

*MCW Biostatistics Technical Report #68:*

*The Association between Gestational Age and 3<sup>rd</sup> Grade Standardized Reading Score*

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**Objective:** To investigate the association between Gestational Age and 3rd Grade Standardized Reading Score unadjusted and adjusted for following confounding variables – Gender, birth weight, test administration period, race, prenatal cigarette use, special education status, English, attendance and school of attendance

**Methods:** Third grade reading RIT<sup>1</sup> scores were converted to a standardized version with mean=50 and SD=10. Simple linear regression was used to evaluate the effect of being born at 37 (38) weeks vs 39 to 41 weeks on the standardized scores. Multiple linear regression was used to evaluate this effect controlling for significant confounding variables. Leave one school out (a variation of leave-one-out jackknifing approach applied to clusters of data) cross validation was used to assess the variance-covariance matrix of the regression coefficients.

**Results:** 47,925 test scores from 122 Milwaukee Public Schools were linked with birth certificate data and included in the statistical analysis. The data included test scores from years 2010 to 2015 and children born at gestational age of 37-41 weeks. Being born at 37 (38) weeks reduced the mean standardized score by 0.95193% (0.37365%) when compared to a normal term birth. After adjustment for gender, birth weight, test administration period, race, prenatal cigarette use, special education status, English learner status, attendance, schools, the score increased by 0.17057% (0.12671%). Table 1 reports variance-covariance matrix of these four regression coefficients, Table 2 reports the respective correlation and Table 3 reports parameter estimates from the adjusted model.

**Table 1. Variance-covariance matrix of regression coefficients**

	<i>AdjDiff1</i>	<i>AdjDiff2</i>	<i>UnadjDiff1</i>	<i>UnadjDiff2</i>
<i>AdjDiff1</i>	0.0467408718	0.0100610462	0.0499675797	0.0108153546
<i>AdjDiff2</i>	0.0100610462	0.0284577051	0.0123666148	0.0259803214
<i>UnadjDiff1</i>	0.0499675797	0.0123666148	0.0768166235	0.0182351035
<i>UnadjDiff2</i>	0.0108153546	0.0259803214	0.0182351035	0.0363493739

*AdjDiff1* – Adjusted difference in mean test scores between children born at 37 weeks vs normal term (39-41)

*AdjDiff2* – Adjusted difference in mean test scores between children born at 38 weeks vs normal term (39-41)

*UnadjDiff1* – Unadjusted difference in mean test scores between children born at 37 weeks vs normal term (39-41)

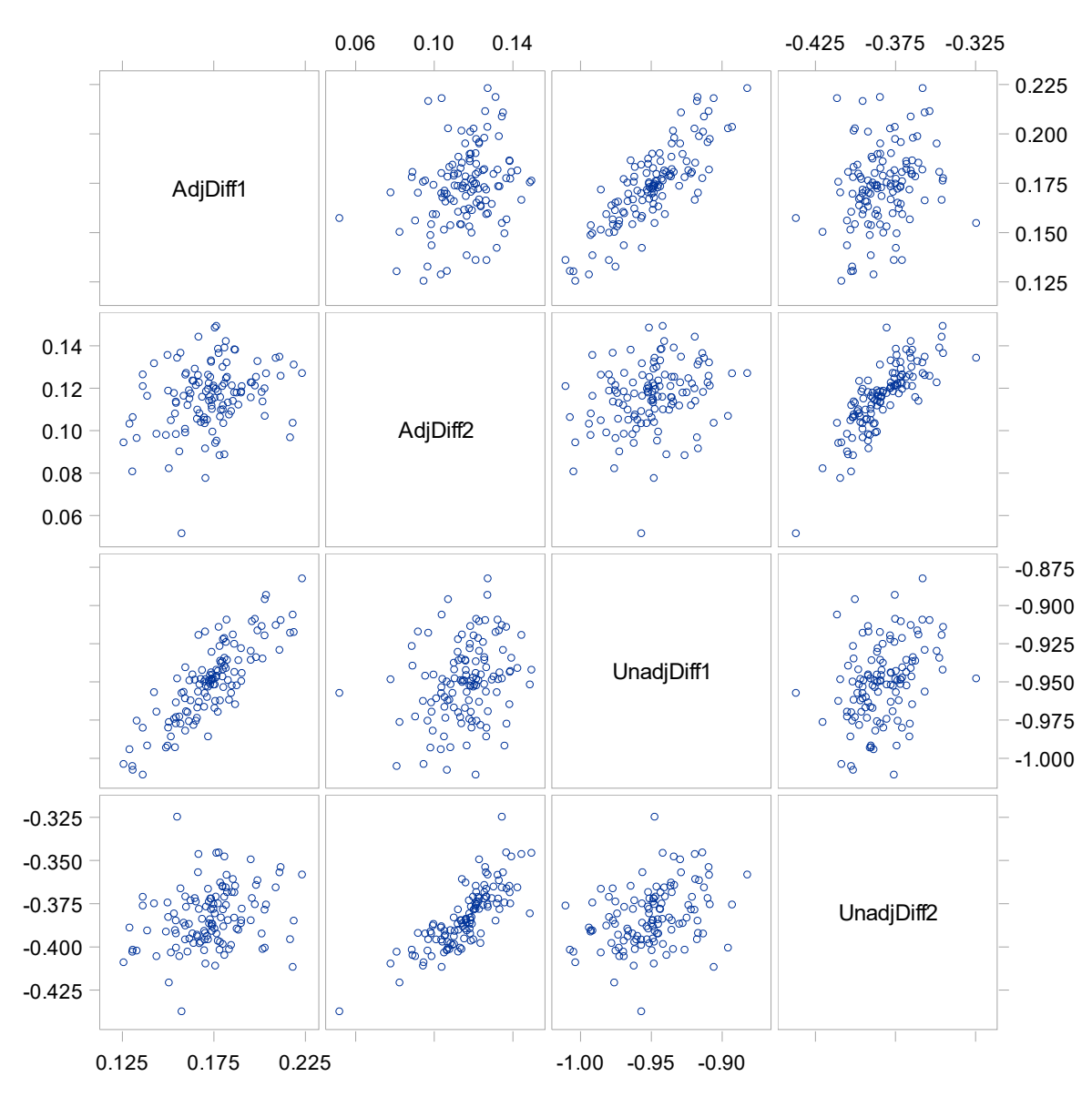
*UnadjDiff2* – Unadjusted difference in mean test scores between children born at 38 weeks vs normal term (39-41)

