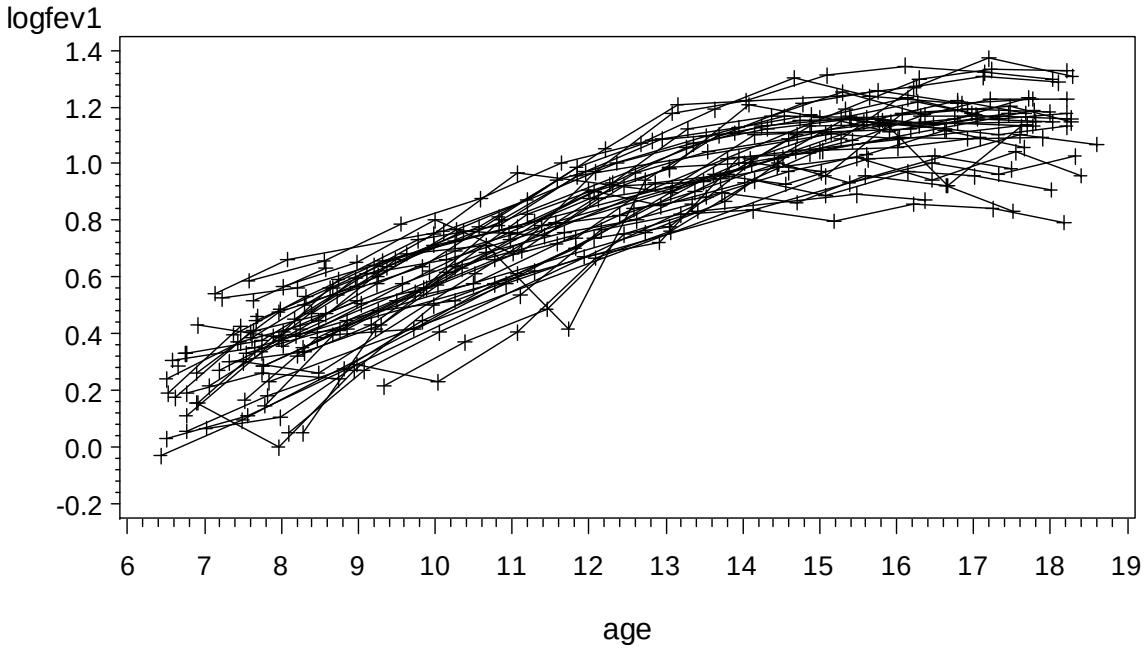
# Subject-specific observed profiles of log(fev1) vs age

**First 50 subjects in Six Cities Study**



With random subject-specific intercepts

The Mixed Procedure

Model Information

| | |
|---|---|
| Data Set | WORK.FEV |
| Dependent Variable | logfev1 |
| Covariance Structure | Unstructured |
| Subject Effect | id |
| Estimation Method | ML |
| Residual Variance Method | Profile |
| Fixed Effects SE Method | Model-Based |
| Degrees of Freedom Method | Containment |

Class Level Information

| Class | Levels | Values |
|---|---|---|
| id | 299 | not printed |

Dimensions

| | |
|---|---|
| Covariance Parameters | 2 |
| Columns in X | 3 |
| Columns in Z Per Subject | 1 |
| Subjects | 299 |
| Max Obs Per Subject | 12 |

Number of Observations

| | |
|---|---|
| Number of Observations Read | 1993 |
| Number of Observations Used | 1993 |
| Number of Observations Not Used | 0 |

Iteration History

| Iteration | Evaluations | -2 Log Like | Criterion |
|---|---|---|---|
| 0 | 1 | -2024.23711896 | |
| 1 | 2 | -3985.32127682 | 0.00021849 |
| 2 | 1 | -3986.22690484 | 0.00000430 |
| 3 | 1 | -3986.24355839 | 0.00000000 |

Convergence criteria met.

