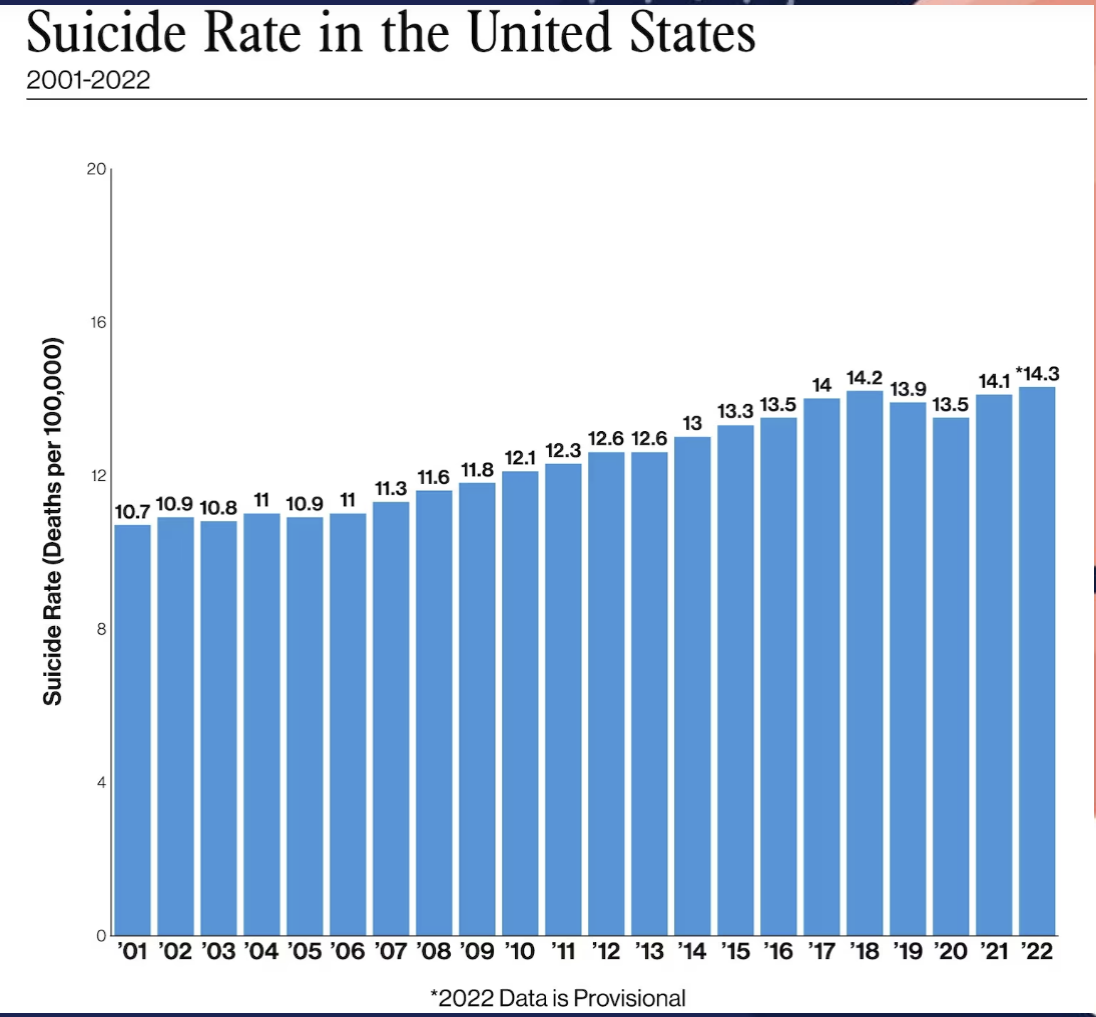
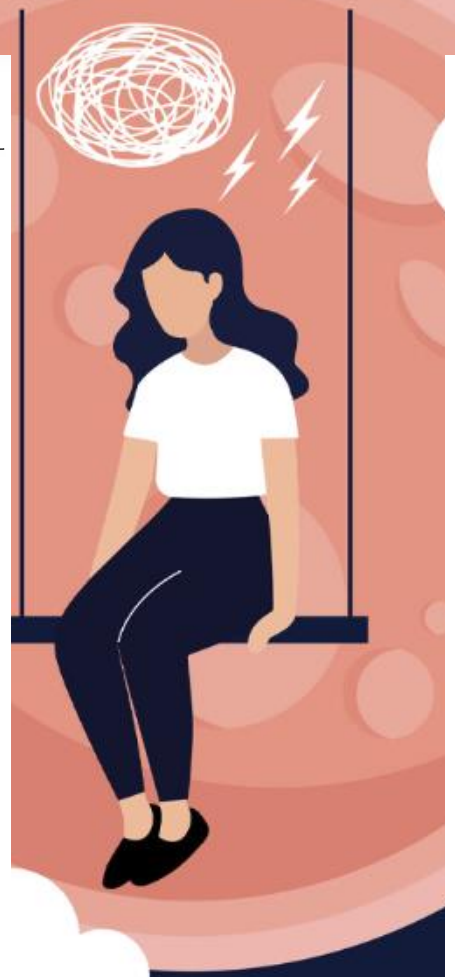
