

APPENDIX N

Report on Child Sample Analyses

Descriptive statistics

Following the analytical framework applied to the parent-reported data, we conducted a set of preliminary analyses on the child-reported sample ($n = 523$) to assess data structure, descriptive patterns, and attrition mechanisms.

Sample Characteristics and Descriptive Statistics

A descriptive overview of key sociodemographic and clinical variables is presented in Table 1 (see Appendix M). The sample consisted of 523 children and adolescents (mean age at baseline = 12.77 years, $SD = 2.93$), with a balanced distribution by gender (36% female). Participants were recruited across 10 clinical centers with different geographic areas of residence, and SES levels were measured via a standardized index derived from parental education and occupation.

Syntax

```
ClinicoPathDescriptives::tableone(  
  data = data,  
  vars = vars(participation_parent_pcq_baseline_t0,  
partecipazione_patient_ypcq_baseline_t0, num_age_t0, Cat_sex, Ord_residencial_area,  
Ord_school_level_attended_in_2020, Num_ses_father_t1, Num_ses_t1, mother, Ord_Socio-  
economic_status_t1, Num_cgas_t1, Cat_site, Cat_quest_child_followup_march_2021_complete,  
Cat_questionnaire_children_followup_march_2022_complete, Diagnostic_category))
```

Characteristic	N = 523
participation_parent_pcq_baseline_t0	
1 compl t0	481 (92%)
0 missing t0	42 (8.0%)
participation_child_ypcq_baseline_t0	
1 compl child t0	502 (96%)
miss child t0	20 (3.8%)
Unknown	1
num_age_t0	12.80 (10.14, 15.27)
Unknown	16
Cat_sex	
0	325 (64%)
1	183 (36%)
Unknown	15
Ord_residencial_area	
Rural	42 (8.3%)
Suburban	193 (38%)
Urban	272 (54%)
Unknown	15
Ord_school_level_attended_in_2020	
Upper secondary	172 (34%)
Lower secondary	156 (31%)
Primary	172 (34%)
Unknown	23
Ord_Socio-economic_status_t1	
High	26 (5.6%)
Upper-middle	91 (20%)
Middle	90 (19%)
Lower-middle	116 (25%)
Low	139 (30%)

Characteristic	N = 523
Unknown	61
Num_cgas_t1	60 (51, 65)
Unknown	33
Cat_site	
Cagliari	109 (22%)
Sassari	69 (14%)
Turin	13 (2.6%)
Pisa	9 (1.8%)
Lodi	31 (6.3%)
Rome	8 (1.6%)
Naples	102 (21%)
Genoa	32 (6.5%)
Milan	20 (4.1%)
Bolzano	100 (20%)
Unknown	30
Cat_quest child_followup_march_2021_complete	
compl child t1	210 (40.1%)
Unknown	313
Cat_questionario_child_followup_march_2022_complete	
compl child t2	165 (31.5%)
Unknown	358
Diagnostic category	
Internalizing	152 (30%)
External	297 (59%)
Other	56 (11%)
Unknown	18

¹ n (%); Median (Q1, Q3)

```
Syntax
ClinicoPathDescriptives::summarydata(
  data = data,
  vars = vars(Child Emotionality_t0, Mental Health Support_t0, Child Behavior_t0, Child Concerns_t0, Child
Emotionality_t1, Mental Health Support_t1, Child Behavior_t1, Child Concerns_t1, Child Emotionality_t2, Mental
Health Support_t2, Child Behavior_t2, Child Concerns_t2))
```

Summary of Continuous Variables

Mean of Child Emotionality_t0 is: 2.8 ± 0.7 . (Median: 2.7 [Min: 1 - Max: 5])
Mean of Mental Health Support_t0 is: 3.2 ± 0.8 . (Median: 3 [Min: 1 - Max: 5])
Mean of Child Behavior_t0 is: 2.1 ± 0.6 . (Median: 2 [Min: 1 - Max: 4.5])
Mean of Child Concerns_t0 is: 2.3 ± 0.9 . (Median: 2.2 [Min: 1 - Max: 5])
Mean of Child Emotionality_t1 is: 2.8 ± 0.7 . (Median: 2.7 [Min: 1.3 - Max: 4.7])
Mean of Mental Health Support_t1 is: 3.3 ± 0.8 . (Median: 3 [Min: 2 - Max: 5])
Mean of Child Behavior_t1 is: 2.1 ± 0.6 . (Median: 2 [Min: 1 - Max: 4.8])
Mean of Child Concerns_t1 is: 2.1 ± 0.9 . (Median: 2 [Min: 1 - Max: 5])
Mean of Child Emotionality_t2 is: 2.8 ± 0.6 . (Median: 2.7 [Min: 1.3 - Max: 4.8])
Mean of Mental Health Support_t2 is: 3.3 ± 0.7 . (Median: 3 [Min: 1.3 - Max: 5])
Mean of Child Behavior_t2 is: 2 ± 0.5 . (Median: 1.8 [Min: 1 - Max: 3.8])
Mean of Child Concerns_t2 is: 2.2 ± 0.8 . (Median: 2 [Min: 1 - Max: 4.7])

Column	Missing	Mean	Median	SD
Child Emotionality_t0	1.3%	2.8	2.7	0.7
Mental Health Support_t0	2.9%	3.2	3.0	0.8
Child Behavior_t0	1.3%	2.1	2.0	0.6
Child Concerns_t0	1.3%	2.3	2.2	0.9
Child Emotionality_t1	58.9%	2.8	2.7	0.7
Mental Health Support_t1	59.1%	3.3	3.0	0.8
Child Behavior_t1	58.9%	2.1	2.0	0.6
Child Concerns_t1	58.9%	2.1	2.0	0.9
Child Emotionality_t2	68.1%	2.8	2.7	0.6
Mental Health Support_t2	68.1%	3.3	3.0	0.7
Child Behavior_t2	68.1%	2.0	1.8	0.5
Child Concerns_t2	68.1%	2.2	2.0	0.8

Attrition and Missing Data Patterns

Attrition at T2 (second follow-up) was substantial, with 165 respondents completing the child self-report questionnaires (68.4% missing rate at T2).

