Regression III: Lab 3 Answers

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This lab exercise is meant to get you thinking about the nature of multilevel data and how explanations of phenomena in situations like this can be of both the "between" and "within" forms. We're using data from the most recent wave of the World Values Survey (2005-2008) for 38 countries. The following variables are in the dataset (which you can get from `http://www.quantoid.net/wvs_lab3.dta`):

Table 1: Variables in `wvs_lab3.dta`

nation	Country Name
satisfied	Overall life satisfaction (1=low, 10=high)
org_mem	Number of active organizational memberships
married	Coded 1 if respondent is married
ind_democ	Country is governed: (1=non-democratically, 10=democratically)
weekrel	Coded 1 if the respondent attends church weekly
civlibs	Civil Liberties (from Freedom House Data)
gdppc	GDP/capita

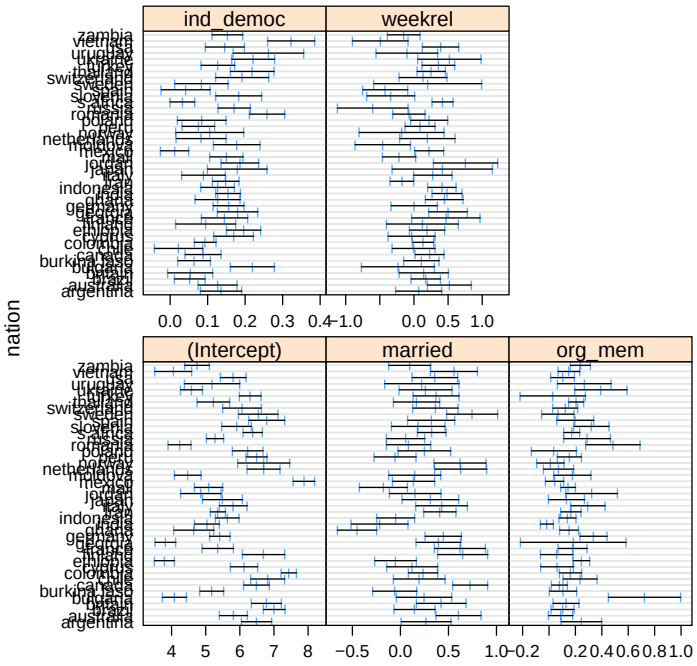
In today's exercise, we are going to be especially interested in the extent to which both individual and country-level factors explain overall life satisfaction.

1. In an exploratory way, consider some individual factors that may influence life-satisfaction (so use `satisfied` as the dependent variable). Use the `lmList()` command to estimate different linear models for each country and investigate the heterogeneity of models. Use `married`, `org_mem`, `ind_democ`, and `weekrel` as the independent variables. What does this tell us about the likely need for random parameters in our multilevel regression model?

   HINT: The `lmList()` command is in the `lme` library and will want a data frame that has no missing data. To accomplish this, use `newdata <- na.omit(dat)`, assuming your data frame is called `dat`.

```
> library(nlme)
> library(foreign)
> dat <- read.dta("wvs_lab3.dta")
> newdata <- na.omit(dat)
> mod.list <- lmList(satisfied ~ married + org_mem + ind_democ +
+     weekrel | nation, data = newdata)

> print(plot(intervals(mod.list)))
```



2. Now, estimate the between-unit regression of satisfaction on the variables you used above *and* GDP/capita, and civil liberties. Given the relatively few observations here, it might make sense (as we're simply in exploratory mode here), to estimate a different "between" regression for each variable you're interested in. To do this, you will have to create a country-level dataset of country means of the variables of interest. What does this tell you about the between-effects you might want to include in the multi-level model?

