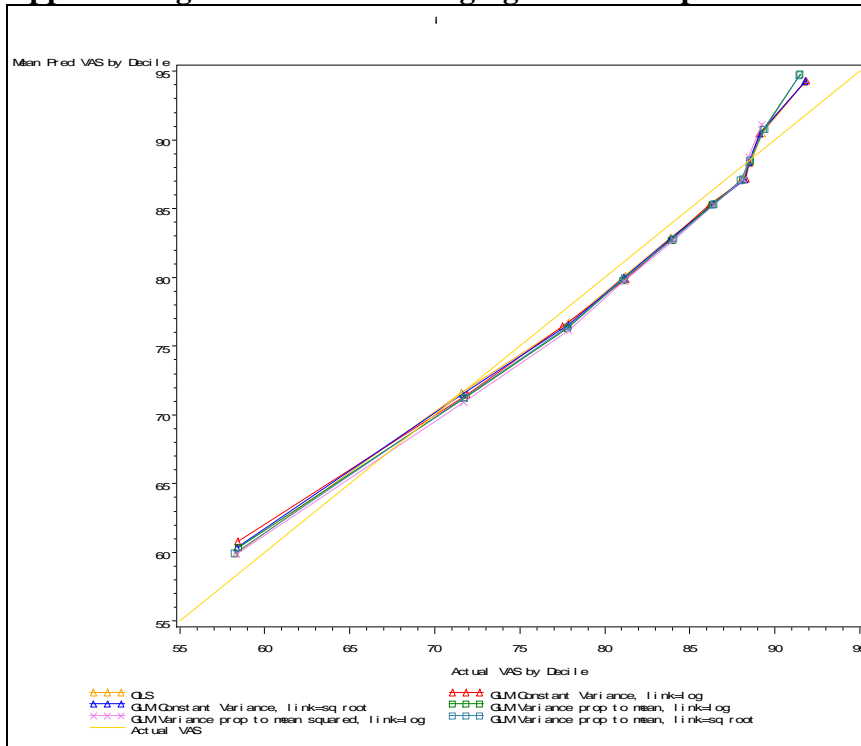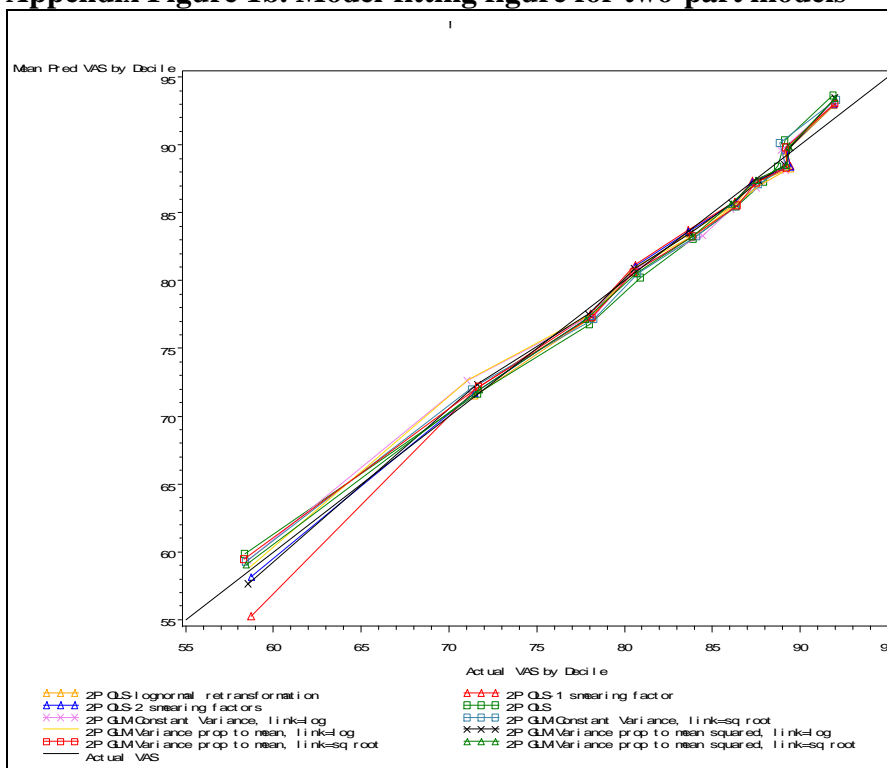Alonso, J., Vilagut, G., Chatterji, S., Heeringa, S., Schoenbaum, M., Üstün, T.B., Rojas-Farreras, S., Angermeyer, M., Bromet, E., Bruffaerts, R., de Girolamo, G., Gureje, O., Haro, J.M., Karam, A.N., Kovess, V., Levinson, D., Liu, Z., Medina-Mora, M.E., Ormel, J., Posada-Villa, J., Uda, H., Kessler, R.C. (2010 epub). Including information about co-morbidity in estimates of disease burden: results from the World Health Organization World Mental Health Surveys. Psychological Medicine.

