

HW 8

AUTHOR
Aarthi Ganapathi

Research Question

Do individuals' perception of emotional support sources differ across the adult lifespan, and is this effect moderated by sexual orientation?







Variables

- `identity_bin`: sexual orientation of respondents (0 = exclusively heterosexual, 1 = not exclusively heterosexual)
- `support_partner`: perceived reliance on romantic partner/spouse for emotional support on a scale of 1-5, 1 = not at all and 5 = a great deal
- `support_family`: perceived reliance on family members for emotional support on a scale of 1-5, 1 = not at all and 5 = a great deal
- `support_friends`: perceived reliance on friends for emotional support on a scale of 1-5, 1 = not at all and 5 = a great deal
- `age_bin`: age group; given the relatively limited age range of the population (20-60), typical age-related terms (i.e., younger vs older adult) will not be used, but instead participants are sorted into lower, middle, and upper age groups; lower = ages 20-34, middle = 35-50; upper = 51-60

Data Import

Variable Summary

Table 1 shows the summary statistics of perceived partner support ratings by sexual orientation.

Table 1: Descriptive statistics by groups			
		Exclusively Heterosexual	Not Exclusively Heterosexual
support_partner	N	2012	1617
	Median	4.00	4.00
	Mean	4.00	4.14
	Min	1.00	1.00
	Max	5.00	5.00
	Histogram		
		Exclusively Heterosexual	Not Exclusively Heterosexual
support_family	N	2012	1617
	Median	3.00	3.00
	Mean	3.37	2.92
	Min	1.00	1.00
	Max	5.00	5.00
	Histogram		
		Exclusively Heterosexual	Not Exclusively Heterosexual
support_friends	N	2012	1617
	Median	3.00	3.00
	Mean	2.97	3.28
	Min	1.00	1.00
	Max	5.00	5.00
	Histogram		

Model

Let Y = support_partner, G =

Model:

$$\begin{aligned} Y_{\{1\}}, Y_{\{2\}}, Y_{\{3\}} &\sim \text{mathcal{N}}(\boldsymbol{\mu}_i, \boldsymbol{\Sigma}) \backslash \boldsymbol{\mu}_i = \begin{bmatrix} \mu_{\{1\}} \\ \mu_{\{2\}} \\ \mu_{\{3\}} \end{bmatrix} \backslash \text{mathbf{X}}_i \boldsymbol{\beta} \backslash \text{mathbf{X}}_i = \begin{bmatrix} 1 & \text{age_bin} & \text{age_bin}^2 \end{bmatrix} \end{aligned}$$

Priors are pulled from Li, Ji, & Chen 2014, which estimated perceived support sources specifically in married older adults:

$$\begin{aligned} \beta_{1, upper} &= N(4.23, 0.95^2) \\ \beta_{2, upper} &= N(3.95, 0.92^2) \\ \beta_{3, upper} &= N(3.12, 0.93^2) \end{aligned}$$

Analysis

Ensure support variables are being treated as ordinal

The model without any priors:

Including age priors from Li, Ji, & Chen (2014):

Setting 'rescor' to FALSE by default for this model

Warning: Rows containing NAs were excluded from the model.

Compiling Stan program...

Start sampling

Results

```
Family: MV(cumulative, cumulative, cumulative)
Links: mu = logit; disc = identity
      mu = logit; disc = identity
      mu = logit; disc = identity
Formula: support_partner ~ identity_bin + age_bin + identity_bin * age_bin
         support_family ~ identity_bin + age_bin + identity_bin * age_bin
         support_friends ~ identity_bin + age_bin + identity_bin * age_bin
Data: nchat (Number of observations: 3629)
Draws: 2 chains, each with iter = 2000; warmup = 1000; thin = 1;
       total post-warmup draws = 2000
```

Regression Coefficients:

	Estimate	Est.Error	1-95% CI	u-95% CI
supportpartner_Intercept[1]	-3.82	0.14	-4.11	-3.54
supportpartner_Intercept[2]	-2.57	0.12	-2.82	-2.33
supportpartner_Intercept[3]	-1.37	0.11	-1.59	-1.15
supportpartner_Intercept[4]	-0.03	0.11	-0.26	0.19
supportfamily_Intercept[1]	-2.19	0.11	-2.40	-1.96
supportfamily_Intercept[2]	-0.90	0.10	-1.10	-0.70
supportfamily_Intercept[3]	0.26	0.10	0.05	0.46
supportfamily_Intercept[4]	1.58	0.11	1.37	1.79
supportfriends_Intercept[1]	-2.15	0.11	-2.38	-1.94
supportfriends_Intercept[2]	-0.84	0.10	-1.05	-0.64
supportfriends_Intercept[3]	0.50	0.10	0.29	0.69
supportfriends_Intercept[4]	1.98	0.11	1.77	2.19
supportpartner_identity_bin	0.08	0.14	-0.18	0.36
supportpartner_age_binMIDDLE	-0.36	0.13	-0.62	-0.12
supportpartner_age_binUPPER	-0.54	0.13	-0.80	-0.29
supportpartner_identity_bin:age_binMIDDLE	0.01	0.17	-0.31	0.33
supportpartner_identity_bin:age_binUPPER	0.23	0.18	-0.11	0.58
supportfamily_identity_bin	-0.43	0.13	-0.68	-0.16
supportfamily_age_binMIDDLE	0.28	0.12	0.06	0.51
supportfamily_age_binUPPER	0.25	0.12	0.02	0.49
supportfamily_identity_bin:age_binMIDDLE	-0.30	0.16	-0.61	-0.00
supportfamily_identity_bin:age_binUPPER	-0.25	0.17	-0.58	0.06
supportfriends_identity_bin	0.41	0.13	0.15	0.66
supportfriends_age_binMIDDLE	-0.16	0.12	-0.39	0.06
supportfriends_age_binUPPER	-0.28	0.12	-0.51	-0.06
supportfriends_identity_bin:age_binMIDDLE	-0.06	0.15	-0.35	0.24
supportfriends_identity_bin:age_binUPPER	0.15	0.16	-0.17	0.45

Rhat Bulk_ESS Tail_ESS

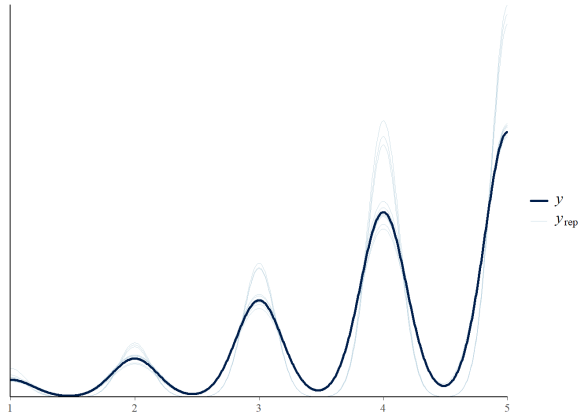
supportpartner_Intercept[1]	1.00	1194	1283
supportpartner_Intercept[2]	1.00	1179	1269
supportpartner_Intercept[3]	1.00	1121	1374
supportpartner_Intercept[4]	1.00	1074	1301
supportfamily_Intercept[1]	1.00	1056	1383
supportfamily_Intercept[2]	1.00	988	1155
supportfamily_Intercept[3]	1.00	1024	1220
supportfamily_Intercept[4]	1.00	1074	1251
supportfriends_Intercept[1]	1.00	1085	1338
supportfriends_Intercept[2]	1.00	1128	1268
supportfriends_Intercept[3]	1.00	1076	1223
supportfriends_Intercept[4]	1.00	1155	1349
supportpartner_identity_bin	1.00	1004	1103
supportpartner_age_binMIDDLE	1.00	1092	1254
supportpartner_age_binUPPER	1.00	1025	1222
supportpartner_identity_bin:age_binMIDDLE	1.00	1017	1308
supportpartner_identity_bin:age_binUPPER	1.00	1093	1285
supportfamily_identity_bin	1.00	995	1354
supportfamily_age_binMIDDLE	1.00	1128	1064
supportfamily_age_binUPPER	1.00	1071	1496
supportfamily_identity_bin:age_binMIDDLE	1.00	991	1041
supportfamily_identity_bin:age_binUPPER	1.00	1084	1461
supportfriends_identity_bin	1.00	985	1071
supportfriends_age_binMIDDLE	1.00	1189	1477
supportfriends_age_binUPPER	1.00	1102	1230
supportfriends_identity_bin:age_binMIDDLE	1.00	1030	1564
supportfriends_identity_bin:age_binUPPER	1.00	1189	1424

