

Double burdened yet resilient: quality of life of caregivers of people with x-linked hypophosphatemia

Supplementary documentation

Table S1. CarGOQoL domains, items and item reversion for scoring purposes (do not use without permission).

Domain	Item	Item reversion
Psychological well-being	Been worried, anxious?	Yes
	Been sad, depressed?	Yes
	Been emotionally tired, worn out?	Yes
	Been stressed?	Yes
Burden	Felt a lack of freedom?	Yes
	Been bothered by the feeling of being confined?	Yes
	Been bothered by the fact that your life was entirely devoted to the care recipient?	Yes
	Been embarrassed to be the only person to provide assistance?	Yes
Relationship with health care	Been satisfied with information given by health care providers (doctors, nurses...)?	No
	Been reassured by the health care providers (doctors, nurses...)?	No
	Felt that your role as caregiver was recognized by health care providers (doctors, nurses...)?	No
Administration and finances	Had financial difficulties (lodging, transportation...)?	Yes
	Had other difficulties (lodging, transportation...)?	Yes
	Encountered difficulties in the administrative process (health insurance paperwork and other paperwork related to the cancer illness)? *	Yes
Coping	Experienced feelings of guilt?	Yes
	Been bothered by a feeling of helplessness against disease?	Yes
	Felt a feeling of injustice, anger, or rebellion?	Yes
Physical well-being	Had sleeping difficulties?	Yes
	Had problems with your appetite?	Yes
	Been physically tired, worn out?	Yes
	Had the impression that your health was fragile?	Yes
Self-Esteem	Felt you made a difference for the person you are helping?	No
	Felt useful?	No
Leisure	Could rest, relax?	No
	Could take care of yourself, pay attention to your own health?	No
Social support	Been assisted, supported, understood by your family?	No
	Been assisted, supported, understood by your friends?	No
Private Life	Had difficulties in your intimate, emotional life?	Yes
	Had a satisfying love and sexual life?	No

*: the reference to “cancer” on this question was replaced by “rare disease” to capture the difficulties encountered on paperwork related to XLH.

Table S2. Summary statistics of CarGOQoL domain scores for caregivers

Domain	Min	Mean	Median	IQR	Max
Psychological well-being	0.00	46.15	43.75	50.00	100.00
Burden	18.75	74.52	81.25	31.25	100.00
Relationship with health care	0.00	48.72	41.67	16.67	100.00
Administration and finances	25.00	73.08	75.00	50.00	100.00
Coping	0.00	56.41	66.67	41.67	100.00
Physical well-being	12.50	52.40	37.50	62.50	100.00
Self-Esteem	50.00	65.38	62.50	25.00	100.00
Leisure	12.50	39.42	37.50	25.00	75.00
Social support	12.50	54.81	50.00	50.00	100.00
Private life	0.00	35.58	37.50	37.50	87.50
Overall Score - QoL	32.92	54.65	49.58	18.75	82.92

Checking for linear regression assumptions

To assess the linearity between the response variable and each continuous covariate, scatter plots were generated, with categorical variables converted into numerical form to visualize linear relationships. The assumption of homoscedasticity (constant variance of residuals across levels of the independent variables) was evaluated by plotting the residuals against the fitted values. The assumption was satisfied if no discernible pattern appeared in this plot. To test the normality of the residuals, a Q-Q plot was used. The normality assumption was considered met if the points closely followed the diagonal reference line on the Q-Q plot.

Figure S1 – Histogram and density plot of CarGOQoL overall score for XLH caregivers