   HINT: To make the country-level dataset, first, you should get all of the variables you want into a matrix (`X` below). Then, you can do (assuming your dataset is called `dat`):

```
by.X <- by(X, list(dat$nation), apply, 2, mean, na.rm=T)
between.dat <- as.data.frame(do.call(rbind, by.X))
```

```
> X <- as.matrix(dat[, -1])
> by.X <- by(X, list(dat[["nation"]]), apply, 2, mean, na.rm = T)
> between.dat <- as.data.frame(do.call(rbind, by.X))
> summary(b.mod1 <- lm(satisfied ~ org_mem, data = between.dat))

Call:
lm(formula = satisfied ~ org_mem, data = between.dat)

Residuals:
    Min      1Q  Median      3Q     Max
-2.0766 -0.8368  0.2313  0.6702  1.5574

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   6.5529     0.2631  24.906   <2e-16 ***
org_mem       0.3668     0.2859   1.283    0.206
```

```
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 1

Residual standard error: 0.9354 on 47 degrees of freedom
Multiple R-squared: 0.03384,        Adjusted R-squared: 0.01328
F-statistic: 1.646 on 1 and 47 DF,  p-value: 0.2058

> summary(b.mod2 <- lm(satisfied ~ married, data = between.dat))

Call:
lm(formula = satisfied ~ married, data = between.dat)

Residuals:
    Min      1Q  Median      3Q     Max
-1.9022 -0.7185  0.2203  0.7246  1.4733

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   6.6700     1.0413   6.405 6.54e-08 ***
married       0.2785     1.6551   0.168    0.867
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 1

Residual standard error: 0.9513 on 47 degrees of freedom
Multiple R-squared: 0.0006019,        Adjusted R-squared: -0.02066
F-statistic: 0.02831 on 1 and 47 DF,  p-value: 0.8671

> summary(b.mod3 <- lm(satisfied ~ ind_democ, data = between.dat))

Call:
lm(formula = satisfied ~ ind_democ, data = between.dat)

Residuals:
     Min       1Q   Median       3Q      Max
-1.83009 -0.55109  0.05753  0.45599  1.51881

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  3.50285    0.62756   5.582 1.48e-06 ***
ind_democ    0.52444    0.09663   5.427 2.47e-06 ***
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 1

Residual standard error: 0.7005 on 43 degrees of freedom
  (4 observations deleted due to missingness)
Multiple R-squared: 0.4065,        Adjusted R-squared: 0.3927
F-statistic: 29.45 on 1 and 43 DF,  p-value: 2.473e-06

> summary(b.mod4 <- lm(satisfied ~ weekrel, data = between.dat))

Call:
lm(formula = satisfied ~ weekrel, data = between.dat)

Residuals:
    Min      1Q  Median      3Q     Max
```

```
-2.0824 -0.4392  0.2554  0.6038  1.5436

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   7.2132     0.2177  33.128   <2e-16 ***
weekrel      -0.9860     0.5088  -1.938   0.0589 .
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 1

Residual standard error: 0.9055 on 45 degrees of freedom
  (2 observations deleted due to missingness)
Multiple R-squared: 0.07703,        Adjusted R-squared: 0.05652
F-statistic: 3.756 on 1 and 45 DF,  p-value: 0.05891
```

```
> summary(b.mod5 <- lm(satisfied ~ gdppc, data = between.dat))

Call:
lm(formula = satisfied ~ gdppc, data = between.dat)

Residuals:
     Min       1Q   Median       3Q      Max
-1.51332 -0.63857  0.07845  0.58611  1.79009

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 6.427e+00  1.532e-01   41.97  < 2e-16 ***
gdppc       3.898e-05  9.347e-06    4.17  0.00013 ***
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 1

Residual standard error: 0.813 on 47 degrees of freedom
Multiple R-squared: 0.2701,        Adjusted R-squared: 0.2545
F-statistic: 17.39 on 1 and 47 DF,  p-value: 0.0001299
```

```
> summary(b.mod6 <- lm(satisfied ~ civlibs, data = between.dat))

Call:
lm(formula = satisfied ~ civlibs, data = between.dat)

Residuals:
    Min      1Q  Median      3Q     Max
-1.8548 -0.4742  0.0241  0.5701  1.7450

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   6.6159     0.1280  51.668  < 2e-16 ***
civlibs       0.6296     0.1501   4.194 0.000120 ***
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 1

Residual standard error: 0.8117 on 47 degrees of freedom
Multiple R-squared: 0.2724,        Adjusted R-squared: 0.2569
F-statistic: 17.59 on 1 and 47 DF,  p-value: 0.0001202
```