Further Distributional Parameters:

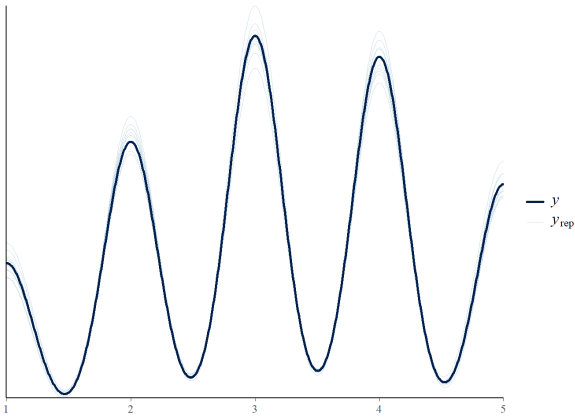
	Estimate	Est.Error	1-95% CI	u-95% CI	Rhat	Bulk_ESS	Tail_ESS
disc_supportpartner	1.00	0.00	1.00	1.00	NA	NA	NA
disc_supportfamily	1.00	0.00	1.00	1.00	NA	NA	NA
disc_supportfriends	1.00	0.00	1.00	1.00	NA	NA	NA

Draws were sampled using sampling(NUTS). For each parameter, Bulk_ESS and Tail_ESS are effective sample size measures, and Rhat is the potential scale reduction factor on split chains (at convergence, Rhat = 1).

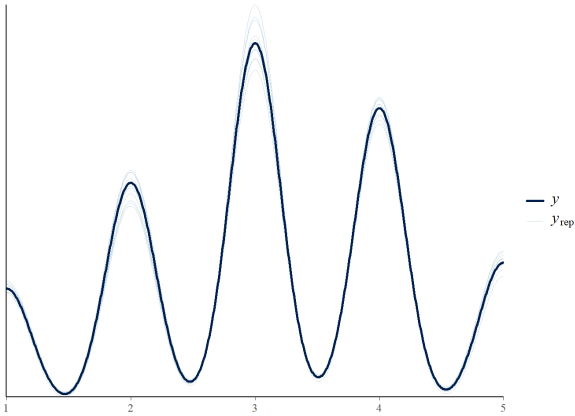
Using 10 posterior draws for ppc type 'dens_overlay' by default.



Using 10 posterior draws for ppc type 'dens_overlay' by default.



Using 10 posterior draws for ppc type 'dens_overlay' by default.



The model seems to fit decently, but there still seems to be some overestimation happening, particularly for partner support.

```
Family: MV(cumulative, cumulative, cumulative)
Links: mu = logit; disc = identity
       mu = logit; disc = identity
       mu = logit; disc = identity
Formula: support_partner ~ identity_bin + age_bin + identity_bin * age_bin
         support_family ~ identity_bin + age_bin + identity_bin * age_bin
         support_friends ~ identity_bin + age_bin + identity_bin * age_bin
Data: nchat (Number of observations: 3629)
Draws: 2 chains, each with iter = 2000; warmup = 1000; thin = 1;
       total post-warmup draws = 2000
```