To understand attrition mechanisms, we performed descriptive comparisons between participants who completed T2 and those who did not (“stayers” vs. “leavers”).

Independent samples Mann-Whitney tests and bivariate Chi-square tests indicated significant baseline differences in age, SES, and certain factor scores (e.g., Child Concerns_t0, $p = 0.047$), but not in clinical diagnosis or gender.

Syntax

```
jmv::ttestIS(
  formula = num_age_t0 + Child Emotionality_t0 + Mental Health Support_t0 + Child Behavior_t0 +
  Child Concerns_t0 ~ missing_t2,
  data = data,
  vars = vars(num_age_t0, Child Emotionality_t0, Mental Health Support_t0, Child Behavior_t0,
  Child Concerns_t0),
  mann = TRUE,
  norm = TRUE,
  eqv = TRUE,
  meanDiff = TRUE,
  ci = TRUE,
  effectSize = TRUE,
  desc = TRUE)
```

Independent Samples -Test

	TEST	Statistic	df	p	Mean difference	SE difference	95% Confidence Interval			Effect Size
							Lower	Upper		
num_age_t0	Student's t	3.060	505	0.002	0.8453	0.2763	0.30247	1.388	Cohen's d	0.2905
	Mann-Whitney U	23481		0.003	0.893		0.315	1.500	Rank biserial correlation	-0.1651
Child Emotionality_t0	Student's t	-0.401	514	0.689	-0.0270	0.0672	-0.15908	0.105	Cohen's d	-0.0380
	Mann-Whitney U	27831		0.550	-1.79e-5		-0.167	0.167	Rank biserial correlation	0.0326
Mental Health Support_t0	Student's t	1.515	506	0.130	0.1159	0.0765	-0.03445	0.266	Cohen's d	0.1440
	Mann-Whitney U	25233		0.059	6.34e-6		-3.35e-5	0.333	Rank biserial correlation	-0.1026
Child Behavior_t0	Student's t	0.703	514	0.483	0.0432	0.0615	-0.07763	0.164	Cohen's d	0.0665
	Mann-Whitney U	27828		0.546	5.30e-5		-3.12e-5	0.250	Rank biserial correlation	-0.0327
Child Concerns_t0	Student's t	1.989	514	0.047	0.1719	0.0865	0.00208	0.342	Cohen's d	0.1883
	Mann-Whitney U	24959		0.015	0.333		6.80e-6	0.333	Rank biserial correlation	-0.1325

Note. $H_0: \mu_0 = \mu_1$

Group Descriptives

	Group	N	Mean	Median	SD	SE
num_age_t0	0	343	13.04	13.24	2.883	0.1557
	1	164	12.20	11.87	2.967	0.2316
Child Emotionality_t0	0	353	2.76	2.67	0.723	0.0385
	1	163	2.79	2.67	0.681	0.0534
Mental Health Support_t0	0	345	3.27	3.00	0.777	0.0418
	1	163	3.15	3.00	0.863	0.0676
Child Behavior_t0	0	353	2.07	2.00	0.664	0.0353
	1	163	2.03	2.00	0.618	0.0484
Child Concerns_t0	0	353	2.36	2.33	0.882	0.0469
	1	163	2.18	2.00	0.977	0.0765

Contingency Tables

```
jmv::contTables(
  formula = .COUNTS ~ missing_t2:Cat_sex,
```

```
data = data,
phiCra = TRUE,
pcRow = TRUE)
```

Contingency Tables

		Cat_sex		
		Male	Female	Total
0	Observed	221	123	344
	% within row	64.2%	35.8%	100.0%
1	Observed	104	60	164
	% within row	63.4%	36.6%	100.0%
Total	Observed	325	183	508
	% within row	64.0%	36.0%	100.0%

χ^2 Tests

	Value	df	p
χ^2	0.0332	1	0.856
N	508		

Nominal

	Value
Phi-coefficient	0.00808
Cramer's V	0.00808

Contingency Tables

```
jmv::contTables(  
  formula = .COUNTS ~ missing_t2:Ord_residencial_area,  
  data = data,  
  phiCra = TRUE,  
  pcRow = TRUE)
```

Contingency Tables

		Ord_residencial_area			
missing_t2		rural	suburban	urban	Total
0	Observed	24	135	184	344
	% within row	7.0%	39.2%	53.5%	100.0%
1	Observed	18	58	88	164
	% within row	11.0%	35.4%	53.7%	100.0%
Total	Observed	42	193	272	508
	% within row	8.3%	38.0%	53.5%	100.0%