3. Estimate a multi-level linear model with `satisfaction` as the dependent variable, `married`, `org_mem`, `ind_democ`, and `weekrel` as level-1 variables and `gdppc` and `civlibs` as level 2 variables. How do

the between effects differ for `civlibs` and `gdppc` here as opposed to the between regression from the previous step?

```
> lme.mod <- lme(satisfied ~ married + org_mem + ind_democ + weekrel +
+     gdppc + civlibs, random = ~1 | nation, data = newdata, method = "ML")
> summary(lme.mod)

Linear mixed-effects model fit by maximum likelihood
 Data: newdata
       AIC      BIC    logLik
  244023.2 244103.8 -122002.6

Random effects:
 Formula: ~1 | nation
        (Intercept) Residual
StdDev:   0.6520639 2.049751

Fixed effects: satisfied ~ married + org_mem + ind_democ + weekrel + gdppc +      civlibs
               Value  Std.Error    DF  t-value p-value
(Intercept) 5.368181 0.13753753 57004 39.03066  0.0000
married     0.260608 0.01799945 57004 14.47864  0.0000
org_mem     0.147961 0.00712785 57004 20.75812  0.0000
ind_democ   0.130785 0.00385483 57004 33.92750  0.0000
weekrel     0.152432 0.02124039 57004  7.17652  0.0000
gdppc       0.000024 0.00000983    40  2.47384  0.0177
civlibs     0.206889 0.17547201    40  1.17904  0.2453
 Correlation:
          (Intr) marrid org_mm ind_dm weekrl gdppc
married   -0.073
org_mem   -0.030  0.000
ind_democ -0.163 -0.029 -0.009
weekrel   -0.051 -0.047 -0.124 -0.048
gdppc     -0.463 -0.002 -0.005 -0.010  0.023
civlibs   -0.084  0.001 -0.002 -0.006  0.001 -0.614

Standardized Within-Group Residuals:
        Min          Q1         Med          Q3         Max
-3.87366717 -0.56160041  0.09731765  0.67991508  2.81966992

Number of Observations: 57051
Number of Groups: 43
```

4. Now add the mean of `ind_democ` and an interaction between the mean of `ind_democ` and the level-1 `ind_democ` variable to the model above. Compare the two models using `anova()`. What does this tell you about the importance of random slopes on `ind_democ`?

HINT: To get the country-mean from the between data above back into your dataset, again assuming your dataset is called `dat`, you can do:

```
dat$mean_ind_democ <- between.dat$ind_democ[match(dat$nation, rownames(between.dat))]
```

```
> newdata[["mean_ind_democ"]] <- between.dat[["ind_democ"]][match(newdata[["nation"]],
+     rownames(between.dat))]
> lme.mod2 <- lme(satisfied ~ married + org_mem + weekrel + gdppc +
```

```
+     civlibs + ind_democ * mean_ind_democ, random = ~1 + ind_democ |
+     nation, data = newdata, method = "ML")
> summary(lme.mod2)

Linear mixed-effects model fit by maximum likelihood
 Data: newdata
       AIC    BIC    logLik
  243847.6 243964 -121910.8

Random effects:
 Formula: ~1 + ind_democ | nation
 Structure: General positive-definite, Log-Cholesky parametrization
            StdDev     Corr
(Intercept) 0.85535692 (Intr)
ind_democ   0.06030035 -0.764
Residual    2.04528270

Fixed effects: satisfied ~ married + org_mem + weekrel + gdppc + civlibs + ind_democ *      mean_in
                              Value Std.Error    DF   t-value p-value
(Intercept)                3.785093 0.8181404 57003  4.626459  0.0000
married                    0.260619 0.0179742 57003 14.499666  0.0000
org_mem                    0.146340 0.0071188 57003 20.556809  0.0000
weekrel                    0.152312 0.0212184 57003  7.178264  0.0000
gdppc                      0.000023 0.0000087    39  2.597405  0.0132
civlibs                    0.010401 0.1534005    39  0.067800  0.9463
ind_democ                  0.201891 0.0614727 57003  3.284241  0.0010
mean_ind_democ             0.258506 0.1291112    39  2.002200  0.0523
ind_democ:mean_ind_democ -0.009942 0.0094946 57003 -1.047088  0.2951
 Correlation:
                          (Intr) married org_mm weekrl gdppc  civlbs ind_dm
married                   -0.015
org_mem                    0.005  0.000
weekrel                    0.004 -0.046 -0.124
gdppc                      0.083 -0.006 -0.005  0.027
civlibs                    0.083  0.003  0.001  0.005 -0.559
ind_democ                 -0.747  0.000 -0.004 -0.008 -0.011  0.007
mean_ind_democ            -0.981  0.003 -0.010 -0.013 -0.156 -0.100  0.723
ind_democ:mean_ind_democ  0.738 -0.003  0.003  0.006  0.012 -0.006 -0.986
                          mn_nd_
married
org_mem
weekrel
gdppc
civlibs
ind_democ
mean_ind_democ
ind_democ:mean_ind_democ -0.734

Standardized Within-Group Residuals:
        Min          Q1         Med          Q3         Max
-3.89345888 -0.56414581  0.09814704  0.68791014  2.93470556

Number of Observations: 57051
Number of Groups: 43
```

```
> anova(lme.mod, lme.mod2)

         Model df      AIC      BIC    logLik   Test  L.Ratio p-value
lme.mod      1  9 244023.2 244103.8 -122002.6
lme.mod2     2 13 243847.6 243964.0 -121910.8 1 vs 2 183.6317  <.0001
```

