

Appendix A to the 2014 Utah Growth Model Report

Utah Student Growth Model Fit Plots

June 2015

1 Student Growth Percentile Fit Plots

A goodness of fit plot is produced for each unique analysis run in 2014. Each analysis is defined by the grade and content area for the grade-level analyses and the unique course progression sequences for the end of course test (EOCT) subjects.

Each fit plot contains three panels. The top panel is a mosaic plot that shows the percentage of students that fall into each proficiency level, and the location of the 10th through 90th quantiles of the Student Growth Percentile (SGP) distribution represented as dashed white lines (with the exception of the solid white line for the median/50th percentile). The bottom left panel shows the empirical distribution of SGPs given prior scale score deciles in the form of a 10 by 10 cell grid. Percentages of student growth percentiles between the 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, and 90th percentiles were calculated based upon the decile of the prior year's scaled score (the total students in each for the analyses varies depending on grade and subject). Deviations from perfect fit are indicated by red and blue shading. The further above 10 the darker the red, and the further below 10 the darker the blue. A more detailed discussion about the reasons for and implications of model misfit for the various SGP analysis types can be found in the "Goodness of Fit" section of the 2014 Utah Student Growth Model report. The bottom right panel of each plot is a Q-Q plot which compares the observed distribution of SGPs with the theoretical (uniform) distribution.