The Mixed Procedure

Covariance Parameter Estimates

| Cov Parm | Subject | Estimate | Standard Error | Z Value | Pr > Z |
|---|---|---|---|---|---|
| UN(1,1) | id | 0.01674 | 0.001480 | 11.31 | <.0001 |
| Residual | | 0.005141 | 0.000177 | 29.13 | <.0001 |

Fit Statistics

| | |
|---|---|
| -2 Log Likelihood | -3986.2 |
| AIC (smaller is better) | -3976.2 |
| AICC (smaller is better) | -3976.2 |
| BIC (smaller is better) | -3957.7 |

Null Model Likelihood Ratio Test

| DF | Chi-Square | Pr > ChiSq |
|---|---|---|
| 1 | 1962.01 | <.0001 |

Solution for Fixed Effects

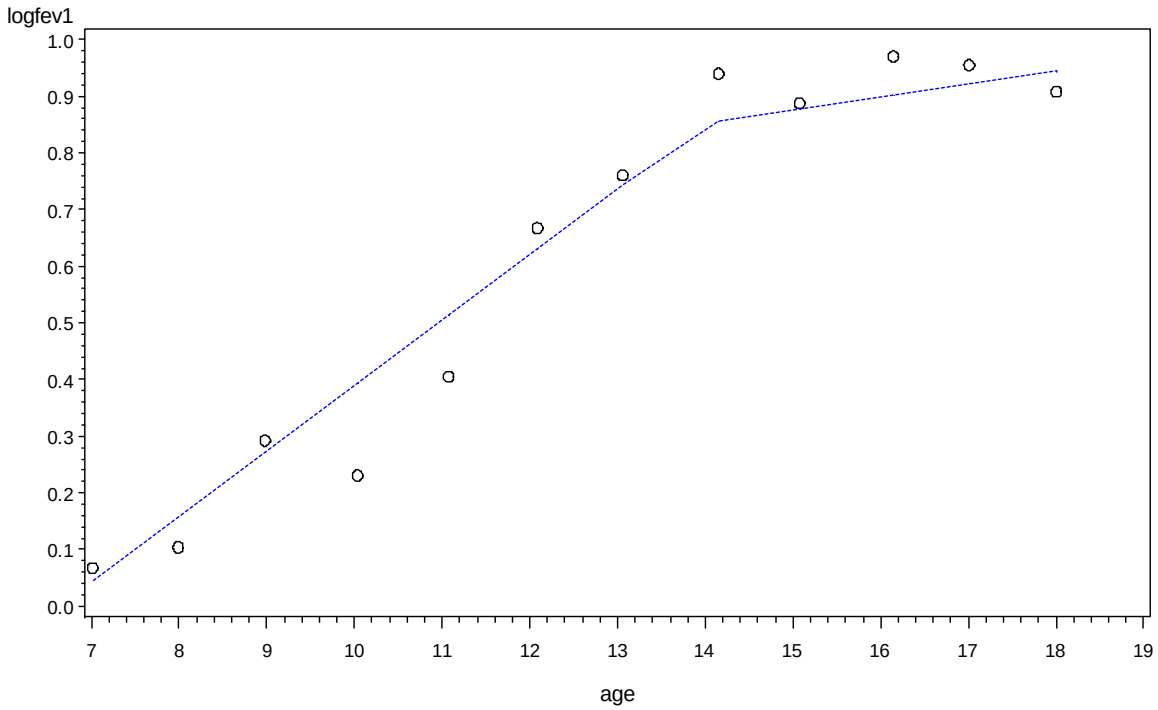
| Effect | Estimate | Standard Error | DF | t Value | Pr > \|t\| |
|---|---|---|---|---|---|
| Intercept | -0.5627 | 0.01225 | 298 | -45.92 | <.0001 |
| age | 0.1154 | 0.000890 | 1692 | 129.70 | <.0001 |
| age14Oplus | -0.09219 | 0.002217 | 1692 | -41.58 | <.0001 |

