

## Appendix I. Exploration of Linear and Alternative Regression Models for WOMAC Knee Pain

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## APPENDIX I: Exploration of Linear and Alternative Regression Models for WOMAC knee pain

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One challenge encountered in this project was related to distribution of the 1-year WOMAC scores. We realized that the follow-up WOMAC Pain scores at 1-year (or closest visit to 1-year) were right skewed with most subjects having low scores (less pain). In addition to looking at linear regression models as planned, we also explored using general linear mixed models assuming the outcome had either a negative binomial model (with the outcome rounded to integer values of 0 to 100) or a beta distribution (outcome was rescaled as .01 to 0.99 with 0 equal to .01 and 1 equal to 0.99)

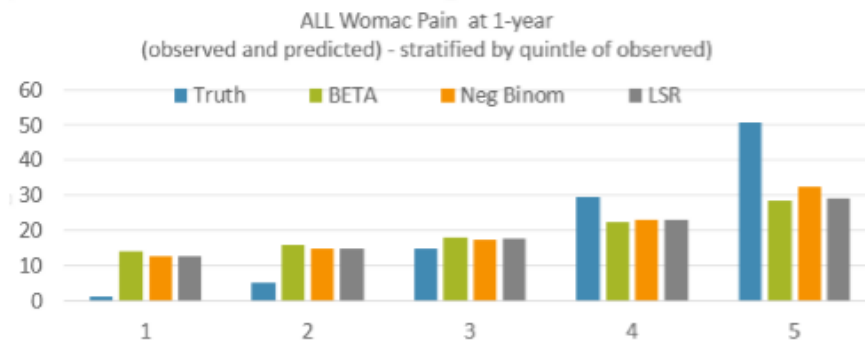
We then ranked the true 1-year WOMAC pain outcome by quintile, and compared observed mean WOMAC pain and predicted WOMAC pain (from each model) to see if we might improve our predictions using a non-linear regression model.

The next page shows some preliminary models that were run on the pooled MOST and OAI databases and plots of predicted values. After reviewing these results, we opted to continue using linear regression for this project, as neither of the alternatives we explored appeared much better than the simpler and pre-planned approach using linear regression.

Model P1: Pain outcome at 1 year – OAI and MOST Pooled - Explore different forms of model – Linear Regression vs. Negative binomial vs. Beta Distribution

1) Look at P1 Model for 1-year pain (3 different underlying distributions)															
P1: LEAST SQUARE REGRESSION LINEAR MODEL						P1: RE-ESTIMATE COEFF FOR NEGATIVE BINOMIAL MODEL (Outcome rounded to integer 0 to 100)					P1: RE-ESTIMATE COEFF FOR BETA DISTRIBUTION Outcome divided by 100 so scaled as 0 to 100 [0-->.01, 1-->.99] (GLIMMIX: ** caveat...to compute				
Parameter (X)	Estimate (B)	Std Error	95% Confidence Limits		Pr >  t	Estimate	Std Error	95% Confidence Limits		Pr >  t	Estimate	Std Error	95% Confidence Limits		Pr >  t
intercept	-2.99	4.04	-10.95	4.97	0.4597	1.67	0.34	1.00	2.35	<.0001	-2.53	0.24	-3.00	-2.05	<.0001
hadtkr	-5.00	2.77	-10.44	0.44	0.0718	-0.92	0.26	-1.44	-0.41	0.0005	-0.37	0.16	-0.69	-0.06	0.0214
xwomkp	0.42	0.04	0.33	0.50	<.0001	0.02	0.00	0.01	0.03	<.0001	0.02	0.00	0.01	0.02	<.0001
HOMUNC100	0.11	0.05	0.02	0.20	0.0155	0.01	0.00	0.00	0.01	0.1366	0.01	0.00	0.00	0.01	0.0098
xhip01	2.00	1.80	-1.55	5.54	0.2694	0.08	0.15	-0.21	0.38	0.5720	0.13	0.10	-0.07	0.33	0.2035
l_xwomkp	-0.18	0.06	-0.30	-0.06	0.0026	0.01	0.01	0.00	0.02	0.2286	-0.01	0.00	-0.01	0.00	0.0174
l_xhip01	-3.82	2.29	-8.31	0.66	0.0948	-0.27	0.20	-0.67	0.13	0.1912	-0.22	0.14	-0.48	0.05	0.1050
xage_u60	4.44	1.41	1.67	7.22	0.0017	0.25	0.13	0.00	0.49	0.0517	0.19	0.08	0.03	0.35	0.0175
xbmi	0.22	0.12	-0.01	0.46	0.0628	0.02	0.01	0.00	0.03	0.1135	0.01	0.01	0.00	0.02	0.1983
xcontra_womkp	0.13	0.04	0.06	0.21	0.0006	0.01	0.00	0.00	0.01	0.0153	0.01	0.00	0.00	0.01	0.0015
PREDICTED VALUE	XBETA = B0+(B1*x1)+(B2*x2)...					EXP(XBETA)					100*EXP(XBETA)/(1+EXP(XBETA))				
Avg Adj R-SQ	0.32														
R-SQ range	0.31-0.33														
Spear Rank Corr ^2	0.55758					0.54842					0.55799				
Rank Corr ^2	0.3109					0.30076					0.31135				

Calibration Plots –  
Sorted by Quintile of  
**OBSERVED** 1-year  
(Womac Pain)  
outcome



Calibration Plots – Sorted by QUINTILE of **PREDICTED** value (overall, and separately by TKR and non-TKR)