χ^2 Tests

	Value	df	p
χ^2	3.06	2	0.382
N	508		

Nominal

	Value
Phi-coefficient	NaN
Cramer's V	0.0777

Contingency Tables

```
jmv::contTables(  
  formula = .COUNTS ~ missing_t2:Diagnostic_category,  
  data = data,  
  phiCra = TRUE,  
  pcRow = TRUE)
```

Contingency Tables

missing_t2		Diagnostic_category			Total
		internalizing	externalizing	other	
0	Observed	110	199	32	341
	% within row	32.3%	58.4%	9.4%	100.0%
1	Observed	42	98	24	164
	% within row	25.6%	59.8%	14.6%	100.0%
Total	Observed	152	297	56	505
	% within row	30.1%	58.8%	11.1%	100.0%

χ^2 Tests

	Value	df	p
χ^2	4.42	2	0.110
N	505		

Nominal

	Value
Phi-coefficient	NaN
Cramer's V	0.0935

Contingency Tables

```
jmv::contTables(  
  formula = .COUNTS ~ missing_t2:Ord_Socio-economic_status_t1,  
  data = data,  
  phiCra = TRUE,  
  pcRow = TRUE)
```

Contingency Tables

missing_t 2		Ord_Socio-economic_status_t1					Total
		High	Upper-middle	Middle	Lower-middle	Low	
0	Observed	18	69	69	82	75	313
	% within row	5.8%	22.0%	22.0%	26.2%	24.0%	100.0%
1	Observed	8	22	21	34	64	149
	% within row	5.4%	14.8%	14.1%	22.8%	43.0%	100.0%
Total	Observed	26	91	90	116	139	462
	% within row	5.6%	19.7%	19.5%	25.1%	30.1%	100.0%

χ^2 Tests

	Value	df	p
χ^2	18.6	4	<.001
N	462		

Nominal

	Value
Phi-coefficient	NaN
Cramer's V	0.201

A binomial logistic regression was then conducted to predict dropout status (missing at T2), including baseline variables as covariates. Results indicated that younger age (OR = 0.899, 95% CI: [0.836, 0.966], $p = 0.004$) and area of residence were significant predictors of missingness.

Binomial Logistic Regression

```
jmv::logRegBin(
  data = data,
  dep = missing_t2,
  covs = num_age_t0,
  factors = vars(Cat_sex, Diagnostic_category, Ord_residencial_area, Ord_Socio-economic_status_t1),
  blocks = list(
    list(
      "num_age_t0",
      "Cat_sex",
      "Diagnostic_category",
      "Ord_residencial_area",
      "Ord_Socio-economic_status_t1"
    ),
    refLevels = list(
      list(
        var="missing_t2",
        ref="0"
      ),
      list(
        var="Cat_sex",
        ref="0"
      ),
      list(
        var="Diagnostic_category",
        ref="Internalizing"
      ),
      list(
        var="Ord_residencial_area",
        ref="0"
      ),
      list(
        var="Ord_Socio-economic_status_t1",
        ref="5"
      )
    ),
    bic = TRUE,
    pseudoR2 = c("r2mf", "r2cs", "r2n"),
    OR = TRUE,
    ciOR = TRUE,
    collin = TRUE)
)
```

Model Fit Measures

Model	Deviance	AIC	BIC	R ² _{Mcf}	R ² _{CS}	R ² _N
1	545	569	618	0.0599	0.0726	0.101

Note. Models estimated using a sample size of N=460

Model Coefficients - missing_t2

Predictor	Estimate	SE	Z	p	Odds ratio	95% Confidence Interval	
						Lower	Upper
Intercept	1.2263	0.8162	1.5025	0.133	3.409	0.688	16.878
num_age_t0	-0.1066	0.0370	-2.8811	0.004	0.899	0.836	0.966
Cat_sex:							
Female – Male	-0.1099	0.2439	-0.4504	0.652	0.896	0.555	1.445
Diagnostic_category:							
Externalizing – Internalizing	-0.1165	0.2710	-0.4298	0.667	0.890	0.523	1.514
Other – Internalizing	0.4252	0.3631	1.1710	0.242	1.530	0.751	3.117
Ord_residencial_area:							
suburban – rural	-0.7967	0.3877	-2.0553	0.040	0.451	0.211	0.964
urban – rural	-0.5833	0.3781	-1.5426	0.123	0.558	0.266	1.171
Ord_Socio-economic_status_t1:							
Upper-middle – High	-0.3427	0.5047	-0.6791	0.497	0.710	0.264	1.909
Middle – High	-0.4021	0.5109	-0.7870	0.431	0.669	0.246	1.821
Lower – Middle	-0.0913	0.4879	-0.1872	0.852	0.913	0.351	2.375
Low – High	0.6278	0.4762	1.3182	0.187	1.873	0.737	4.764

Note. Estimates represent the log odds of "missing_t2 = 1" vs. "missing_t2 = 0"

Assumption Checks

Collinearity Statistics

	VIF	Tolerance
num_age_t0	1.04	0.964
Cat_sex	1.11	0.898
Diagnostic_category	1.08	0.926
Ord_residencial_area	1.01	0.990
Ord_Socio-economic_status_t1	1.01	0.991

Missingness Evaluation

We applied Little's MCAR test and additional diagnostics:

Results rejected the Missing Completely at Random (MCAR) assumption ($p < 0.001$).

Further analyses suggested that the missingness was consistent with the Missing at Random (MAR) assumption, as patterns of missing data were significantly associated with observed variables such as child participation at baseline and socioeconomic status.

