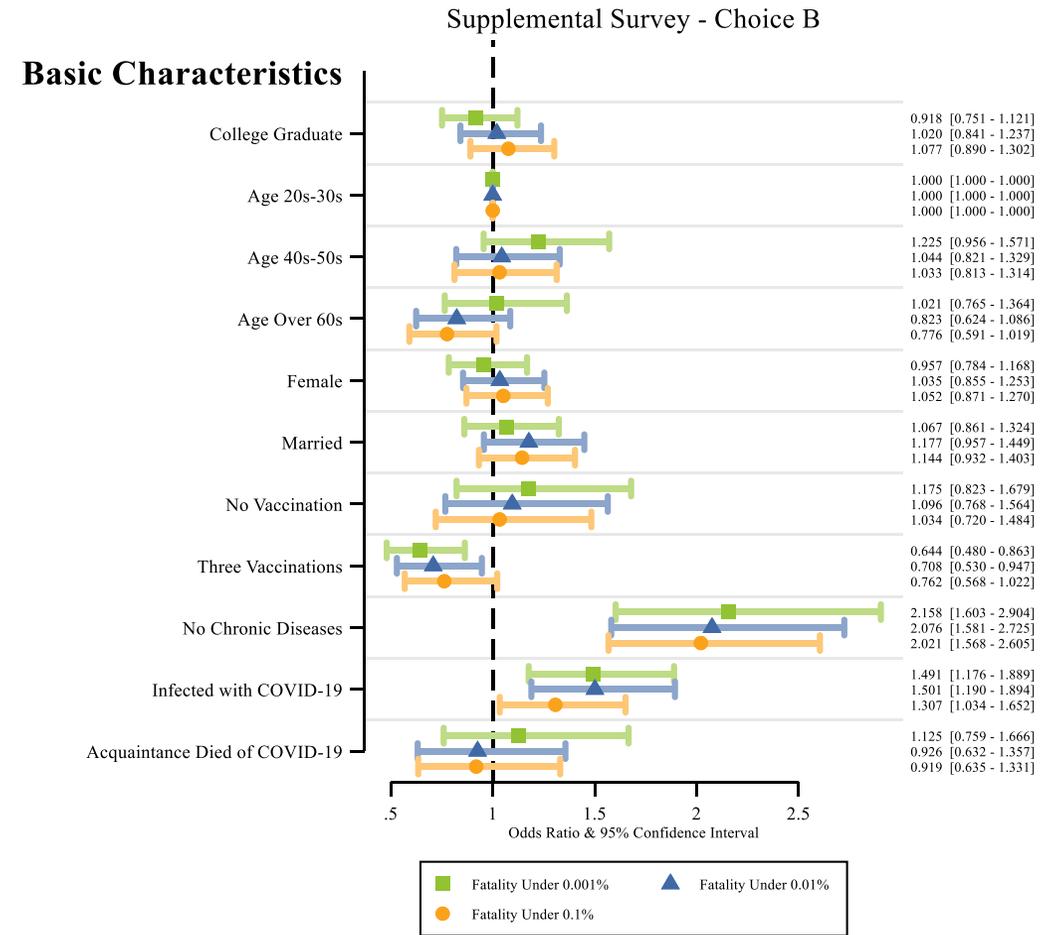
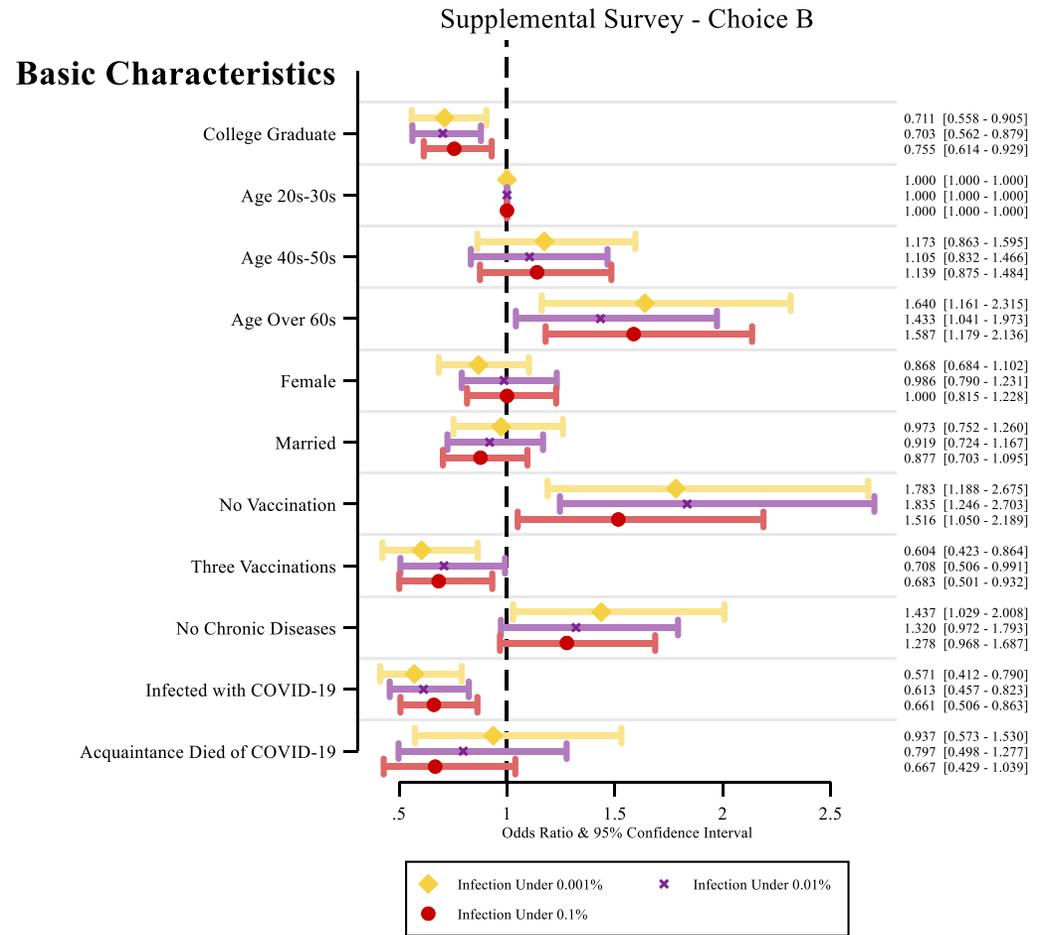
Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.

# Robustness – Determinants of risk underestimation

## Supplemental Survey – Group “Choice B”

### Infection Risk

### Fatality Risk

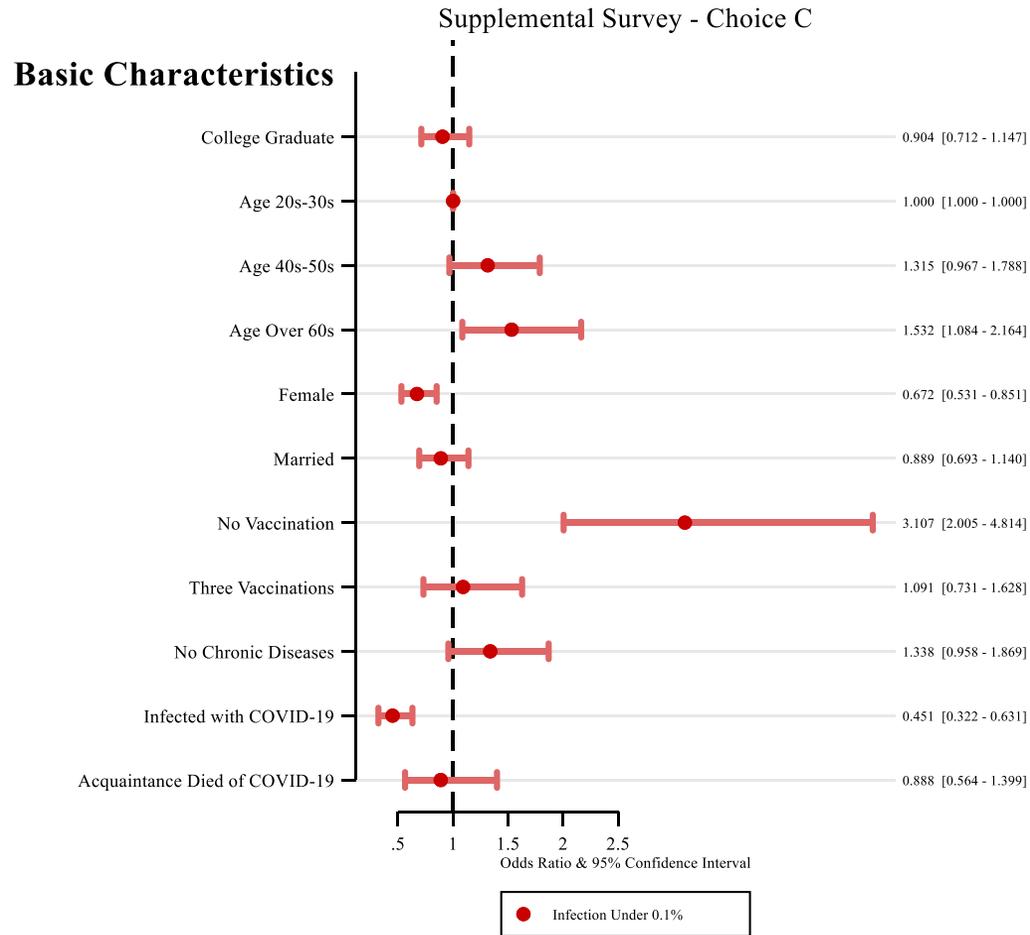


Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.

