

Mental Health Analysis

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Looking at Mental Health, Loneliness and Trust

```
Attaching package: 'dplyr'
```

```
The following objects are masked from 'package:stats':
```

```
  filter, lag
```

```
The following objects are masked from 'package:base':
```

```
  intersect, setdiff, setequal, union
```

```
Warning: package 'ggplot2' was built under R version 4.3.3
```

```
Warning: package 'ggrepel' was built under R version 4.3.3
```

```
Warning: package 'haven' was built under R version 4.3.3
```

```
Warning: package 'locfit' was built under R version 4.3.3
```

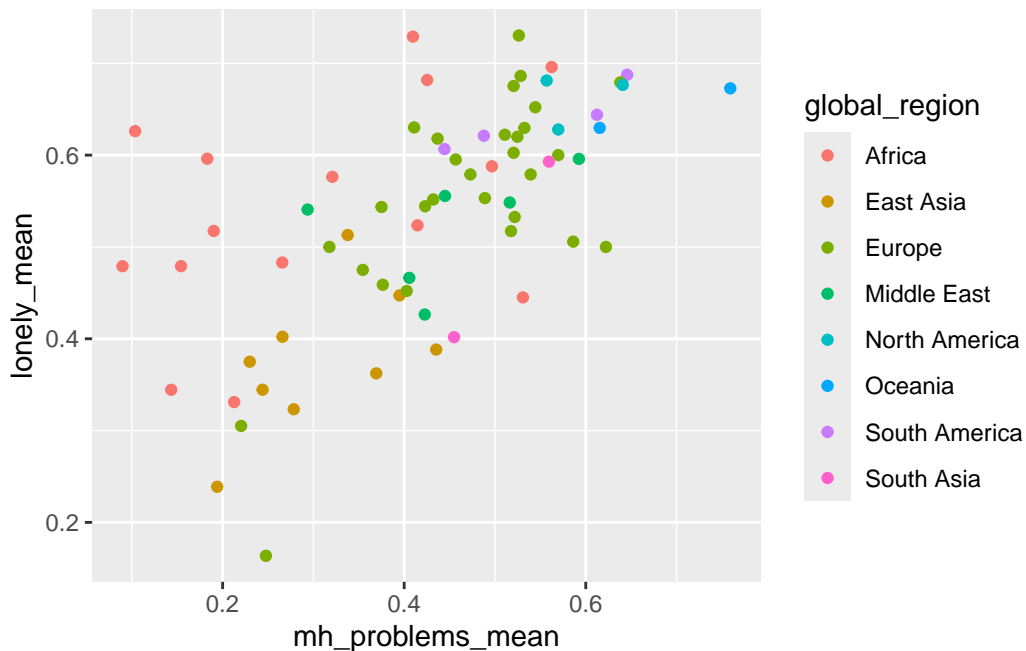
```
locfit 1.5-9.10      2024-06-24
```

Aggregating to the country level there is a positive relationship between loneliness and MH problems in all countries (first graph) and there appears to be a strong positive relationship between the level of MH problems and levels of loneliness across countries. But there very large differences between countries. Vietnam has ~20% of young people having MH problems and loneliness, US, Ireland, Iraq and Chile have >60%.

``summarise()`` has grouped output by 'lonely'. You can override using the ``groups`` argument.

```
# A tibble: 4 x 4
  lonely mh_problems     n  prop
  <lgl>  <lgl>      <int> <dbl>
1 FALSE FALSE      3818 0.361
2 FALSE TRUE       1046 0.0989
3 TRUE  FALSE      2492 0.236
4 TRUE  TRUE       3223 0.305
```

``summarise()`` has grouped output by 'country'. You can override using the ``groups`` argument.