This supports the use of Linear Mixed Models (LMMs) under MAR assumptions, as done for the parent sample.

Missing Values Estimation

```
jYS::mMF(
  data = data,
  learnvar = vars(participation_parent_pcq_baseline_t0,
participation_patient_ypcq_baseline_t0, Cat_sex, Ord_residencial_area, Ord_Socio-
economic_status_t1, Cat_site, Diagnostic_category),
  imputevar = vars(Child Emotionality_t0, Mental Health Support_t0, Child Behavior_t0,
Child Concerns_t0, Child Emotionality_t1, Mental Health Support_t1, Child Behavior_t1,
Child Concerns_t1, Child Emotionality_t2, Mental Health Support_t2, Child Behavior_t2,
Child Concerns_t2),
  fullmars = TRUE)
```

Missing Values Estimation

Classify missing completely at random (MCAR)

	P-value	D ²	Degree of Freedom (df)	MissingPatterns
MCAR	0.00	1188	305	27

Note. MCAR - missing completely at random (if the p_{value} is not significant, there is evidence that the data is MCAR).

Classify missing at random (MAR)

Variable	N	P-value	Explanatory
Child Emotionality_t0	7	1.21e-22	participation_patient_ypcq_baseline_t0
Mental Health Support_t0	15	7.14e-35	participation_patient_ypcq_baseline_t0
Child Behavior_t0	7	1.21e-22	participation_patient_ypcq_baseline_t0
Child Concerns_t0	7	1.21e-22	participation_patient_ypcq_baseline_t0
Child Emotionality_t1	308	3.48e0-5	Mental Health Support_t0
Mental Health Support_t1	309	2.59e0-5	Mental Health Support_t0
Child Behavior_t1	308	3.48e0-5	Mental Health Support_t0
Child Concerns_t1	308	3.48e0-5	Mental Health Support_t0
Child Emotionality_t2	356	6.72e0-4	Ord_Socio-economic_status_t1
Mental Health Support_t2	356	6.72e0-4	Ord_Socio-economic_status_t1
Child Behavior_t2	356	6.72e0-4	Ord_Socio-economic_status_t1
Child Concerns_t2	356	6.72e0-4	Ord_Socio-economic_status_t1

Note. N - number of missing values; MAR - missing at random (if each p_{value} is significant, there is evidence that the data is MAR); Explanatory - variable corresponding to MAR with minimal P_{value} .

Note. If at least one p_{value} MAR is not significant, and the p_{value} in MCAR is significant, then the data is MNAR (Missing Not At Random).

Evaluation of MAR explainers

Variable - Child Emotionality_t0

Explanatory	P-value
participation_patient_ypcq_baseline_t0	1.21e-22
Mental Health Support_t2	0.0552
Mental Health Support_t0	0.1275
Child Emotionality_t2	0.1725
Child Behavior_t1	0.2197
Cat_site	0.2713
Ord_Socio-economic_status_t1	0.3340
Child Emotionality_t1	0.4107
participation_parent_pcq_baseline_t0	0.4322
Ord_residencial_area	0.4818
Child Behavior_t0	0.4953
Mental Health Support_t1	0.5250
Diagnostic_category	0.6784
Cat_sex	0.6799
Child Concerns_t2	0.8910
Child Behavior_t2	0.9221
Child Emotionality_t0	0.9288

Variable - Child Emotionality_t0

Explanatory	P-value
Child Concerns_t1	0.9474
Child Concerns_t0	0.9724

Variable - Mental Health Support_t0

Explanatory	P-value
participation_patient_ypcq_baseline_t0	7.14e-35
Child Concerns_t0	0.0211
Child Behavior_t0	0.0418
Mental Health Support_t2	0.0552
Mental Health Support_t0	0.1275
Child Emotionality_t2	0.1725
Child Behavior_t1	0.2197
Ord_residencial_area	0.2484
Cat_sex	0.3844
Child Emotionality_t1	0.4107
Mental Health Support_t1	0.5250
Diagnostic_category	0.5548
Cat_site	0.5849
Child Emotionality_t0	0.6371
Ord_Socio-economic_status_t1	0.7641
participation_parent_pcq_baseline_t0	0.8440
Child Concerns_t2	0.8910
Child Behavior_t2	0.9221
Child Concerns_t1	0.9474

Variable - Child Behavior_t0

Explanatory	P-value
participation_patient_ypcq_baseline_t0	1.21e-22
Mental Health Support_t2	0.0552
Mental Health Support_t0	0.1275
Child Emotionality_t2	0.1725
Child Behavior_t1	0.2197
Cat_site	0.2713
Ord_Socio-economic_status_t1	0.3340
Child Emotionality_t1	0.4107
participation_parent_pcq_baseline_t0	0.4322
Ord_residencial_area	0.4818
Child Behavior_t0	0.4953
Mental Health Support_t1	0.5250
Diagnostic_category	0.6784
Cat_sex	0.6799
Child Concerns_t2	0.8910
Child Behavior_t2	0.9221
Child Emotionality_t0	0.9288
Child Concerns_t1	0.9474
Child Concerns_t0	0.9724