2 SAGE Grade-Level Plots

2.1 ELA

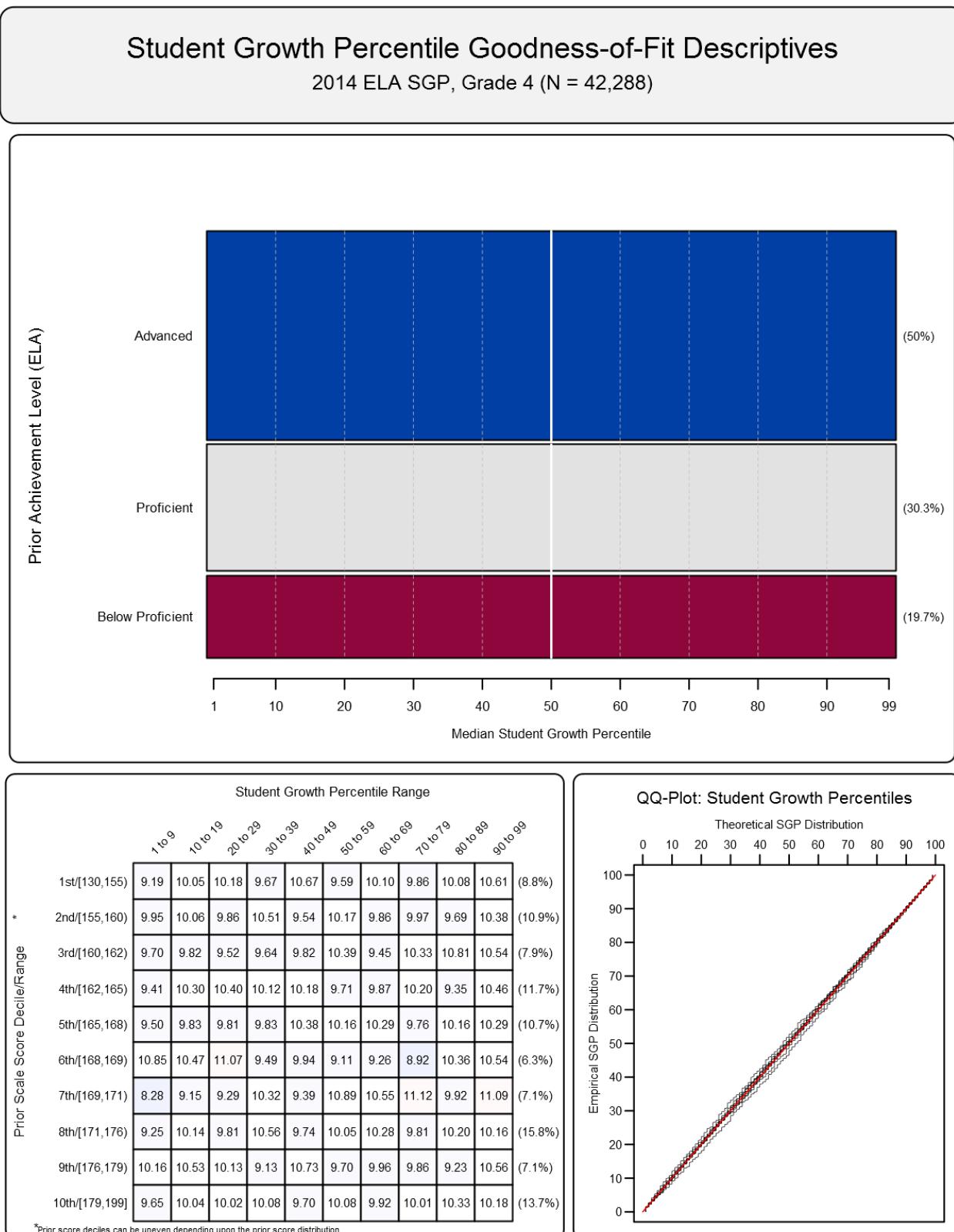


Figure 1: Goodness of Fit Plot for Grade 4 ELA, 2014.

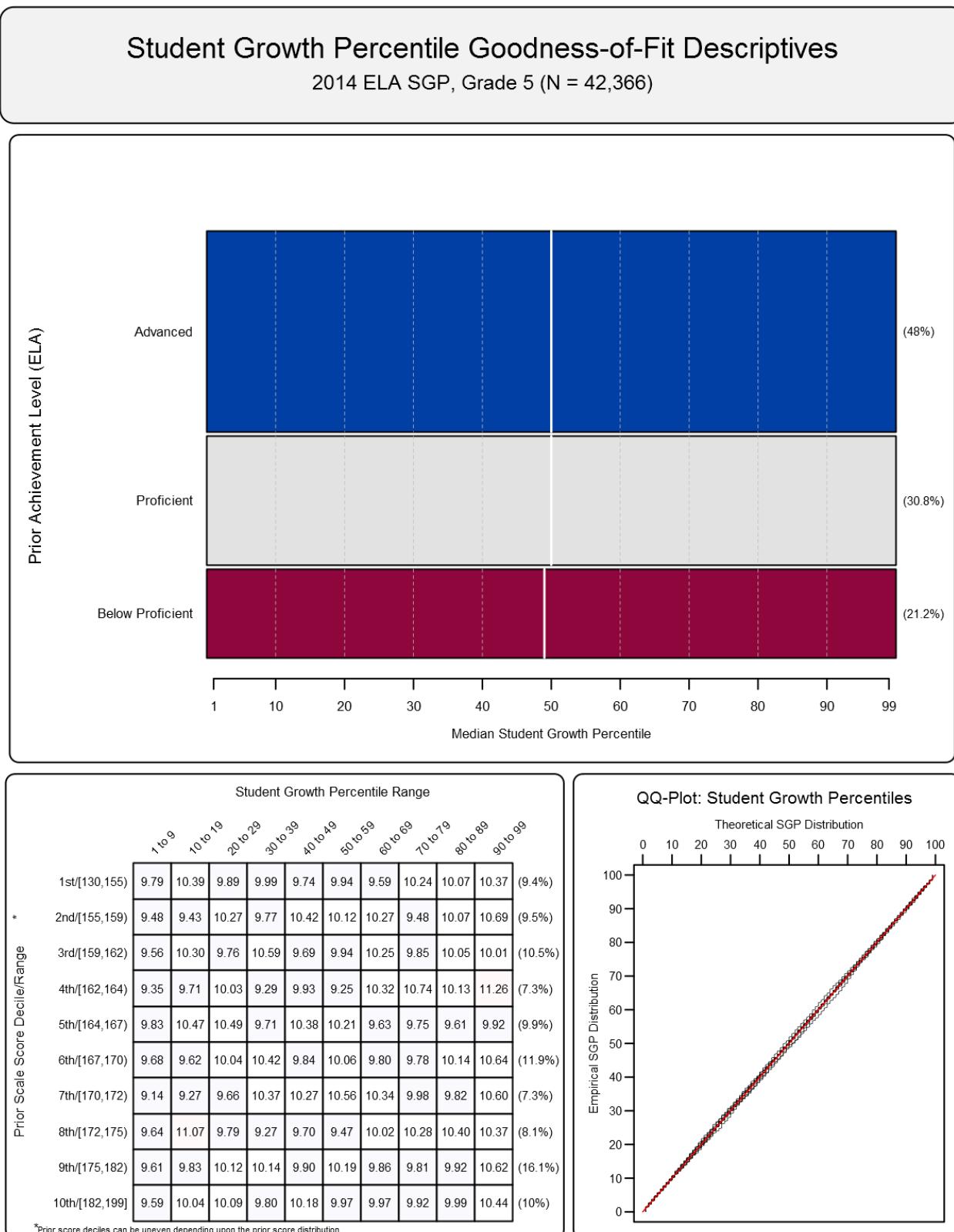


Figure 2: Goodness of Fit Plot for Grade 5 ELA, 2014.