APPENDIX MATERIALS

Appendix Figure 1a. Model-fitting figure for one-part models

Appendix Figure 1b. Model-fitting figure for two-part models

Appendix Table 1. Mean Square Error (MSE) and Mean Absolute Prediction Error (MAPE) of 17 one-part and two-part functional forms compared

Model	MSE	MAPE
OLS	270.42279	11.809138
GLM Constant Variance, link=log	272.3286	11.856497
GLM Constant Variance, link=square root	271.313	11.832206
GLM Variance prop to mean, link=log	272.4885	11.872778
GLM Variance prop to mean squared, link=log	273.03428	11.896181
GLM Variance prop to mean, link=square root	271.46835	11.846401
GLM Variance prop to mean squared, link=square root*	983.79226	26.018077
2P OLS-lognormal retransformation	275.43747	11.833964
2P OLS-1 smearing factor	273.65284	11.753644
2P OLS-2 smearing factors	271.23583	11.72833
2P OLS	269.59903	11.770551
2P GLM-Constant Variance, link=log	268.49476	11.717132
2P GLM-Constant Variance, link=square root	268.22045	11.715089
2P GLM-Variance prop to mean, link=log	269.27739	11.711505
2P GLM-Variance prop to mean squared, link=log	270.88361	11.693274
2P GLM-Variance prop to mean, link=square root	268.90017	11.718927
2P GLM-Variance prop to mean squared, link=square root	269.90099	11.712024

* The negative of the Hessian is not positive definite. The convergence is questionable

Appendix Table 2a. Regression coefficients for all the models tested for the <u>total</u> sample