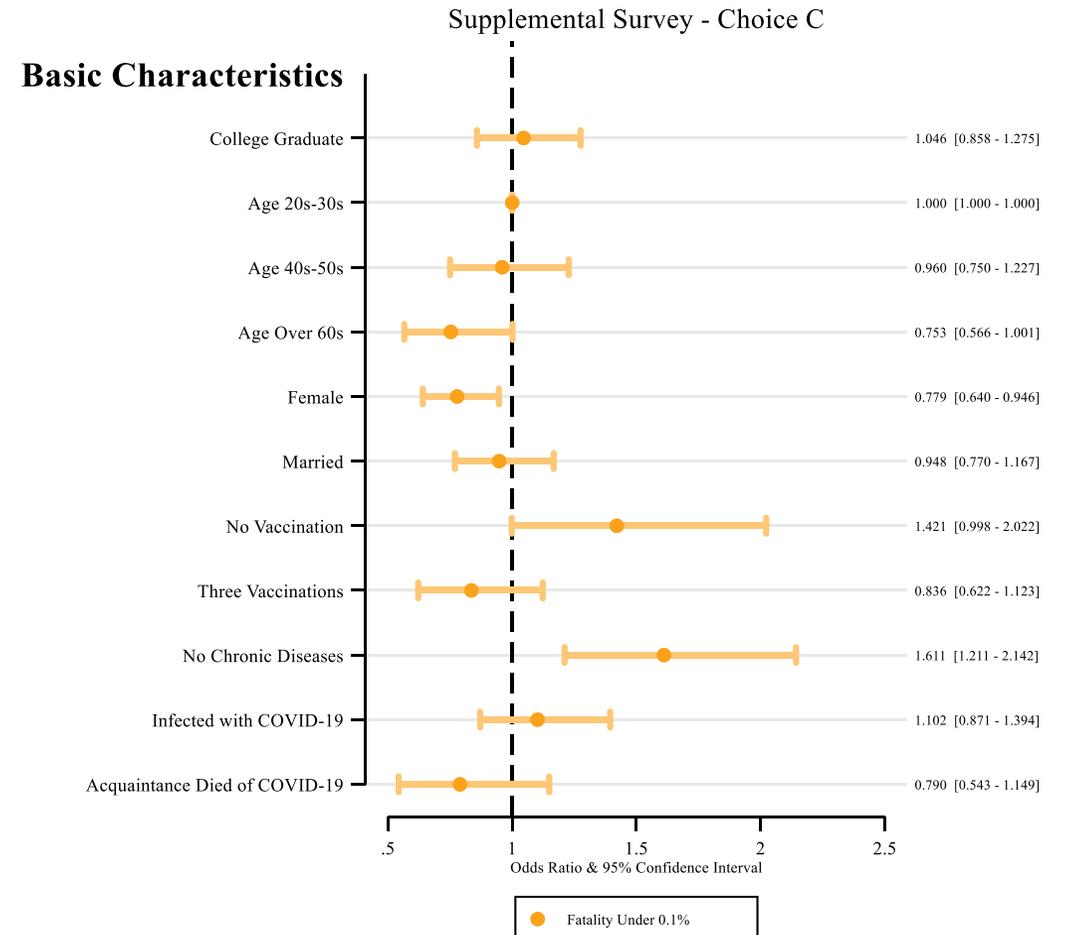
# Robustness – Determinants of risk underestimation

## Supplemental Survey – Group “Choice C”

### Infection Risk



### Fatality Risk

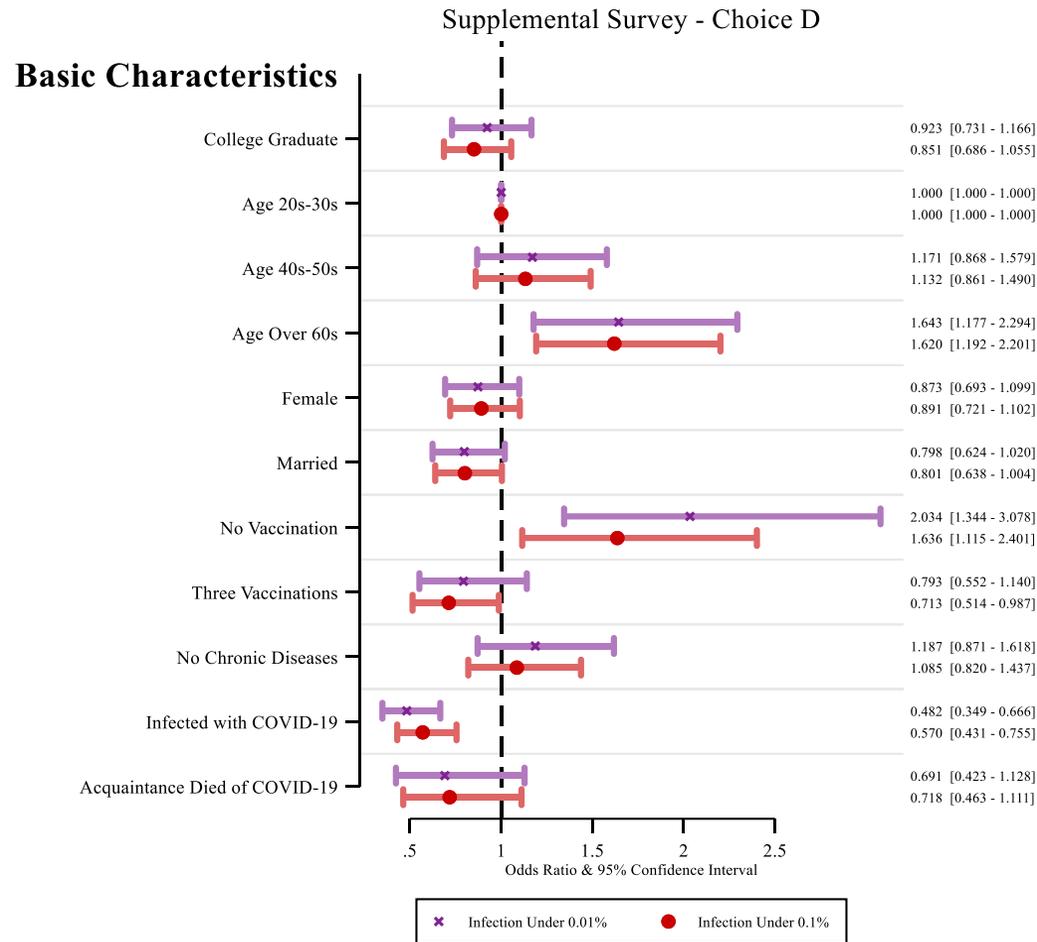


Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.

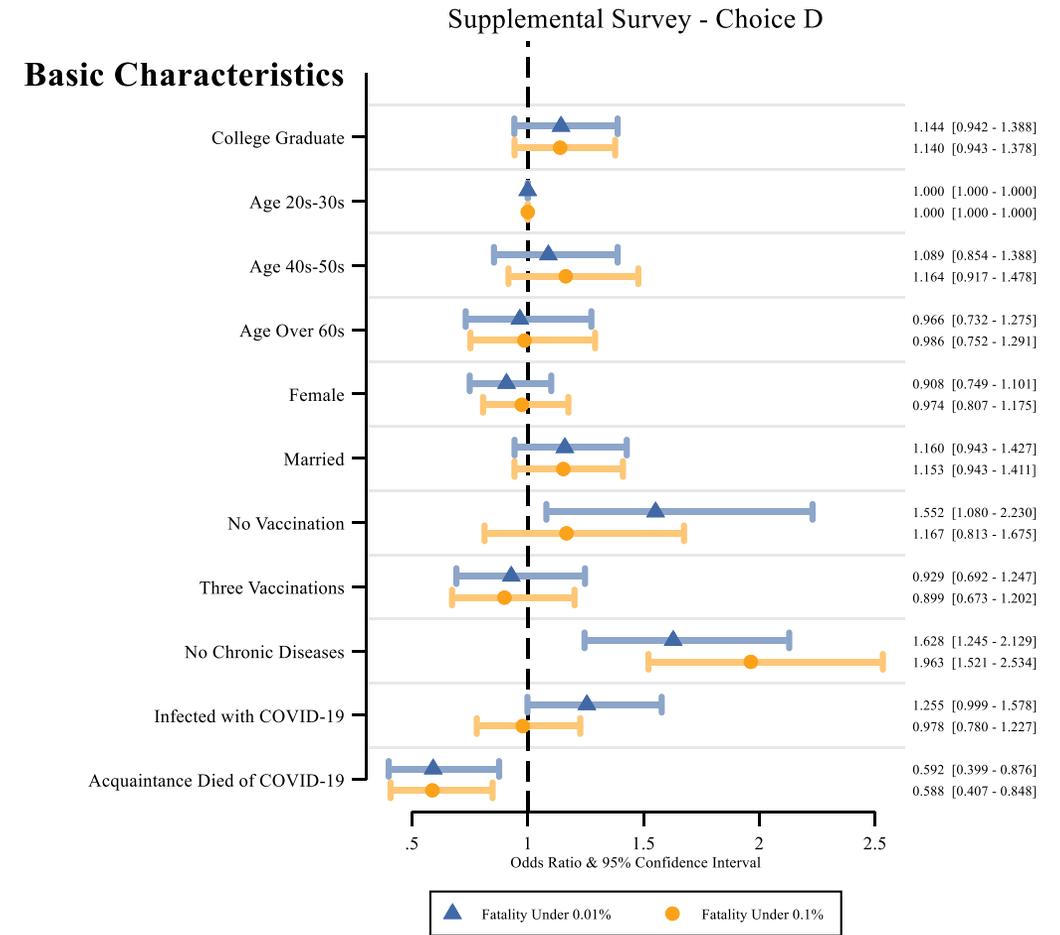
# Robustness – Determinants of risk underestimation