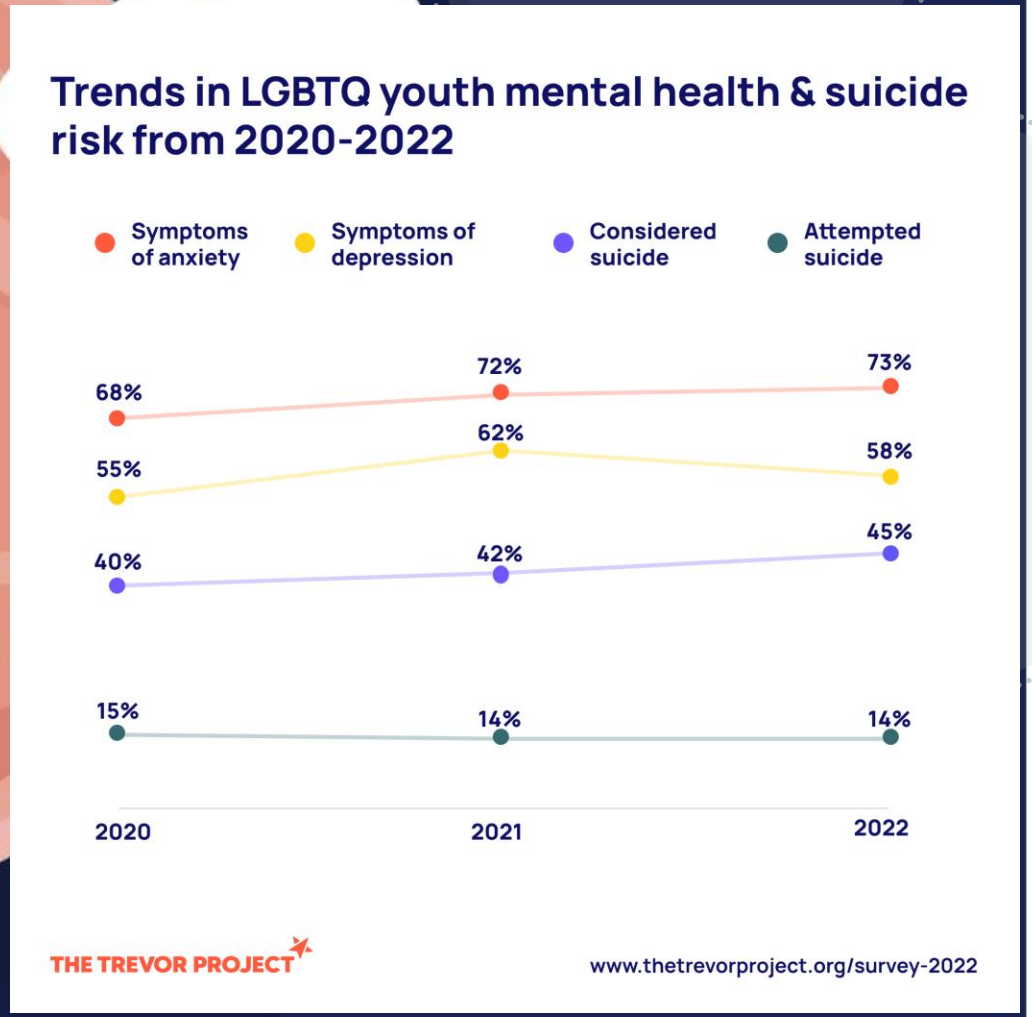
"When the figures tell the story"