	Model 0 (19 models)	Model 1 (1 model)	Model 2 (1 model)	Model 3 (1 model)	Model 4 (1 model)
Arthritis	-9.48 (0.46)*	-4.84 (0.44)*		-5.04 (0.54)*	-5.06 (0.69)*
Cancer	-2.58 (1.09)*	-0.78 (0.90)		-1.08 (0.96)	-2.08 (1.61)
Cardiovascular disorders	-8.37 (0.43)*	-4.84 (0.40)*		-5.02 (0.48)*	-4.98 (0.49)*
Chronic pain	-10.92 (0.37)*	-6.71 (0.38)*		-6.91 (0.52)*	-6.72 (0.68)*
Diabetes	-8.77 (0.95)*	-6.04 (0.79)*		-6.29 (0.83)*	-4.48 (1.13)*
Digestive disorders	-9.88 (0.89)*	-4.13 (0.78)*		-4.36 (0.84)*	-4.37 (1.03)*
Headache or migraine	-9.91 (0.42)*	-4.32 (0.40)*		-4.48 (0.49)*	-3.83 (0.59)*
Insomnia	-16.05 (0.69)*	-8.00 (0.67)*		-8.21 (0.79)*	-8.45 (1.28)*
Neurological disorder	-17.79 (1.70)*	-12.21 (1.40)*		-12.51 (1.41)*	-13.20 (2.59)*
Respiratory disorder	-4.32 (0.39)*	-1.43 (0.36)*		-1.62 (0.41)*	-2.06 (0.45)*
Alcohol abuse	-7.28 (1.13)*	-3.36 (1.09)*		-3.57 (1.15)*	-4.88 (1.84)*
Bipolar disorder	-17.80 (1.40)*	-4.83 (1.50)*		-5.56 (1.54)*	-10.77 (2.56)*
Drug abuse	-12.37 (1.78)*	-4.85 (1.72)*		-5.32 (1.76)*	-5.39 (2.34)*
Generalized anxiety disorder	-13.41 (1.14)*	-4.63 (1.15)*		-4.83 (1.21)*	-8.21 (1.98)*
Major depressive episode	-14.76 (0.54)*	-8.00 (0.51)*		-8.21 (0.59)*	-9.67 (0.81)*
Panic disorder	-16.64 (0.95)*	-6.33 (0.98)*		-6.85 (1.03)*	-6.91 (1.83)*
Post-traumatic stress disorder	-15.29 (1.10)*	-4.32 (0.90)*		-4.78 (0.96)*	-3.10 (1.53)*
Social phobia	-11.17 (0.78)*	-2.73 (0.80)*		-3.08 (0.89)*	-6.08 (0.95)*
Specific phobia	-8.12 (0.61)*	-2.48 (0.59)*		-2.72 (0.70)*	-3.62 (0.77)*
Exactly 1 condition			-4.71 (0.35)*		
Exactly 2 conditions			-8.91 (0.37)*	1.11 (0.66)	1.24 (0.65)
Exactly 3 conditions			-14.63 (0.49)*	0.63 (0.97)	0.81 (0.95)
4 or 5 conditions			-22.62 (0.66)*	-0.29 (1.49)	-0.22 (1.60)
6 or 7 conditions			-32.35 (1.34)*	1.37 (2.25)	0.20 (2.81)
8+ conditions			-39.71 (1.91)*	7.51 (3.58)*	0.31 (5.26)
Arthritis*#comorbid disorders					0.04 (0.30)
Cancer*#comorbid disorders					0.53 (0.53)
Chronic pain*#comorbid disorde					-0.21 (0.33)
Diabetes*#comorbid disorders					-0.99 (0.44)*
Digestive disorders*#comorbid disorders					0.09 (0.37)
Headache or migraine*#comorbid					-0.46 (0.27)
Insomnia*#comorbid dis					0.08 (0.38)
Neurological disorders*#comorbid disorde					0.42 (0.72)
Respiratory disorders*#comorbid disorder					0.35 (0.24)
Alcohol abuse*#comorbid disord					0.73 (0.64)
Bipolar disorder*#comorbid disorders					1.28 (0.57)*
Drug_abuse*#comorbid disorders					-0.34 (0.76)
Generalized anxiety disorder*#comorbid disorders					1.08 (0.53)*
Major depressive episode*#comorbid disorders					0.72 (0.33)*
Panic disorder*#comorbid disorders					-0.16 (0.52)
Post-traumatic stress disorder*#comorbid disorders					-0.63 (0.45)
Social phobia*#comorbid disorders					1.02 (0.37)*
Specific phobia*#comorbid disorders					0.41 (0.31)

Model 0: 19 models with one condition at a time adjusted by demographic controls
Model 1: Additive model (a separate predictor variable for each of the 19 conditions without additional terms for comorbidities) adjusted by demographic controls
Model 2: Series of dummy predictor variables for number of conditions without information about type of conditions adjusted by demographic controls
Model 3: 19 predictors for type of condition and additional predictors for number of conditions
Model 4: 19 predictors for type of condition, additional predictors for number of conditions and 18 interactions between each condition and the number of comorbid disorders

Appendix Table 2b. Regression coefficients for all the models tested for developing countries sample