## Supplemental Survey – Group “Choice D”

### Infection Risk



### Fatality Risk

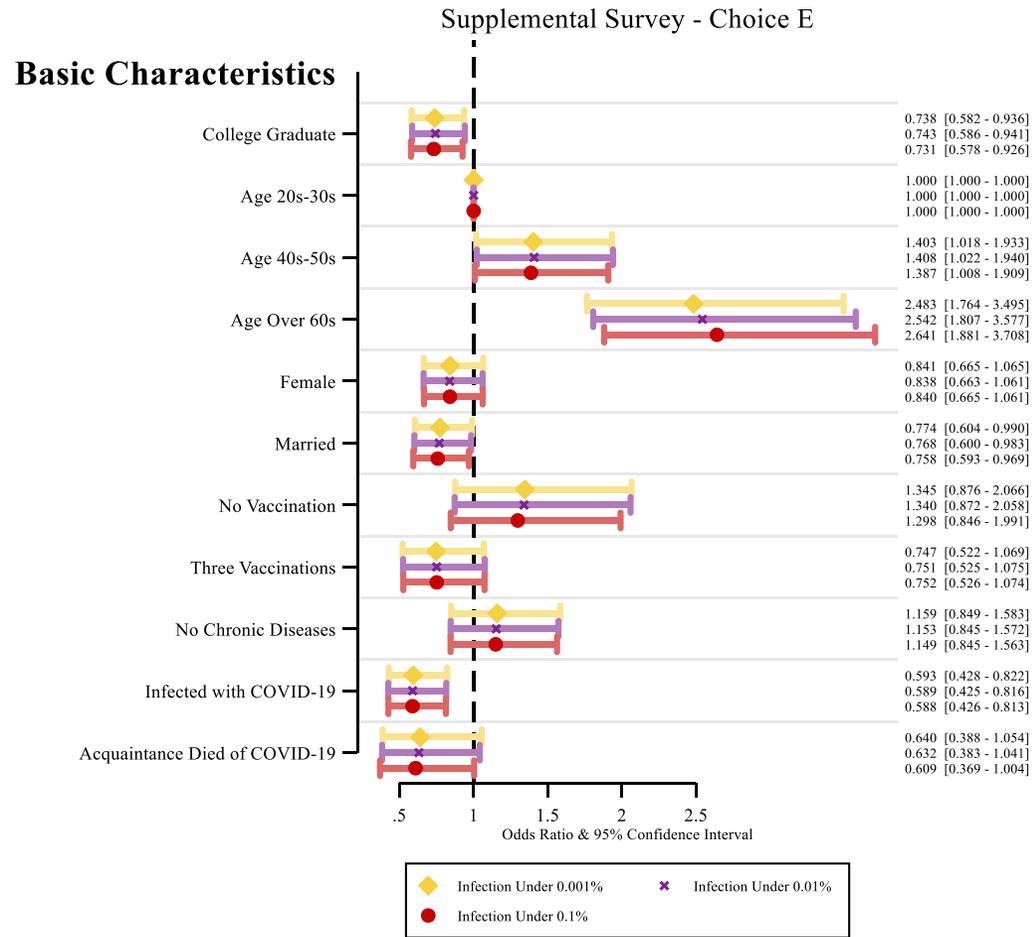


Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.

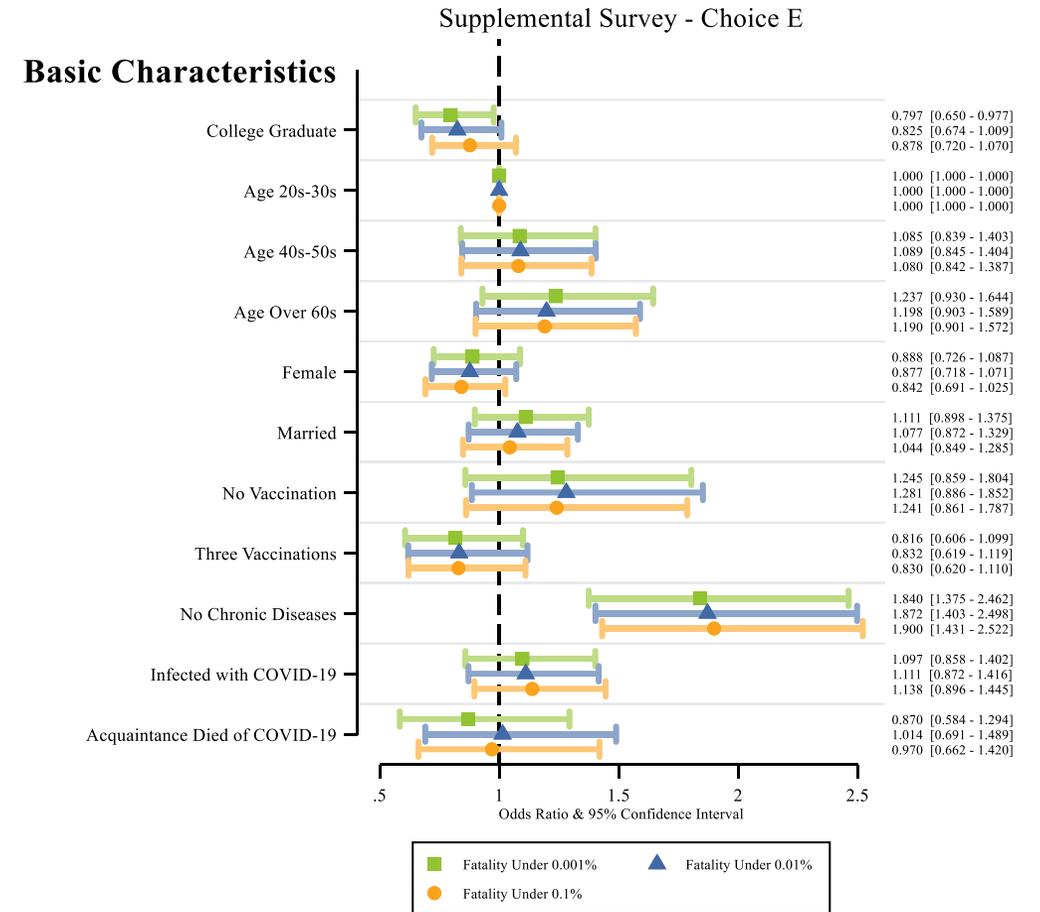
# Robustness – Determinants of risk underestimation

## Supplemental Survey – Group “Choice E”

### Infection Risk



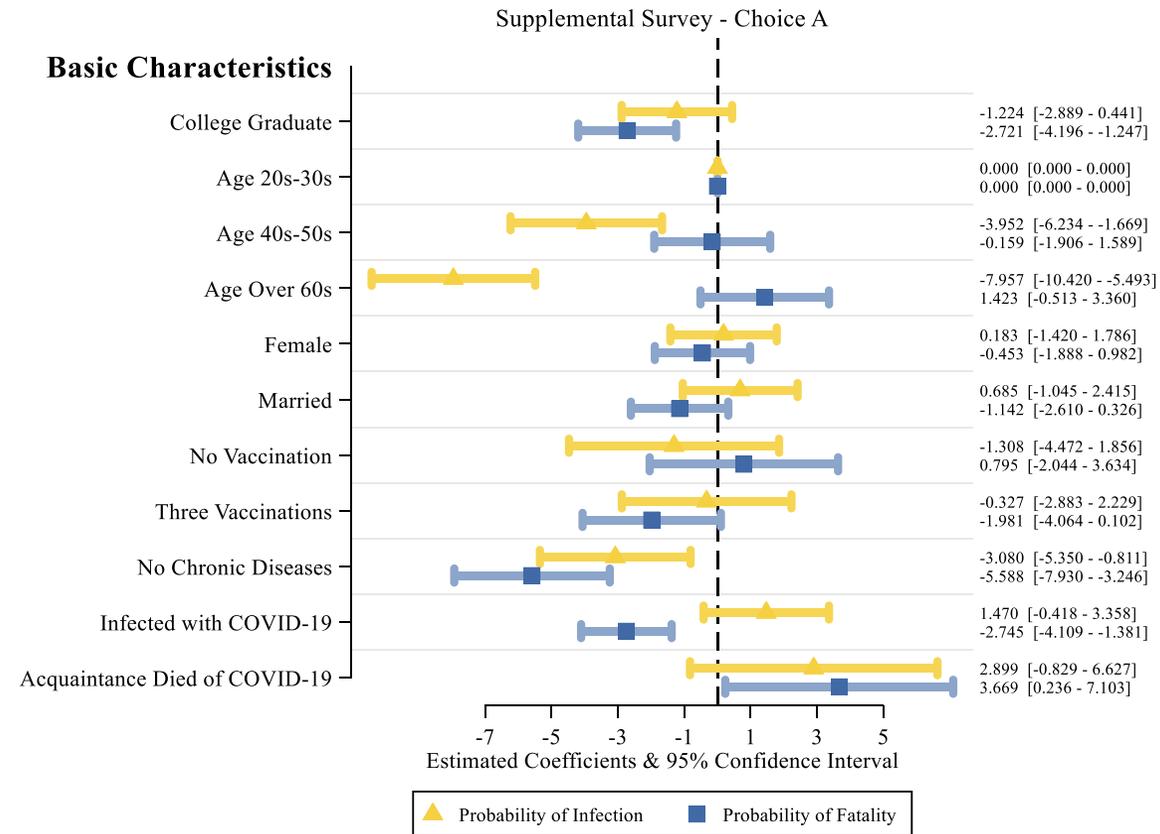
### Fatality Risk



Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.

# Robustness - Linear Regression

## Supplemental Survey – Group “Choice A”

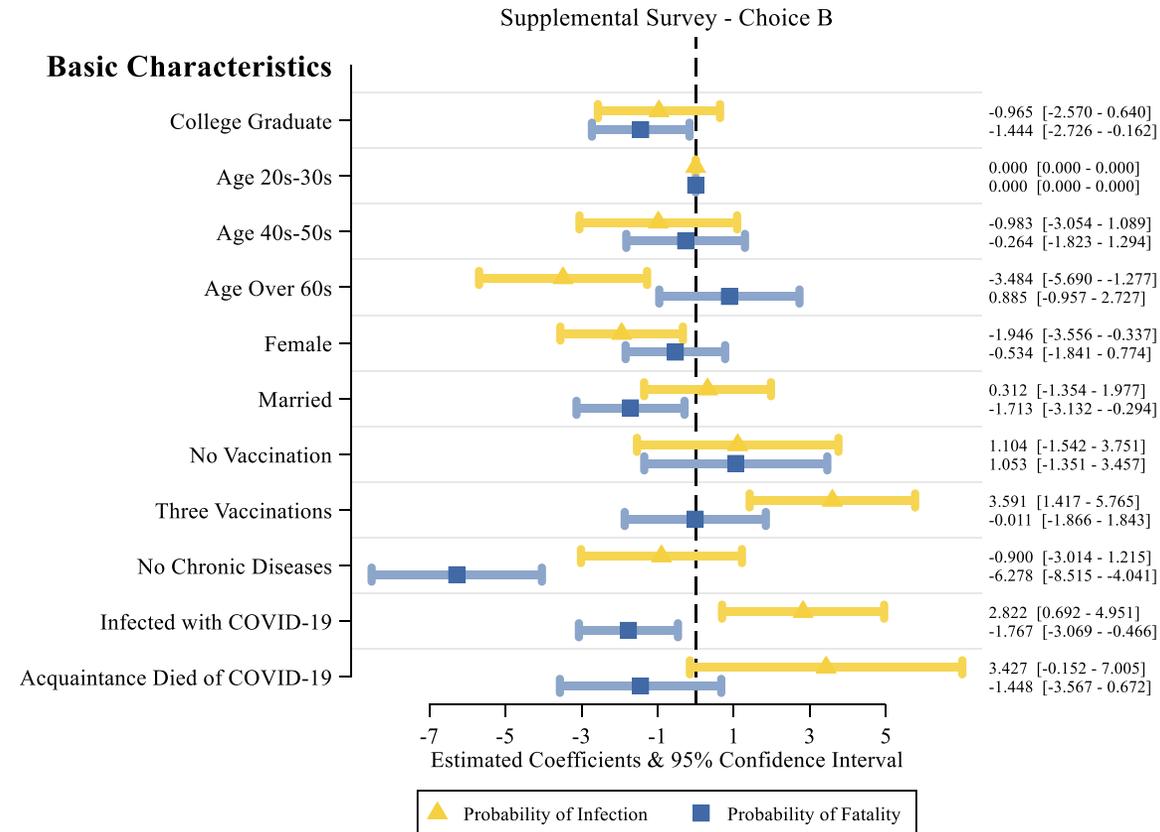


Note: The outcome variables are continuous.

