Supplementary Material

The role of medical mistrust in vaccination decisions in rural, indigenous Namibian communities

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Additional methodolological details

For participants who completed the study, we collected information on their tribal identity, year of birth, place of residence, and sex. Next participants completed the medical mistrust inventory developed by La Veist et al. (2009), though questions were slightly modified (see Prall et al., 2024). We also asked participants the following questions:

- "How worried are you about getting COVID-19?" - not at all worried/a little worried/very worried/extremely worried
- "Do you know people who have gotten sick with COVID-19?" - yes/no
- "Do you know people who have died from COVID-19?" - yes/no
- "In your opinion, do you think that vaccines generally are safe?" - yes/no
- "Have you received the COVID vaccine?" - yes/no
- "If not, why?" - open ended
- "There is a new vaccine for malaria that is being developed. If that vaccine is available how likely would yo ube to get it?" - very unlikely/unlikely/likely/very likely

Factor analysis details

A factor analysis was completed on the medical mistrust questions using the *factional* command in R with a varimax rotation. Uniqueness values for the seven questions are 0.94, 0.55, 0.47, 0.45, 0.00, 0.66, and 0.55 respectively. The estimated Chi square statistic is 15.38 on eight degrees of freedom, with a p-value of 0.0522. Inspection of the scree plot identified only one factor. Below we show a scree plot produced using the *psych* package (Revelle 2024), and a correlation matrix of question responses.

Figure S1: Scree plot

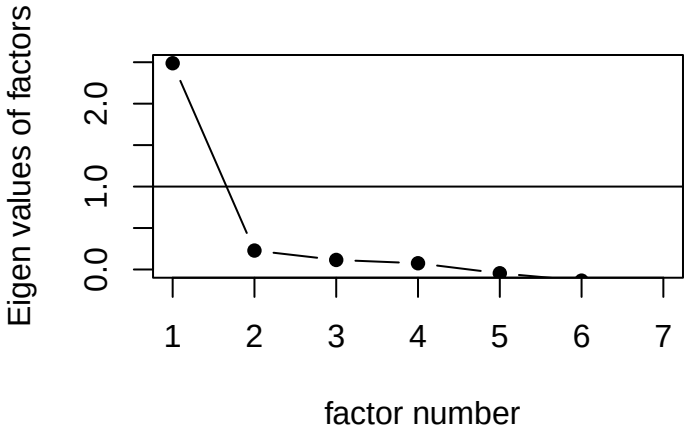
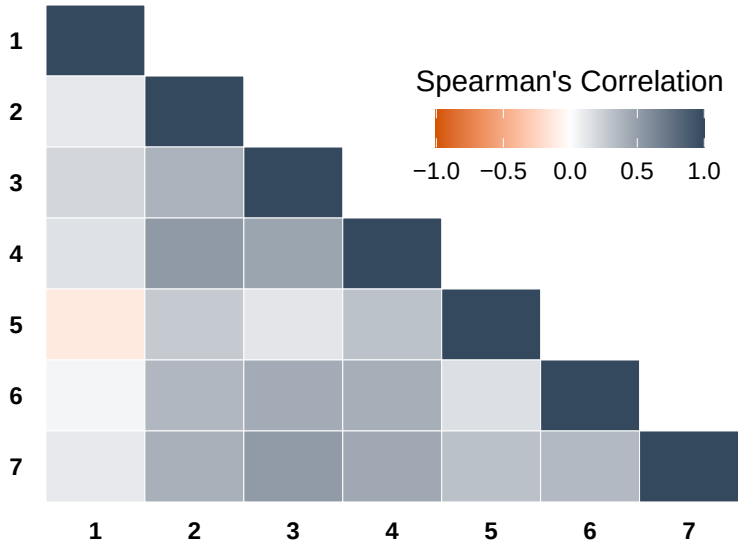


Figure S2: Correlation matrix plot



Additional multilevel modeling details and results

Model predicting medical mistrust

To predict medical mistrust we used the model defined below. Note that this model distribution is truncated between 1 and 4, representing the minimum and maximum possible values in the MMI scale. Figure S3 shows the distribution of MMI values by location. Figure S4 shows the posterior distributions of the model. Figure S5 shows the model predictions for MMI by location, while Figure S6 shows the predicted effect of sex and age on MMI values.

$$MMI \sim Gaussian(\mu, \sigma)$$
$$\mu = \alpha + \alpha_{location} + (\beta_{age} + \beta_{age[location]}) * age + (\beta_{male} + \beta_{male[location]}) * male$$
$$\sigma = \alpha + \alpha_{location}$$