	Model 0 (19 models)	Model 1 (1 model)	Model 2 (1 model)	Model 3 (1 model)	Model 4 (1 model)
Arthritis	-8.79 (0.78)*	-4.71 (0.76)*		-6.73 (0.95)*	-6.95 (1.27)*
Cancer	-3.95 (4.61)	-2.90 (4.20)		-5.09 (4.23)	-4.14 (6.13)
Cardiovascular disorders	-8.35 (0.82)*	-4.90 (0.74)*		-6.74 (0.97)*	-5.02 (1.17)*
Chronic pain	-9.84 (0.68)*	-6.21 (0.79)*		-7.94 (1.20)*	-8.42 (1.59)*
Diabetes	-7.99 (1.78)*	-6.12 (1.67)*		-8.20 (1.82)*	-9.93 (2.62)*
Digestive disorders	-4.83 (0.99)*	-0.70 (0.86)		-2.65 (1.05)*	-4.74 (1.29)*
Headache or migraine	-9.71 (0.70)*	-4.97 (0.69)*		-6.82 (0.99)*	-5.68 (1.11)*
Insomnia	-13.33 (1.50)*	-7.34 (1.54)*		-9.66 (1.75)*	-10.59 (2.99)*
Neurological disorders	-14.80 (3.00)*	-9.54 (2.48)*		-11.92 (2.54)*	-10.62 (5.14)*
Respiratory disorders	-4.57 (0.72)*	-1.71 (0.69)*		-3.36 (0.84)*	-3.68 (1.02)*
Alcohol abuse	-7.46 (2.19)*	-4.83 (2.07)*		-6.33 (2.22)*	-6.92 (3.44)*
Bipolar disorder	-14.18 (2.58)*	-4.87 (2.62)		-7.04 (2.80)*	-7.45 (2.99)*
Drug abuse	-18.95 (4.82)*	-11.79 (4.52)*		-14.28 (4.79)*	-13.87 (5.07)*
Generalized anxiety disorder	-9.56 (1.93)*	-1.33 (2.26)		-4.15 (2.08)*	-7.02 (2.76)*
Major depressive episode	-13.33 (0.88)*	-7.46 (0.86)*		-9.75 (1.10)*	-10.03 (1.45)*
Panic disorder	-12.87 (1.84)*	-5.25 (2.13)*		-8.03 (2.03)*	-10.25 (4.07)*
Post-traumatic stress disorder	-14.17 (2.83)*	-4.76 (2.26)*		-7.24 (2.34)*	-0.75 (3.14)
Social phobia	-8.65 (1.34)*	-2.56 (1.27)*		-4.72 (1.53)*	-7.78 (2.16)*
Specific phobia	-4.90 (0.85)*	-0.98 (0.84)		-2.61 (1.01)*	-2.66 (1.11)*
Exactly 1 condition			-6.14 (0.74)*		
Exactly 2 conditions			-8.41 (0.58)*	4.34 (1.47)*	4.08 (1.44)*
Exactly 3 conditions			-14.97 (0.80)*	4.42 (2.22)*	3.67 (2.47)
Exactly 4 conditions			-19.92 (1.17)*	6.36 (2.95)*	5.15 (4.28)
Exactly 5 conditions			-23.75 (1.61)*	10.02 (3.94)*	8.02 (6.83)
Exactly 6 conditions			-30.66 (2.84)*	10.11 (4.66)*	7.43 (9.24)
Exactly 7 conditions			-29.04 (3.10)*	19.13 (5.52)*	13.47 (12.5)
8+ conditions			-33.57 (4.84)*	26.09 (7.23)*	17.25 (18.8)
Arthritis*#comorbid disorders					0.30 (0.63)
Cancer*#comorbid disorders					-0.34 (1.76)
Cardiovascular disorder*#comorbid disor					-1.32 (0.64)*
Chronic pain*#comorbid disorde					0.72 (0.84)
Diabetes*#comorbid disorders					1.29 (0.96)
Digestive disorders*#comorbid disorders					1.36 (0.60)*
Headache or migraine*#comorbid					-0.72 (0.62)
Insomnia*#comorbid dis					0.64 (0.88)
Neurological disorders*#comorbid disorde					-0.15 (1.45)
Respiratory disorders*#comorbid disorder					0.41 (0.55)
Alcohol abuse*#comorbid disord					0.53 (1.17)
Bipolar disorder*#comorbid disorders					-0.11 (1.09)
Generalized anxiety disorder*#comorbid disorders					1.25 (1.11)
Major depressive episode*#comorbid disorders					0.27 (0.59)
Panic disorder*#comorbid disorders					0.82 (1.02)
Post-traumatic stress disorder*#comorbid disorders					-1.94 (0.85)*
Social phobia*#comorbid disorders					1.49 (0.74)*
Specific phobia*#comorbid disorders					0.08 (0.70)