- *Probability of Infection (or Fatality)*: the midpoints in responses about subjective risks.
- In the regressions, we also control for the media source and region fixed effects.

# Robustness - Linear Regression

## Supplemental Survey – Group “Choice B”

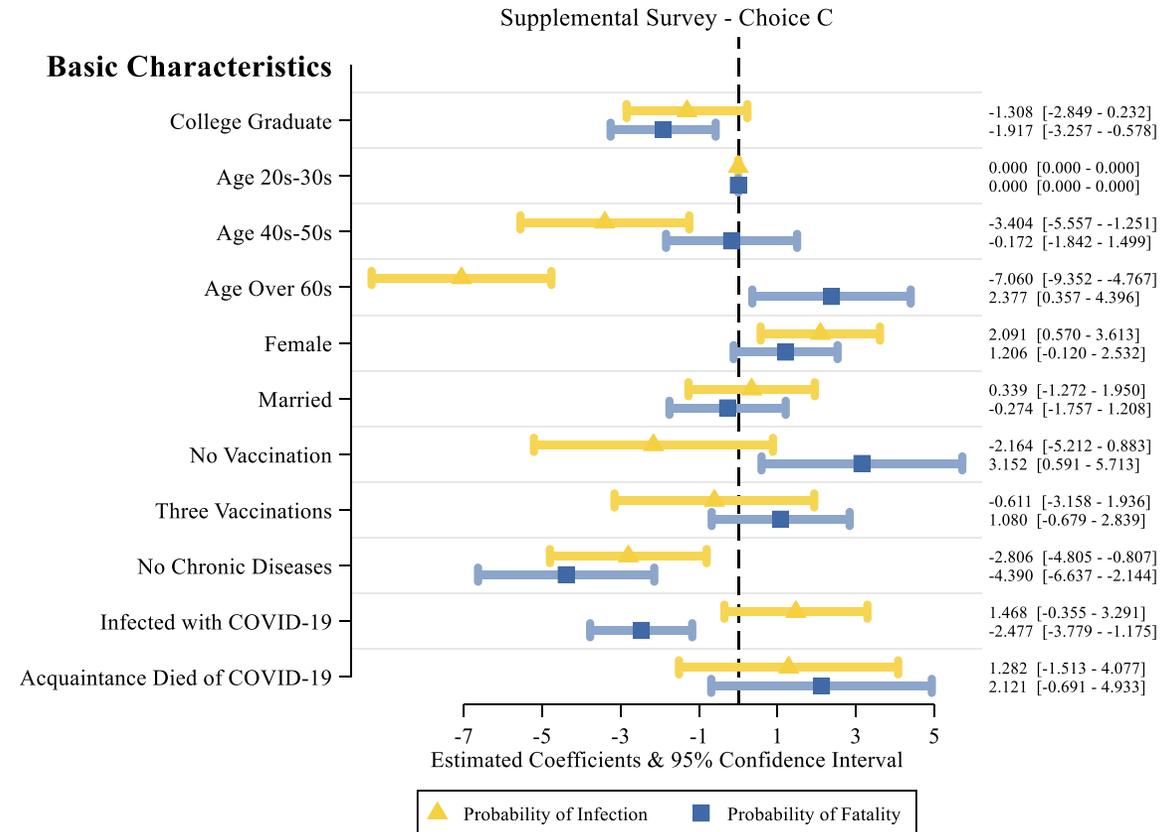


Note: The outcome variables are continuous.

- *Probability of Infection (or Fatality)*: the midpoints in responses about subjective risks.
- In the regressions, we also control for the media source and region fixed effects.

# Robustness - Linear Regression

## Supplemental Survey – Group “Choice C”

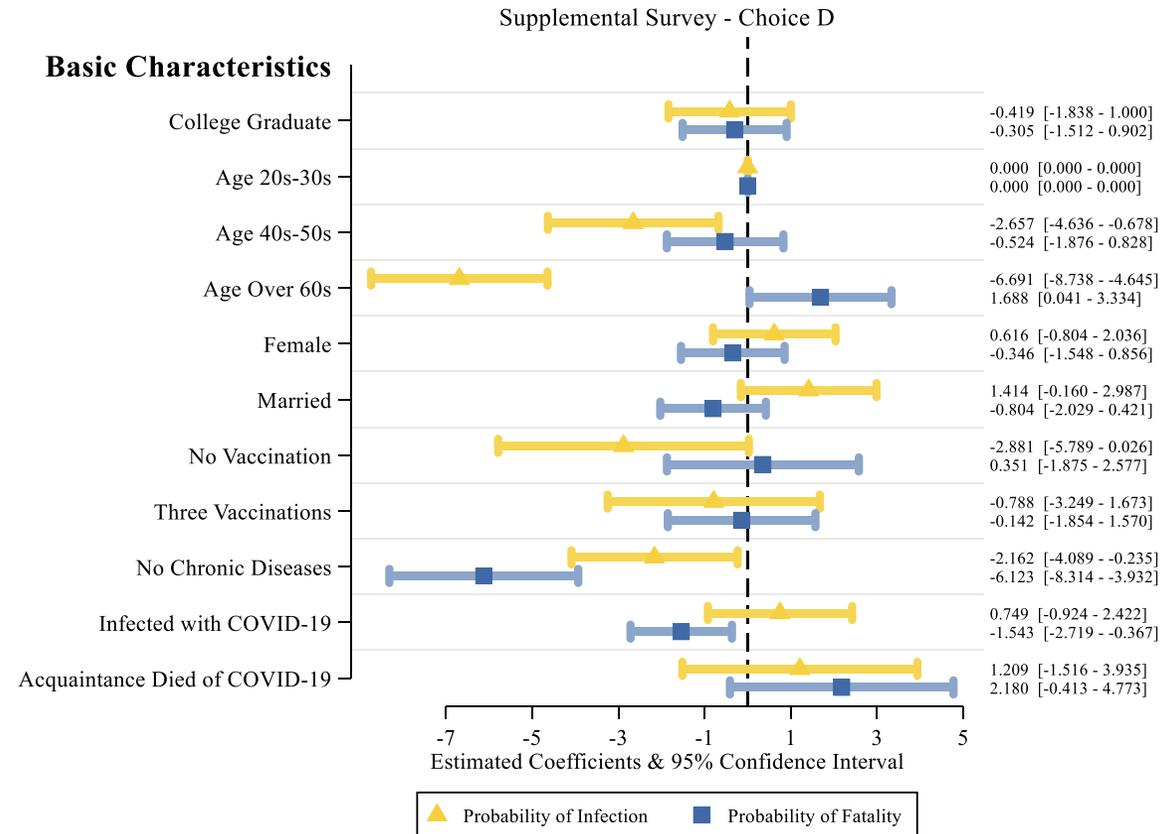


Note: The outcome variables are continuous.

- *Probability of Infection (or Fatality)*: the midpoints in responses about subjective risks.
- In the regressions, we also control for the media source and region fixed effects.

# Robustness - Linear Regression

## Supplemental Survey – Group “Choice D”

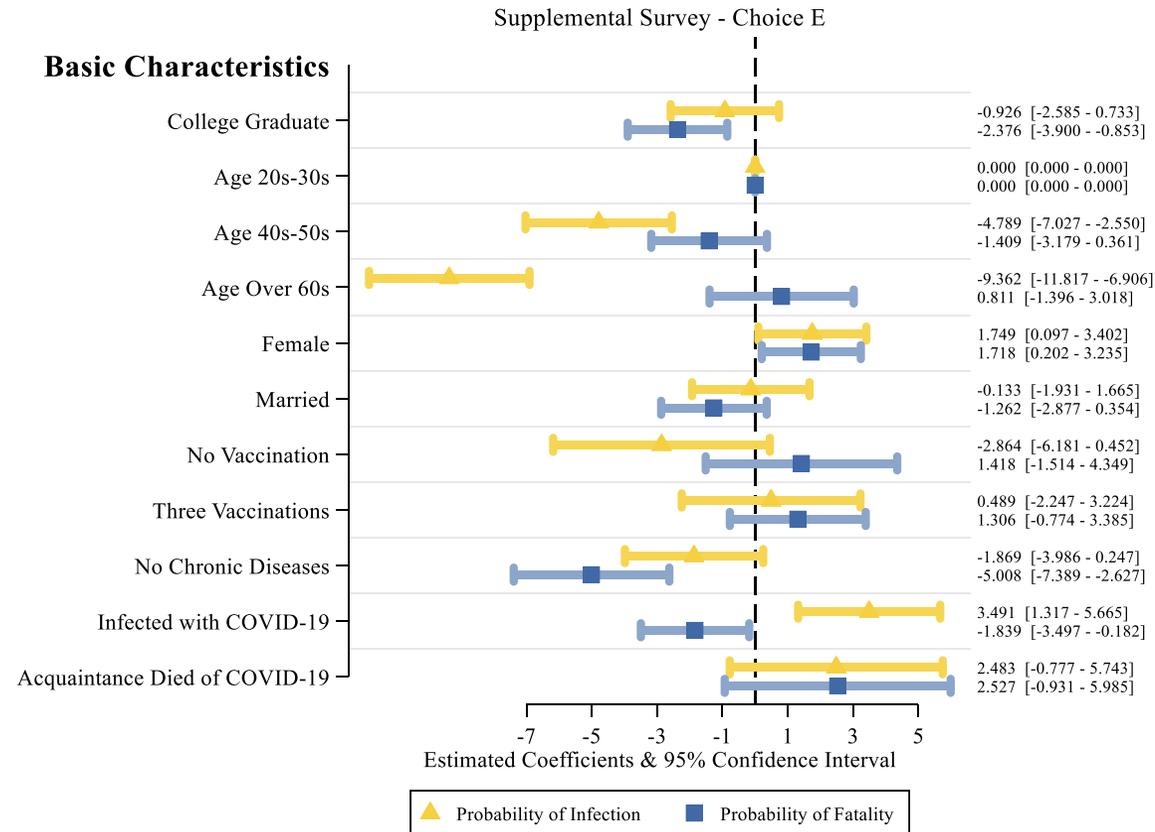


Note: The outcome variables are continuous.