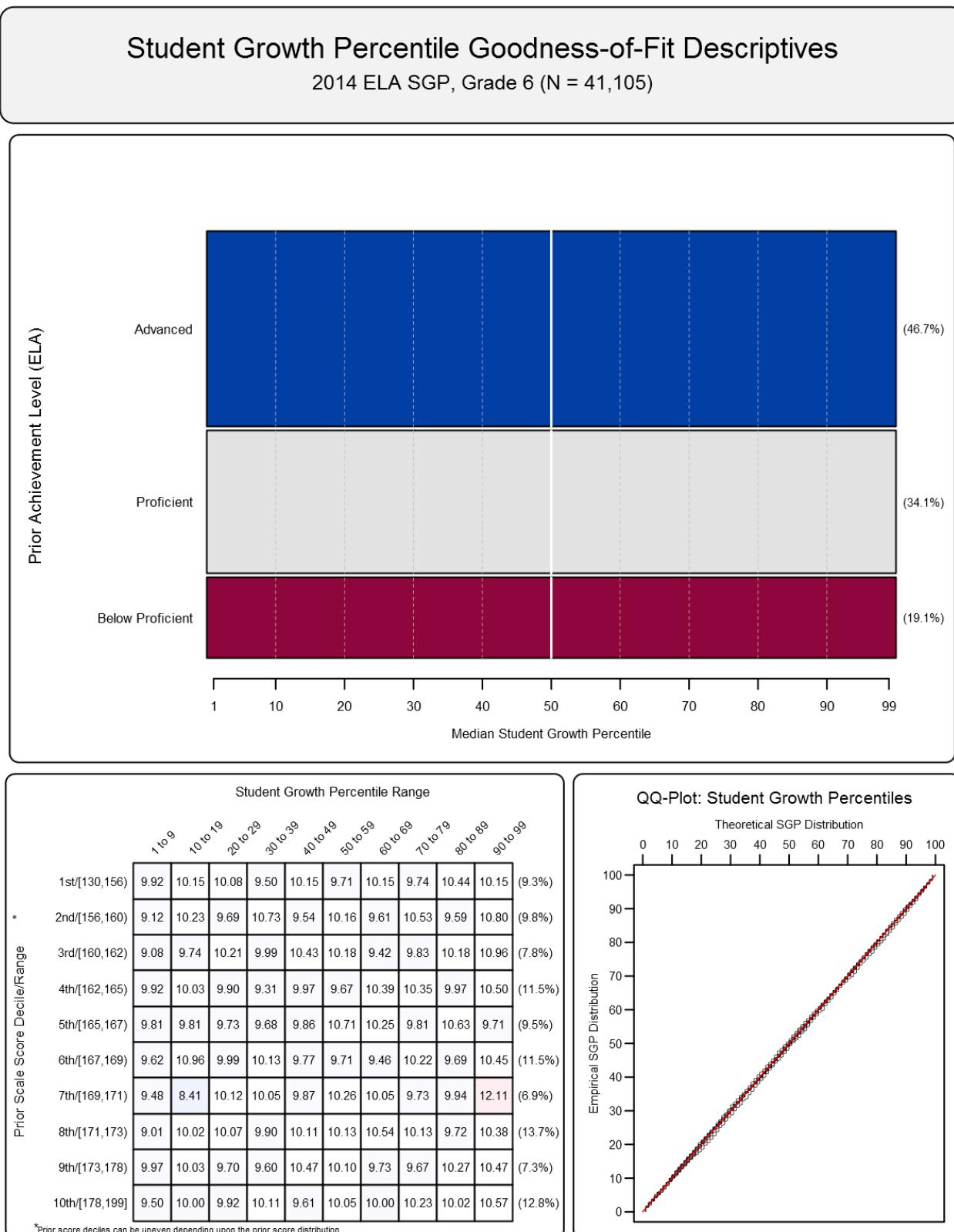


Figure 3: Goodness of Fit Plot for Grade 4 ELA, 2014.