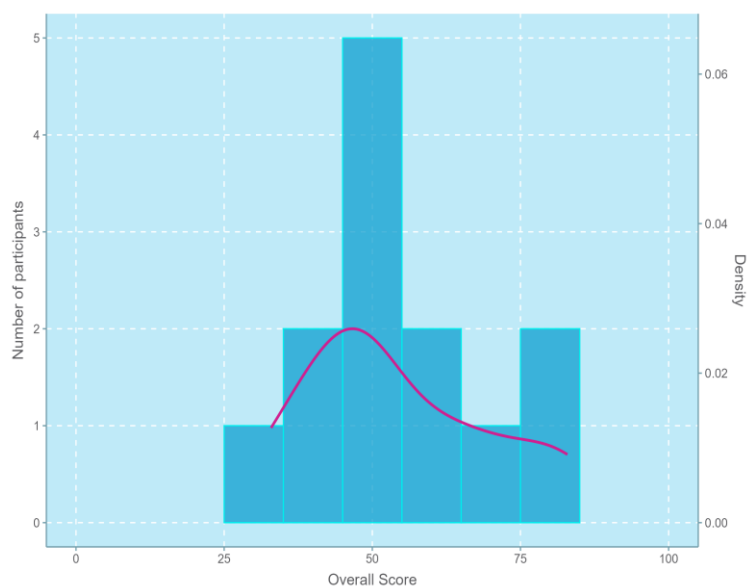


Table S3. Results of univariate linear regression models with CarGOQoL overall score as response variable

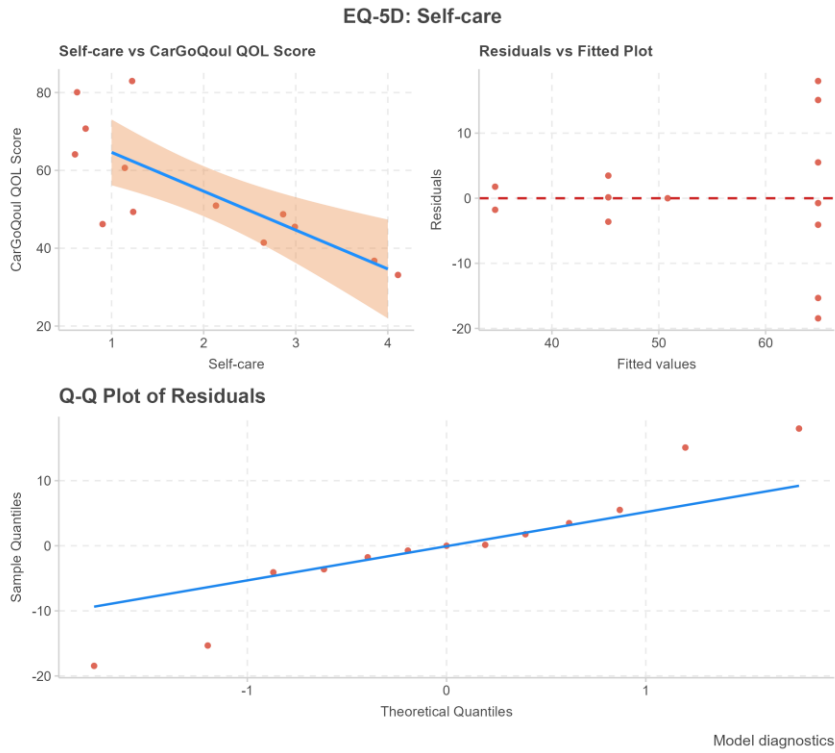
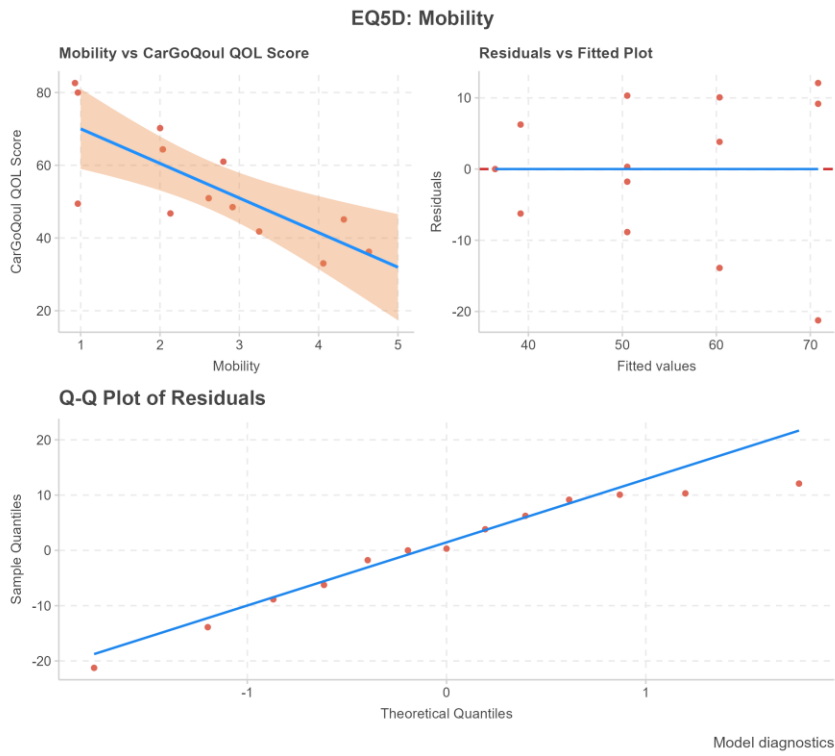
Predictor variable	Estimate (β)	Standard error	t-value	Pr(> t)	Adjusted R-squared
EQ-5D index	30.749	5.727	5.369	0.000 ***	0.699
Age	-0.089	0.487	-0.183	0.858	-0.088
Female gender	27.465	15.122	1.816	0.097	0.161

