

SUPPLEMENTARY MATERIAL

SUPPLEMENTARY RESULTS

Analysis taking into account overall healthcare spending

To ensure that our results were not impacted by overall healthcare expenditures, we decided to regress out the influence of healthcare spending on the prevalence of each mental health issue and to re-run our analysis using the residuals as dependent variables. When performed on a combination of mental health disorders, multiple linear regression models revealed that the effect of development (r_{HDI}), inequalities (r_{GINI}) and unemployment (r_{unemploy}) was medium to large (r range: 0.47-0.54). However they demonstrated great variation when performed amongst different mental health issues (r range: -0.34 to 0.52, **Supplementary Table 2**).

Across mental issues, the socio-economic indicators' effect sizes were strongly related to each other ($r_{\text{HDI-GINI}}=0.89$, $r_{\text{HDI-unemploy}}=0.93$, $r_{\text{unemploy-GINI}}=0.87$). Principal component analysis demonstrated that the first principal component of the three variables (r_{HDI} , r_{GINI} , r_{unemploy}) explained 94% of the variance ($p=0$, permutation test with 1000 repetitions).

Therefore, this analysis yield similar results than that reported in the main text.

Analysis using robust regression methods

To ensure that our results were not impacted by outliers, we re-ran our analyses using robust regression methods [1]. We used the `lmrob` function from the `robustbase` package in R (version 3.6.1), which computes fast MM-type estimators for linear regression models. We sat the default arguments as suggested in Koller and Stahel (2011) with an initial S-estimate, followed by an M-estimate, a Design Adaptive Scale estimate and a final M-step; and a “linear quadratic quadratic” (lqq for short) psi function [2].

When performed on a combination of mental health disorders, multiple linear regression

models revealed that the effect of development (r_{HDI}), inequalities (r_{GINI}) and unemployment (r_{unemploy}) was medium to large (r range: 0.44-0.59). However they demonstrated great variation when performed amongst different mental health issues (r range: -0.43 to 0.55, **Supplementary Table 3**). Across mental issues, the socio-economic indicators' effect sizes were strongly related to each other ($r_{\text{HDI-GINI}}=0.93$, $r_{\text{HDI-unemploy}}=0.87$, $r_{\text{unemploy-GINI}}=0.91$). Principal component analysis demonstrated that the first principal component of the three variables (r_{HDI} , r_{GINI} , r_{unemploy}) explained 94% of the variance ($p=0$, permutation test with 1000 repetitions).

Therefore, results using robust linear regression methods were highly comparable to those using non-robust methods.

SUPPLEMENTARY TABLES

Supplementary Table 1. Summary statistics of multiple linear regression models run on the prevalence of 10 mental health issues (N=36).

Predictor	Estimator coefficient	95% Confidence interval	T value	Effect size (Pearson's r)	P value
Combined mental health issues^a					
HDI	45.9	31.8 to 60.1	6.6	0.76	0.0000002
GINI index	22.1	11.2 to 33.0	4.1	0.59	0.0002
Unemployment	0.2	0.08 to 0.3	3.3	0.51	0.002
Autism Spectrum Disorder					
HDI	2.5	1.7 to 3.3	6.3	0.74	0.0000005
GINI index	0.9	0.3 to 1.5	3.0	0.46	0.006
Unemployment	0.003	-0.004 to 0.01	0.8	0.15	0.4
ADHD					
HDI	2.3	-1.6 to 6.1	1.2	0.21	0.2
GINI index	2.6	-0.4 to 5.6	1.8	0.30	0.09
Unemployment	0.03	-0.007 to 0.06	1.6	0.27	0.1
Depressive Disorders					
HDI	12.3	7.6 to 17.1	5.2	0.68	0.0000009
GINI index	7.5	3.9 to 11.2	4.2	0.59	0.0002
Unemployment	0.05	0.01 to 0.09	2.6	0.42	0.01
Schizophrenia					
HDI	1.0	0.6 to 1.3	5.8	0.72	0.000002
GINI index	0.4	0.1 to 0.7	3.1	0.49	0.004
Unemployment	0.001	-0.001 to 0.004	1.0	0.18	0.3
Anxiety Disorders					
HDI	27.4	15.9 to 38.9	4.9	0.65	0.00003
GINI index	10.6	1.7 to 19.4	2.4	0.40	0.02
Unemployment	0.08	-0.02 to 0.2	1.7	0.29	0.1
Eating Disorders					
HDI	3.7	2.5 to 4.9	6.2	0.74	0.0000005
GINI index	1.3	0.4 to 2.2	2.8	0.45	0.008
Unemployment	0.01	0.004 to 0.02	2.8	0.45	0.008
Alcohol Use Disorders					
HDI	-7.6	-17.5 to 2.3	-1.6	-0.27	0.1
GINI index	-2.1	-9.7 to 5.5	-0.6	-0.10	0.6
Unemployment	-0.04	-0.1 to 0.04	-1.0	-0.18	0.3