**Table 2. Correlation between regression coefficients**

	<i>AdjDiff1</i>	<i>AdjDiff2</i>	<i>UnadjDiff1</i>	<i>UnadjDiff2</i>
<i>AdjDiff1</i>	1.00000	0.27586	0.83390	0.26239

	<i>AdjDiff1</i>	<i>AdjDiff2</i>	<i>UnadjDiff1</i>	<i>UnadjDiff2</i>
<i>AdjDiff2</i>	0.27586	1.00000	0.26450	0.80779
<i>UnadjDiff1</i>	0.83390	0.26450	1.00000	0.34509
<i>UnadjDiff2</i>	0.26239	0.80779	0.34509	1.00000

**Figure 1. Scatterplot Matrix**



**Table 3. Parameter Estimates from Adjusted model**

<i>Parameter</i>	<i>Estimate</i>	<i>StdErr</i>	<i>DenDF</i>	<i>tValue</i>	<i>Probt</i>
Intercept	46.7653101	0.53745028	121	87.01	<.0001
Gestational Age (37 Weeks)	0.1730957	0.21476121	121	0.81	0.4218
Gestational Age (38 Weeks)	0.1157869	0.16742243	121	0.69	0.4905
Gender (Female)	1.0639309	0.11986482	121	8.88	<.0001
Birth Weight (Ounces)	0.0275857	0.00438923	121	6.28	<.0001
Test Admin Period (Fall)	-3.5706825	0.08005206	121	-44.60	<.0001
Test Admin Period (Spring)	2.2364872	0.08550699	121	26.16	<.0001
Prenatal Cigarette Use (Yes)	-1.7472376	0.23408944	121	-7.46	<.0001
Race (White)	6.5903758	0.37619563	121	17.52	<.0001
Race (Other)	2.9151862	0.35316409	121	8.25	<.0001
Special Education Status (Yes)	-9.8533498	0.24863789	121	-39.63	<.0001
English Learner Status (Yes)	-4.3566183	0.36500308	121	-11.94	<.0001
Missing Attendance Data Indicator (No)	-6.4820257	1.01287333	121	-6.40	<.0001
Attendance	0.0510579	0.00805051	121	6.34	<.0001

Reference Group: Gestational Age – 39-41 weeks, Gender – Male, Test Admin Period – Winter, Prenatal Cigarette Use – No, Race – African American, Student Special Education – No, Student English Language Learner – No, Missing Attendance - Yes

**Conclusion:** Although the gestational age was associated with reduction in test score in unadjusted analysis, the association became non-significant in the adjusted analysis controlling for the effects of other confounding variables (Table 3).

References:

1. Northwest Evaluation Association. (2011a). RIT Scale Norms Study: For Use with Measures of Academic Progress (MAP R) and MAP R for Primary Grades. Portland, OR: Author