Relationship of Religion with Suicidal Ideation, Suicide Plan, Suicide Attempt, and Suicide Death: A Meta-analysis

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Abstract

Background: Suicide is a significant public health problem and one of the leading causes of death worldwide. The effect of religion on suicidal behaviors (i.e., ideation, plan, attempt, and death) is an important issue worthy of consideration.

Methods: Major electronic databases, including MEDLINE, Web of Science, and Scopus, were searched for the articles published until 26 April 2021. Reference lists were also screened. Observational studies addressing the associations between religion and suicidal behaviors were also examined. Between-study heterogeneity was investigated using the χ^2, τ^2, and I^2 statistics. The probability of publication bias was explored using the Begg and Egger tests, as well as trim-and-fill analysis. The effect size was expressed as odds ratio (OR) with 95% confidence intervals (CIs) using a random-effects model.

Results: Out of 11 389 identified studies, 63 articles were eligible, involving 8,053,697 participants. There was an inverse association between religion and suicidal ideation OR = 0.83 (95% CI: 0.78, 0.88; $P<0.001$), suicidal plan OR = 0.93 (95% CI: 0.83, 1.04; $P=0.200$), suicide attempt OR = 0.84 (95% CI: 0.79, 0.89; $P<0.001$), and completed suicide OR = 0.31 (95% CI: 0.14, 0.72; $P=0.006$). There was a no evidence of publication bias.

Conclusions: The results of this meta-analysis support the notion that religion can play a protective role against suicidal behaviors. Nonetheless, the effect of religion on suicidal behaviors varies across countries with different religions and cultures. Although this association does not necessarily imply causation, an awareness of the relationship between religion and suicide risk can be of great help in suicide prevention policies and programs.

Religion as a Risk Factor for Suicide Attempt and Suicide Ideation Among Depressed Patients

Lawrence, Ryan E. MD, MDiv[*†]; Brent, David MD[‡]; Mann, J. John MD[*§]; Burke, Ainsley K. PhD[*§]; Grunebaum, Michael F. MD[*§]; Galfalvy, Hanga C. PhD[*§]; Oquendo, Maria A. MD[*§]

We aimed to examine the relationship between religion and suicide attempt and ideation. Three hundred twenty-one depressed patients were recruited from mood-disorder research studies at the New York State Psychiatric Institute. Participants were interviewed using the Structured Clinical Interview for *DSM* Disorders, Columbia University Suicide History form, Scale for Suicide Ideation, and Reasons for Living Inventory. Participants were asked about their religious affiliation, importance of religion, and religious service attendance. We found that past suicide attempts were more common among depressed patients with a religious affiliation (odds ratio, 2.25; $p = 0.007$). Suicide ideation was greater among depressed patients who considered religion more important (coefficient, 1.18; $p = 0.026$) and those who attended services more frequently (coefficient, 1.99; $p = 0.001$). We conclude that the relationship between religion and suicide risk factors is complex and can vary among different patient populations. Physicians should seek deeper understanding of the role of religion in an individual patient's life in order to understand the person's suicide risk factors more fully.

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Associations of religiosity, attitudes towards suicide and religious coping with suicidal ideation and suicide attempts in 11 muslim countries ☆

Conclusions

Findings from this study suggest that the effects of religiosity in the suicidal process operate through attitudes towards suicide. We therefore conclude that clinical assessment as well as research in suicidology may benefit from paying due attention to attitudes towards suicide.

Religiosity and Suicidal Ideation by Sexual Orientation

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Outlines

- Introduction
- Data
- Methods
- Results
- Conclusion

Introduction

Why is this important?

- Suicidal ideation affects individuals across all age groups and walks of life.
- Some populations are particularly vulnerable. E.g., young people and older adults are among the groups of high-risk suicide.
- Also, individuals who identify as LGBTQ+ often face unique challenges, including discrimination, rejection, and lack of support.

The numbers tell a stark story

- Suicide **is the second leading cause** of death among people aged 15 to 24 globally.
- LGBTQ+ youth are **four times more likely** to attempt suicide compared to their heterosexual.

Objectives

- We aim to assess the association between religious beliefs and suicidal ideation among age and sexual orientation groups.

Data

Where do the data come from?

- The National Surveys on Drug Use and Health (NSDUH).
- NSDUH conducted both face-to-face household interviews and web-based interviews.
- Samples include all people living in the United States who are:
  - Age 12 or older;
  - Not living in institutions such as prisons or nursing homes;
  - Not military personnel on active duty;
  - Not experiencing homelessness with no fixed address;
  - Able to answer the questionnaire in either English or Spanish.

  Details can be found at https://www.samhsa.gov/data/data-we-collect/nsduh-national-survey-drug-use-and-health