Type 3 Tests of Fixed Effects

| Effect | Num DF | Den DF | Chi-Square | F Value | Pr > ChiSq | Pr > F |
|---|---|---|---|---|---|---|
| age | 1 | 1692 | 16822.0 | 16822.0 | <.0001 | <.0001 |
| age14Oplus | 1 | 1692 | 1729.14 | 1729.14 | <.0001 | <.0001 |

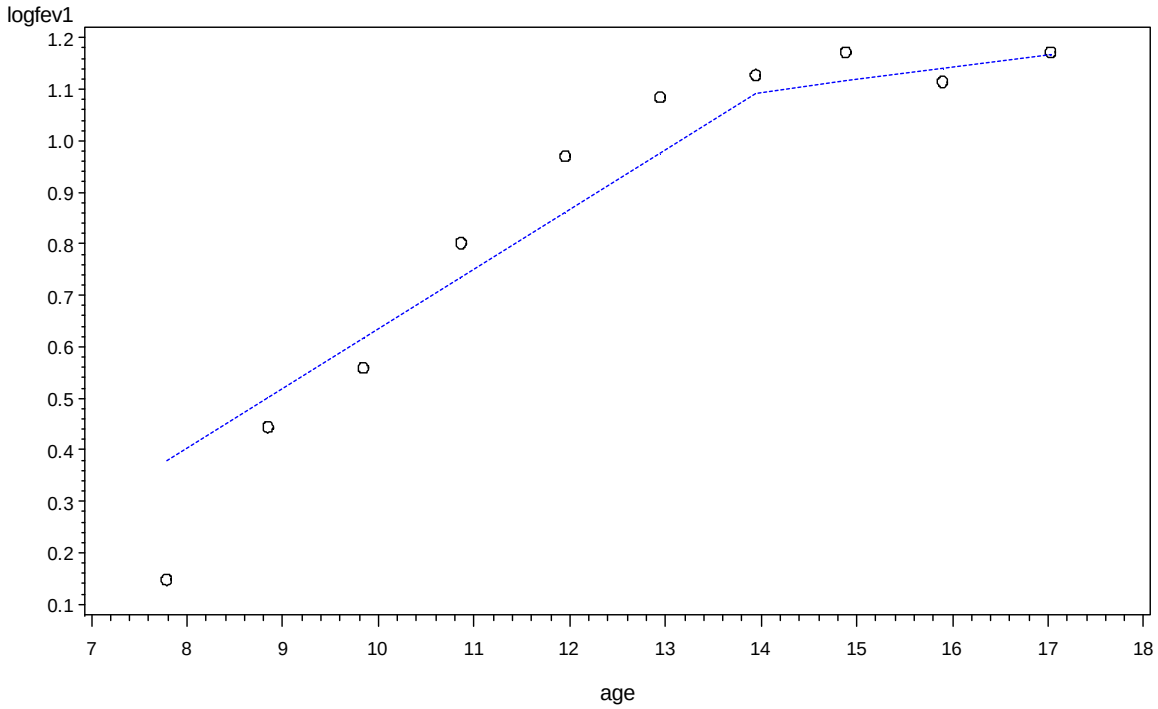
# Plot of observed and predicted logfev1 vs age curve - model 1