Model 0: 19 models with one condition at a time adjusted by demographic controls
Model 1: Additive model (a separate predictor variable for each of the 19 conditions without additional terms for comorbidities) adjusted by demographic controls
Model 2: Series of dummy predictor variables for number of conditions without information about type of conditions adjusted by demographic controls
Model 3: 19 predictors for type of condition and additional predictors for number of conditions
Model 4: 19 predictors for type of condition, additional predictors for number of conditions and 18 interactions between each condition and the number of comorbid disorders.

Appendix Table 2c. Regression coefficients for all the models tested for developed countries sample

	Model 0 (19 models)	Model 1 (1 model)	Model 2 (1 model)	Model 3 (1 model)	Model 4 (1 model)
Arthritis	-9.75 (0.56)*	-4.86 (0.54)*		-4.21 (0.65)*	-4.30 (0.83)*
Cancer	-2.65 (1.12)*	-0.57 (0.92)		-0.05 (0.99)	-1.76 (1.63)
Cardiovascular disorders	-8.40 (0.51)*	-4.74 (0.48)*		-4.20 (0.56)*	-3.04 (0.62)*
Chronic pain	-11.40 (0.45)*	-6.85 (0.41)*		-6.30 (0.52)*	-5.77 (0.60)*
Diabetes	-8.97 (1.12)*	-6.01 (0.88)*		-5.39 (0.92)*	-5.21 (0.94)*
Digestive disorders	-14.81 (1.34)*	-7.47 (1.23)*		-6.80 (1.28)*	-5.99 (1.67)*
Headache or migraine	-9.97 (0.53)*	-4.02 (0.47)*		-3.41 (0.57)*	-2.71 (0.66)*
Insomnia	-17.00 (0.76)*	-8.06 (0.72)*		-7.35 (0.86)*	-8.14 (1.25)*
Neurological disorders	-19.13 (2.02)*	-13.33 (1.60)*		-12.73 (1.62)*	-14.27 (2.67)*
Respiratory disorders	-4.20 (0.47)*	-1.27 (0.42)*		-0.78 (0.46)	-1.56 (0.49)*
Alcohol abuse	-7.52 (0.91)*	-2.29 (0.92)*		-1.75 (1.00)	-3.15 (1.43)*
Bipolar disorder	-19.09 (1.70)*	-4.75 (1.81)*		-4.92 (1.86)*	-13.22 (3.56)*
Drug abuse	-10.52 (1.76)*	-2.90 (1.72)		-2.58 (1.76)	-3.77 (2.09)
Generalized anxiety disorder	-14.09 (1.30)*	-5.11 (1.30)*		-4.35 (1.39)*	-8.56 (2.38)*
Major depressive episode	-15.32 (0.67)*	-8.32 (0.62)*		-7.74 (0.72)*	-9.29 (0.96)*
Panic disorder	-17.93 (1.11)*	-6.66 (1.08)*		-6.43 (1.20)*	-5.21 (1.79)*
Post-traumatic stress disorder	-15.52 (1.16)*	-4.09 (0.96)*		-3.71 (1.03)*	-3.61 (1.83)*
Social phobia	-11.99 (0.94)*	-2.74 (0.97)*		-2.28 (1.02)*	-5.83 (1.06)*
Specific phobia	-9.76 (0.82)*	-3.22 (0.77)*		-2.68 (0.91)*	-4.61 (1.10)*
Exactly 1 condition			-3.91 (0.36)*		
Exactly 2 conditions			-9.07 (0.46)*	-0.48 (0.70)	-0.06 (0.76)
Exactly 3 conditions			-14.41 (0.62)*	-1.24 (1.04)	-0.17 (1.23)
Exactly 4 conditions			-21.25 (1.06)*	-3.31 (1.68)*	-1.57 (2.09)
Exactly 5 conditions			-27.24 (1.18)*	-4.72 (1.99)*	-2.68 (2.75)
Exactly 6 conditions			-30.16 (1.78)*	-2.97 (2.61)	-0.85 (3.67)
Exactly 7 conditions			-39.43 (2.42)*	-5.98 (3.24)	-4.69 (4.45)
8+ conditions			-40.54 (2.07)*	1.05 (4.07)	-2.35 (6.76)
Arthritis*#comorbid disorders					0.05 (0.31)
Cancer*#comorbid disorders					0.81 (0.53)
Cardiovascular disorders*#comorbid disor					-1.02 (0.34)*
Chronic pain*#comorbid disorde					-0.60 (0.35)
Digestive disorders*#comorbid disorders					-0.22 (0.47)
Headache or migraine*#comorbid					-0.55 (0.31)
Insomnia*#comorbid dis					0.20 (0.38)
Neurological disorders*#comorbid disorde					0.72 (0.71)
Respiratory disorders*#comorbid disorder					0.57 (0.29)*
Alcohol abuse*#comorbid disord					0.50 (0.67)
Bipolar disorder*#comorbid disorders					1.90 (0.73)*
Drug_abuse*#comorbid disorders					0.07 (0.82)
Generalized anxiety disorder*#comorbid disorders					1.28 (0.59)*
Major depressive episode*#comorbid disorders					0.64 (0.41)
Panic disorder*#comorbid disorders					-0.71 (0.52)
Post-traumatic stress disorder*#comorbid disorders					-0.20 (0.50)
Social phobia*#comorbid disorders					1.01 (0.40)*
Specific phobia*#comorbid disorders					0.73 (0.37)*