Supplementary Table 1 continued

Predictor	Estimator coefficient	95% Confidence interval	T value	Effect size (Pearson's r)	P value
Suicide					
HDI	-9.1	-55.6 to 37.4	-0.4	-0.07	0.7
GINI index	-6.8	-42.6 to 28.9	-0.4	-0.07	0.7
Unemployment	-0.4	-0.8 to 0.0005	-2.0	-0.34	0.05
Bipolar Disorders					
HDI	1.8	0.4 to 3.2	2.7	0.43	0.01
GINI index	0.4	-0.6 to 1.5	0.8	0.14	0.4
Unemployment	0.01	-0.001 to 0.02	1.8	0.30	0.08

^a this includes Autism Spectrum Disorders, ADHD, Conduct Disorders, Idiopathic developmental intellectual disability, Depressive disorders, Schizophrenia, Anxiety disorders, Eating disorder and Bipolar disorders.

Supplementary Table 2. Summary statistics of multiple linear regression models run on the prevalence of 10 mental health issues after controlling for overall healthcare spending (N=36).

Predictor	Estimator coefficient	95% Confidence interval	T value	Effect size (Pearson's r)	P value
Combined mental health issues^a					
HDI	20.5	6.6 to 34.4	3.0	0.47	0.005
GINI index	16.9	6.2 to 27.6	3.2	0.49	0.003
Unemployment	0.2	0.1 to 0.3	3.7	0.54	0.0009
Autism Spectrum Disorder					
HDI	1.0	0.1 to 1.8	2.3	0.38	0.03
GINI index	0.6	-0.1 to 1.3	1.5	0.31	0.08
Unemployment	0.004	-0.004 to 0.01	1.0	0.18	0.3
ADHD					
HDI	2.4	-1.4 to 6.3	1.3	0.22	0.2
GINI index	2.6	-0.4 to 5.6	1.8	0.30	0.1
Unemployment	0.03	-0.008 to 0.06	1.6	0.27	0.1
Depressive Disorders					
HDI	6.2	1.4 to 10.9	2.6	0.42	0.01
GINI index	6.3	2.6 to 9.9	3.5	0.52	0.001
Unemployment	0.06	0.02 to 0.1	2.8	0.45	0.008
Schizophrenia					
HDI	0.4	0.04 to 0.8	2.3	0.38	0.03
GINI index	0.3	0.01 to 0.6	2.1	0.35	0.04
Unemployment	0.002	-0.001 to 0.005	1.2	0.21	0.2
Anxiety Disorders					
HDI	9.6	-1.5 to 20.7	1.8	0.30	0.09
GINI index	6.9	-1.6 to 15.4	1.7	0.28	0.1
Unemployment	0.09	-0.001 to 0.2	2.0	0.34	0.05
Eating Disorders					
HDI	1.8	0.5 to 3.1	2.8	0.44	0.009
GINI index	0.9	-0.1 to 1.9	1.8	0.31	0.08
Unemployment	0.02	0.005 to 0.03	2.9	0.42	0.007
Alcohol Use Disorders					
HDI	-2.2	-12.0 to 7.5	-0.5	-0.08	0.6
GINI index	-1.0	-8.5 to 6.5	-0.3	-0.05	0.8
Unemployment	-0.05	-0.1 to 0.04	-1.1	-0.20	0.3

Supplementary Table 2 continued

Predictor	Estimator coefficient	95% Confidence interval	T value	Effect size (Pearson's r)	P value
Suicide					
HDI	-7.8	-54.2 to 38.7	-0.3	-0.06	0.7
GINI index	-6.5	-42.3 to 29.2	-0.4	-0.07	0.7
Unemployment	-0.4	-0.8 to -0.0008	-2.0	-0.34	0.05
Bipolar Disorders					
HDI	1.2	-0.2 to 2.7	1.7	0.29	0.09
GINI index	0.3	-0.8 to 1.4	0.6	0.10	0.6
Unemployment	0.01	-0.001 to 0.02	1.8	0.30	0.08

^a this includes Autism Spectrum Disorders, ADHD, Conduct Disorders, Idiopathic developmental intellectual disability, Depressive disorders, Schizophrenia, Anxiety disorders, Eating disorder and Bipolar disorders.