**Subject number 35**



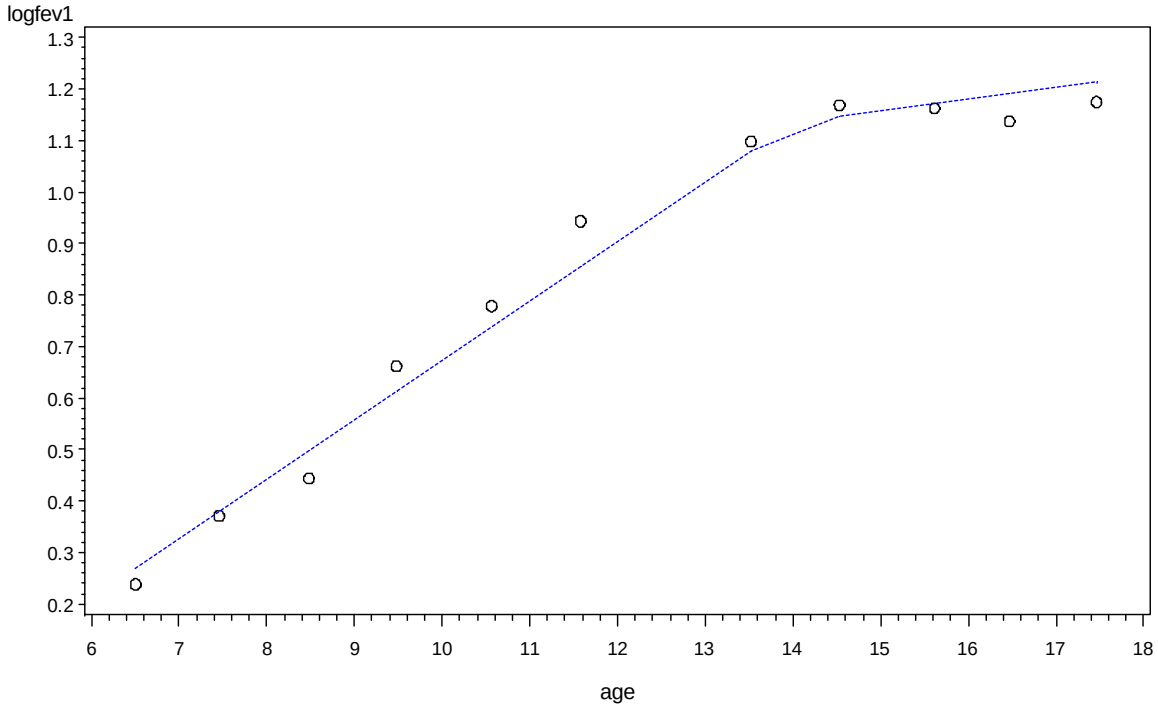

# Plot of observed and predicted logfev1 vs age curve - model 1

**Subject number 10**



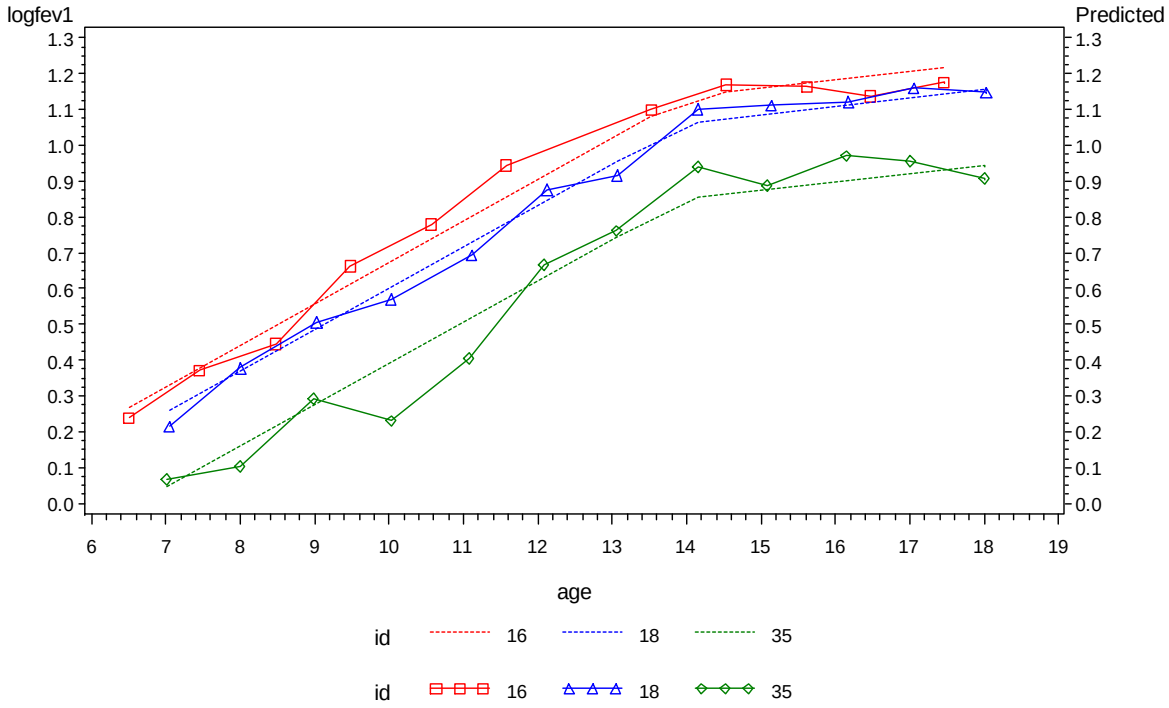
# Plot of observed and predicted logfev1 vs age curve - model 1