Variable - Child Concerns_t0

Explanatory	P-value
participation_patient_ypcq_baseline_t0	1.21e-22
Mental Health Support_t2	0.0552
Mental Health Support_t0	0.1275
Child Emotionality_t2	0.1725
Child Behavior_t1	0.2197
Cat_site	0.2713
Ord_Socio-economic_status_t1	0.3340
Child Emotionality_t1	0.4107
participation_parent_pcq_baseline_t0	0.4322
Ord_residencial_area	0.4818
Child Behavior_t0	0.4953
Mental Health Support_t1	0.5250
Diagnostic_category	0.6784
Cat_sex	0.6799
Child Concerns_t2	0.8910
Child Behavior_t2	0.9221
Child Emotionality_t0	0.9288
Child Concerns_t1	0.9474
Child Concerns_t0	0.9724

Variable - Child Emotionality_t1

Explanatory	P-value
Mental Health Support_t0	3.48e-5
Cat_site	5.73e-5
Ord_Socio-economic_status_t1	1.47e-4
Ord_residencial_area	0.00197
Child Concerns_t2	0.00862
partecipation_patient_ypcq_baseline_t0	0.02737
Child Emotionality_t0	0.08708
Child Behavior_t1	0.14282
Child Concerns_t0	0.27058
partecipation_parent_pcq_baseline_t0	0.28644
Child Concerns_t1	0.29068
Cat_sex	0.32784
Child Behavior_t2	0.33593
Child Behavior_t0	0.36146
Mental Health Support_t2	0.47061
Child Emotionality_t1	0.62575
Mental Health Support_t1	0.68249
Child Emotionality_t2	0.83269
Diagnostic_category	0.98114

Variable - Mental Health Support_t1

Explanatory	P-value
Mental Health Support_t0	2.59e-5
Cat_site	9.36e-5
Ord_Socio-economic_status_t1	1.72e-4
Ord_residencial_area	0.00150
Child Concerns_t2	0.00862
Child Behavior_t1	0.02402
partecipation_patient_ypcq_baseline_t0	0.02604
Child Emotionality_t0	0.08833
Child Concerns_t1	0.29068
partecipation_parent_pcq_baseline_t0	0.29812
Child Concerns_t0	0.31664
Child Emotionality_t1	0.32026
Child Behavior_t2	0.33593
Child Behavior_t0	0.35694
Cat_sex	0.36205
Mental Health Support_t2	0.47061
Mental Health Support_t1	0.68249
Child Emotionality_t2	0.83269
Diagnostic_category	0.99651

Variable - Child Behavior_t1

Explanatory	P-value
Mental Health Support_t0	3.48e-5
Cat_site	5.73e-5
Ord_Socio-economic_status_t1	1.47e-4
Ord_residencial_area	0.00197
Child Concerns_t2	0.00862
partecipation_patient_ypcq_baseline_t0	0.02737
Child Emotionality_t0	0.08708
Child Behavior_t1	0.14282
Child Concerns_t0	0.27058
partecipation_parent_pcq_baseline_t0	0.28644
Child Concerns_t1	0.29068
Cat_sex	0.32784
Child Behavior_t2	0.33593
Child Behavior_t0	0.36146
Mental Health Support_t2	0.47061
Child Emotionality_t1	0.62575
Mental Health Support_t1	0.68249
Child Emotionality_t2	0.83269
Diagnostic_category	0.98114

Variable - Child Concerns_t1

Explanatory	P-value
Mental Health Support_t0	3.48e-5
Cat_site	5.73e-5
Ord_Socio-economic_status_t1	1.47e-4

Variable - Child Concerns_t1

Explanatory	Pvalue
Ord_residencial_area	0.00197
Child Concerns_t2	0.00862
partecipation_patient_ypcq_baseline_t0	0.02737
Child Emotionality_t0	0.08708
Child Behavior_t1	0.14282
Child Concerns_t0	0.27058
partecipation_parent_pcq_baseline_t0	0.28644
Child Concerns_t1	0.29068
Cat_sex	0.32784
Child Behavior_t2	0.33593
Child Behavior_t0	0.36146
Mental Health Support_t2	0.47061
Child Emotionality_t1	0.62575
Mental Health Support_t1	0.68249
Child Emotionality_t2	0.83269
Diagnostic_category	0.98114

Variable - Child Emotionality_t2

Explanatory	Pvalue
Ord_Socio-economic_status_t1	6.72e-4
partecipation_parent_pcq_baseline_t0	0.00113
Mental Health Support_t2	0.01317
Cat_site	0.01371
Child Concerns_t0	0.07212
Diagnostic_category	0.07437
partecipation_patient_ypcq_baseline_t0	0.09701
Mental Health Support_t0	0.18496
Child Emotionality_t1	0.34374
Ord_residencial_area	0.39587
Child Behavior_t1	0.42419
Child Behavior_t0	0.43010
Child Concerns_t2	0.45755
Mental Health Support_t1	0.45827
Child Behavior_t2	0.66072
Child Emotionality_t0	0.70989
Child Emotionality_t2	0.82617
Cat_sex	0.96852
Child Concerns_t1	0.98572

Variable - Mental Health Support_t2

Explanatory	Pvalue
Ord_Socio-economic_status_t1	6.72e-4
partecipation_parent_pcq_baseline_t0	0.00113
Mental Health Support_t2	0.01317
Cat_site	0.01371
Child Concerns_t0	0.07212
Diagnostic_category	0.07437
partecipation_patient_ypcq_baseline_t0	0.09701
Mental Health Support_t0	0.18496
Child Emotionality_t1	0.34374
Ord_residencial_area	0.39587
Child Behavior_t1	0.42419
Child Behavior_t0	0.43010
Child Concerns_t2	0.45755
Mental Health Support_t1	0.45827
Child Behavior_t2	0.66072
Child Emotionality_t0	0.70989
Child Emotionality_t2	0.82617
Cat_sex	0.96852
Child Concerns_t1	0.98572