Supplementary Table 3. Summary statistics of multiple linear models run on the prevalence of 10 mental health issues using robust regression methods (after controlling for overall healthcare spending) (N=36).

Predictor	Estimator coefficient	95% Confidence interval	T value	Effect size (Pearson's r)	P value
Combined mental health disorders^a					
HDI	17.5	4.5 to 30.5	2.7	0.44	0.01
GINI index	13.9	3.8 to 24.0	2.8	0.44	0.01
Unemployment	0.2	0.1 to 0.3	4.1	0.59	0.0002
Autism Spectrum Disorders					
HDI	0.9	0.2 to 1.6	2.6	0.42	0.01
GINI index	0.6	0.06 to 1.1	2.3	0.37	0.03
Unemployment	0.004	-0.001 to 0.01	1.5	0.26	0.1
ADHD					
HDI	1.5	-1.6 to 4.6	1.0	0.17	0.3
GINI index	1.5	-0.8 to 3.9	1.3	0.23	0.2
Unemployment	0.03	0.0009 to 0.05	2.1	0.35	0.04
Depressive Disorders					
HDI	6.4	1.6 to 11.2	2.7	0.43	0.01
GINI index	6.7	3.0 to 10.4	3.7	0.55	0.0008
Unemployment	0.06	0.02 to 0.1	2.8	0.45	0.008
Schizophrenia					
HDI	0.3	-0.0003 to 0.7	2.0	0.34	0.05
GINI index	0.2	-0.02 to 0.5	1.9	0.32	0.07
Unemployment	0.002	-0.001 to 0.005	1.3	0.23	0.2
Anxiety Disorders					
HDI	7.4	-2.6 to 17.5	1.5	0.26	0.1
GINI index	4.4	-3.5 to 12.3	1.1	0.20	0.3
Unemployment	0.1	0.02 to 0.2	2.4	0.40	0.02
Eating Disorders					
HDI	1.9	0.8 to 3.0	3.5	0.52	0.001
GINI index	1.2	0.3 to 2.0	2.7	0.43	0.01
Unemployment	0.02	0.006 to 0.02	3.4	0.52	0.002
Alcohol Use Disorders					
HDI	0.9	-6.4 to 8.2	0.3	0.04	0.8
GINI index	-1.2	-6.7 to 4.4	-0.4	-0.07	0.7
Unemployment	-0.05	-0.1 to 0.02	-1.5	-0.26	0.1

Supplementary Table 3 continued

Predictor	Estimator coefficient	95% Confidence interval	T value	Effect size (Pearson's r)	P value
Suicide					
HDI	-3.2	-35.5 to 29.1	-0.2	-0.04	0.8
GINI index	-18.8	-43.8 to 6.3	-1.5	-0.26	0.1
Unemployment	-0.4	-0.6 to -0.09	-2.7	-0.43	0.01
Bipolar Disorders					
HDI	1.4	-0.05 to 2.8	2.0	0.33	0.06
GINI index	0.5	-0.6 to 1.6	0.9	0.16	0.4
Unemployment	0.01	-0.001 to 0.02	1.8	0.30	0.08

^a this includes Autism Spectrum Disorders, ADHD, Conduct Disorders, Idiopathic developmental intellectual disability, Depressive disorders, Schizophrenia, Anxiety disorders, Eating disorder and Bipolar disorders.

REFERENCES

- 1 Maronna RA, Martin RD, Yohai VJ, Salibián-Barrera M. *Robust statistics: theory and methods (with R)*. John Wiley & Sons, 2019.
- 2 Koller M, Stahel WA. Sharpening wald-type inference in robust regression for small samples. *Comput Stat Data Anal* 2011; **55**: 2504–2515.