**Subject number 16**




# Plot of observed and predicted logfev1 vs age curve - model 1

**Subject numbers 16, 18, 35**



The Mixed Procedure

Model Information

| | |
|---|---|
| Data Set | WORK.FEV |
| Dependent Variable | logfev1 |
| Covariance Structure | Unstructured |
| Subject Effect | id |
| Estimation Method | ML |
| Residual Variance Method | Profile |
| Fixed Effects SE Method | Model-Based |
| Degrees of Freedom Method | Containment |

Class Level Information

| Class | Levels | Values |
|---|---|---|
| id | 299 | not printed |

Dimensions

| | |
|---|---|
| Covariance Parameters | 7 |
| Columns in X | 3 |
| Columns in Z Per Subject | 3 |
| Subjects | 299 |
| Max Obs Per Subject | 12 |

Number of Observations

| | |
|---|---|
| Number of Observations Read | 1993 |
| Number of Observations Used | 1993 |
| Number of Observations Not Used | 0 |

Iteration History

| Iteration | Evaluations | -2 Log Like | Criterion |
|---|---|---|---|
| 0 | 1 | -2024.23711896 | |
| 1 | 3 | -4206.67859916 | 0.00085828 |
| 2 | 1 | -4210.49464582 | 0.00004820 |
| 3 | 1 | -4210.69266050 | 0.00000025 |
| 4 | 1 | -4210.69363995 | 0.00000000 |

Convergence criteria met.

The Mixed Procedure

Covariance Parameter Estimates

| Cov Parm | Subject | Estimate | Standard Error | Z Value | Pr Z |
|---|---|---|---|---|---|
| UN(1,1) | id | 0.03116 | 0.004544 | 6.86 | <.0001 |
| UN(2,1) | id | -0.00156 | 0.000339 | -4.62 | <.0001 |
| UN(2,2) | id | 0.000178 | 0.000031 | 5.68 | <.0001 |
| UN(3,1) | id | 0.001394 | 0.000727 | 1.92 | 0.0553 |
| UN(3,2) | id | -0.00031 | 0.000070 | -4.44 | <.0001 |
| UN(3,3) | id | 0.001071 | 0.000203 | 5.27 | <.0001 |
| Residual | | 0.003606 | 0.000141 | 25.51 | <.0001 |

Fit Statistics

| | |
|---|---|
| -2 Log Likelihood | -4210.7 |
| AIC (smaller is better) | -4190.7 |
| AICC (smaller is better) | -4190.6 |
| BIC (smaller is better) | -4153.7 |