- *Probability of Infection (or Fatality)*: the midpoints in responses about subjective risks.
- In the regressions, we also control for the media source and region fixed effects.

# Robustness - Linear Regression

## Supplemental Survey – Group “Choice E”



Note: The outcome variables are continuous.

- *Probability of Infection (or Fatality)*: Responses of group “Choice E” about subjective risks.
- In the regressions, we also control for the media source and region fixed effects.

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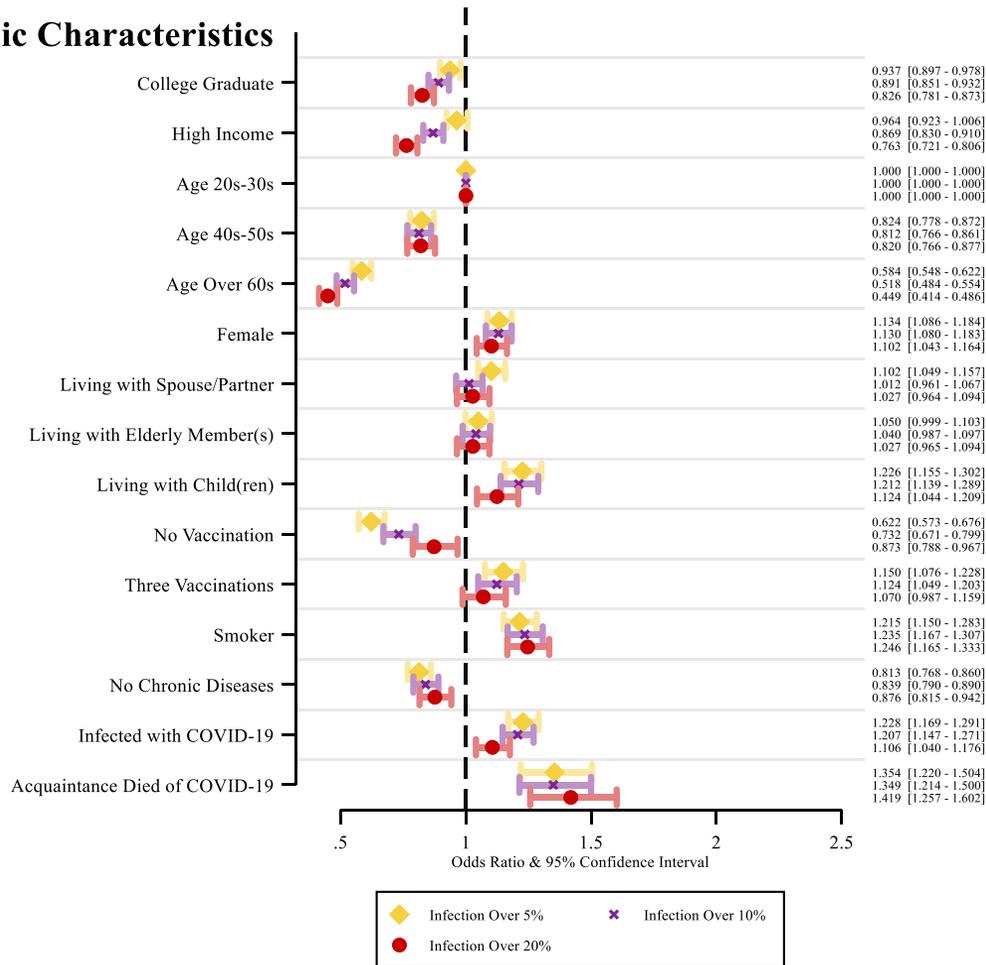
# Appendix