Model 0: 19 models with one condition at a time adjusted by demographic controls
Model 1: Additive model (a separate predictor variable for each of the 19 conditions without additional terms for comorbidities) adjusted by demographic controls
Model 2: Series of dummy predictor variables for number of conditions without information about type of conditions adjusted by demographic controls
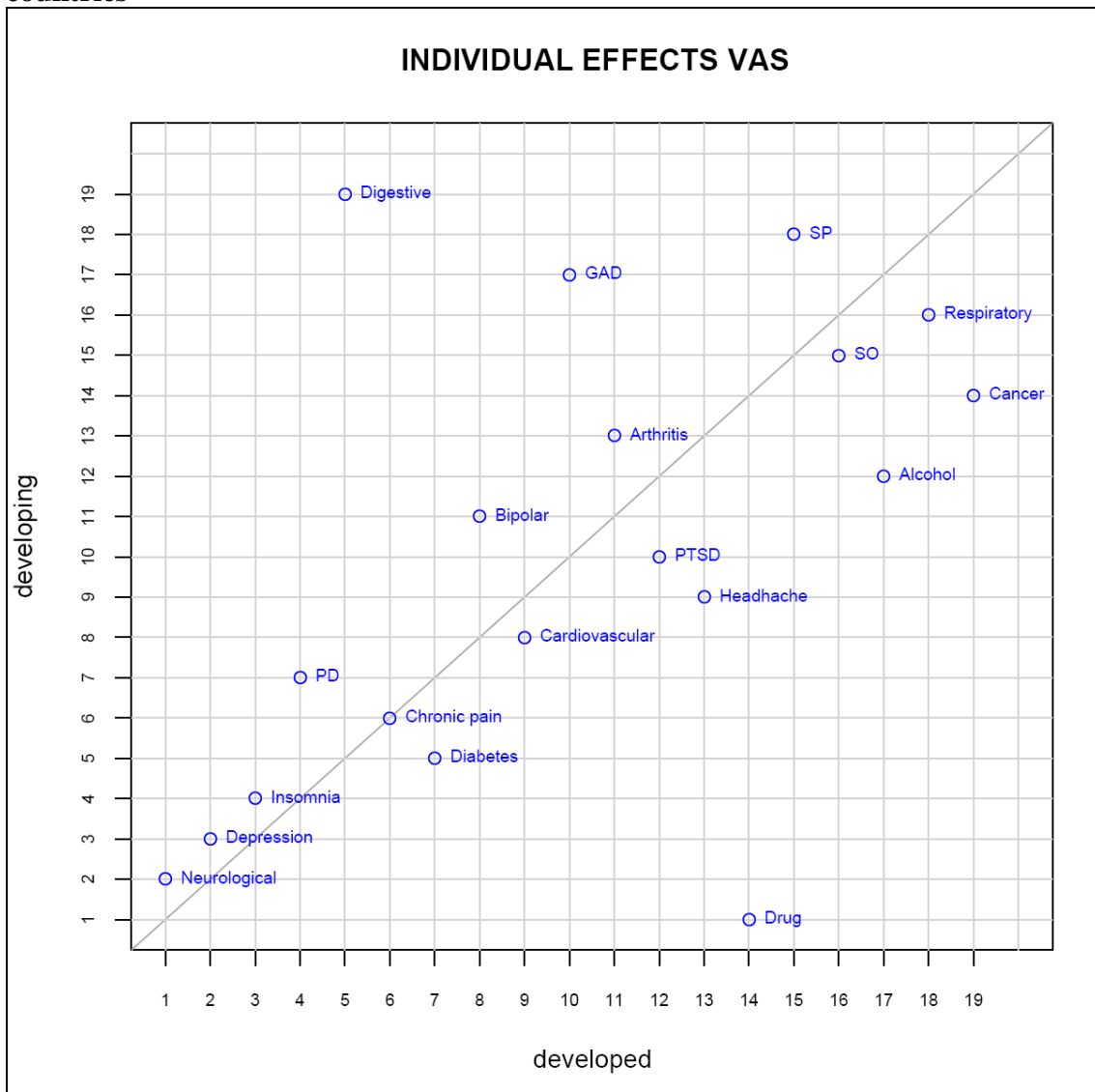Model 3: 19 predictors for type of condition and additional predictors for number of conditions
Model 4: 19 predictors for type of condition, additional predictors for number of conditions and 18 interactions between each condition and the number of comorbid disorders