So, what does this mean and how do we make substantive inferences from this model? Well, first, it's worth writing out the model to see exactly what is going on. We can write the model as follows:

$$\text{Satisfaction}_{ij} = \beta_{0j} + \beta_{1j}\text{ind\_democ}_{ij} + \beta_2\text{org\_mem}_{ij} + \beta_3\text{weekrel}_{ij} + R_{ij} \quad (1)$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\overline{\text{ind\_democ}}_j + \gamma_{02}\text{GDP/capita}_j + \gamma_{03}\text{civlibs}_j + U_{0j} \quad (2)$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}\overline{\text{ind\_democ}}_j + U_{1j} \quad (3)$$

and substituting into the reduced form equation gives:

$$\begin{aligned}\text{Satisfaction}_{ij} = {} & \gamma_{00} + \gamma_{01}\overline{\text{ind\_democ}}_j + \gamma_{02}\text{GDP/capita}_j + \gamma_{03}\text{civlibs}_j \\ & + \gamma_{10}\text{ind\_democ}_{ij} + \gamma_{11}\text{ind\_democ}_{ij} \times \overline{\text{ind\_democ}}_j \\ & + \beta_2\text{org\_mem}_{ij} + \beta_3\text{weekrel}_{ij} + U_{0j} + \text{ind\_democ}_{ij}U_{1j} + R_{ij}\end{aligned} \quad (4)$$

The most complicated effect here is the effect of `ind_democ` - the extent to which individuals think they are democratically governed (a level-1 variable). The coefficient on `ind_democ` is the within effect of `ind_democ` on `Satisfaction` when the country-mean of `inde_democ` is equal to 0 (a situation which is theoretically impossible). So, the within effect of `ind_democ` on `Satisfaction` when `ind_democ` takes on its mean value (6.4) is:

$$\gamma_{10} + \gamma_{11} \times 6.4 = 0.138 \quad (5)$$

which you will notice is quite similar to the 0.131 from the first mixed model. You will also note that $V(U_{1j})$ is $0.0603004^2 = 0.004$, which is relatively small compared to the other random effects. For example, $V(U_{0j}) = 0.732$ and $V(R_{ij}) = 4.183$. Thus, the variance in the coefficients of `ind_democ` is not nearly as big as the variance in the intercepts.

If we wanted to figure out the between effect of `ind_democ`, all we need to do is take averages on both sides (and looking only at the terms for `ind_democ`):

$$\gamma_{01} + \gamma_{10} + \gamma_{11}\overline{\text{ind\_democ}}_j \quad (6)$$

Thus, the between effect is:

$\overline{\text{ind\_democ}}$	Between Effect
4	0.42
5	0.41
6	0.40
7	0.39
8	0.38

This shows us, that over the reasonable values of the mean of `ind_democ`, there is little variation in the between effect. Looking at the between effect at 6.4 (the mean of `ind_democ`), we see that it is approximately 0.40, which is quite a bit bigger than the within effect of approximately 0.13 (see above).

The interpretation of this is as follows. The variable `ind_democ` indicates (at the individual level) how democratically people feel they are governed. The best way to think about all of the effects is to

think about two people at different ends of the scale. One things she is very democratically governed (`ind_democ`=10) and the other things she is not democratically governed at all (`ind_democ`=1). In countries where most people feel they are not democratically governed the difference in satisfaction between these two individuals will be large. In places where most people feel they are democratically governed, the difference in expected satisfaction between these two individuals is smaller.