Variable - Child Behavior_t2

Explanatory	Pvalue
Ord_Socio-economic_status_t1	6.72e-4
partecipation_parent_pcq_baseline_t0	0.00113
Mental Health Support_t2	0.01317
Cat_site	0.01371
Child Concerns_t0	0.07212
Diagnostic_category	0.07437

Variable - Child Behavior_t2

Explanatory	P-value
participation_patient_ypcq_baseline_t0	0.09701
Mental Health Support_t0	0.18496
Child Emotionality_t1	0.34374
Ord_residencial_area	0.39587
Child Behavior_t1	0.42419
Child Behavior_t0	0.43010
Child Concerns_t2	0.45755
Mental Health Support_t1	0.45827
Child Behavior_t2	0.66072
Child Emotionality_t0	0.70989
Child Emotionality_t2	0.82617
Cat_sex	0.96852
Child Concerns_t1	0.98572

Variable - Child Concerns_t2

Explanatory	P-value
Ord_Socio-economic_status_t1	6.72e-4
participation_parent_pcq_baseline_t0	0.00113
Mental Health Support_t2	0.01317
Cat_site	0.01371
Child Concerns_t0	0.07212
Diagnostic_category	0.07437
participation_patient_ypcq_baseline_t0	0.09701
Mental Health Support_t0	0.18496
Child Emotionality_t1	0.34374
Ord_residencial_area	0.39587
Child Behavior_t1	0.42419
Child Behavior_t0	0.43010
Child Concerns_t2	0.45755
Mental Health Support_t1	0.45827
Child Behavior_t2	0.66072
Child Emotionality_t0	0.70989
Child Emotionality_t2	0.82617
Cat_sex	0.96852
Child Concerns_t1	0.98572

Planned Analyses with LMM

Based on these findings, we applied the assumption that data were Missing at Random (MAR), thereby justifying the use of model-based methods under this assumption.

Consistent with this, LMMs estimated via REML were employed, as they provide unbiased and efficient estimates under MAR when key predictors of missingness are included (Schafer & Graham, 2002; Wolbers et al., 2022). This approach avoids the bias and inefficiency of complete-case analysis and does not require imputation, leveraging all available observations.

Socioeconomic Status (SES) was modeled as a categorical variable in the LMMs to reflect the ordinal nature of the Hollingshead Index and enhance the interpretability of group comparisons. Although SES could be treated as a continuous variable, using a categorical specification avoids imposing linearity assumptions and facilitates the examination of interaction effects (e.g., SES $\times$ factor, SES $\times$ time). Nonlinear effects and interactions involving SES were tested and are discussed in the results section.

All details, including the results of sensitivity analyses and alternative model specifications, have been added to the Statistical Analysis and Limitations sections of the manuscript.

Full tables and model diagnostics are included.

LMM - Report of steps in model analysis

We used linear mixed-effects models (LMMs) to assess changes in outcome scores (valore) over time across four factors, examining the effect of sociodemographic and clinical variables in the child sample. We accounted for both intra-individual dependency and clustering by center.

We followed a stepwise approach, starting with a basic model and progressively adding:

- Random intercepts for individuals (ID)
- Random slopes for time
- Random intercepts for center (Cat_site)
- Main effects: factor, time, age, parental participation, SES, diagnosis, area
- Interaction term: factor $\times$ SES

Final Model Specification

Equation

$$valore_{ijk} = \beta_0 + \beta_1 \cdot time_j + \beta_2 \cdot factor_k + \beta_3 \cdot age_i^{scaled} + \beta_4 \cdot participation_i + \beta_5 \cdot SES_i + \beta_6 \cdot diagnostic_category_i + \beta_7 \cdot area_i + \beta_8 \cdot (factor_k \times SES_i) + u_{0i} + u_{1i} \cdot time_j + v_{0c} + \epsilon_{ijk}$$

Where:

- $u_{0i} \sim N(0, \sigma_u^2)$: random intercept (individual)
- $u_{1i} \sim N(0, \sigma_t^2)$: random slope for time (individual)
- $v_{0c} \sim N(0, \sigma_c^2)$: random intercept (center)
- $\epsilon_{ijk} \sim N(0, \sigma^2)$: residual

The estimation method was Restricted Maximum Likelihood (REML).

The final linear mixed-effects model was specified and included:

- Random intercepts and slopes for time at the individual level
- Random intercepts for center
- Fixed effects: factor (F1–F4), SES (5 levels), time (2020–2022), age (scaled), parental participation, diagnosis (Diagnostic_category), area of residence
- Interaction term: factor $\times$ SES

Random Effects

Random Effect	Variance	Std. Dev.
Child ID (Intercept)	0.132	0.364
Child ID (Slope: Time2021)	0.00003	0.006
Child ID (Slope: Time2022)	0.0526	0.229
Center (Intercept)	0.0044	0.066
Residual	0.436	0.661

Interpretation: Variance due to time-related changes is modest; center-level variance is small but retained for accuracy and completeness.