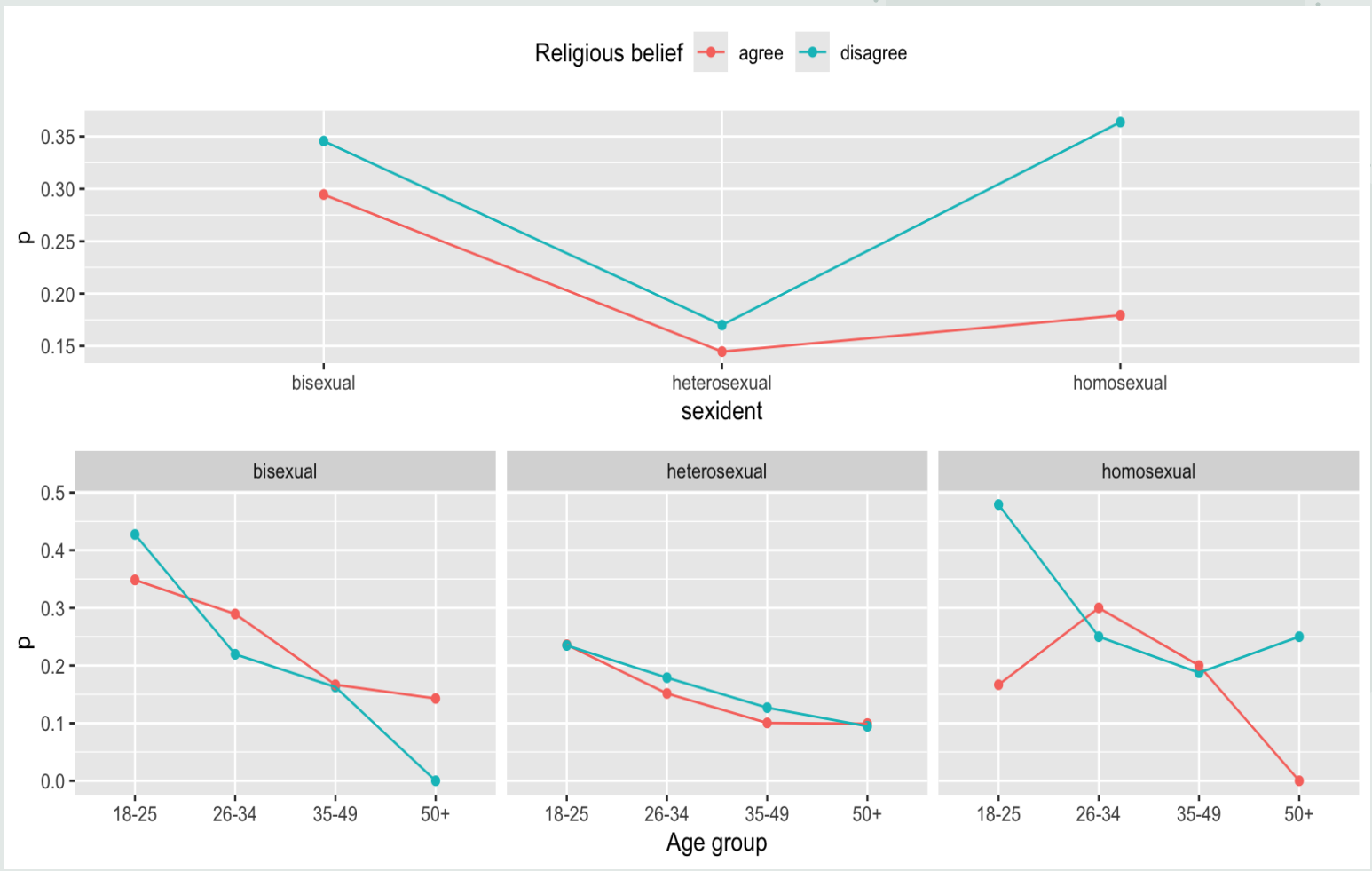
Data

Primary Variables	Information
Suicidal thought (outcome)	Survey question: during the past 12 months, did you make any plans to kill yourself? (yes or no [ref.])
Religious belief (exposure)	Survey question: Do your religious beliefs influence how you make decisions in your life? (agree or disagree [ref.])
Sexual identity	Survey question: Which one of the following do you consider yourself to be? (lesbian/gay, bisexual, heterosexual [ref.])
Age	Four categories: 18-25, 26-34, 35-49, and 50+

- **Confounding variables (10 variables)**: gender, race, income, work, marriage status, overall health, emotional distress, sleeping issues, education, and drug use.
- Refined data have 2,129 subjects;
- The outcome has five missing values.

Data

- Overall, religious beliefs reduce the probability of suicidal ideation.
- **Heterosexual group**: The difference is minimal.
- **Bisexual group**: the difference reverses between the youth and older adults.
- **Homosexual group**: Religious beliefs reduce the probability of suicidal ideation significantly in youth and older adults and reverse in the other two groups but not markedly.



Methods

Logistic models are fitted using the Bayesian framework.

- Full model:

$$Y_i \sim Bin(1, p_i), where\ logit(p_i) = \beta_0 + x_i^{require\prime}\beta_1 + x_i^{adjust\ 1\prime}\beta_2$$

  - $x_i^{require}$ is a vector representing predictors of interest: religious belief, sexual identity, age group, religious belief x sexual, religious belief x age.
  - $x_i^{adjust\ 1}$ is a vector representing 10 predictors that are adjusted in the model.