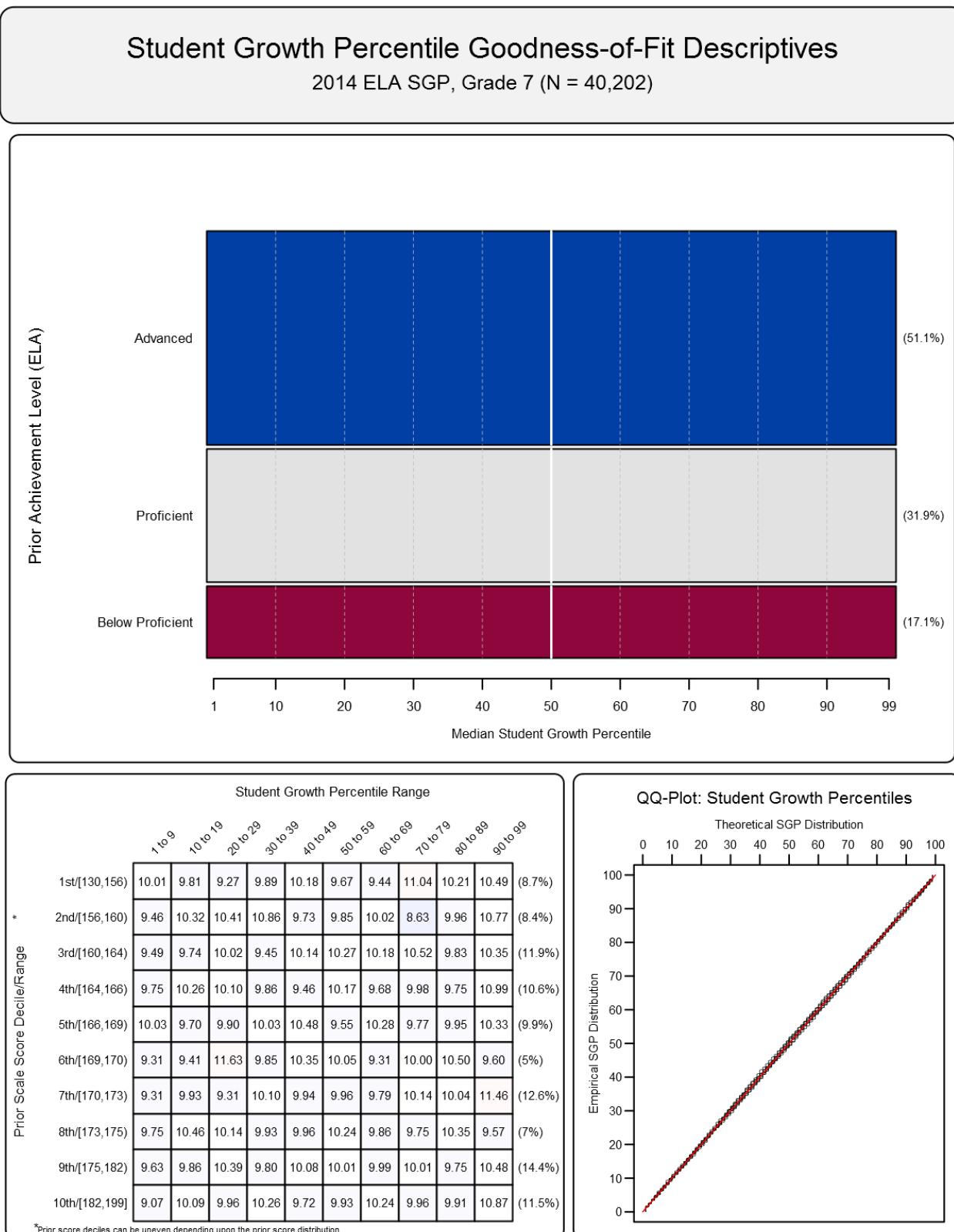


Figure 4: Goodness of Fit Plot for Grade 7 ELA, 2014.