Null Model Likelihood Ratio Test

| DF | Chi-Square | Pr > ChiSq |
|---|---|---|
| 6 | 2186.46 | <.0001 |

Solution for Fixed Effects

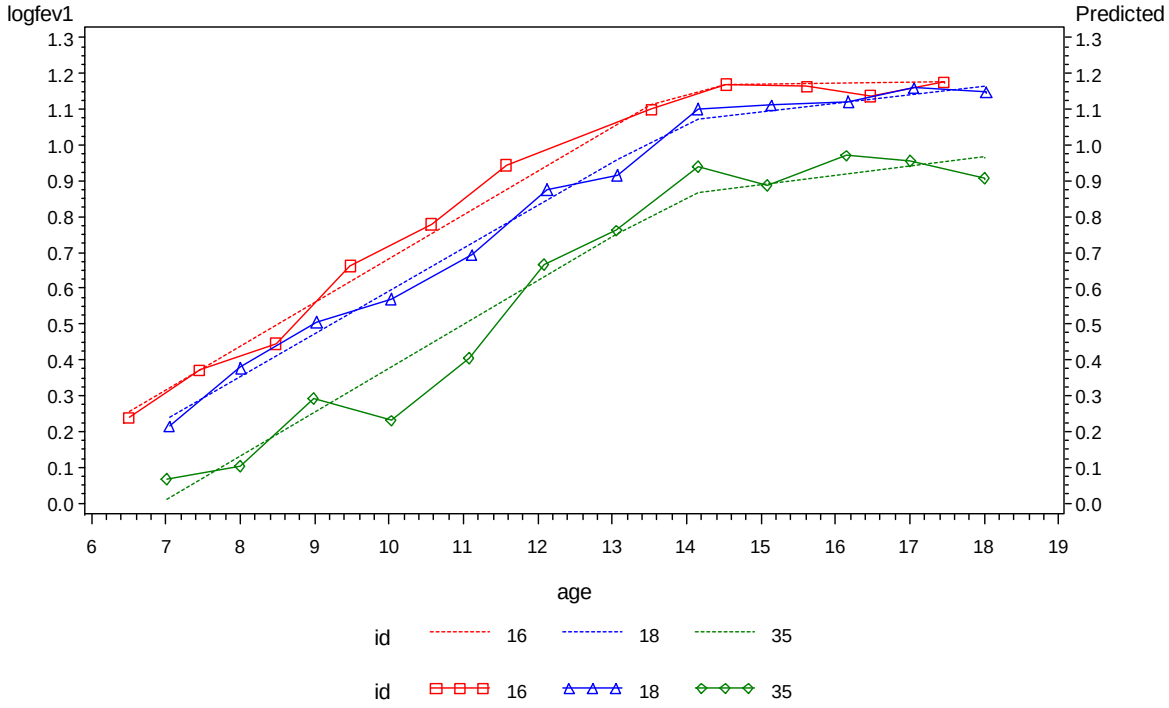
| Effect | Estimate | Standard Error | DF | t Value | Pr > \|t\| |
|---|---|---|---|---|---|
| Intercept | -0.5691 | 0.01417 | 298 | -40.16 | <.0001 |
| age | 0.1159 | 0.001212 | 251 | 95.62 | <.0001 |
| age14Oplus | -0.09152 | 0.003044 | 203 | -30.06 | <.0001 |

Type 3 Tests of Fixed Effects

| Effect | Num DF | Den DF | Chi-Square | F Value | Pr > ChiSq | Pr > F |
|---|---|---|---|---|---|---|
| age | 1 | 251 | 9142.45 | 9142.45 | <.0001 | <.0001 |
| age14Oplus | 1 | 203 | 903.71 | 903.71 | <.0001 | <.0001 |

# Plot of observed and predicted logfev1 vs age curve - model 2

**Subject numbers 16, 18, 35**




Fit statistics for different knot locations based on model 2 5

| Obs | Descr | value130 | value135 | value140 | value145 | value150 |
|---|---|---|---|---|---|---|
| 1 | -2 Log Likelihood | -4044.5 | -4151.8 | -4210.7 | -4198.3 | -4117.1 |
| 2 | AIC (smaller is better) | -4024.5 | -4131.8 | -4190.7 | -4178.3 | -4097.1 |
| 3 | AICC (smaller is better) | -4024.4 | -4131.7 | -4190.6 | -4178.2 | -4097.0 |
| 4 | BIC (smaller is better) | -3987.5 | -4094.8 | -4153.7 | -4141.3 | -4060.1 |