Regression Coefficients:				
	Estimate	Est.Error	1-95% CI	u-95% CI
supportpartner_Intercept[1]	-3.75	0.14	-4.03	-3.48
supportpartner_Intercept[2]	-2.52	0.12	-2.75	-2.28
supportpartner_Intercept[3]	-1.31	0.11	-1.52	-1.08
supportpartner_Intercept[4]	0.03	0.11	-0.18	0.24
supportfamily_Intercept[1]	-2.15	0.11	-2.36	-1.93
supportfamily_Intercept[2]	-0.86	0.11	-1.07	-0.65
supportfamily_Intercept[3]	0.30	0.10	0.09	0.52
supportfamily_Intercept[4]	1.62	0.11	1.41	1.84
supportfriends_Intercept[1]	-2.11	0.11	-2.33	-1.88
supportfriends_Intercept[2]	-0.00	0.10	-0.99	-0.59
supportfriends_Intercept[3]	0.54	0.10	0.34	0.75
supportfriends_Intercept[4]	2.02	0.11	1.80	2.25
supportpartner_identity_bin	0.14	0.14	-0.12	0.41
supportpartner_age_binMIDDLE	-0.31	0.12	-0.55	-0.07
supportpartner_age_binUPPER	-0.46	0.13	-0.71	-0.22
supportpartner_identity_bin:age_binMIDDLE	-0.03	0.16	-0.36	0.28
supportpartner_identity_bin:age_binUPPER	0.16	0.17	-0.18	0.50
supportfamily_identity_bin	-0.39	0.13	-0.65	-0.12
supportfamily_age_binMIDDLE	0.32	0.12	0.08	0.56
supportfamily_age_binUPPER	0.31	0.12	0.08	0.56
supportfamily_identity_bin:age_binMIDDLE	-0.34	0.16	-0.66	-0.02
supportfamily_identity_bin:age_binUPPER	-0.30	0.17	-0.64	0.01
supportfriends_identity_bin	0.45	0.13	0.21	0.71
supportfriends_age_binMIDDLE	-0.12	0.12	-0.35	0.13
supportfriends_age_binUPPER	-0.22	0.12	-0.46	0.01
supportfriends_identity_bin:age_binMIDDLE	-0.10	0.16	-0.44	0.20
supportfriends_identity_bin:age_binUPPER	0.09	0.16	-0.25	0.40
Rhat Bulk_ESS Tail_ESS				
supportpartner_Intercept[1]	1.00	1121	1328	
supportpartner_Intercept[2]	1.00	1018	1284	
supportpartner_Intercept[3]	1.00	940	1159	
supportpartner_Intercept[4]	1.00	934	1186	
supportfamily_Intercept[1]	1.00	928	1069	
supportfamily_Intercept[2]	1.00	834	1014	
supportfamily_Intercept[3]	1.00	820	984	
supportfamily_Intercept[4]	1.00	856	1241	
supportfriends_Intercept[1]	1.00	1204	1520	
supportfriends_Intercept[2]	1.00	1178	1471	
supportfriends_Intercept[3]	1.00	1156	1587	
supportfriends_Intercept[4]	1.00	1278	1563	
supportpartner_identity_bin	1.00	876	1293	
supportpartner_age_binMIDDLE	1.00	1082	1437	
supportpartner_age_binUPPER	1.00	980	1282	
supportpartner_identity_bin:age_binMIDDLE	1.00	961	1402	
supportpartner_identity_bin:age_binUPPER	1.00	1052	1423	
supportfamily_identity_bin	1.00	761	985	

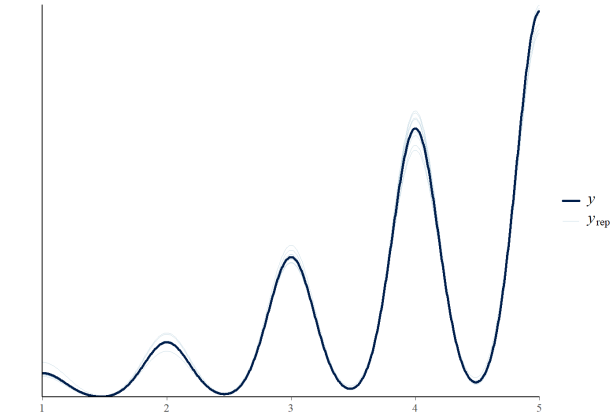
supportfamily_age_binMIDDLE	1.00	855	1082
supportfamily_age_binUPPER	1.00	739	1150
supportfamily_identity_bin:age_binMIDDLE	1.00	771	1073
supportfamily_identity_bin:age_binUPPER	1.00	749	967
supportfriends_identity_bin	1.00	993	1338
supportfriends_age_binMIDDLE	1.00	1173	1516
supportfriends_age_binUPPER	1.00	1283	1310
supportfriends_identity_bin:age_binMIDDLE	1.00	1075	1375
supportfriends_identity_bin:age_binUPPER	1.00	1119	1485