Figure S3: Medical mistrust by location

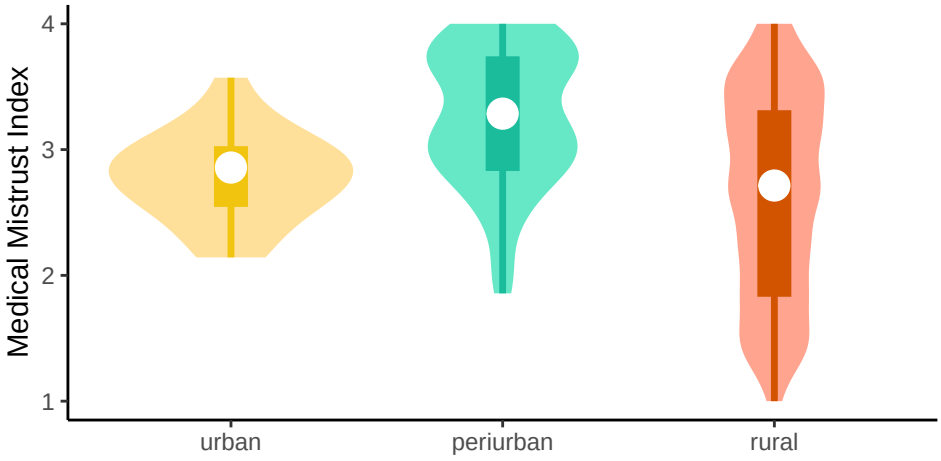


Figure S4: Posterior distributions

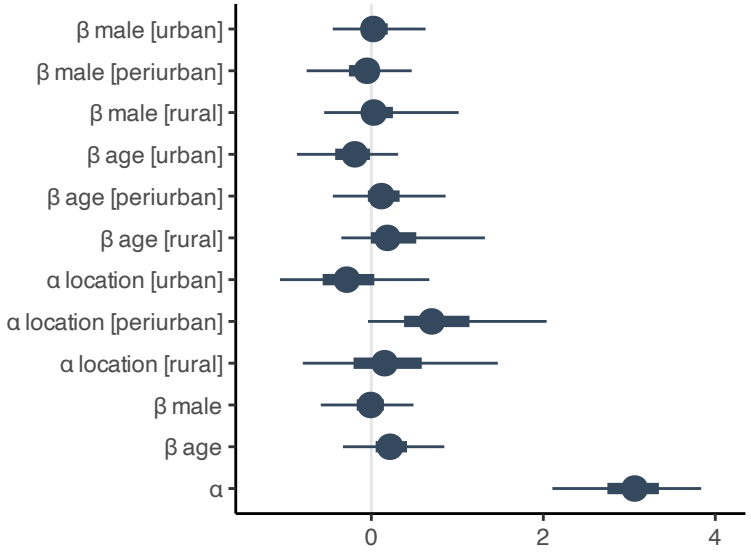


Figure S5: Posterior predictions by location

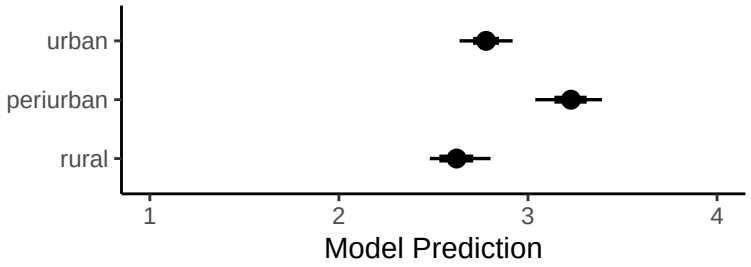
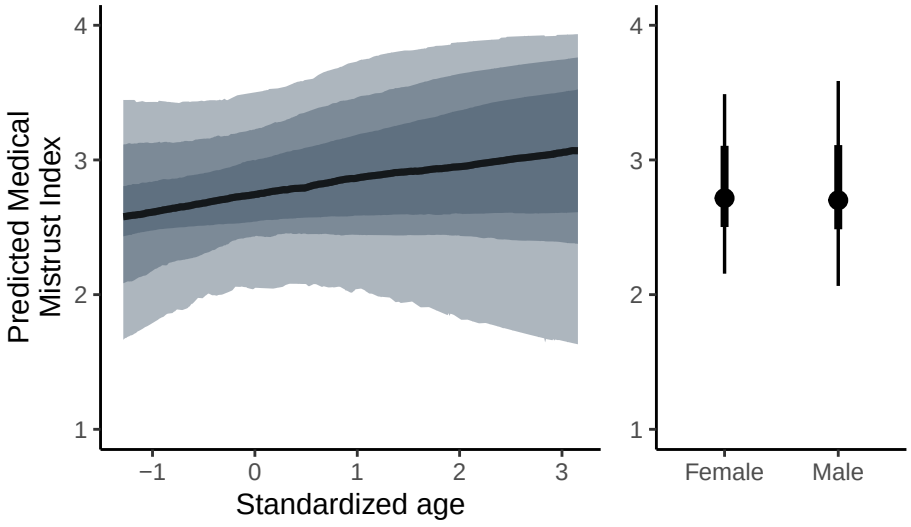