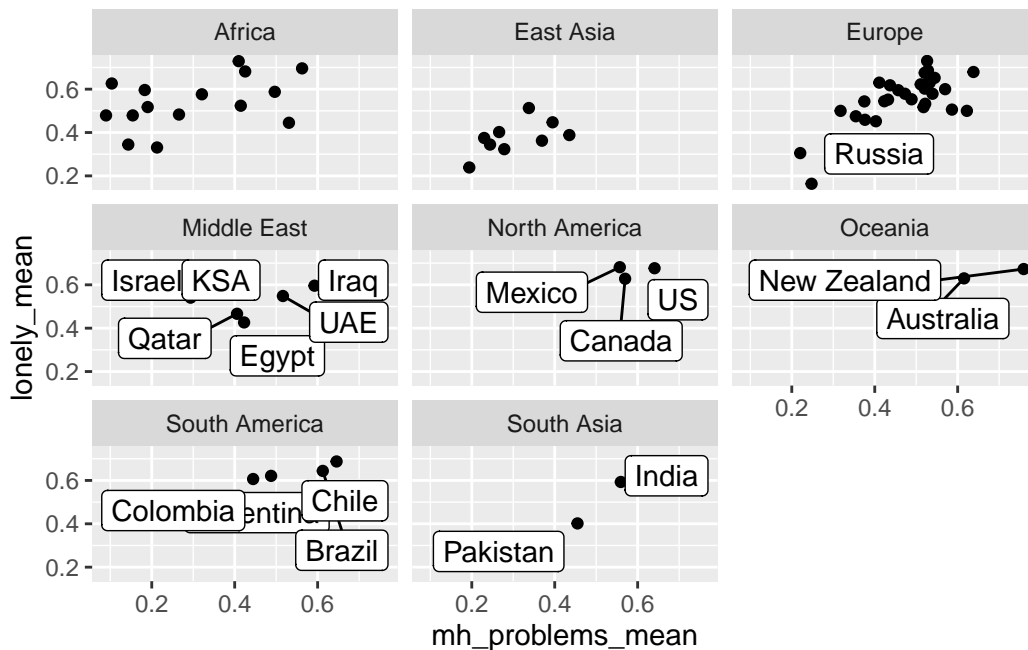


``summarise()`` has grouped output by 'country'. You can override using the ``groups`` argument.

Warning: ggrepel: 15 unlabeled data points (too many overlaps). Consider increasing max.overlaps

Warning: ggrepel: 9 unlabeled data points (too many overlaps). Consider increasing max.overlaps

Warning: ggrepel: 28 unlabeled data points (too many overlaps). Consider increasing max.overlaps



Are effects within countries as strong as effects between countries?

Logistic regression tells us the strength of the relationship between two variables.

The first regression shows that the parameter estimate for the relationship between loneliness and mh is 1.55 (or = 4.72). Adjusting for country, the relationship increases to 1.61 (OR 5.02) - the relationship is stronger within country than between countries.

Call:

```
glm(formula = lonely ~ mh_problems, family = "binomial", data = d_young)
```

Coefficients:

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	-0.42664	0.02575	-16.57	<2e-16 ***
mh_problemsTRUE	1.55198	0.04393	35.33	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 14597 on 10578 degrees of freedom
 Residual deviance: 13221 on 10577 degrees of freedom
 (744 observations deleted due to missingness)
 AIC: 13225

Number of Fisher Scoring iterations: 4

[1] 4.72081

Call:

```
glm(formula = lonely ~ mh_problems + country, family = "binomial",
    data = d_young)
```

Coefficients:

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	-0.235707	0.177849	-1.325	0.185065
mh_problemsTRUE	1.613178	0.047508	33.956	< 2e-16 ***
countryAustralia	-0.098008	0.285781	-0.343	0.731636
countryAustria	-0.283863	0.299617	-0.947	0.343425
countryBelgium	0.062253	0.301366	0.207	0.836347
countryBrazil	-0.114903	0.267201	-0.430	0.667179
countryBulgaria	0.164446	0.317859	0.517	0.604907
countryCameroon	0.047546	0.210273	0.226	0.821113
countryCanada	0.006536	0.307380	0.021	0.983035
countryChile	0.179615	0.278099	0.646	0.518366
countryColombia	0.105963	0.244027	0.434	0.664122
countryCroatia	-0.092485	0.305236	-0.303	0.761894
countryDenmark	0.049879	0.288015	0.173	0.862509
countryDRC	0.376566	0.209867	1.794	0.072763 .
countryEgypt	-0.771961	0.236432	-3.265	0.001094 **
countryEstonia	-0.519810	0.294160	-1.767	0.077212 .
countryEthiopia	-0.884056	0.209865	-4.213	2.53e-05 ***
countryFinland	-0.226757	0.298247	-0.760	0.447076
countryFrance	-0.235565	0.294300	-0.800	0.423466
countryGermany	-0.022410	0.316203	-0.071	0.943499
countryGhana	-0.222343	0.210556	-1.056	0.290977
countryGreece	0.082321	0.296089	0.278	0.780992
countryHong Kong	-0.621207	0.289639	-2.145	0.031972 *
countryHungary	-0.602654	0.297683	-2.024	0.042921 *
countryIndia	-0.255601	0.229753	-1.113	0.265922
countryIndonesia	-0.637123	0.248435	-2.565	0.010331 *