- Reduced model:

$$Y_i \sim Bin(1, p_i), where\ logit(p_i) = \beta_0 + x_i^{require\prime}\beta_1 + x_i^{adjust\ 2\prime}\beta_2$$

  - $x_i^{adjust\ 2}$ is selected from two variable selection models: Spike and slab, and LASSO, using Bayesian framework.

These models are fitted based on the vague priors.

Methods

Handling missing values:

- The missing mechanism is fitted jointly with the analysis model under the non-ignorability assumption, i.e.

$$R_i \sim Bin\left(p_i^{missing}\right),$$

$$where\ logit\left(p_i^{missing}\right) = \alpha_0 + suicidal_i\alpha_1 + health_i\alpha_2 + emotional\_distress\alpha_3$$

- These predictors are selected with the following assumptions:
  - As people think more about suicide, they do not want to disclose.
  - As people have worse health, they do not want to disclose.
  - As people encounter emotional distress, they do not want to disclose.
- However, the data is large, and our assumptions may be wrong. We, therefore, select vague prior distributions.

Methods

- We also found a study investigating characteristics associated with non-disclosure of suicidal ideation in adult s.
- These figures are used to specify the priors of the missing mechanism model.
- Suppose coefficients of the missing mechanism follow normal distributions, where the mean is logOR, and the variance is calculated using the CI.
- This model is compared to the reduced model fitted using the vague priors.

Characteristics Associated with Non-Disclosure of Suicidal Ideation in Adults

Saskia Mérelle [1,*], Elise Foppen [2], Renske Gilissen [1], Jan Mokkenstorm [1,3,4], Resi Cluitmans [2] and Wouter Van Ballegooijen [3,4,5]

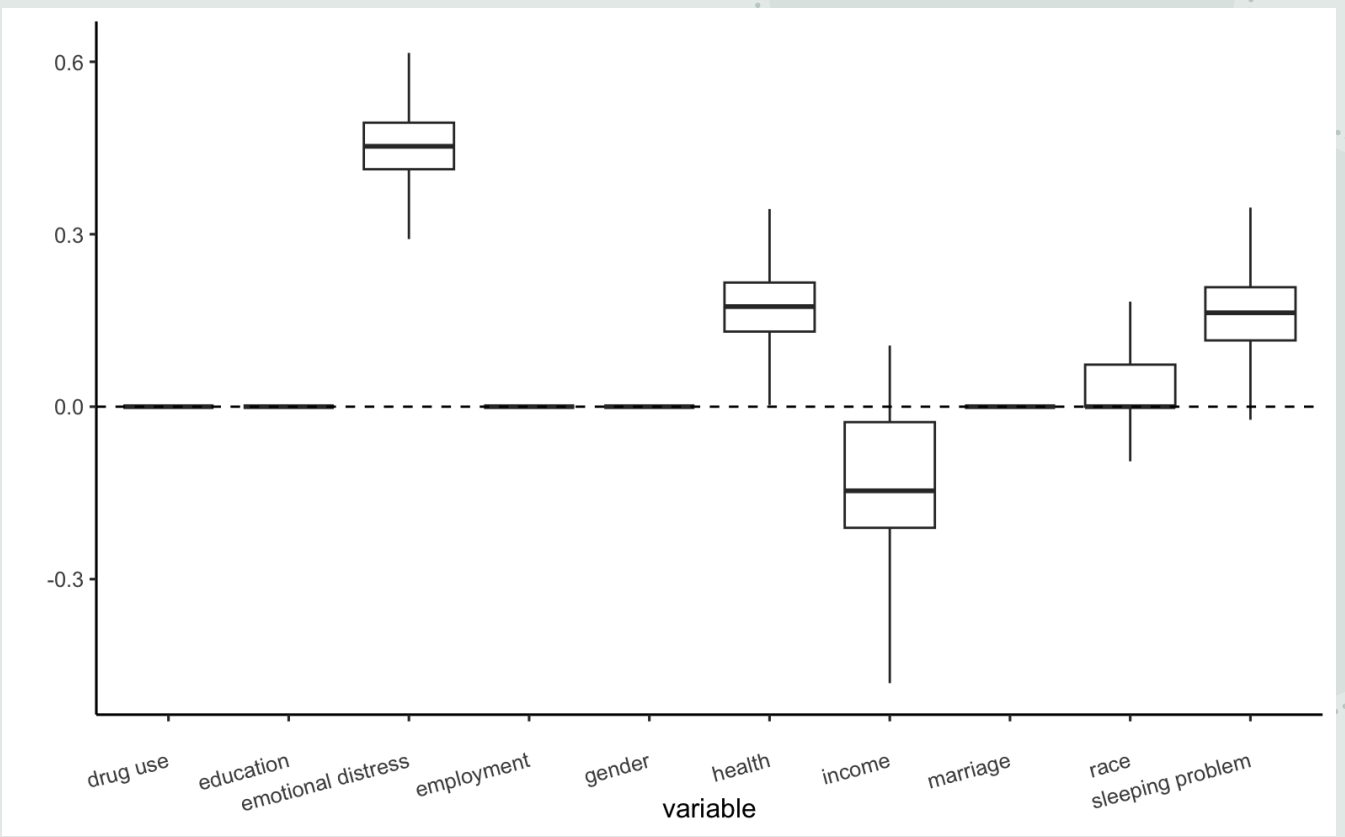
Health status very good-poor health status (1–5)	0.63	0.52–0.75 ***	0.60	0.47–0.76 ***	0.63	0.51–0.78 ***
Suicidal ideation a few times-very often (1–4)	0.46	0.37–0.57 ***	0.45	0.34–0.59 ***	0.48	0.37–0.62 ***
Psychological distress						
mild (10–15)	1.00		1.00			
moderate (16–29)	0.85	0.52–1.39	1.01	0.57–1.79		
severe (30–50)	0.34	0.20–0.57 ***	0.69	0.34–1.39	0.63	0.42–0.94 *