Figure S6: Posterior predictions by age and sex



Model predicting receiving the COVID-19 vaccine

To predict receiving the COVID-19 vaccine, the following bernoulli model was used, with varying effects by location. Below we show the posterior distributions of the model (Figure S7), and posterior predictions from the model for sex, age, and location (Figure S8 - 9)

$$Vaccinated \sim Bernoulli(p)$$
$$logit(p) = \alpha + \alpha_{location} + (\beta_{age} + \beta_{age[location]}) * age + (\beta_{male} + \beta_{male[location]}) * male + (\beta_{MMI} + \beta_{MMI[location]}) * MMI$$

Figure S7: Posterior distributions

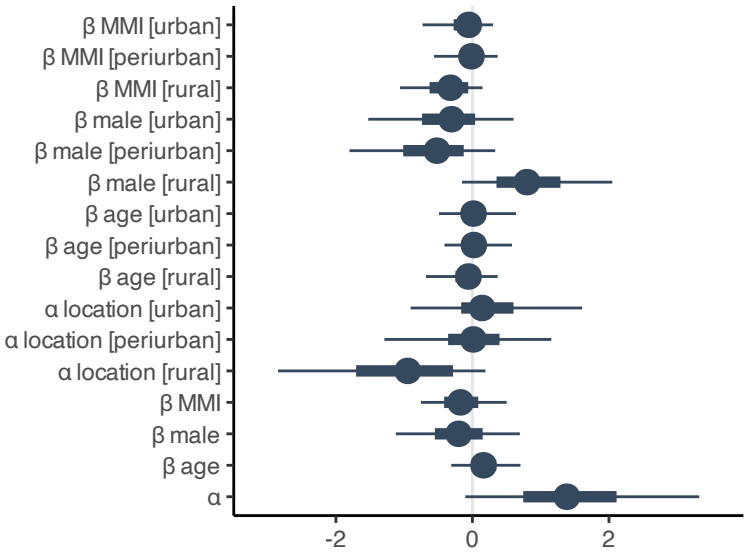


Figure S8: Posterior predictions for sex by location

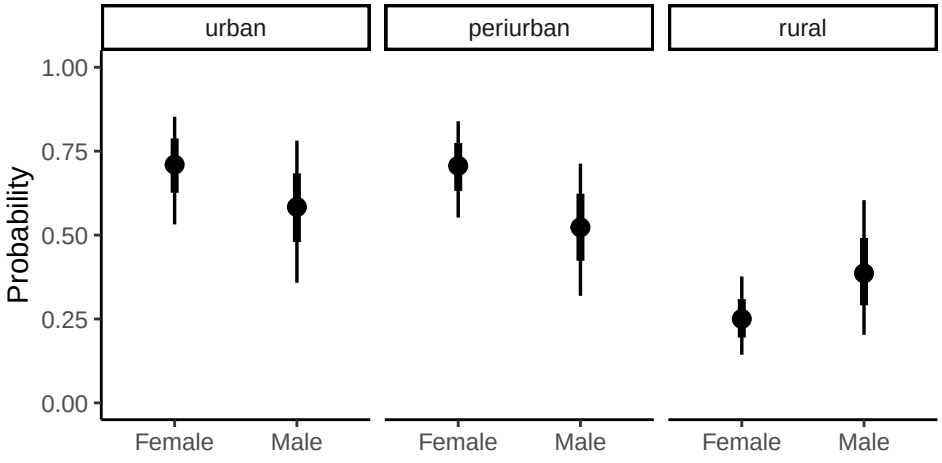
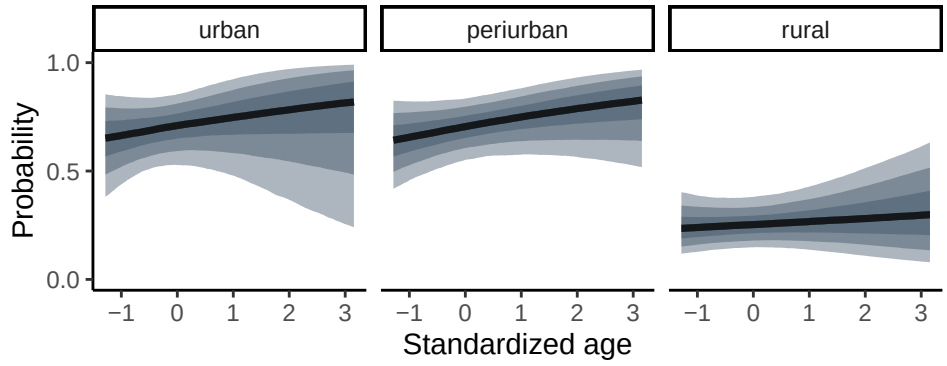