countryIraq	-0.283347	0.218922	-1.294	0.195566	
countryIreland	0.097276	0.291203	0.334	0.738343	
countryIsrael	-0.070893	0.260354	-0.272	0.785397	
countryItaly	0.186150	0.321035	0.580	0.562021	
countryIvory Coast	0.064184	0.222708	0.288	0.773195	
countryJapan	-1.001628	0.332764	-3.010	0.002612	**
countryKenya	-0.314644	0.208596	-1.508	0.131455	
countryKSA	-0.181468	0.234870	-0.773	0.439740	
countryLatvia	-0.485531	0.317833	-1.528	0.126605	
countryLiberia	0.100283	0.207331	0.484	0.628610	
countryLithuania	-0.307288	0.305646	-1.005	0.314718	
countryMalaysia	-0.272316	0.249953	-1.089	0.275948	
countryMali	-0.059291	0.227718	-0.260	0.794580	
countryMexico	0.269014	0.257586	1.044	0.296316	
countryNetherlands	-0.105215	0.290076	-0.363	0.716818	
countryNew Zealand	-0.160825	0.285796	-0.563	0.573620	
countryNiger	-0.155888	0.252487	-0.617	0.536965	
countryNigeria	-0.658788	0.222320	-2.963	0.003044	**
countryNorway	0.251758	0.289645	0.869	0.384739	
countryPakistan	-0.986322	0.229464	-4.298	1.72e-05	***
countryPhilippines	-0.848972	0.235126	-3.611	0.000305	***
countryPoland	-0.040595	0.308981	-0.131	0.895473	
countryPortugal	-0.506551	0.288959	-1.753	0.079598	.
countryQatar	-0.596665	0.233552	-2.555	0.010627	*
countryRomania	-0.318282	0.296044	-1.075	0.282321	
countryRussia	-1.897929	0.323718	-5.863	4.55e-09	***
countrySenegal	0.611007	0.227056	2.691	0.007124	**
countrySierra Leone	0.424681	0.210801	2.015	0.043946	*
countrySlovakia	0.085982	0.299632	0.287	0.774143	
countrySlovenia	-0.206389	0.319547	-0.646	0.518357	
countrySouth Africa	-0.961124	0.262684	-3.659	0.000253	***
countrySouth Korea	-0.946973	0.302515	-3.130	0.001746	**
countrySouth Sudan	0.716174	0.232820	3.076	0.002097	**
countrySpain	-0.222896	0.304219	-0.733	0.463753	
countrySweden	-0.795094	0.295875	-2.687	0.007204	**
countrySwitzerland	-0.342319	0.289249	-1.183	0.236620	
countryTaiwan	-0.985551	0.293602	-3.357	0.000789	***
countryThailand	-0.652674	0.293584	-2.223	0.026207	*
countryTurkey	0.490487	0.263414	1.862	0.062598	.
countryUAE	-0.381482	0.241247	-1.581	0.113811	
countryUganda	0.293504	0.226400	1.296	0.194839	
countryUK	-0.818648	0.291655	-2.807	0.005002	**
countryUkraine	-1.006358	0.347996	-2.892	0.003830	**

```
countryUS          0.047695    0.292620    0.163 0.870524
countryVietnam     -1.328818    0.277272   -4.792 1.65e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

(Dispersion parameter for binomial family taken to be 1)

```
Null deviance: 14597  on 10578  degrees of freedom
Residual deviance: 12720  on 10508  degrees of freedom
(744 observations deleted due to missingness)
AIC: 12862
```

Number of Fisher Scoring iterations: 4

```
[1] 5.018736
```

Does the strength of relationship differ across countries?

The analysis below shows that it does.

The first analysis treats country as a random effect, with random intercepts. The intercepts have a variance - we know this. But the second analysis shows that allowing the relationship between mental health and loneliness to vary across countries improves the model fit (by AIC and ANOVA) suggesting that the relationship between loneliness and MH varies in strength across countries.