In total, 14,620 of the 15,600 participants answered the question about suicidal ideation at the end of the questionnaire, and 2% (n = 298) reported that they did not want to answer this question. The

Results – Variable selection model

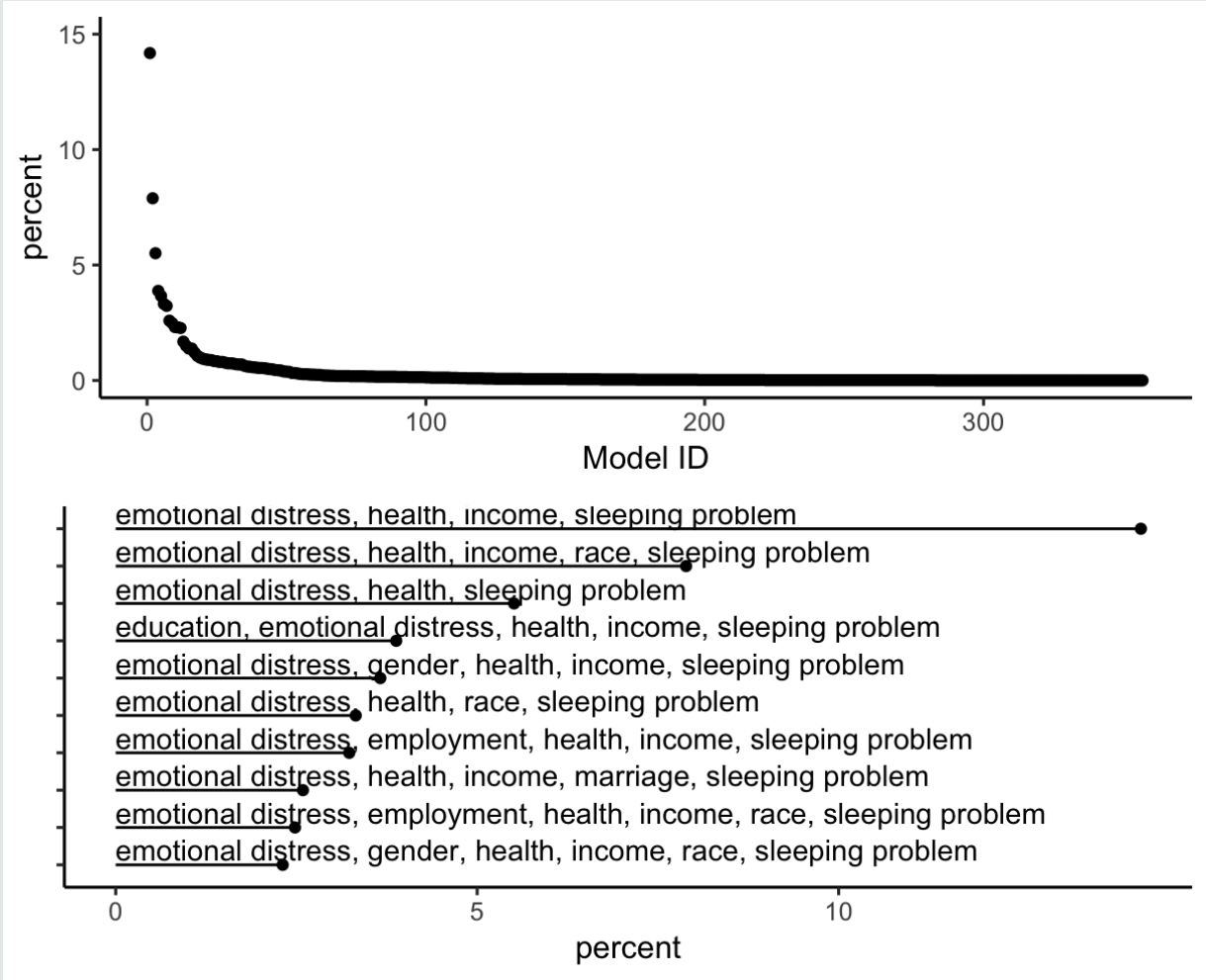
Four variables whose means differ from zero:

- Emotional distress
- Health
- Income
- Sleep disorder



Results – Variable selection model (Spike and Slab)

- The first ten model candidates have the highest probabilities.
- The probability of the first model, including emotional distress, health, income, and sleep disorder, is markedly higher than the others.
- The reduced model then includes these four predictors.



