

Modelling hierarchically structured data with MLwiN software

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University of Helsinki

Lehtonen R. and Pahkinen E. (2004). Practical Methods for Design and Analysis of Complex Surveys. Second Edition. Chichester: Wiley.

9.4 MULTI-LEVEL MODELLING IN AN EDUCATIONAL SURVEY

(Selected tables for the course)

Table 9.8 Descriptive statistics for combined reading literacy score in the PISA 2000 Survey by country (in alphabetical order).

Country	Combined reading literacy score					Number of observations in data set	
	Mean	Standard error	Overall design effect	Design-effect accounting for stratification and clustering	Effective sample size of students	Students	Schools
Brazil	402.9	3.82	8.33	5.17	476	3961	290
Finland	550.7	2.15	2.79	2.74	1600	4465	147
Germany	497.4	5.68	13.47	11.68	305	4108	183
Hungary	485.7	6.02	20.00	16.20	231	4613	184
Republic of Korea	526.6	3.66	12.99	11.67	351	4564	144
United Kingdom	531.4	4.08	14.08	7.16	564	7935	328
United States	517.0	5.16	6.93	5.46	354	2455	112

Data source: OECD PISA database, 2001.

Table 9.9 Estimates of two-level variance component models (null models) for combined reading literacy score in the PISA 2000 Survey by country (ordered by the size of the estimated intra-school correlation coefficient).

Country	Intra-school correlation coefficient	Variance components			Standard error
		School level	Student level	Intercept	
Hungary	0.659	6093.7	3148.3	464.1	5.84
Germany	0.553	5572.2	4507.8	496.1	5.61
Brazil	0.428	3146.9	4201.4	387.9	3.61
Republic of Korea	0.375	1828.6	3043.0	520.9	3.74
United States	0.241	2318.2	7315.5	503.3	4.97
United Kingdom	0.212	1917.5	7126.5	529.0	2.88
Finland	0.063	470.7	6960.9	550.6	2.18

Data source: OECD PISA database, 2001.

Table 9.10 Estimates of two-level models for combined reading literacy score in the PISA 2000 Survey by country.

		Hungary	Germany	Brazil	Republic of Korea	United States	United Kingdom	Finland
Fixed effects:								
Coefficient								
Intercept	γ_0	471.2	496.4	382.0	506.8	496.6	524.9	531.6
	s.e	6.36	4.58	4.56	6.29	6.05	3.38	4.91
	t-test	74.14	108.37	83.75	80.53	82.12	155.06	108.27
	p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>School-level variables:</i>								
School size	γ_1	30.6	27.4	2.4	7.1	1.0	3.8	5.9
	s.e	9.00	9.22	1.47	3.44	2.54	3.14	7.35
	t-test	3.41	2.97	1.64	2.07	0.38	1.20	0.80
	p-value	0.001	0.003	0.100	0.039	0.705	0.232	0.426
Teacher autonomy	γ_2	4.8	-7.1	-3.1	2.5	4.1	-2.3	2.8
	s.e	5.62	5.22	4.24	5.39	3.63	2.61	2.68
	t-test	0.86	-1.37	-0.74	0.47	1.14	-0.89	1.06
	p-value	0.392	0.171	0.459	0.641	0.256	0.374	0.291
<i>Student-level variables:</i>								
Female	β_1	6.4	3.6	3.1	15.9	14.9	9.8	19.6
	s.e	2.22	2.41	2.54	2.49	3.71	2.64	2.43
	t-test	2.89	1.50	1.21	6.38	4.00	3.71	8.09
	p-value	0.004	0.133	0.228	0.000	0.000	0.000	0.000
Socioeconomic background	β_2	6.0	11.5	9.9	2.2	16.7	23.3	15.8
	s.e	1.09	1.53	1.35	0.92	2.22	1.32	1.34
	t-test	5.56	7.50	7.34	2.40	7.51	17.70	11.78
	p-value	0.000	0.000	0.000	0.016	0.000	0.000	0.000
Engagement in reading	β_3	19.5	19.0	19.5	16.6	28.9	31.5	33.9
	s.e	1.04	0.98	1.51	1.04	1.99	1.40	1.26
	t-test	18.68	19.36	12.87	15.94	14.49	22.59	27.05
	p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Achievement press	β_4	0.9	-1.6	3.4	3.4	-3.3	-7.2	-3.7
	s.e	0.93	1.16	1.44	0.89	2.04	1.59	1.40
	t-test	0.92	-1.35	2.36	3.85	-1.62	-4.52	-2.65
	p-value	0.356	0.176	0.018	0.000	0.106	0.000	0.008
Random effects:								
Variance component								
School level		4744.2	3501.6	2730.5	1387.3	1770.6	999.6	394.8
Student level		2897.4	3981.9	3830.6	2809.6	6094.1	5779.0	4984.3
Residual intra-school correlation coefficient		0.621	0.468	0.416	0.331	0.225	0.147	0.073
Proportional reduction in variance components, compared to null model (%)								
School level		22.1	37.2	13.2	24.1	23.6	47.9	16.1
Student level		8.0	11.7	8.8	7.7	16.7	18.9	28.4
Total		17.3	25.8	10.7	13.8	18.4	25.0	27.6

Data source: OECD PISA database, 2001.