# Determinants of risk overestimation – Logistic regression

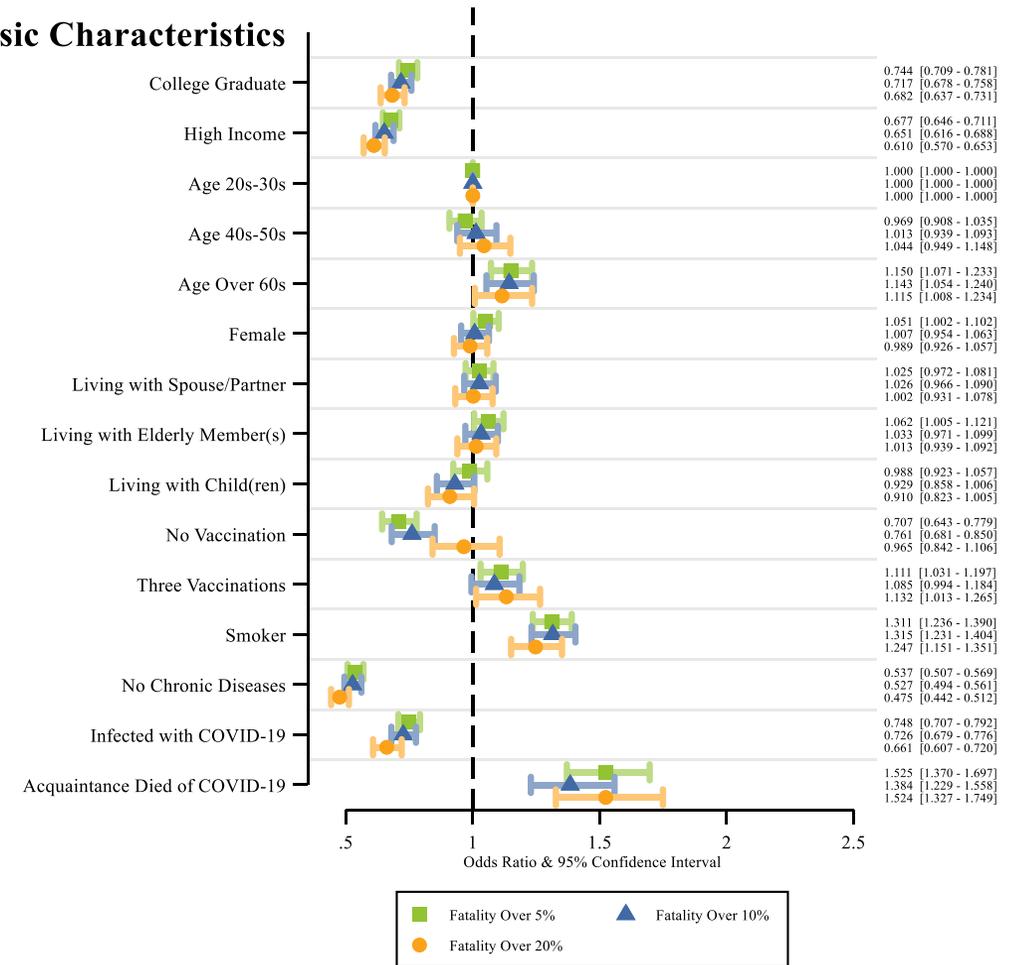
## Infection Risk

## Fatality Risk

### Basic Characteristics



### Basic Characteristics



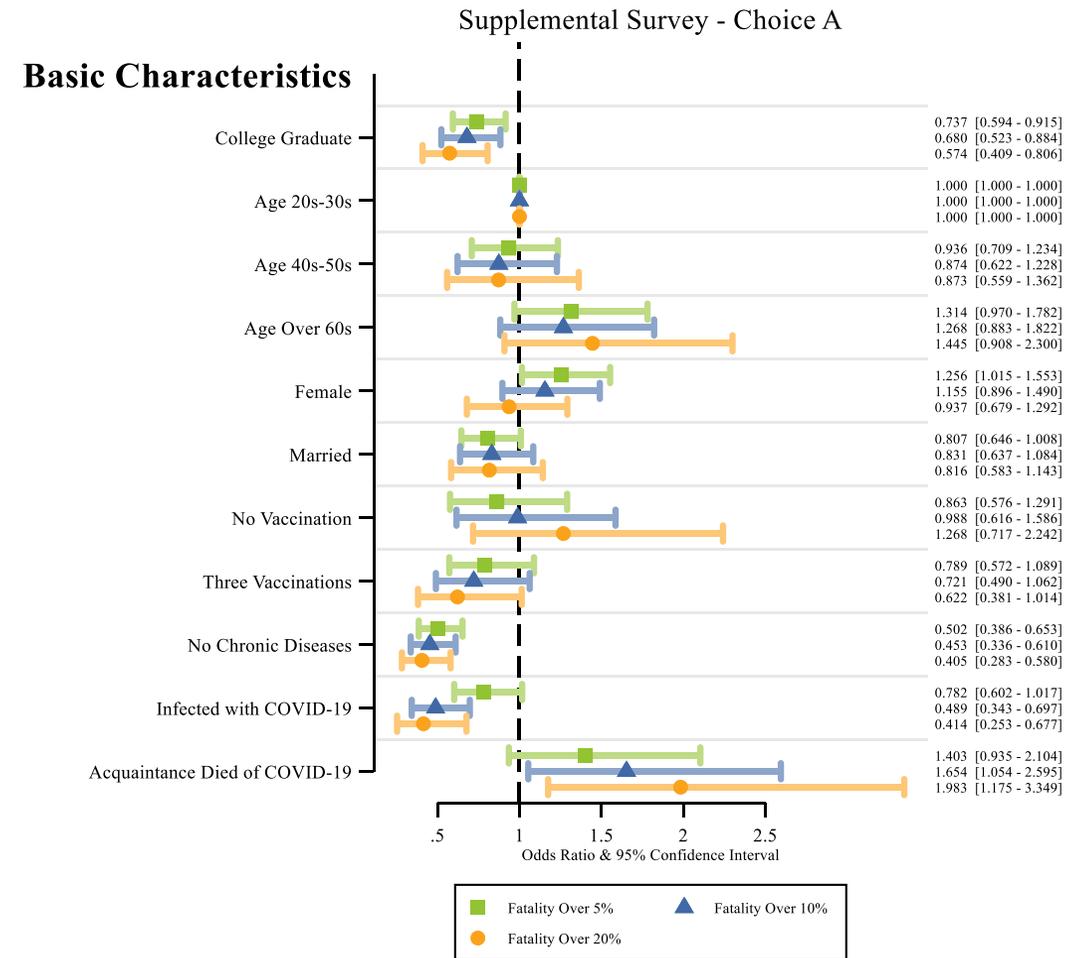
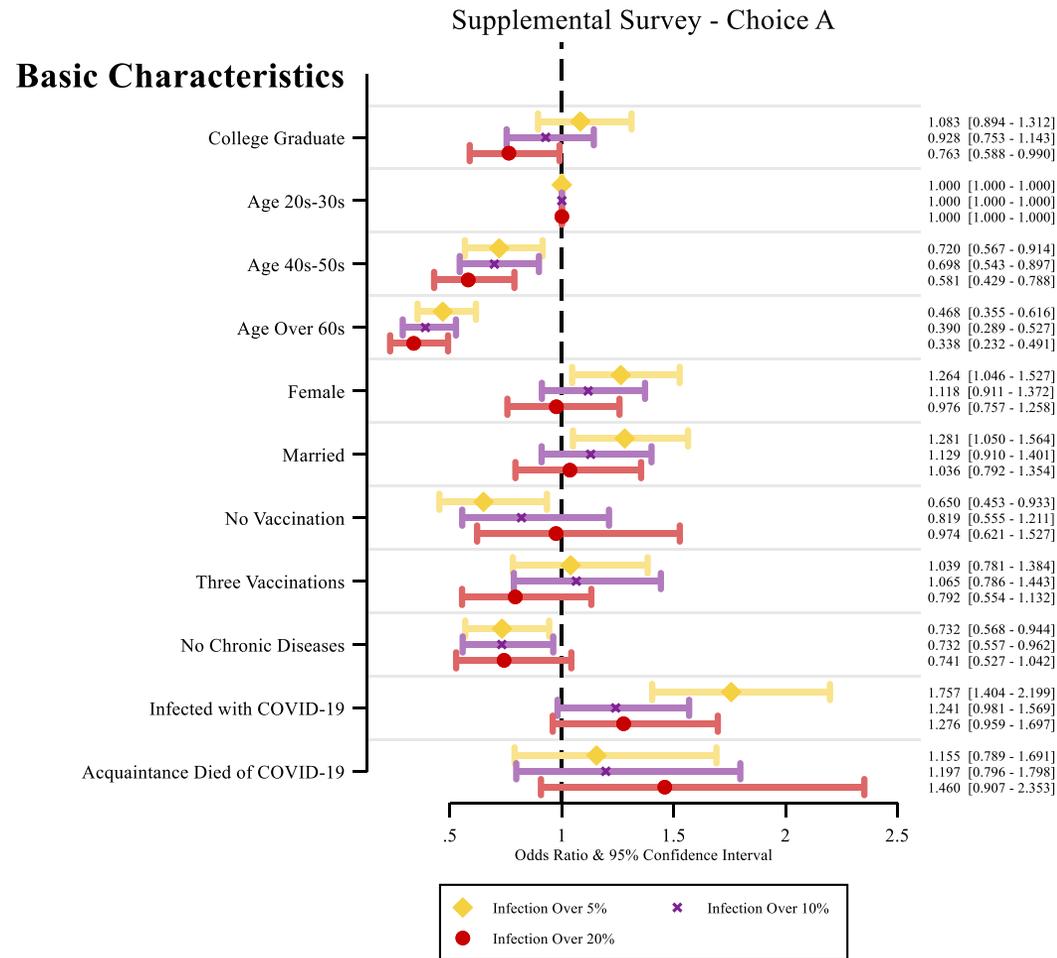
Note: N = 40,000. In the regressions, we also control for the media source and prefecture fixed effects.

# Robustness – Determinants of risk overestimation

## Supplemental Survey – Group “Choice A”

### Infection Risk

### Fatality Risk



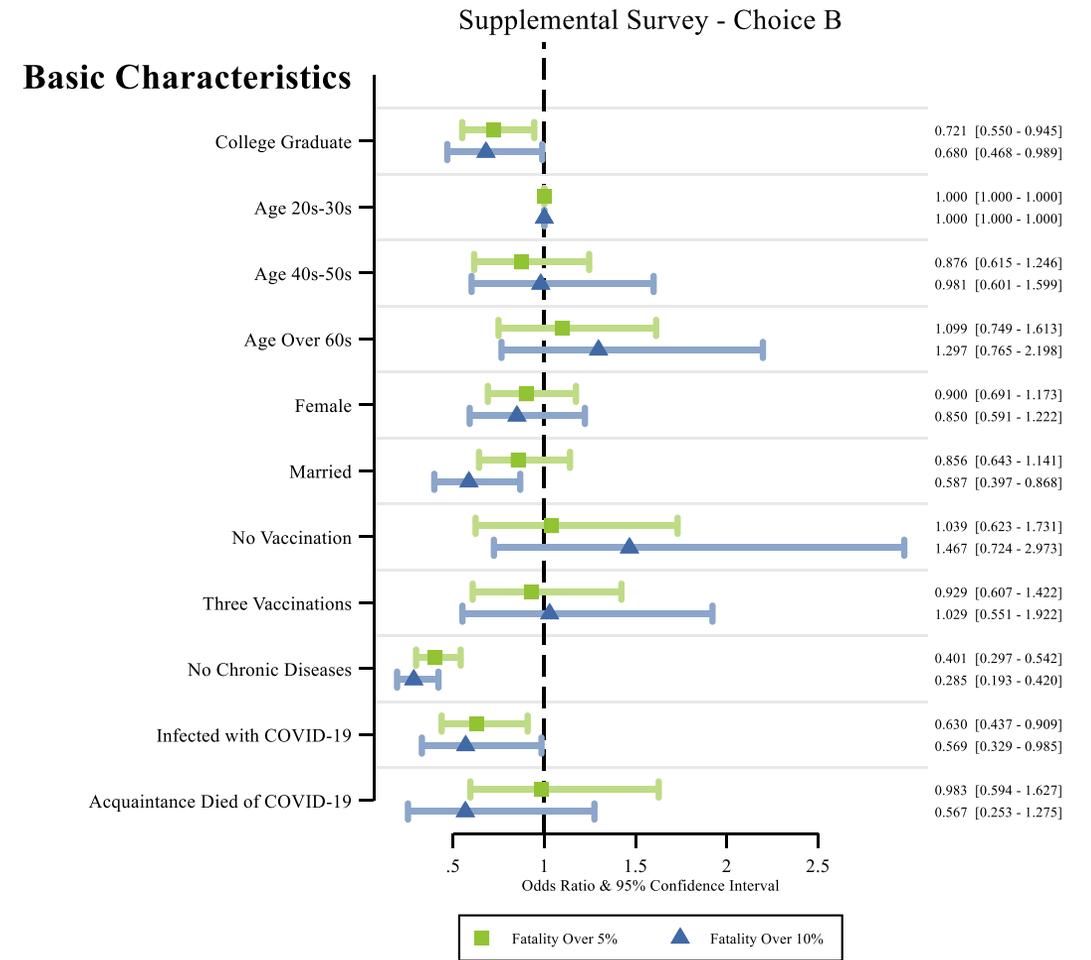
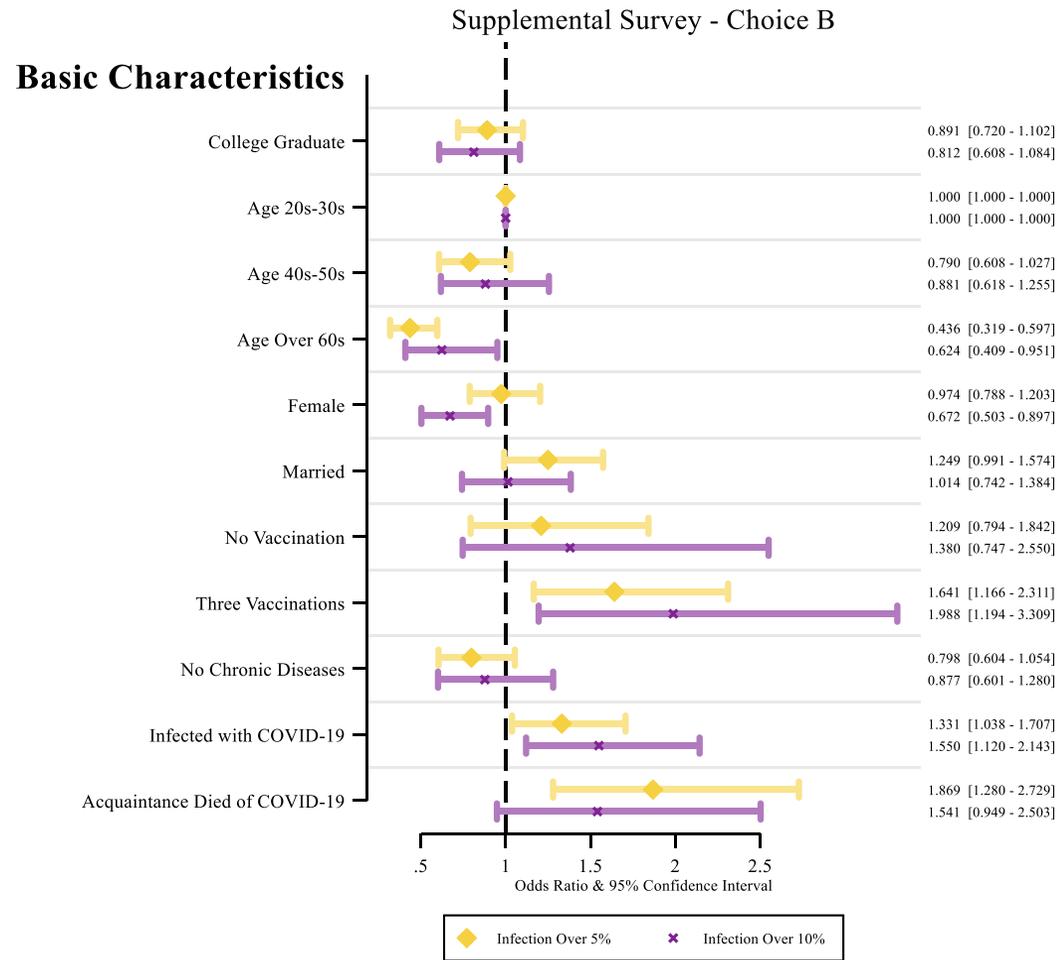
Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.