Further Distributional Parameters:

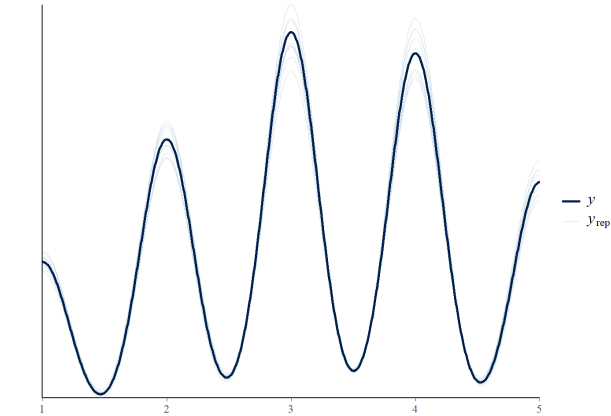
	Estimate	Est.Error	1-95% CI	u-95% CI	Rhat	Bulk_ESS	Tail_ESS
disc_supportpartner	1.00	0.00	1.00	1.00	NA	NA	NA
disc_supportfamily	1.00	0.00	1.00	1.00	NA	NA	NA
disc_supportfriends	1.00	0.00	1.00	1.00	NA	NA	NA

Draws were sampled using sampling(NUTS). For each parameter, Bulk_ESS and Tail_ESS are effective sample size measures, and Rhat is the potential scale reduction factor on split chains (at convergence, Rhat = 1).

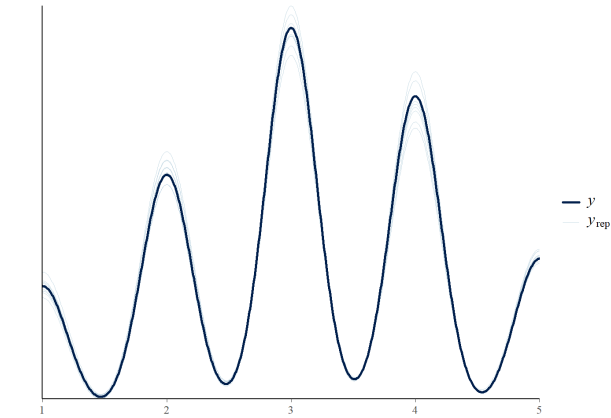
Using 10 posterior draws for ppc type 'dens_overlay' by default.



Using 10 posterior draws for ppc type 'dens_overlay' by default.



Using 10 posterior draws for ppc type 'dens_overlay' by default.



The specified priors does not seem to improve the model fit at all.

As shown in the rank histogram in [Figure 1](#) below, the chains mixed well.

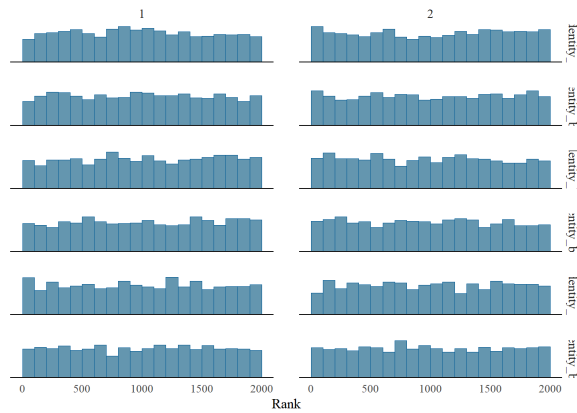


Figure 1: Rank histogram of the posterior distributions of model parameters.

?@tbl-summary-table1 shows the posterior distributions of the interaction between age and sexual orientation with default priors.