Figure S9: Posterior predictions for age by location



Model predicting belief that vaccines are generally safe

To predict the probability that vaccines in general are believed to be safe, we used the following Bernoulli model, again with varying effects by location. Below we show posterior distributions (Figure 10) and posterior predictions by age, sex, and location (Figure 11-12).

$$Safe \sim Bernoulli(p)$$
$$logit(p) = \alpha + \alpha_{location} + (\beta_{age} + \beta_{age[location]}) * age + (\beta_{male} + \beta_{male[location]}) * male + (\beta_{MMI} + \beta_{MMI[location]}) * MMI$$

Figure S10: Posterior distributions

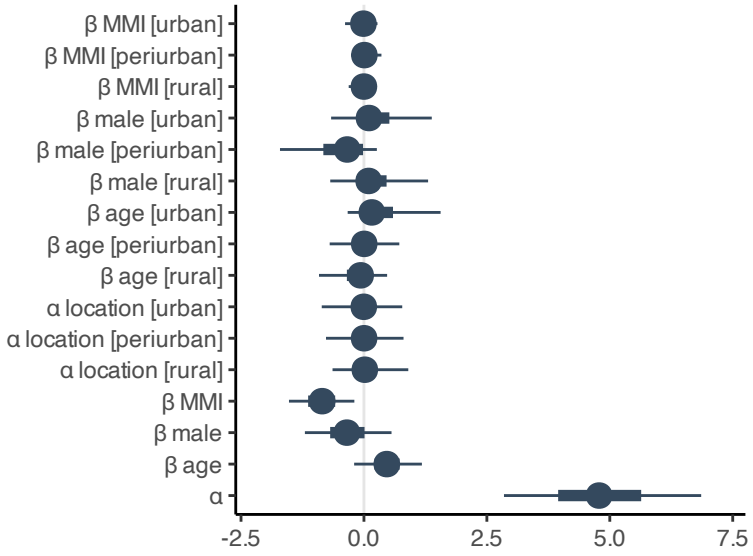


Figure S11: Posterior predictions for sex by location

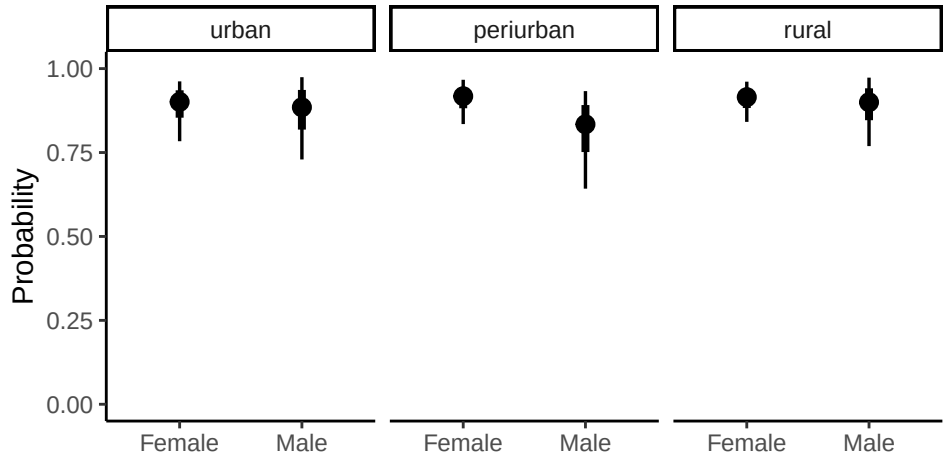
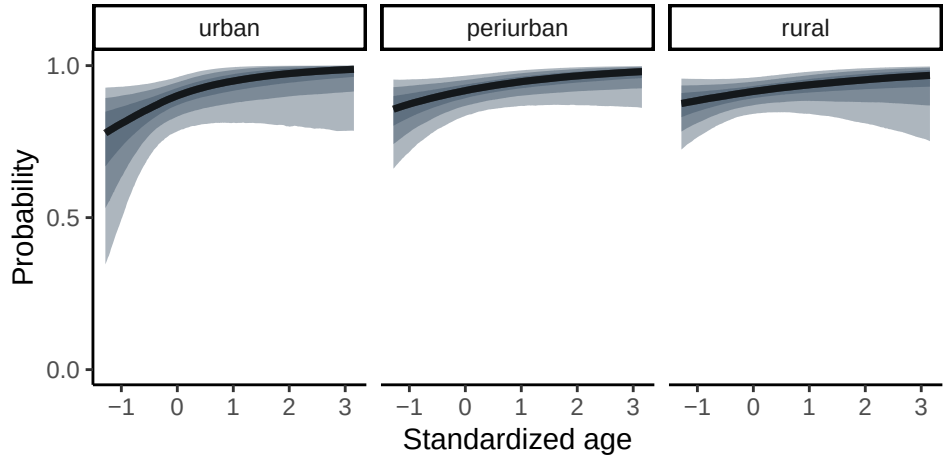


Figure S12: Posterior predictions for age by location



Model predicting interest in the malaria vaccine

Lastly, to predict whether vaccines are believed to be safe (with Likert scale outcome), the following cumulative ordered logit model was used, with, with varying effects by location. Below we show the posterior distributions of the intercepts for the model (capturing the baseline level of interest in each outcome, and by location, Figure S13), and the posterior distributions of the varying slopes by location (Figure S14). Lastly we show posterior predictions by age, sex, and location (Figure S15-16).

$$Rating \sim OrderedLogit(\theta, \kappa)$$
$$\theta = \alpha + \alpha_{location} + (\beta_{age} + \beta_{age[location]}) * age + (\beta_{male} + \beta_{male[location]}) * male + (\beta_{MMI} + \beta_{MMI[location]}) * MMI$$