# Robustness – Determinants of risk overestimation

## Supplemental Survey – Group “Choice B”

### Infection Risk

### Fatality Risk



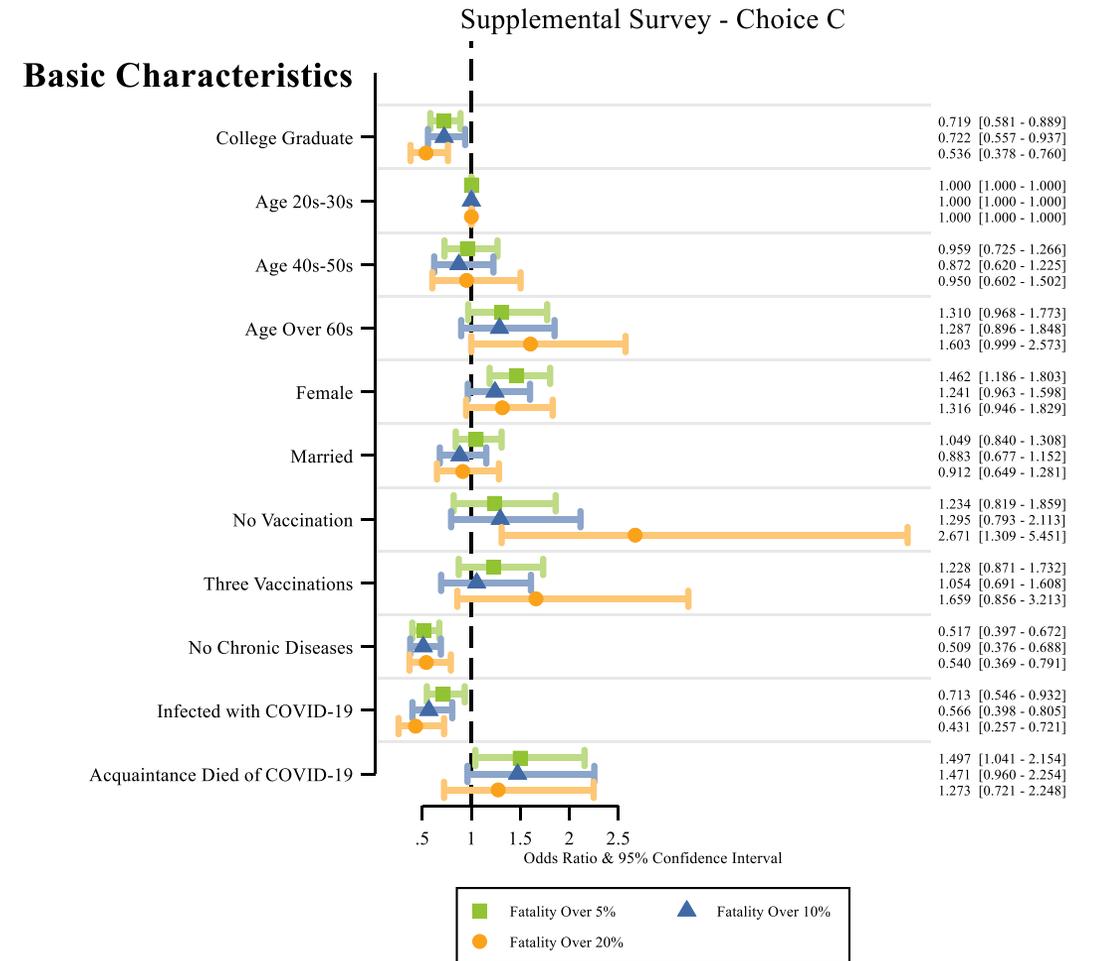
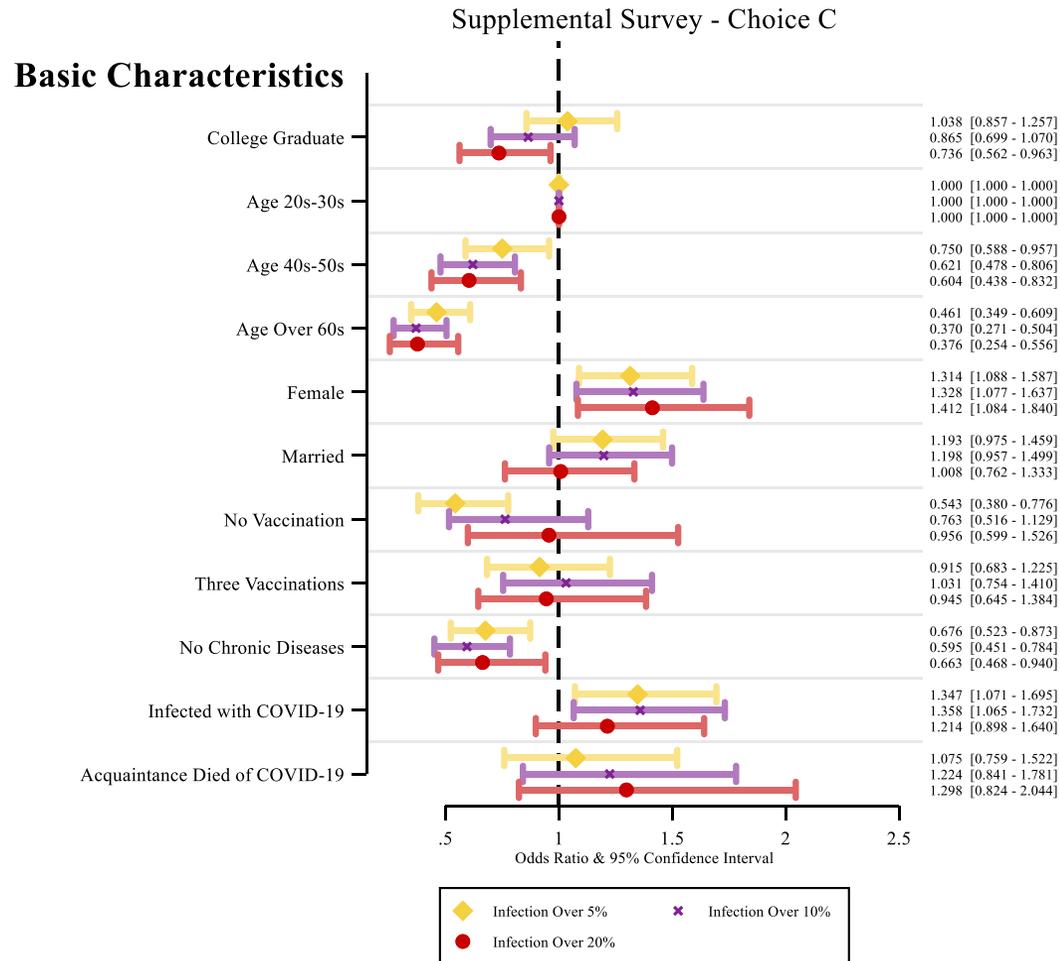
Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.