Fixed Effects

Predictor	Estimate	Std. Error	df	t value	p-value	Sig.
(Intercept)	2.620	0.344	443	7.61	<.001	***
Mental Health Support (vs Child Emotionality)	0.325	0.060	2489	5.40	<.001	***
Child Behavior	-0.814	0.060	2488	-13.52	<.001	***
Child Concerns	-0.655	0.060	2488	-10.88	<.001	***
SES 2 (vs 1)	-0.249	0.078	1398	-3.19	.001	**
SES 3	-0.307	0.086	1280	-3.58	<.001	***
SES 4	-0.261	0.085	1149	-3.07	.002	**
SES 5	+0.031	0.128	1271	0.24	.810	ns
Time 2021	-0.048	0.032	1364	-1.50	.135	ns
Time 2022	+0.003	0.036	207	0.09	.932	ns
Age (scaled)	+0.029	0.021	394	1.36	.173	ns
Parental participation (yes)	+0.387	0.333	426	1.16	.245	ns
Diagnosis = 1	-0.043	0.049	362	-0.87	.384	ns
Diagnosis = 2	-0.120	0.073	329	-1.64	.103	ns
Area of residence 1–3	all ns	–	–	–	>.05	ns

Note: Factor Child Emotionality served as the reference.

Table UU. Interaction Effects: Factor $\times$ SES

Interaction Term	Estimate	Std. Error	df	t	p	Sig.
Mental Health Support × SES 2	+0.263	0.092	2492	2.86	.004	**
Mental Health Support × SES 3	+0.207	0.098	2490	2.10	.035	*
Mental Health Support × SES 4	+0.258	0.096	2490	2.68	.007	**
Child Concerns × SES 4	+0.226	0.096	2488	2.36	.018	*
Other interactions	—	—	—	—	ns	—

Factor effects:

Compared to the Child Emotionality factor, Mental Health Support had slightly higher predicted scores, while Child Behavior and Child Concerns had significantly lower scores (* $p < .001$).

SES main effect:

Lower SES (levels 2–4) was associated with significantly lower scores across factors.

Interactions:

SES moderates the effect of factor scores:

Mental Health Support showed a positive interaction with lower SES levels, suggesting that the decrease in outcome seen in lower SES is less pronounced for this factor.

For Child Concerns, children from lower SES still scored significantly lower, although this was slightly moderated by the interaction term.

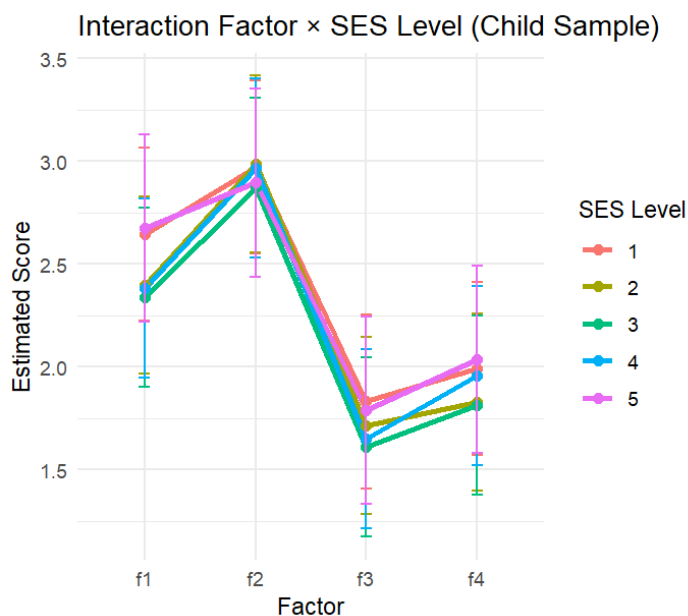
Model Fit (ML comparison)

Model	AIC	Δ AIC	p-value
Base (no slope, no interaction)	6728.9	—	—
+ Random slope (time)	6722.4	–6.5	.0056
+ Interaction (factor × SES)	6726.8	+4.4	.075

The interaction plot visualizes the estimated marginal means (EMMs) for each factor across SES levels, showing different patterns of SES sensitivity per factor:

Child Behavior and Child Concerns scores show SES differences (scores decrease with lower SES).

Mental Health Support shows less variation across SES.



Factors: F1=Child Emotionality, F2= Mental Health Support, F3=Child Behavior, F4 = Child Concerns