5. Use `amelia` from the `Amelia` package to impute the missing data in the original dataset. Then, use `zelig` from the `Zelig` package to estimate the model using these data. How do these results compare to those from the models above?

```
> library(Amelia)

##
## Amelia II: Multiple Imputation
## (Version 1.2-17, built: 2010-05-10)
## Copyright (C) 2005-2010 James Honaker, Gary King and Matthew Blackwell
## Refer to http://gking.harvard.edu/amelia/ for more information
##

> library(Zelig)

##
##  Zelig (Version 3.4-8, built: 2010-01-20)
##  Please refer to http://gking.harvard.edu/zelig for full
##  documentation or help.zelig() for help with commands and
##  models supported by Zelig.
##

##  Zelig project citations:
##    Kosuke Imai, Gary King, and Olivia Lau. (2009).
##    ``Zelig: Everyone's Statistical Software,''
##    http://gking.harvard.edu/zelig.
##  and
##    Kosuke Imai, Gary King, and Olivia Lau. (2008).
##    ``Toward A Common Framework for Statistical Analysis
##    and Development,'' Journal of Computational and
##    Graphical Statistics, Vol. 17, No. 4 (December)
##    pp. 892-913.

##  To cite individual Zelig models, please use the citation format printed with
##  each model run and in the documentation.
##

> dat.am <- amelia(dat, idvars = "nation")

-- Imputation 1 --

 1  2  3  4

-- Imputation 2 --

 1  2  3  4

-- Imputation 3 --

 1  2  3  4
```

```
-- Imputation 4 --

 1  2  3  4

-- Imputation 5 --

 1  2  3  4

> fixef.mod <- zelig(satisfied ~ married + org_mem + ind_democ +
+     weekrel + as.factor(nation), data = dat.am[["imputations"]],
+     model = "normal")

How to cite this model in Zelig:
Kosuke Imai, Gary King, and Oliva Lau. 2007. "normal: Normal Regression for Continuous Dependent Va

> summary(fixef.mod)

  Model: normal
  Number of multiply imputed data sets: 5

Combined results:

Call:
zelig(formula = satisfied ~ married + org_mem + ind_democ + weekrel +
    as.factor(nation), model = "normal", data = dat.am[["imputations"]])

Coefficients:
                                  Value  Std. Error       t-stat
(Intercept)                  6.474701734 0.072938642  88.76915708
married                      0.254764702 0.016588542  15.35787213
org_mem                      0.151704651 0.006711112  22.60499599
ind_democ                    0.141238173 0.004374678  32.28538699
weekrel                      0.139194131 0.019521964   7.13012937
as.factor(nation)australia  -0.544789323 0.086799185  -6.27643363
as.factor(nation)brazil     -0.104806305 0.086508581  -1.21151339
as.factor(nation)britain    -0.189879513 0.093019966  -2.04127695
as.factor(nation)bulgaria   -2.039998388 0.094083412 -21.68286989
as.factor(nation)burkina faso -2.044621773 0.087046608 -23.48881607
as.factor(nation)canada     -0.139603689 0.080426852  -1.73578457
as.factor(nation)chile      -0.505479311 0.094153436  -5.36867617
as.factor(nation)colombia    0.647671779 0.076949872   8.41680121
as.factor(nation)cyprus     -0.322397286 0.092548427  -3.48355231
as.factor(nation)egypt      -1.753646292 0.077497400 -22.62845333
as.factor(nation)ethiopia   -2.465297589 0.088014703 -28.01006557
as.factor(nation)finland     0.037087408 0.093524854   0.39655136
as.factor(nation)france     -0.817198557 0.093780719  -8.71392930
as.factor(nation)georgia    -2.332456849 0.087014748 -26.80530477
as.factor(nation)germany    -0.731394168 0.081346754  -8.99106761
as.factor(nation)ghana      -2.041650832 0.086748411 -23.53531101
as.factor(nation)guatemala   0.320308099 0.095510398   3.35364637
as.factor(nation)india      -2.037941031 0.082299248 -24.76257163
as.factor(nation)indonesia  -0.945246708 0.085953648 -10.99716800
as.factor(nation)iran       -1.102746444 0.078245789 -14.09336479
as.factor(nation)italy      -0.707437159 0.093780707  -7.54352557
```

```
as.factor(nation)japan        -0.716995869 0.091574945  -7.82960743
as.factor(nation)jordan       -0.684329179 0.090880010  -7.53002973
as.factor(nation)malaysia     -0.917975921 0.089967523 -10.20341441
as.factor(nation)mali         -1.825807153 0.089008638 -20.51269622