Results – Variable selection model

coefficient	Lasso	Spike-and-Slab	$\|\beta lasso\|>0.1$	$\|\beta Spike\text{-}and\text{-}Slab\|>0.1$
gender	0.0446	0.0123	0	0
race	0.0774	0.0360	0	0
income	-0.1620	-0.1356	1	1
employment	0.0388	0.0095	0	0
marriage	0.0039	0.0009	0	0
health	0.1605	0.1684	1	1
emotional distress	0.4465	0.4535	1	1
sleep disorder	0.1507	0.1564	1	1
education	-0.0402	-0.0108	0	0
drug use	-0.0035	-0.0014	0	0

Result – Estimate of coefficients of the full and crude model

	Full model			Crude model		
coefficients	Mean	Lower	Upper	Mean	Lower	Upper
Intercept	0.03	0.01	0.07	0.36	0.28	0.46
Religion	0.87	0.52	1.25	0.83	0.52	1.18
Bisexual	1.82	1.26	2.42	1.92	1.34	2.51
Homosexual	2.13	1.12	3.25	2.33	1.28	3.49
Age 26-34	0.64	0.41	0.89	0.53	0.36	0.71
Age 35-49	0.54	0.31	0.8	0.37	0.24	0.52
Age 50+	0.5	0.13	0.91	0.3	0.09	0.53
Religion x Bisexual	0.89	0.44	1.42	1.03	0.53	1.62
Religion x Homosexual	0.57	0.11	1.17	0.57	0.13	1.16
Religion x Age 26-34	1.22	0.59	1.97	1.32	0.64	2.09
Religion x Age 35-49	0.98	0.43	1.63	1.1	0.51	1.8
Religion x Age 50+	1.3	0.26	2.72	1.42	0.33	2.97
WAIC	1975.312			2061.353		

Result – Estimate of coefficients of reduced models

	Reduced model with vague priors			Reduced model with informative priors		
coefficients	Mean	Lower	Upper	Mean	Lower	Upper
Intercept	0.03	0.01	0.05	0.03	0.01	0.05
Religion	0.92	0.56	1.31	0.91	0.57	1.33
Bisexual	1.7	1.18	2.25	1.7	1.18	2.22
Homosexual	2.18	1.16	3.34	2.19	1.17	3.36
Age 26-34	0.58	0.37	0.8	0.58	0.37	0.8
Age 35-49	0.45	0.26	0.65	0.45	0.27	0.65
Age 50+	0.38	0.11	0.7	0.39	0.12	0.7
Religion x Bisexual	0.88	0.43	1.38	0.88	0.43	1.38
Religion x Homosexual	0.52	0.1	1.08	0.53	0.11	1.09
Religion x Age 26-34	1.21	0.58	1.95	1.2	0.55	1.92
Religion x Age 35-49	0.98	0.42	1.64	0.98	0.43	1.65
Religion x Age 50+	1.3	0.3	2.75	1.25	0.27	2.59
WAIC	1975.048			1969.363		