```
fit_3 <- lme4::glmer(
  lonely ~ mh_problems + (1 | country), data = d_young, family = "binomial"
)
summary(fit_3)
```

```
Generalized linear mixed model fit by maximum likelihood (Laplace
Approximation) [glmerMod]
Family: binomial ( logit )
Formula: lonely ~ mh_problems + (1 | country)
Data: d_young
```

```
      AIC      BIC   logLik deviance df.resid
12920.8 12942.6 -6457.4 12914.8    10576
```

Scaled residuals:

```
      Min       1Q   Median       3Q      Max
```

-2.7015 -0.8083 0.4455 0.7660 2.3448

Random effects:

Groups	Name	Variance	Std.Dev.
country	(Intercept)	0.1849	0.43

Number of obs: 10579, groups: country, 70

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	-0.49429	0.05956	-8.298	<2e-16 ***
mh_problemsTRUE	1.61252	0.04705	34.271	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)
mh_prblTRUE	-0.298

AIC(fit_3)

[1] 12920.76

```
fit_4 <- lme4::glmer(  
  lonely ~ mh_problems + (mh_problems | country), data = d_young, family = "binomial"  
)  
summary(fit_4)
```

Generalized linear mixed model fit by maximum likelihood (Laplace
Approximation) [glmerMod]
Family: binomial (logit)
Formula: lonely ~ mh_problems + (mh_problems | country)
Data: d_young

AIC	BIC	logLik	deviance	df.resid
12877.1	12913.5	-6433.6	12867.1	10574

Scaled residuals:

Min	1Q	Median	3Q	Max
-2.5070	-0.8313	0.4571	0.7706	2.5439

Random effects:

```

Groups   Name             Variance Std.Dev. Corr
country (Intercept)      0.2475   0.4975
      mh_problemsTRUE 0.2013   0.4487  -0.58
Number of obs: 10579, groups: country, 70

```

Fixed effects:

```

              Estimate Std. Error z value Pr(>|z|)
(Intercept)   -0.56227    0.06801  -8.268  <2e-16 ***
mh_problemsTRUE 1.74582    0.07586  23.015  <2e-16 ***
---

```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

```

              (Intr)
mh_prblTRUE -0.572

```

```
AIC(fit_4)
```

```
[1] 12877.12
```

```
anova(fit_3, fit_4)
```

Data: d_young

Models:

fit_3: lonely ~ mh_problems + (1 | country)

fit_4: lonely ~ mh_problems + (mh_problems | country)

```

      npar   AIC   BIC logLik deviance Chisq Df Pr(>Chisq)
fit_3    3 12921 12943 -6457.4   12915
fit_4    5 12877 12914 -6433.6   12867 47.64  2  4.52e-11 ***
---

```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Social Media Use

Using facebook daily has a much stronger association with feelings of loneliness than it does with mental health problems.

```

d_young <-
  d_young %>% dplyr::mutate(
    facebook_daily = i18_1 == "Every day",

```



```

facebook_daily = ifelse(i18_1 == "Don't know/ Refused", NA, facebook_daily))

d_young <- d_young %>%
  dplyr::mutate(snapchat_daily = i18_9 == "Every day",
               snapchat_daily = ifelse(i18_9 == "Don't know/ Refused", NA,
                                       snapchat_daily)
               ))

fit_5 <- lme4::glmer(
  lonely ~ facebook_daily + (1 | country), data = d_young, family = "binomial"
)
summary(fit_5)

```

Generalized linear mixed model fit by maximum likelihood (Laplace
Approximation) [glmerMod]
Family: binomial (logit)
Formula: lonely ~ facebook_daily + (1 | country)
Data: d_young

AIC	BIC	logLik	deviance	df.resid
1840.1	1855.8	-917.1	1834.1	1376

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.4782	-0.7920	-0.6626	0.8947	1.5092

Random effects:

Groups	Name	Variance	Std.Dev.
country	(Intercept)	0.2879	0.5366

Number of obs: 1379, groups: country, 11

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	-0.1412	0.1802	-0.784	0.4333
facebook_dailyTRUE	0.2791	0.1162	2.402	0.0163 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)
fcbk_dlTRUE	-0.283