Significance codes: 0 "****" 0.001 "***" 0.01 "**" 0.05 "." 0.1 " " 1

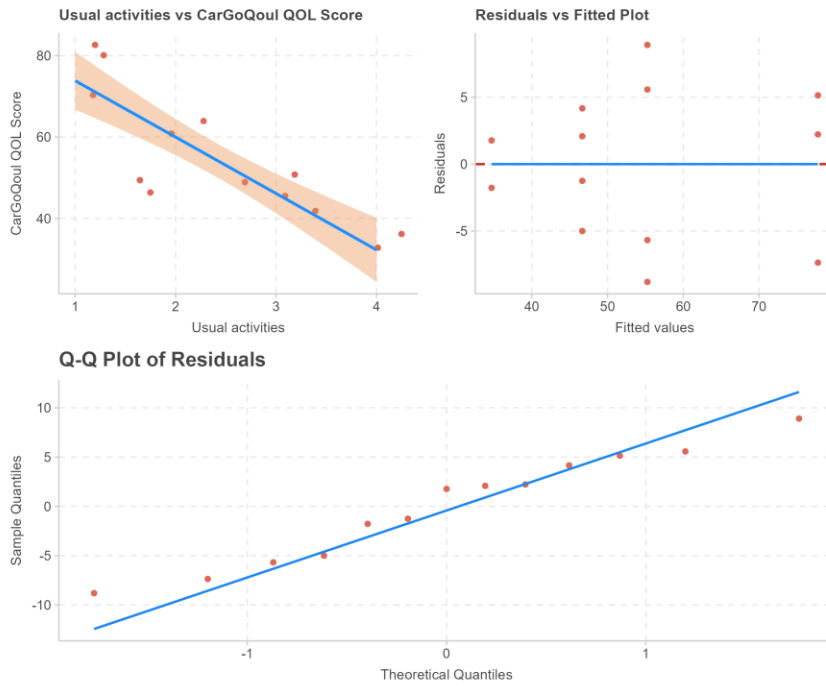
Predictor variable	Estimate (β)	Standard error	t-value	Pr(> t)	Adjusted R-squared	Significance F
Mobility (Reference level = No problem)					0.376	0.100
Slight problems	-10.486	10.233	-1.025	0.335		
Moderate problems	-20.313	9.572	-2.122	0.067		
Severe problems	-31.667	11.441	-2.768	0.024 *		
Unable	-34.375	14.472	-2.375	0.045 *		
Self-care (Reference level = No problem)					0.467	0.034
Slight problems	-14.077	12.376	-1.137	0.285		
Moderate problems	-19.633	7.989	-2.458	0.036 *		
Severe problems	-30.223	9.282	-3.256	0.010 **		
Usual activities (Reference level = No problem)					0.841	<0.001
Slight problems	-22.517	4.831	-4.661	0.001 ***		
Moderate problems	-31.111	4.831	-6.439	0.000 ***		
Severe problems	-43.09	5.775	-7.462	0.000 ***		
Pain / Discomfort (Reference level = No problem)					0.888	<0.001
Slight problems	-19.583	4.332	-4.521	0.002 ***		
Moderate problems	-29.097	4.332	-6.717	0.000 ***		
Severe problems	-34.236	4.843	-7.069	0.000 ***		
Extreme problems	-43.09	4.843	-8.897	0.000 ***		
Anxiety / Depression (Reference level = No problem)					0.466	0.057
Slight problems	-6.563	12.956	-0.507	0.626		
Moderate problems	-22.135	8.194	-2.702	0.027 *		
Severe problems	-30.66	8.85	-3.464	0.009 **		