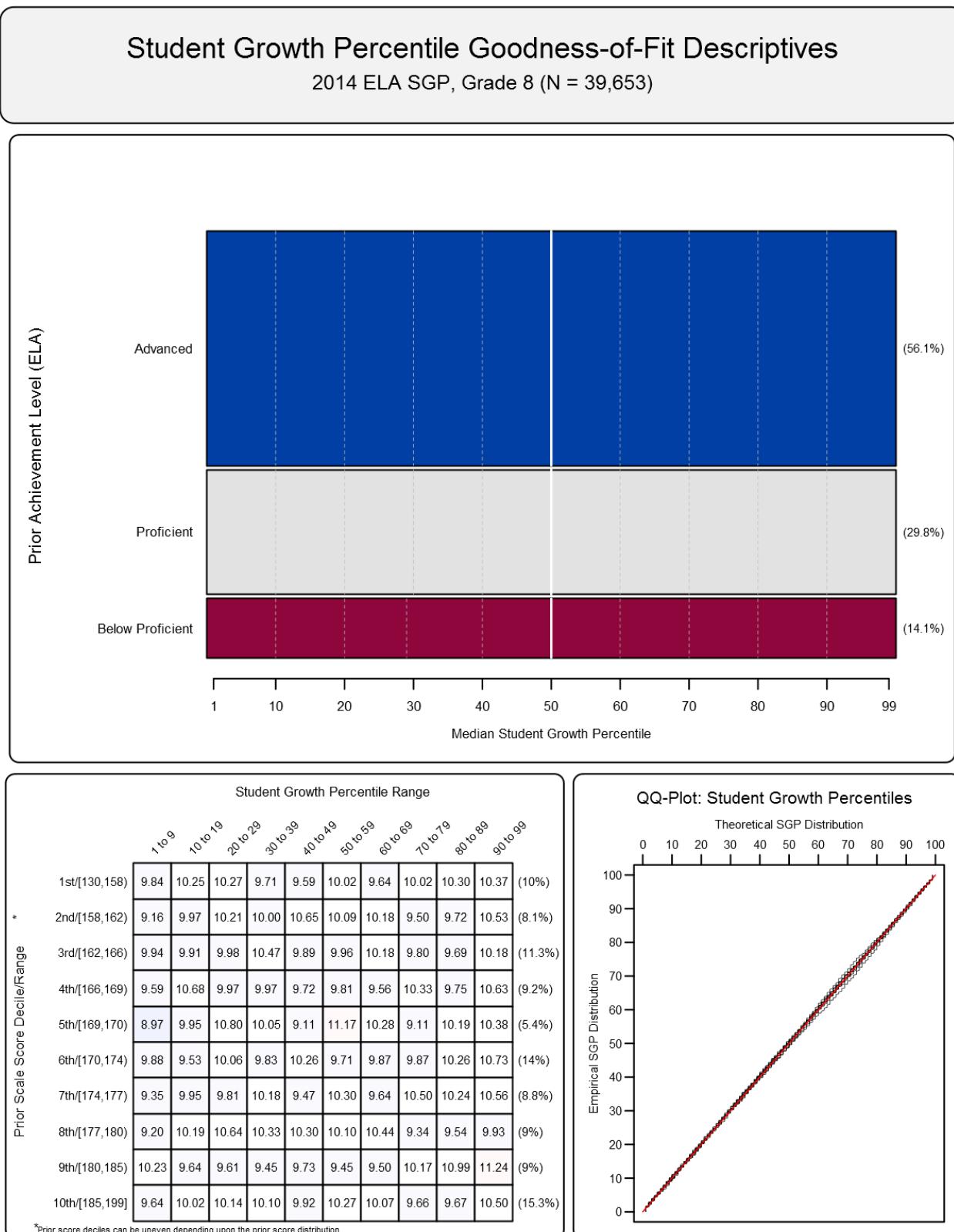


Figure 5: Goodness of Fit Plot for Grade 8 ELA, 2014.