The Mixed Procedure

Model Information

| | |
|---|---|
| Data Set | WORK.FEV |
| Dependent Variable | logfev1 |
| Covariance Structure | Unstructured |
| Subject Effect | id |
| Estimation Method | ML |
| Residual Variance Method | Profile |
| Fixed Effects SE Method | Model-Based |
| Degrees of Freedom Method | Containment |

Class Level Information

| Class | Levels | Values |
|---|---|---|
| id | 299 | not printed |

Dimensions

| | |
|---|---|
| Covariance Parameters | 7 |
| Columns in X | 6 |
| Columns in Z Per Subject | 3 |
| Subjects | 299 |
| Max Obs Per Subject | 12 |

Number of Observations

| | |
|---|---|
| Number of Observations Read | 1993 |
| Number of Observations Used | 1993 |
| Number of Observations Not Used | 0 |

Iteration History

| Iteration | Evaluations | -2 Log Like | Criterion |
|---|---|---|---|
| 0 | 1 | -3015.96514504 | |
| 1 | 3 | -4660.56173122 | 0.00006036 |
| 2 | 1 | -4660.82668065 | 0.00000050 |
| 3 | 1 | -4660.82877180 | 0.00000000 |

Convergence criteria met.

The Mixed Procedure

Covariance Parameter Estimates

| Cov Parm | Subject | Estimate | Standard Error | Z Value | Pr Z |
|---|---|---|---|---|---|
| UN(1,1) | id | 0.01887 | 0.003336 | 5.66 | <.0001 |
| UN(2,1) | id | -0.00126 | 0.000285 | -4.43 | <.0001 |
| UN(2,2) | id | 0.000147 | 0.000028 | 5.32 | <.0001 |
| UN(3,1) | id | 0.001792 | 0.000545 | 3.29 | 0.0010 |
| UN(3,2) | id | -0.00023 | 0.000053 | -4.28 | <.0001 |
| UN(3,3) | id | 0.000493 | 0.000127 | 3.89 | <.0001 |
| Residual | | 0.003304 | 0.000130 | 25.47 | <.0001 |

Fit Statistics

| | |
|---|---|
| -2 Log Likelihood | -4660.8 |
| AIC (smaller is better) | -4634.8 |
| AICC (smaller is better) | -4634.6 |
| BIC (smaller is better) | -4586.7 |

Null Model Likelihood Ratio Test

| DF | Chi-Square | Pr > ChiSq |
|---|---|---|
| 6 | 1644.86 | <.0001 |

Solution for Fixed Effects

| Effect | Estimate | Standard Error | DF | t Value | Pr > \|t\| |
|---|---|---|---|---|---|
| Intercept | -0.2934 | 0.03844 | 297 | -7.63 | <.0001 |
| age | 0.04124 | 0.004218 | 251 | 9.78 | <.0001 |
| age14Oplus | -0.01951 | 0.004672 | 203 | -4.18 | <.0001 |
| baseage | -0.03107 | 0.008196 | 1236 | -3.79 | 0.0002 |
| loght | 1.8323 | 0.09968 | 1236 | 18.38 | <.0001 |
| logbht | 0.5343 | 0.1647 | 1236 | 3.24 | 0.0012 |

Type 3 Tests of Fixed Effects

| Effect | Num DF | Den DF | Chi-Square | F Value | Pr > ChiSq | Pr > F |
|---|---|---|---|---|---|---|
| age | 1 | 251 | 95.59 | 95.59 | <.0001 | <.0001 |
| age14Oplus | 1 | 203 | 17.44 | 17.44 | <.0001 | <.0001 |
| baseage | 1 | 1236 | 14.37 | 14.37 | 0.0002 | 0.0002 |
| loght | 1 | 1236 | 337.86 | 337.86 | <.0001 | <.0001 |

The Mixed Procedure

Type 3 Tests of Fixed Effects

| Effect | Num DF | Den DF | Chi-Square | F Value | Pr > ChiSq | Pr > F |
|---|---|---|---|---|---|---|
| logbht | 1 | 1236 | 10.53 | 10.53 | 0.0012 | 0.0012 |