Figure S13: Posterior distributions of varying intercepts

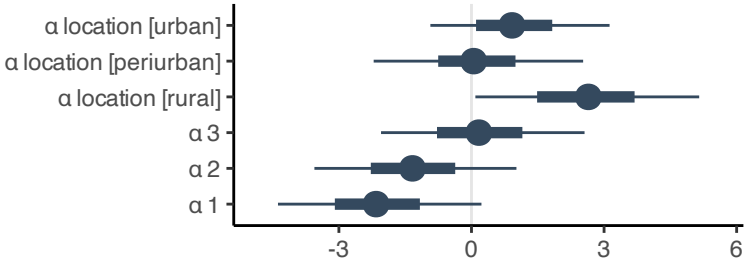


Figure S14: Posterior distributions of varying slopes

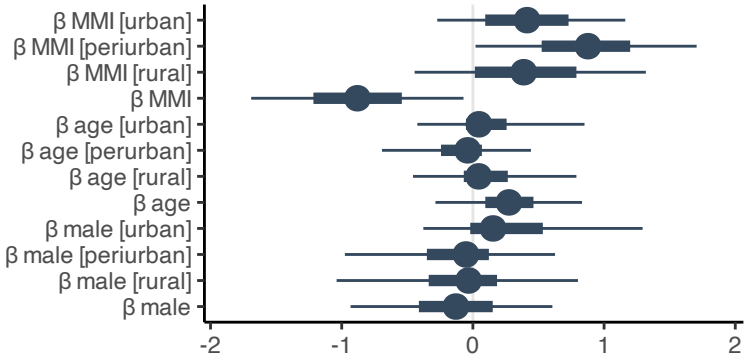


Figure S15: Posterior predictions for sex by location

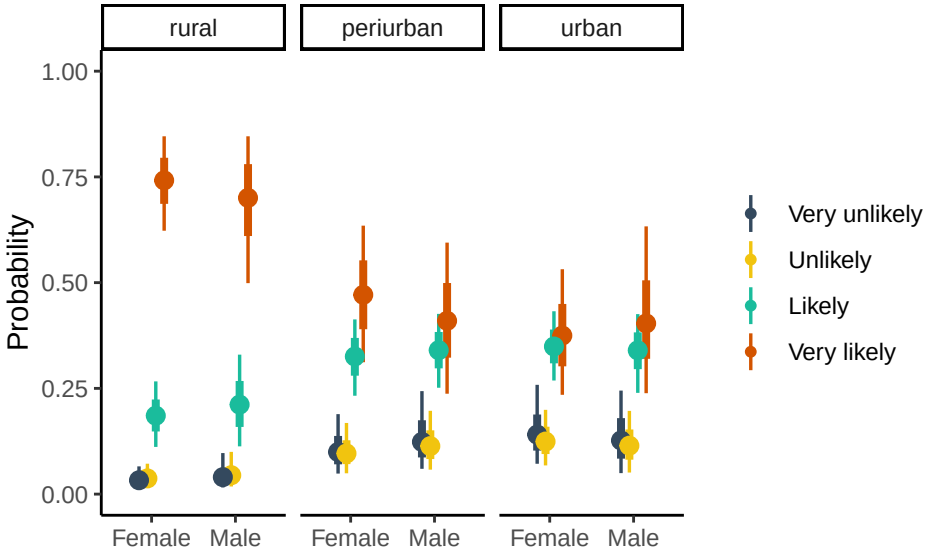
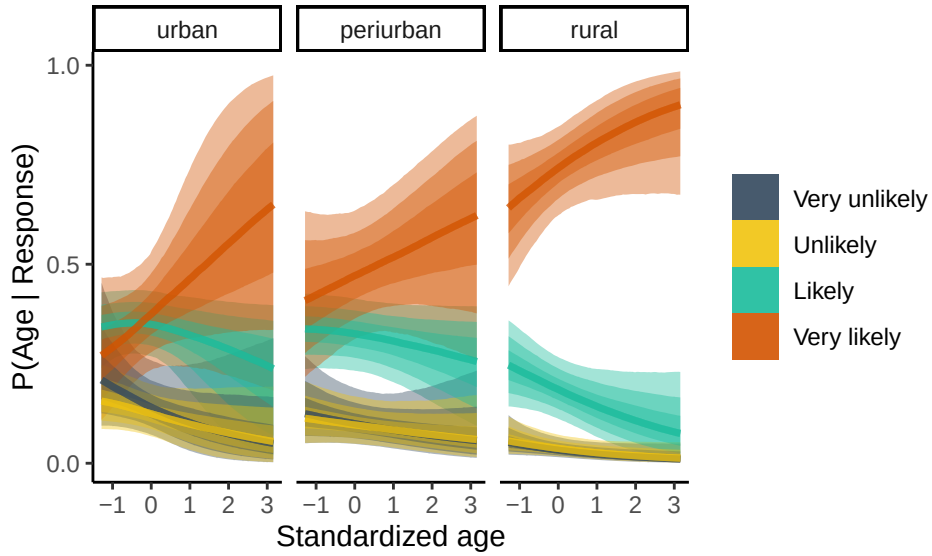


Figure S16: Posterior predictions for age by location



Additional modeling details

All multilevel models were run in the *brms* package (Bürkner 2017). Model convergence was assessed by inspecting $\hat{r}$ values. All models used 4000 iterations, half of which were warm-up, run on three chains. Regularizing priors were used for all models, which can be seen in the associated R file posted to OSF.

References

Bürkner, Paul-Christian. "Brms: An R Package for Bayesian Multilevel Models Using Stan." Journal of Statistical Software 80, no. 1 (August 29, 2017): 1–28. https://doi.org/10.18637/jss.v080.i01.

LaVeist, Thomas A., Lydia A. Isaac, and Karen Patricia Williams. "Mistrust of Health Care Organizations Is Associated with Underutilization of Health Services." Health Services Research 44, no. 6 (December 2009): 2093–2105. https://doi.org/10.1111/j.1475-6773.2009.01017.x.

Prall, Sean P., Brooke A. Scelza, and Helen Elizabeth Davis. "Medical Mistrust, Discrimination, and Healthcare Experiences in a Rural Namibian Community." Global Public Health 19, no. 1 (2024): 2346207. https://doi.org/10.1080/17441692.2024.2346207.

Revelle, William. "Psych: Procedures for Psychological, Psychometric, and Personality Research." Manual. Evanston, Illinois: Northwestern University, 2024. https://CRAN.R-project.org/package=psych.