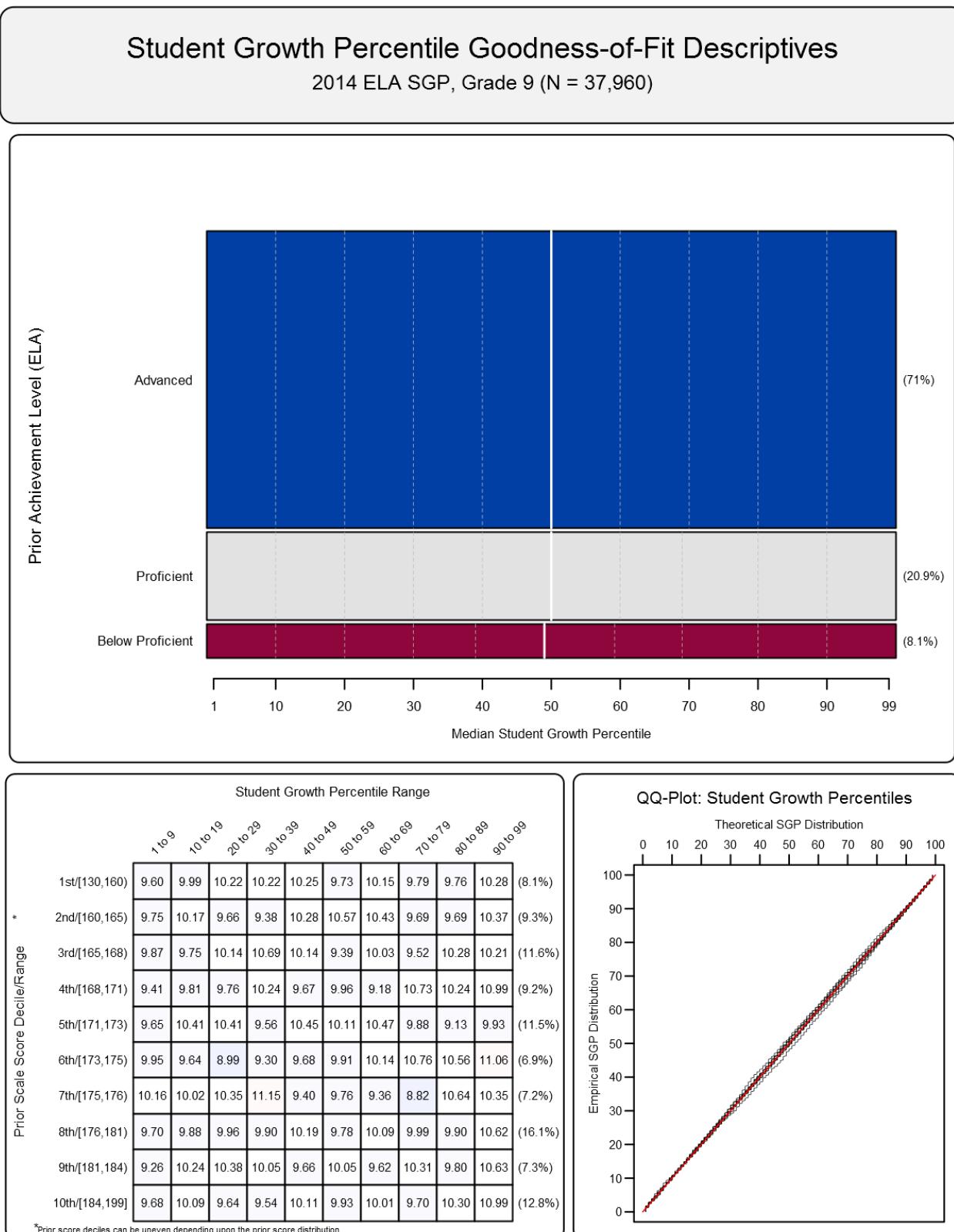


Figure 6: Goodness of Fit Plot for Grade 9 ELA, 2014.