The Mixed Procedure

Model Information

| | |
|---|---|
| Data Set | WORK.FEV |
| Dependent Variable | logfev1 |
| Covariance Structures | Unstructured, Spatial Gaussian |
| Subject Effects | id, id |
| Estimation Method | ML |
| Residual Variance Method | Profile |
| Fixed Effects SE Method | Model-Based |
| Degrees of Freedom Method | Containment |

Class Level Information

| Class | Levels | Values |
|---|---|---|
| id | 299 | not printed |

Dimensions

| | |
|---|---|
| Covariance Parameters | 8 |
| Columns in X | 6 |
| Columns in Z Per Subject | 3 |
| Subjects | 299 |
| Max Obs Per Subject | 12 |

Number of Observations

| | |
|---|---|
| Number of Observations Read | 1993 |
| Number of Observations Used | 1993 |
| Number of Observations Not Used | 0 |

Convergence criteria met.

The Mixed Procedure

Covariance Parameter Estimates

| Cov Parm | Subject | Estimate | Standard Error | Z Value | Pr Z |
|---|---|---|---|---|---|
| UN(1,1) | id | 0.01340 | 0.003373 | 3.97 | <.0001 |
| UN(2,1) | id | -0.00076 | 0.000287 | -2.65 | 0.0081 |
| UN(2,2) | id | 0.000098 | 0.000028 | 3.53 | 0.0002 |
| UN(3,1) | id | 0.000914 | 0.000542 | 1.69 | 0.0915 |
| UN(3,2) | id | -0.00013 | 0.000053 | -2.50 | 0.0126 |
| UN(3,3) | id | 0.000200 | 0.000125 | 1.60 | 0.0550 |
| SP(GAU) | id | 0.8379 | 0.03096 | 27.07 | <.0001 |
| Residual | | 0.003849 | 0.000180 | 21.32 | <.0001 |

Fit Statistics

| | |
|---|---|
| -2 Log Likelihood | -4727.1 |
| AIC (smaller is better) | -4699.1 |
| AICC (smaller is better) | -4698.9 |
| BIC (smaller is better) | -4647.3 |

Null Model Likelihood Ratio Test

| DF | Chi-Square | Pr > ChiSq |
|---|---|---|
| 7 | 1711.16 | <.0001 |

Solution for Fixed Effects

| Effect | Estimate | Standard Error | DF | t Value | Pr > \|t\| |
|---|---|---|---|---|---|
| Intercept | -0.3013 | 0.03849 | 297 | -7.83 | <.0001 |
| age | 0.03988 | 0.004506 | 251 | 8.85 | <.0001 |
| age14Oplus | -0.01948 | 0.004886 | 203 | -3.99 | <.0001 |
| baseage | -0.02894 | 0.008353 | 1236 | -3.46 | 0.0005 |
| loght | 1.8730 | 0.1069 | 1236 | 17.52 | <.0001 |
| logbht | 0.4980 | 0.1686 | 1236 | 2.95 | 0.0032 |

Type 3 Tests of Fixed Effects

| Effect | Num DF | Den DF | Chi-Square | F Value | Pr > ChiSq | Pr > F |
|---|---|---|---|---|---|---|
| age | 1 | 251 | 78.33 | 78.33 | <.0001 | <.0001 |
| age14Oplus | 1 | 203 | 15.90 | 15.90 | <.0001 | <.0001 |
| baseage | 1 | 1236 | 12.00 | 12.00 | 0.0005 | 0.0005 |

The Mixed Procedure

Type 3 Tests of Fixed Effects

| Effect | Num DF | Den DF | Chi-Square | F Value | Pr > ChiSq | Pr > F |
|---|---|---|---|---|---|---|
| loght | 1 | 1236 | 306.95 | 306.95 | <.0001 | <.0001 |
| logbht | 1 | 1236 | 8.72 | 8.72 | 0.0031 | 0.0032 |