```
fit_6 <- lme4::glmer(
  mh_problems ~ facebook_daily + (1 | country), data = d_young, family = "binomial"
)
summary(fit_6)
```

```
Generalized linear mixed model fit by maximum likelihood (Laplace
Approximation) [glmerMod]
Family: binomial ( logit )
Formula: mh_problems ~ facebook_daily + (1 | country)
Data: d_young
```

AIC	BIC	logLik	deviance	df.resid
1665.3	1681.0	-829.7	1659.3	1361

Scaled residuals:

Min	1Q	Median	3Q	Max
-1.3316	-0.7632	-0.4384	0.8662	2.4363

Random effects:

Groups	Name	Variance	Std.Dev.
country	(Intercept)	0.527	0.7259

Number of obs: 1364, groups: country, 11

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	-0.4813	0.2345	-2.053	0.0401 *
facebook_dailyTRUE	0.1318	0.1238	1.064	0.2873

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:

	(Intr)
fcbk_dlTRUE	-0.235

Interaction between social media and loneliness with mental health problems

Lots of models aren't printed.

Does the relationship between social media use (facebook) and loneliness vary depending on the presence of mental health problems?

This first analysis confirms that those with MH problems are significantly more likely to experience loneliness than those without. We also find that the interaction between MH problems and daily Facebook use does not significantly predict loneliness. This shows that daily Facebook users with MH problems do not experience significantly different levels of loneliness compared to non-daily Facebook users with MH problems.

And, are we right to assume that the association between daily facebook usage and loneliness do not vary significantly across countries? Our second analysis shows us that we are. The impact of daily facebook use on loneliness does not vary much between countries.

This can all be seen in the graph below. In almost every country, people who report more loneliness report more MH problems (the effect is smallest in Nigeria), but this difference varies across country. The effect of Facebook use is relatively small and is not statistically significant.

```
d_young_clean <- d_young %>%
  dplyr::filter(!is.na(mh_problems) & !is.na(facebook_daily) & !is.na(lonely))

# Not enough countries for multilevel

fit_7a <- glm(
  mh_problems ~ country + lonely + facebook_daily,
  data = d_young_clean,
  family = "binomial"
)
summary(fit_7a)

fit_7b <- glm(
  mh_problems ~ country + lonely * facebook_daily,
  data = d_young_clean,
  family = "binomial"
)
summary(fit_7b)

# C is the interesting / sig one
fit_7c <- glm(
  mh_problems ~ country * lonely + facebook_daily,
  data = d_young_clean,
  family = "binomial"
)
summary(fit_7c)

fit_7d <- glm(
```

```

    mh_problems ~ country * facebook_daily + lonely ,
    data = d_young_clean,
    family = "binomial"
  )
summary(fit_7d)

fit_7e <- glm(
  mh_problems ~ country * facebook_daily * lonely ,
  data = d_young_clean,
  family = "binomial"
)
summary(fit_7e)

anova(fit_7a, fit_7b, test = "LRT")
anova(fit_7a, fit_7c, test = "LRT")
anova(fit_7a, fit_7d, test = "LRT")

anova(fit_7c, fit_7e, test = "LRT")

```

Visualizing Loneliness, Mental Health Problems, and their Interaction across countries

```

d_young_clean$predicted_mh <- predict(fit_7e, type = "response")

d_young_clean_short <- d_young_clean %>%
  dplyr::select(lonely, predicted_mh, country, facebook_daily) %>%
  dplyr::distinct()

ggplot(d_young_clean_short,
  aes(x = lonely,
    y = predicted_mh,
    color = facebook_daily, group = facebook_daily)) +
  geom_line() +
  geom_point(alpha = 0.5) +
  facet_wrap(~country)

```