Appendix table 3. Tests of comparisons of groups of coefficients in each model, across country groups

Contrast	developing countries			developed countries			overall sample		
	Wald Chisq test	df	p-val	Wald Chisq test	df	p-val	Wald Chisq test	df	p-val
Model 1. Significance (19 DF) of all disorders as a set	1213.5	19	<0.001	2103.8	19	<0.001	2992.1	19	<0.001
Model 2. Significance of all number of disorders dummies as a set	863.6	8	<0.001	1767.4	8	<0.001	2378.1	6	<0.001
Model 3. significance (18DF) of the differences among the 19 disorder coefficients	119.1	18	<0.001	257.1	18	<0.001	279.0	18	<0.001
Model 3. Significance of all number of disorders dummies as a set	22.8	7	0.001	23.8	7	0.001	23.0	5	<0.001
Model 3. Significance (19 DF)of all disorders as a set	194.2	19	<0.001	373.9	19	<0.001	503.0	19	<0.001
Model 4. Significance (19 DF) of all disorders as a set	162.3	19	<0.001	271.8	19	<0.001	358.9	19	<0.001
Model 4. Significance (18 DF) of all interactios s a set	30.5	18	0.04	82.0	18	<0.001	54.5	18	<0.001
Model 4. significance (18DF) of the differences among the 19 disorder coefficients	62.0	18	<0.001	137.6	18	<0.001	150.0	18	<0.001
Model 4. significance (17DF) of the differences among the interactions	30.1	17	0.03	80.6	17	<0.001	49.0	17	<0.001
Model 4. Significance of all number of disorders dummies as a set	12.4	7	0.09	5.5	7	0.61	9.8	5	0.08

Appendix Figure 2. Ranks of individual effects for the VAS, developing vs developed countries

Appendix Figure 3. Ranks of societal effects for the VAS, developing vs developed countries

SOCIETAL EFFECTS VAS