Significance codes: 0 "****" 0.001 "***" 0.01 "**" 0.05 "." 0.1 " " 1

Figure S2. Model diagnostics for univariate regressions with CarGOQoL overall score as response variable

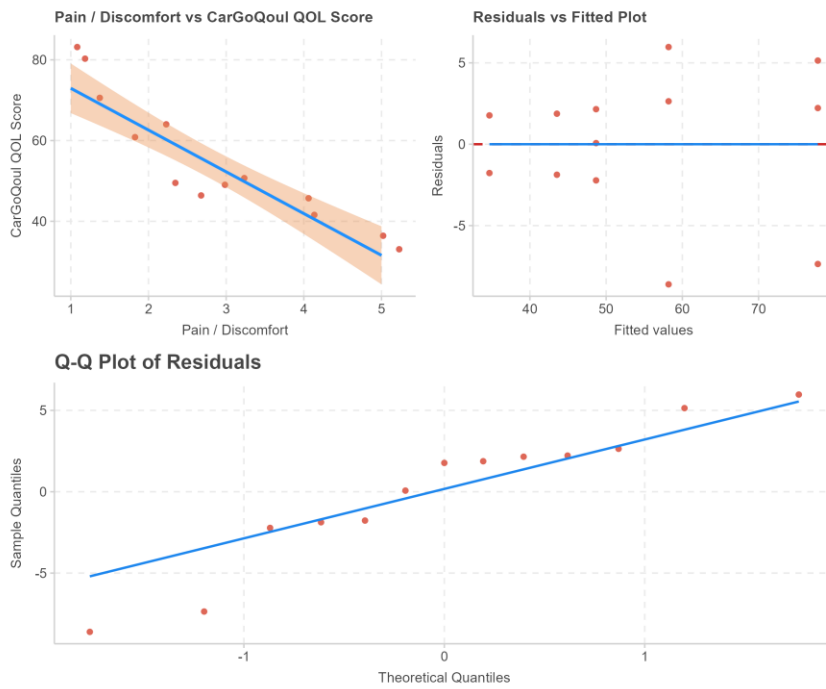


EQ-5D: Usual activities



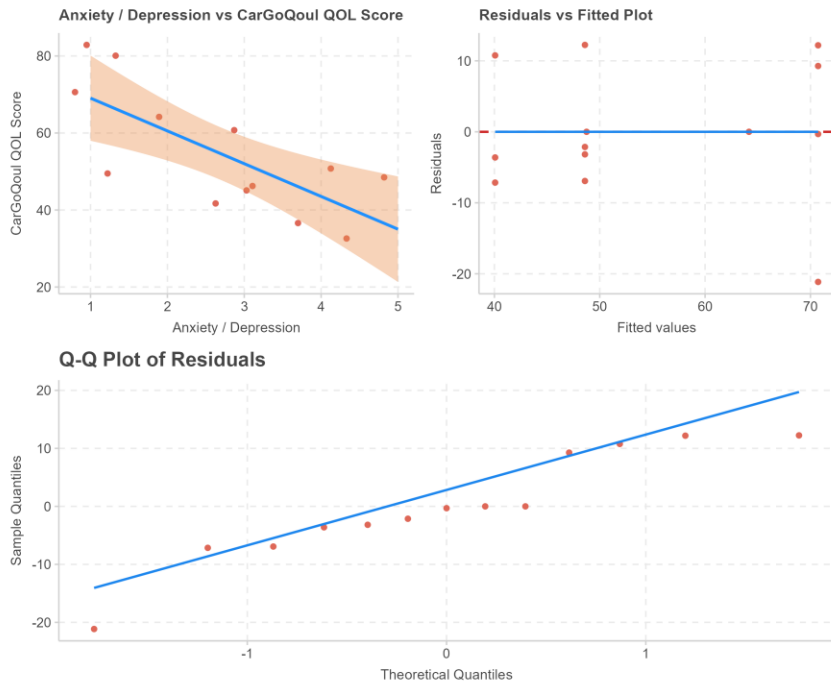
Model diagnostics

EQ-5D: Pain / Discomfort



Model diagnostics

EQ-5D: Anxiety / Depression



Model diagnostics

Table S4. Characteristics of participant caregivers and matched non-caregivers

Variable	Caregivers (n=13)		Matched non-caregivers (n=13)		P-value	Statistical Test
	n	%	n	%		
Gender					>0.999	Fisher's Exact Test
Female	12	92.31	12	92.31		
Age					0.898	Mann-Whitney U Test
Median (IQR)	44.92 (12)		44.46 (8)			
Ethnicity					0.618	Fisher's Exact Test
English / Welsh / Scottish / Northern Irish / British	6	46.15	11	84.62		
Other	2	15.38	2	15.38		
Missing	5	38.46				
Index of multiple deprivation (quintile)					0.823	Mann-Whitney U Test
1 (most deprived)	1	7.69	1	7.69		
2			4	30.77		
3	6	46.15				
4	3	23.08	4	30.77		
5 (least deprived)	2	15.38	4	30.77		
Missing	1	7.69				
Region					0.510	Fisher's Exact Test
East Midlands	1	7.69	1	7.69		
East of England	1	7.69				
London	2	15.38	3	23.08		
North West			3	23.08		