as.factor(nation)mexico        0.353314609 0.085231184   4.14536786
as.factor(nation)moldova      -2.006278926 0.093592135 -21.43640514
as.factor(nation)morocco      -2.170018644 0.090835656 -23.88950259
as.factor(nation)netherlands   0.001867158 0.092776767   0.02012528
as.factor(nation)new zealand  -0.003896605 0.096005291  -0.04058740
as.factor(nation)norway        0.007301039 0.093549802   0.07804441
as.factor(nation)peru         -0.589486606 0.085851655  -6.86633944
as.factor(nation)poland       -0.576847107 0.094407820  -6.11016237
as.factor(nation)romania      -1.727077051 0.086712924 -19.91718149
as.factor(nation)russia       -1.157734906 0.081215318 -14.25512995
as.factor(nation)rwanda       -2.778412002 0.087579626 -31.72441057
as.factor(nation)s africa     -0.679833879 0.076985786  -8.83064155
as.factor(nation)slovenia     -0.365779756 0.093690677  -3.90412119
as.factor(nation)spain        -0.448780865 0.090011599  -4.98581149
as.factor(nation)sweden       -0.133176772 0.093825224  -1.41941331
as.factor(nation)switzerland   0.002170870 0.089402749   0.02428191
as.factor(nation)thailand     -0.660361842 0.085405499  -7.73207637
as.factor(nation)turkey       -0.093190148 0.088068284  -1.05815788
as.factor(nation)ukraine      -1.482633856 0.094005540 -15.77177104
as.factor(nation)uruguay      -0.360425247 0.094552176  -3.81191912
as.factor(nation)usa          -0.511129583 0.089561944  -5.70699519
as.factor(nation)vietnam      -0.827300802 0.086587193  -9.55454006
as.factor(nation)zambia       -1.785899428 0.088553139 -20.16754521
                                   p-value
(Intercept)                     0.000000e+00
married                         1.665195e-52
org_mem                        1.001453e-112
ind_democ                       3.632403e-24
weekrel                         1.547644e-12
as.factor(nation)australia      3.552944e-10
as.factor(nation)brazil         2.257510e-01
as.factor(nation)britain        4.123557e-02
as.factor(nation)bulgaria      1.129316e-103
as.factor(nation)burkina faso  2.485674e-111
as.factor(nation)canada         8.261646e-02
as.factor(nation)chile          8.128740e-08
as.factor(nation)colombia       4.441155e-17
as.factor(nation)cyprus         4.953891e-04
as.factor(nation)egypt         1.150681e-107
as.factor(nation)ethiopia      4.604803e-153
as.factor(nation)finland        6.917021e-01
as.factor(nation)france         3.113891e-18
as.factor(nation)georgia       3.815839e-144
as.factor(nation)germany        3.212654e-19
as.factor(nation)ghana         6.489013e-119
as.factor(nation)guatemala      8.074992e-04
as.factor(nation)india         1.681619e-127
as.factor(nation)indonesia      3.006421e-24
as.factor(nation)iran           9.258421e-45
as.factor(nation)italy          4.856212e-14
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as.factor(nation)japan         4.975591e-15
as.factor(nation)jordan        5.248488e-14
as.factor(nation)malaysia      2.255944e-24
as.factor(nation)mali          2.832610e-72
as.factor(nation)mexico        3.404641e-05
as.factor(nation)moldova       3.608121e-98
as.factor(nation)morocco      1.383561e-119
as.factor(nation)netherlands   9.839436e-01
as.factor(nation)new zealand   9.676266e-01
as.factor(nation)norway        9.377937e-01
as.factor(nation)peru          6.758584e-12
as.factor(nation)poland        1.027850e-09
as.factor(nation)romania       1.150387e-63
as.factor(nation)russia        4.743845e-46
as.factor(nation)rwanda       9.782687e-202
as.factor(nation)s africa      1.127697e-18
as.factor(nation)slovenia      9.572494e-05
as.factor(nation)spain         6.253664e-07
as.factor(nation)sweden        1.557905e-01
as.factor(nation)switzerland   9.806280e-01
as.factor(nation)thailand      1.099386e-14
as.factor(nation)turkey        2.900127e-01
as.factor(nation)ukraine       6.472392e-56
as.factor(nation)uruguay       1.395629e-04
as.factor(nation)usa           1.187325e-08
as.factor(nation)vietnam       2.003528e-21
as.factor(nation)zambia        2.467589e-77

For combined results from datasets i to j, use summary(x, subset = i:j).
For separate results, use print(summary(x), subset = i:j).
```