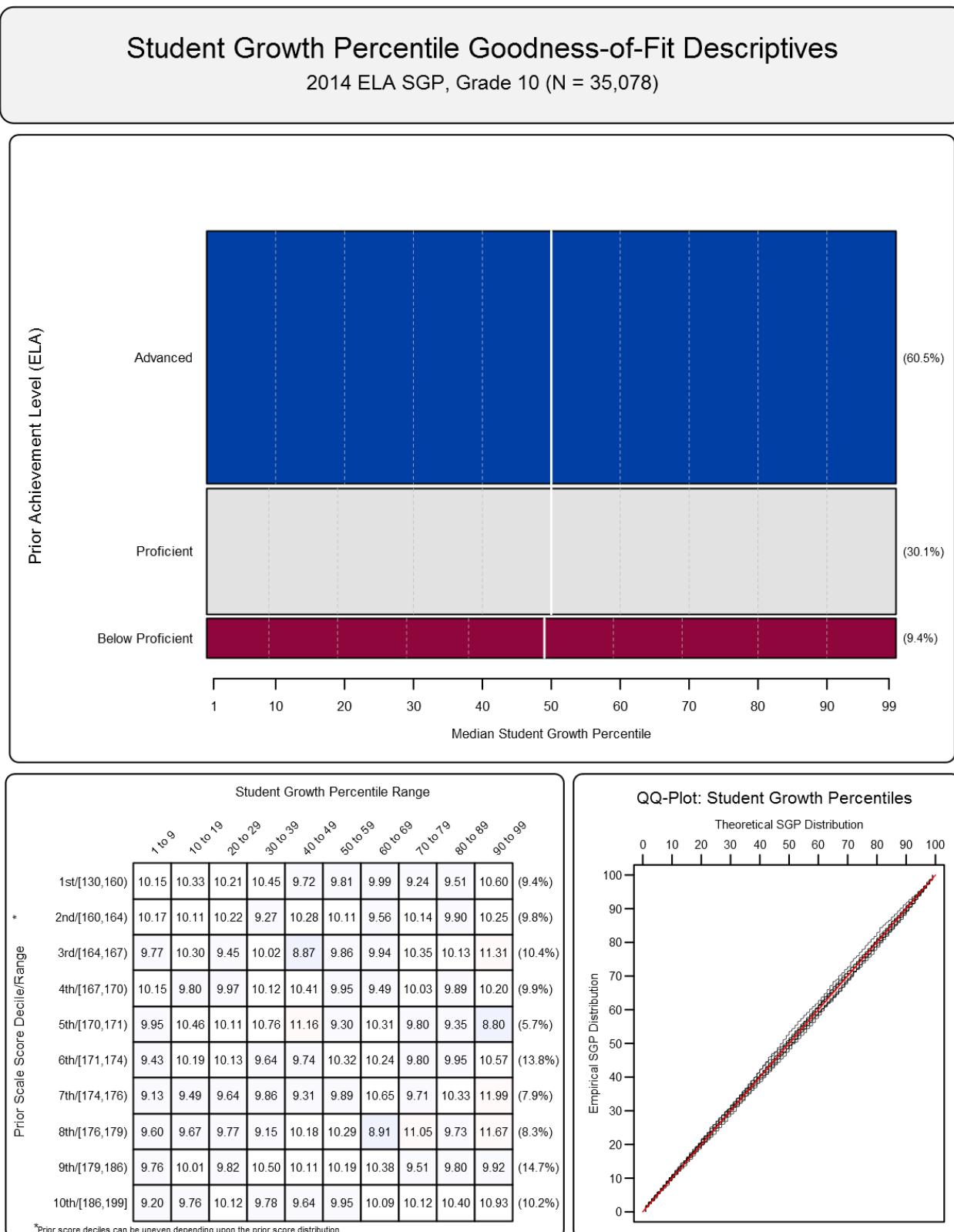


Figure 7: Goodness of Fit Plot for Grade 10 ELA, 2014.

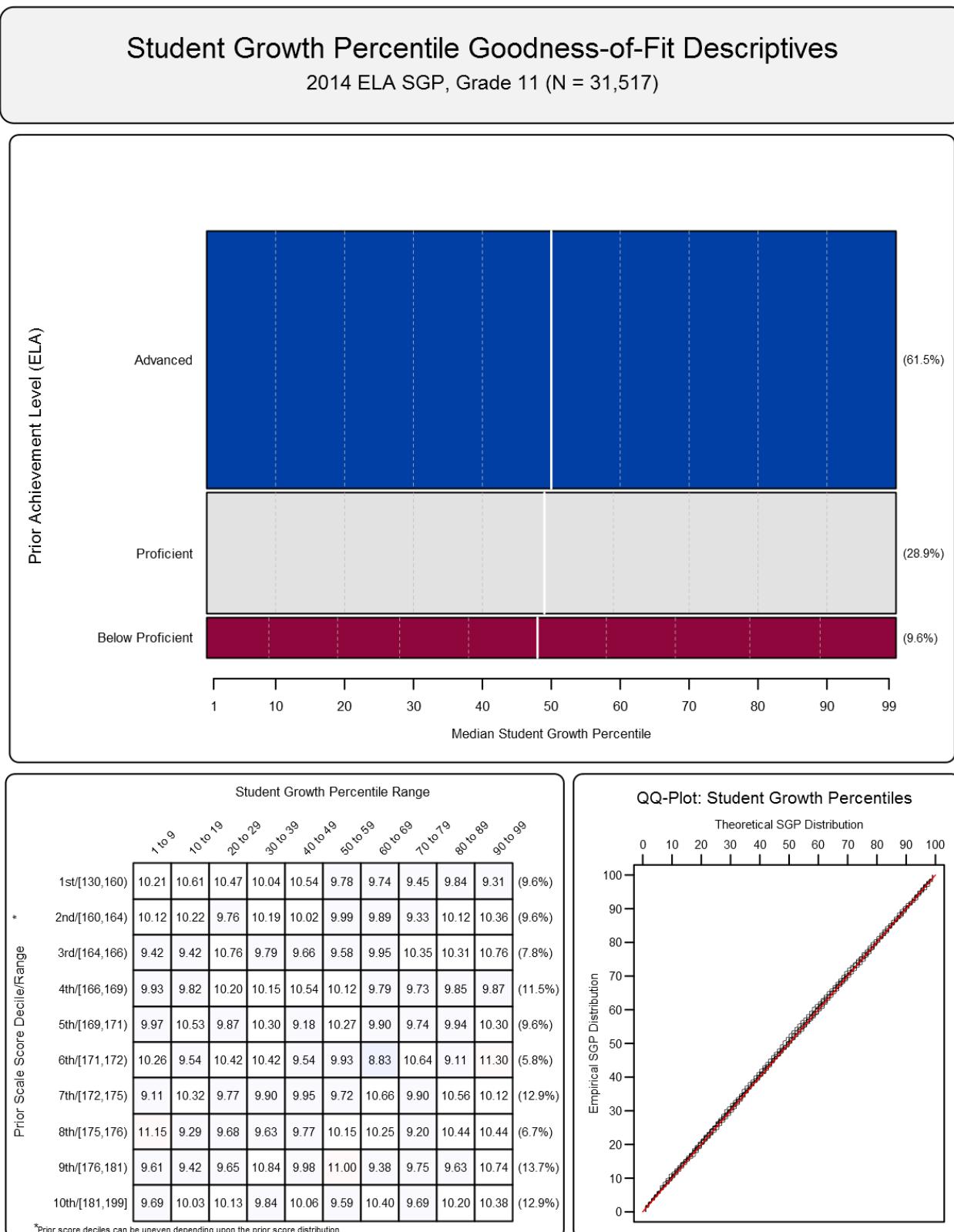


Figure 8: Goodness of Fit Plot for Grade 11 ELA, 2014.