South East	2	15.38	4	30.77		
South West	2	15.38				
West Midlands	1	7.69				
Yorkshire and The Humber	2	15.38	1	7.69		
Wales	1	7.69	1	7.69		
Channel Islands	1	7.69				
First symptom at date of birth					0.201	Fisher's Exact Test
Yes	6	46.15	2	15.38		
No	7	53.85	11	84.62		
Symptoms and co-morbidities						
Abdominal pain	6	46.15	2	16.67	0.202	Fisher's Exact Test
Abnormal heart	2	15.38	-	-	-	-
Diabetes	2	15.38	1	8.33	>0.999	Fisher's Exact Test
Missing	1	7.69				
Count of symptoms and co-morbidities (per patient)					0.844	Fisher's Exact Test
0 - 5	2	15.38	3	23.08		
6 - 10	3	23.08	5	38.46		
11 - 15	4	30.77	2	15.38		
16 - 20	2	15.38	2	15.38		
21+	2	15.38	1	7.69		
Mean	14.62		12.31			
Median (IQR)	11 (9)		10(8)			

Table S5. Summary statistics of EQ-5D for non-caregivers

	No problem	Slight problems	Moderate problems	Severe problems	Extreme problems / Unable
Dimension	n (%)				
Mobility	1 (7.69%)	3 (23.08%)	4 (30.77%)	5 (38.46%)	0 (0%)
Self-care	4 (30.77%)	3 (23.08%)	4 (30.77%)	1 (7.69%)	1 (7.69%)
Usual activities	2 (15.38%)	3 (23.08%)	5 (38.46%)	2 (15.38%)	1 (7.69%)
Pain / Discomfort	0 (0%)	2 (15.38%)	4 (30.77%)	5 (38.46%)	2 (15.38%)
Anxiety / Depression	2 (15.38%)	6 (46.15%)	2 (15.38%)	2 (15.38%)	1 (7.69%)