Results – ORs acquired from the reduced model with informative priors

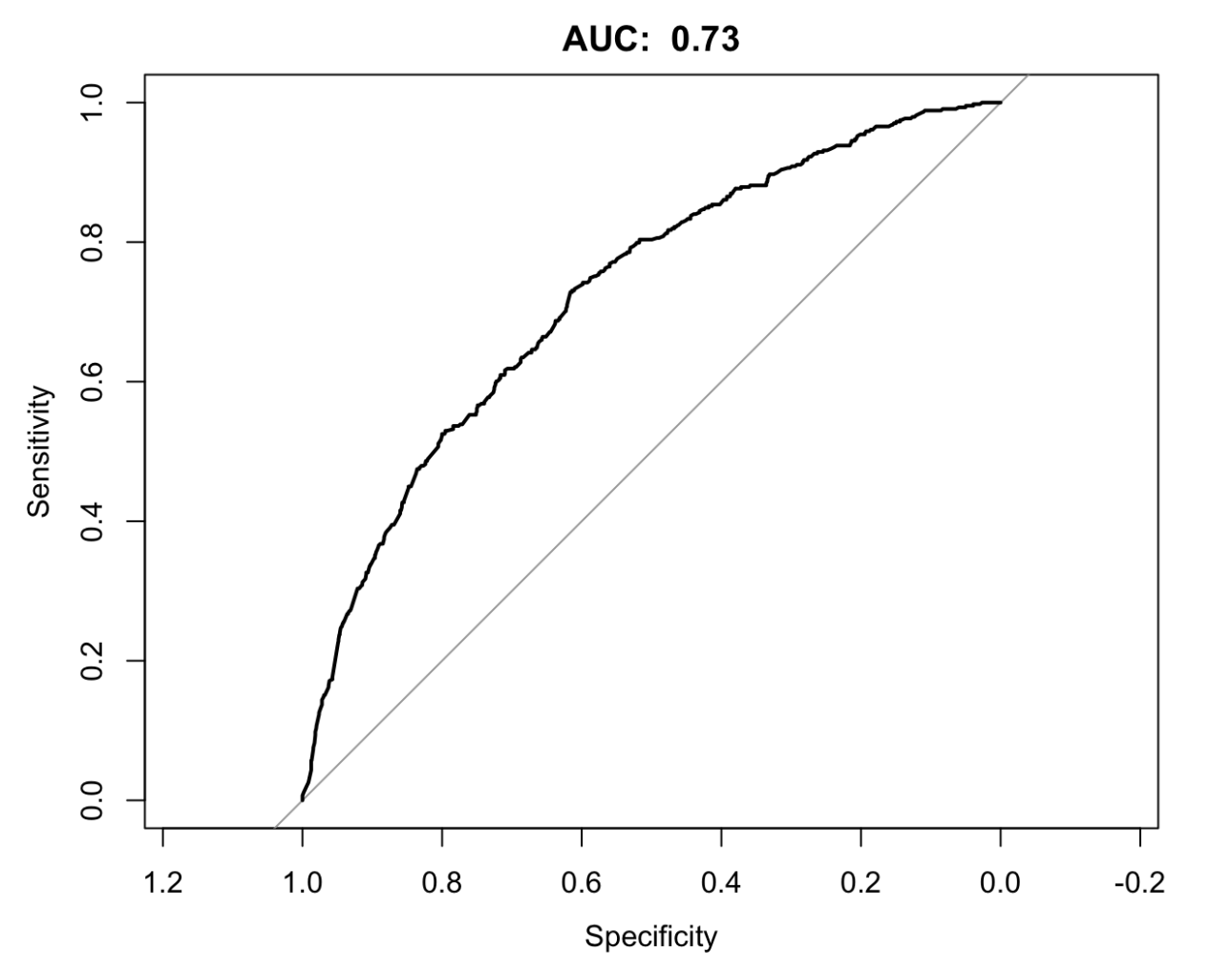
The ORs associated with suicidal ideation between Religion and no Religion are shown below:

Age	Bisexual	Heterosexuality	Homosexual
18-25	0.91(0.88) = 0.8	0.91	0.91(0.53) = 0.48
26-34	0.91(0.88)(1.2) = 0.96	0.91(1.2) = 1.09	0.91(0.53)(1.2) = 0.58
35-49	0.91(0.88)(0.98) = 0.78	0.91(0.98) = 0.89	0.91(0.53)(0.98) = 0.47
50+	0.91(0.88)(1.25) = 1.00	0.91(1.25) = 1.14	0.91(0.53)(1.25) = 0.6

$$\ln OR_{Bisexual+age\ 26-34} = (\text{Intercept} + \text{Religion} + \text{Bisexual} + \text{Age}_{26-34} + \text{Religion} \times \text{Bisexual} + \text{Religion} \times \text{Age}_{26-34}) - (\text{Intercept} + \text{Bisexual} + \text{Age}_{26-34}) = \text{Religion} + \text{Religion} \times \text{Bisexual} + \text{Religion} \times \text{Age}_{26-34}$$

Results – AUC of the reduced model with informative priors

- An AUC of 0.73 indicates that the model has acceptable discrimination.



Conclusions

- Bisexual group: people aged 18-35 and 35-49 who have religious beliefs are less likely to have suicidal thoughts.
- Heterosexual group: It is NOT evident that religious beliefs are associated with suicidal ideation.
- Homosexual group: It is evident that religious beliefs are associated with suicidal ideation.
- The above conclusions are not guaranteed as the 95% HDIs of ORs capture the unity.
- Although the causality cannot be inferred, the results suggest that suicide prevention activities should consider religious beliefs as an essential factor in the homosexual group.
- Future studies should extend data before 2022 and consider the effect of the COVID-19 pandemic within 2019-2021. Also, the information prior distributions specified from the meta-analysis could be utilized for the analysis model.