SES: 1=low; 2=lower-middle; 3=middle, 4=upper-middle, 5=high

```

# Full model
> model_child_interaction <- lmer(
+   valore ~ factor * Ord_Socio-economic_status_t1 +
+   time + num_age_scaled +
+   participation_parent_pcq_baseline_t0 +
+   Diagnostic_category + Ord_residencial_area +
+   (1 + tempo | id) + (1 | Cat_site),
+   data = CLong,
+   REML = TRUE
+ )

> model_child_no_slope <- lmer(
+   valore ~ factor * Ord_Socio-economic_status_t1 +
+   time + num_age_scaled +
+   participation_parent_pcq_baseline_t0 +
+   Diagnostic_category + Ord_residencial_area +
+   (1 | id) + (1 | Cat_site),
+   data = CLong,
+   REML = TRUE
+ )

> model_child_no_interaction <- lmer(
+   valore ~ factor + Ord_Socio-economic_status_t1 +
+   time + num_age_scaled +
+   participation_parent_pcq_baseline_t0 +
+   Diagnostic_category + Ord_residencial_area +
+   (1 + time | id) + (1 | Cat_site),
+   data = CLong,
+   REML = TRUE
+ )

> model_child_base <- lmer(
+   valore ~ factor + Ord_Socio-economic_status_t1 +
+   time + num_age_scaled +
+   participation_parent_pcq_baseline_t0 +
+   Diagnostic_category + Ord_residencial_area +
+   (1 | id) + (1 | Cat_site),
+   data = CLong,
+   REML = TRUE
+ )

> anova(model_child_no_slope, model_child_interaction)
refitting model(s) with ML (instead of REML)Data: CLong
Models:
model_child_no_slope: valore ~ factor * Ord_Socio-economic_status_t1 + time + num_age_scaled +
participation_parent_pcq_baseline_t0 + Diagnostic_category + Ord_residencial_area + (1 | id) + (1 | Cat_site)
model_child_interaction: valore ~ factor * Ord_Socio-economic_status_t1 + time + num_age_scaled +
participation_parent_pcq_baseline_t0 + Diagnostic_category + Ord_residencial_area + (1 + time | id) + (1 | Cat_site)
      npar    AIC    BIC logLik -2*log(L)  Chisq Df Pr(>Chisq)
model_child_no_slope      32 6733.6 6926.8 -3334.8   6669.6
model_child_interaction    37 6726.9 6950.2 -3326.4   6652.9 16.779  5  0.004939

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

>
> anova(model_child_base, model_child_no_interaction, model_child_interaction)
refitting model(s) with ML (instead of REML)Data: CLong
Models:
model_child_base: valore ~ factor + Ord_Socio-economic_status_t1 + time + num_age_scaled +
participation_parent_pcq_baseline_t0 + Diagnostic_category + Ord_residencial_area + (1 | id) + (1 | Cat_site)
model_child_no_interaction: valore ~ factor + Ord_Socio-economic_status_t1 + time + num_age_scaled +
participation_parent_pcq_baseline_t0 + Diagnostic_category + Ord_residencial_area + (1 + time | id) + (1 | Cat_site)
model_child_interaction: valore ~ factor * Ord_Socio-economic_status_t1 + time + num_age_scaled +
participation_parent_pcq_baseline_t0 + Diagnostic_category + Ord_residencial_area + (1 + time | id) + (1 | Cat_site)
      npar    AIC    BIC logLik -2*log(L)  Chisq Df
model_child_base      20 6728.9 6849.6 -3344.4   6688.9
model_child_no_interaction  25 6722.4 6873.3 -3336.2   6672.4 16.457  5
model_child_interaction   37 6726.9 6950.2 -3326.4   6652.9 19.580 12
      Pr(>Chisq)
model_child_base
model_child_no_interaction  0.005654 **
model_child_interaction    0.075453 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

> # Refit with ML for comparison
> model_child_interaction_ML <- update(model_child_interaction, REML = FALSE)
> model_child_no_slope_ML <- update(model_child_no_slope, REML = FALSE)
> model_child_no_interaction_ML <- update(model_child_no_interaction, REML = FALSE)

# Now compare
> anova(model_child_no_slope_ML, model_child_interaction_ML) # Test slope
Data: CLong
Models:
model_child_no_slope_ML: valore ~ factor * Ord_Socio-economic_status_t1 + time + num_age_scaled +
participation_parent_pcq_baseline_t0 + Diagnostic_category + Ord_residencial_area + (1 | id) + (1 | Cat_site)
model_child_interaction_ML: valore ~ factor * Ord_Socio-economic_status_t1 + time + num_age_scaled +
participation_parent_pcq_baseline_t0 + Diagnostic_category + Ord_residencial_area + (1 + time | id) + (1 | Cat_site)
      npar    AIC    BIC logLik -2*log(L)  Chisq Df
model_child_no_slope_ML  32 6733.6 6926.8 -3334.8   6669.6
model_child_interaction_ML 37 6726.8 6950.2 -3326.4   6652.8 16.793  5
      Pr(>Chisq)
model_child_no_slope_ML
model_child_interaction_ML  0.004909 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

> anova(model_child_base_ML, model_child_no_interaction_ML, model_child_interaction_ML) # Test interaction
Data: CLong
Models:

```

```

model_child_base_ML: valore ~ factor + Ord_Socio-economic_status_t1 + time + num_age_scaled
+ participation_parent_pcq_baseline_t0 + Diagnostic_category + Ord_residencial_area + (1 | id) + (1 | Cat_site)
model_child_no_interaction_ML: valore ~ factor + Ord_Socio-economic_status_t1 + time + num_age_scaled + participation_parent_pcq_baseline_t0 +
Diagnostic_category + Ord_residencial_area + (1 + time | id) + (1 | Cat_site)
model_child_interaction_ML: valore ~ factor * Ord_Socio-economic_status_t1 + time + num_age_scaled
+ participation_parent_pcq_baseline_t0 + Diagnostic_category + Ord_residencial_area + (1 + time | id) + (1 | Cat_site)

```

	npar	AIC	BIC	logLik	-2*log(L)	Chisq	Df
model_child_base_ML	20	6728.9	6849.6	-3344.4	6688.9		
model_child_no_interaction_ML	25	6722.4	6873.3	-3336.2	6672.4	16.457	5
model_child_interaction_ML	37	6726.8	6950.2	-3326.4	6652.8	19.595	12

```

Pr(>Chisq)

model_child_base_ML
model_child_no_interaction_ML 0.005654 **
model_child_interaction_ML    0.075151 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>

```