# Robustness – Determinants of risk overestimation

## Supplemental Survey – Group “Choice C”

### Infection Risk

### Fatality Risk



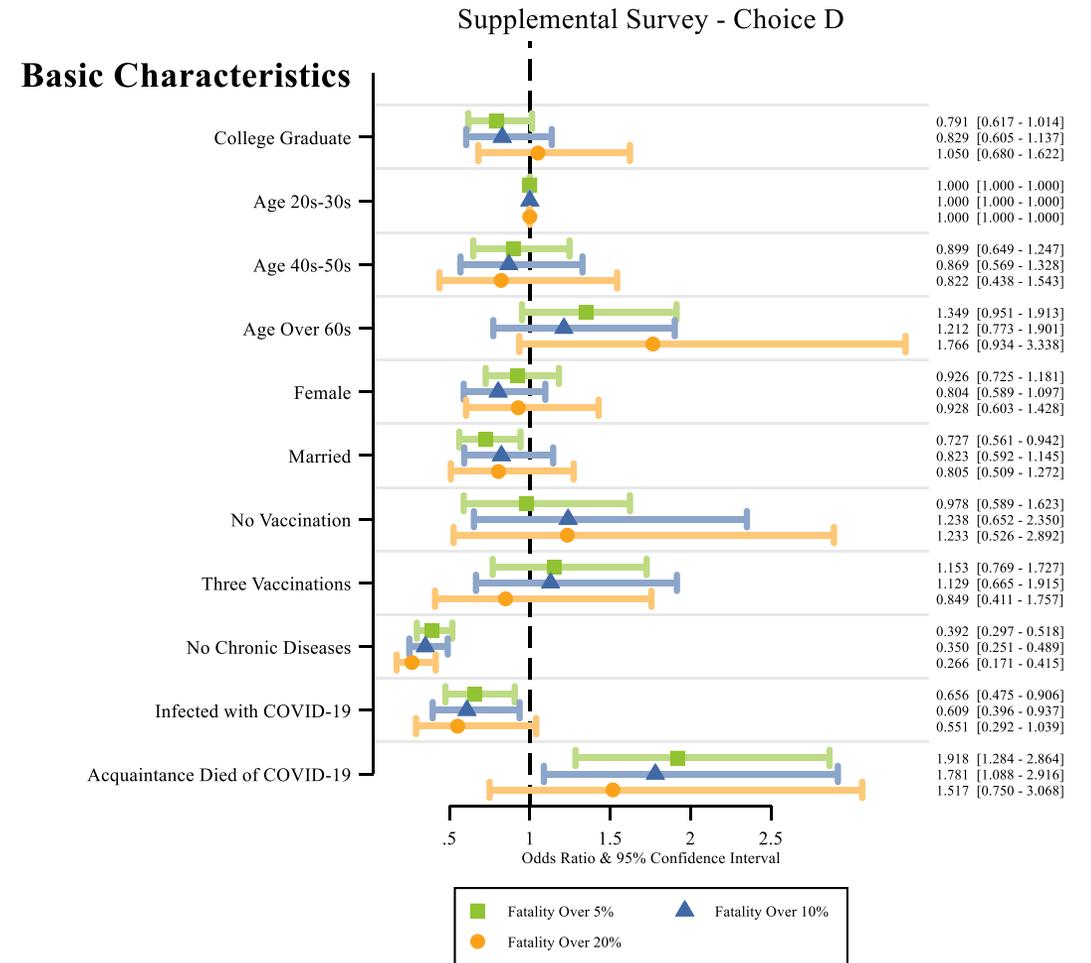
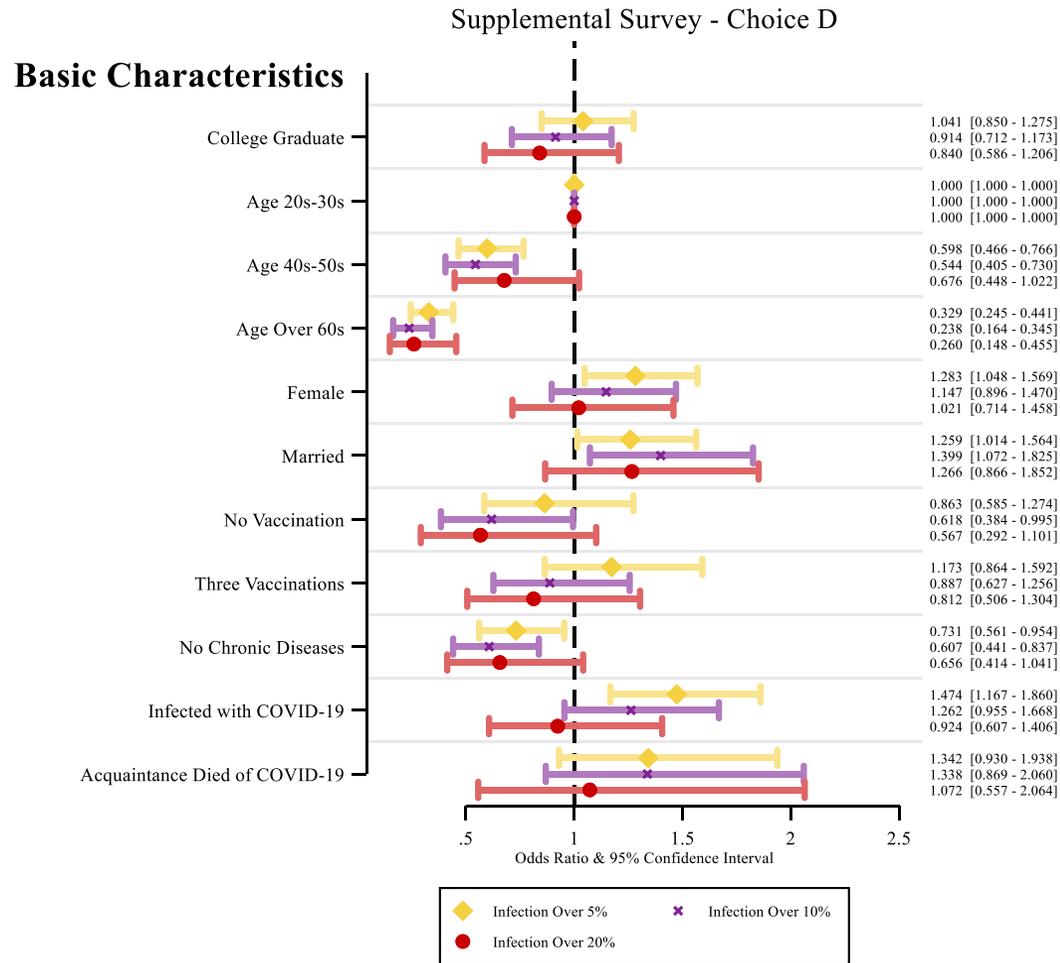
Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.

# Robustness – Determinants of risk overestimation

## Supplemental Survey – Group “Choice D”

### Infection Risk

### Fatality Risk



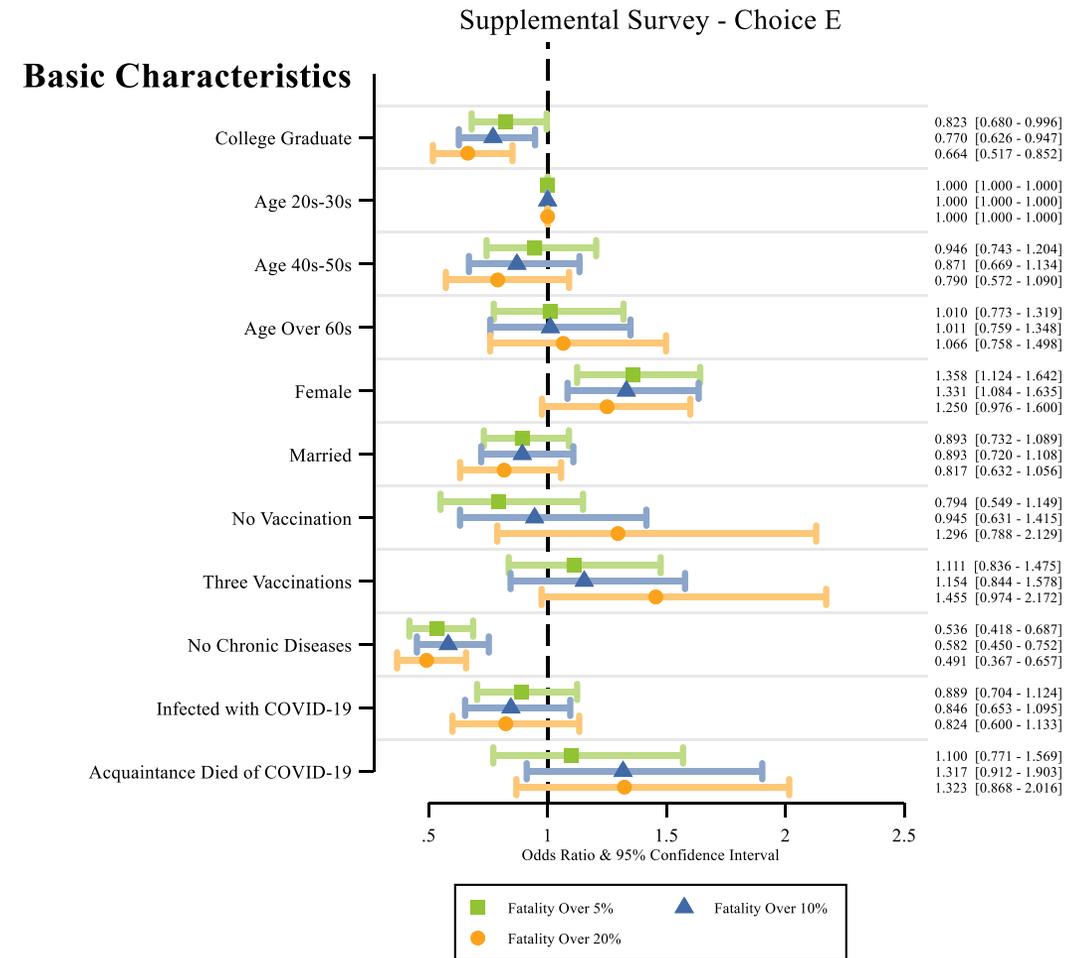
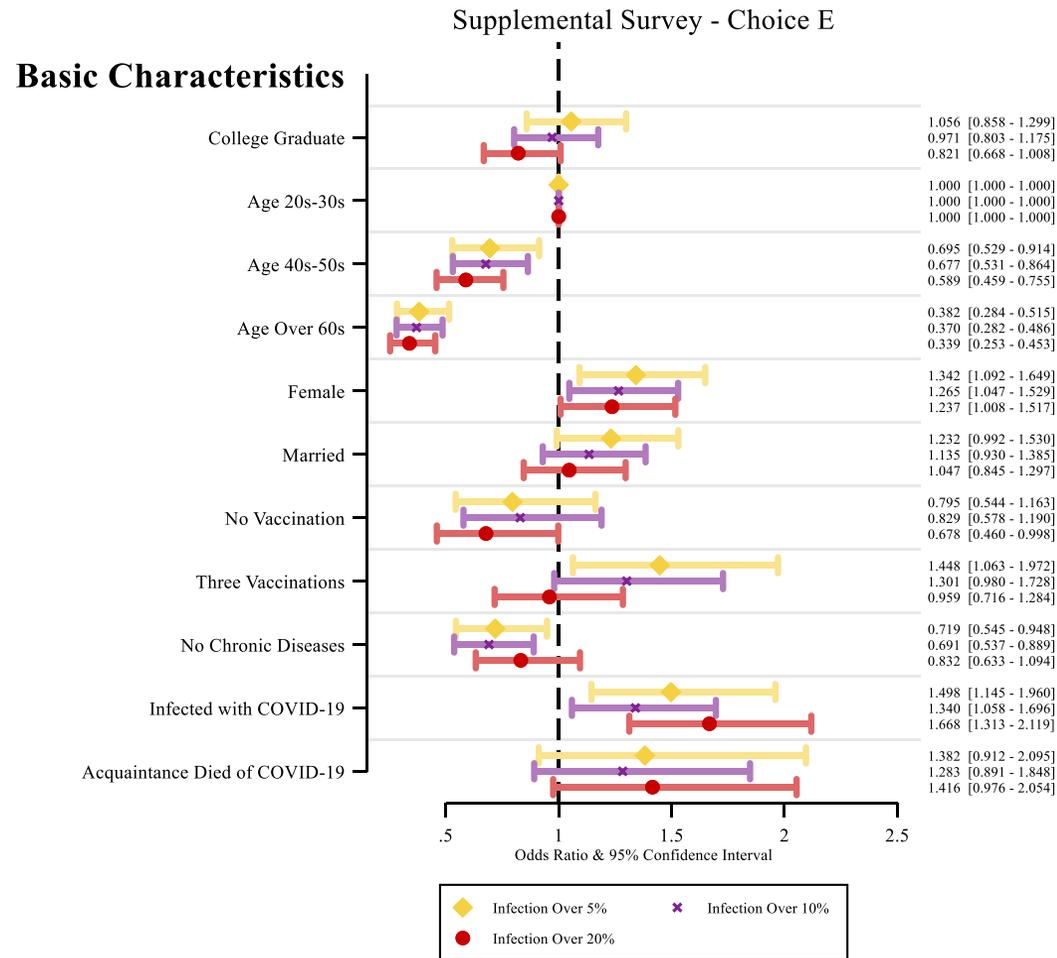
Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.

# Robustness – Determinants of risk overestimation

## Supplemental Survey – Group “Choice E”

### Infection Risk

### Fatality Risk



Note: N = 2,002. In the regressions, we also control for the media source and region fixed effects.