Table 2: Posterior summary of the model parameters.

variable	mean	median	sd	mad	q5	q95	rhat	ess_bulk	ess_tail
b_supportpartner_identity_bin	0.08	0.08	0.14	0.15	-0.15	0.31	1	1004.48	1102.75
b_supportpartner_age_binUPPER	-0.54	-0.54	0.13	0.13	-0.76	-0.34	1	1024.64	1222.08
b_supportpartner_identity_binage_binUPPER	0.23	0.23	0.18	0.18	-0.06	0.52	1	1092.89	1285.07
b_supportfamily_identity_bin	-0.43	-0.43	0.13	0.13	-0.64	-0.21	1	995.24	1353.68
b_supportfamily_age_binUPPER	0.25	0.25	0.12	0.12	0.06	0.46	1	1070.55	1496.40
b_supportfamily_identity_binage_binUPPER	-0.25	-0.25	0.17	0.17	-0.53	0.02	1	1083.52	1460.71
b_supportfriends_identity_bin	0.41	0.40	0.13	0.13	0.20	0.62	1	984.65	1071.13
b_supportfriends_age_binUPPER	-0.28	-0.28	0.12	0.12	-0.47	-0.09	1	1102.28	1230.43
b_supportfriends_identity_binage_binUPPER	0.15	0.15	0.16	0.16	-0.12	0.40	1	1189.14	1424.00

Similarly, for ?@fig-rank-hist-fit2 below, the chains mixed well.

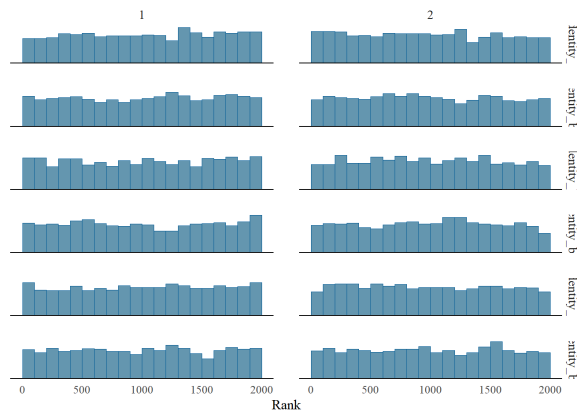


Figure 2: Rank histogram of the posterior distributions of model parameters.

?@tbl-summary-table1 shows the posterior distributions of the interaction between age and sexual orientation with the Li, Ji, & Chen (2014)-informed priors.

Table 3: Posterior summary of the model parameters.

variable	mean	median	sd	mad	q5	q95	rhat	ess_bulk	ess_tail
b_supportpartner_identity_bin	0.14	0.14	0.14	0.14	-0.08	0.37	1	875.90	1292.68
b_supportpartner_age_binUPPER	-0.46	-0.46	0.13	0.13	-0.66	-0.25	1	979.95	1282.37
b_supportpartner_identity_binage_binUPPER	0.16	0.16	0.17	0.17	-0.12	0.44	1	1052.48	1422.62
b_supportfamily_identity_bin	-0.39	-0.39	0.13	0.13	-0.61	-0.16	1	760.54	984.59
b_supportfamily_age_binUPPER	0.31	0.31	0.12	0.12	0.11	0.51	1	739.17	1150.40
b_supportfamily_identity_binage_binUPPER	-0.30	-0.30	0.17	0.17	-0.58	-0.03	1	749.19	967.24
b_supportfriends_identity_bin	0.45	0.45	0.13	0.13	0.25	0.67	1	993.45	1337.96
b_supportfriends_age_binUPPER	-0.22	-0.23	0.12	0.12	-0.42	-0.03	1	1282.85	1309.60
b_supportfriends_identity_binage_binUPPER	0.09	0.09	0.16	0.16	-0.18	0.35	1	1119.49	1484.90

In general, these results suggest that there is a clear moderation effect of sexual minority status on age differences in emotion support reception. Although reliance on romantic partners for emotional support generally decreases with age, this decrease is less pronounced in sexual minority individuals. Similarly, reliance on family generally increases with age, but this effect almost entirely reverses in sexual minority individuals. Lastly, friend support decreases with age, but this effect is also less pronounced in sexual minority individuals.