2.2 Mathematics

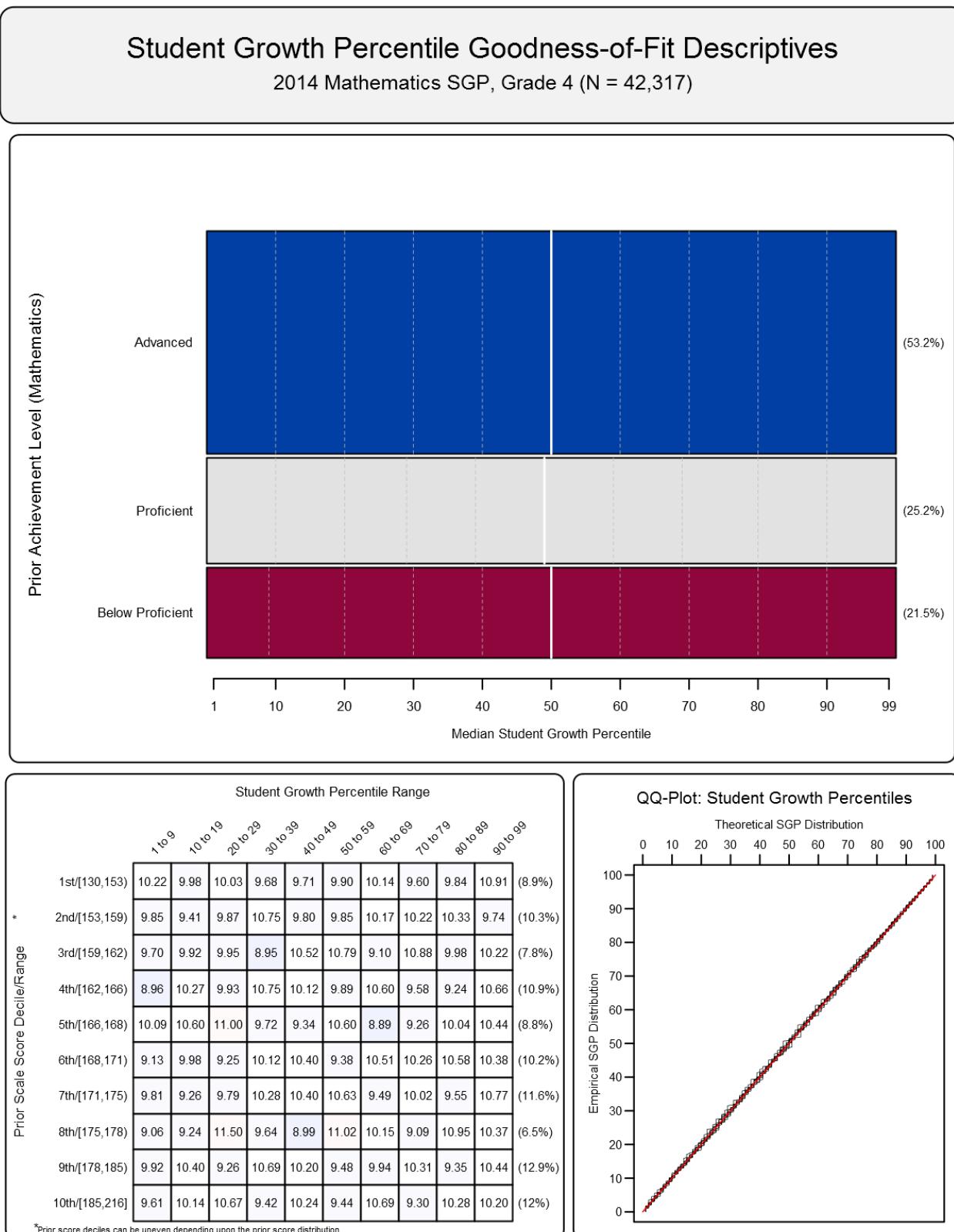


Figure 9: Goodness of Fit Plot for Grade 4 Mathematics, 2014.

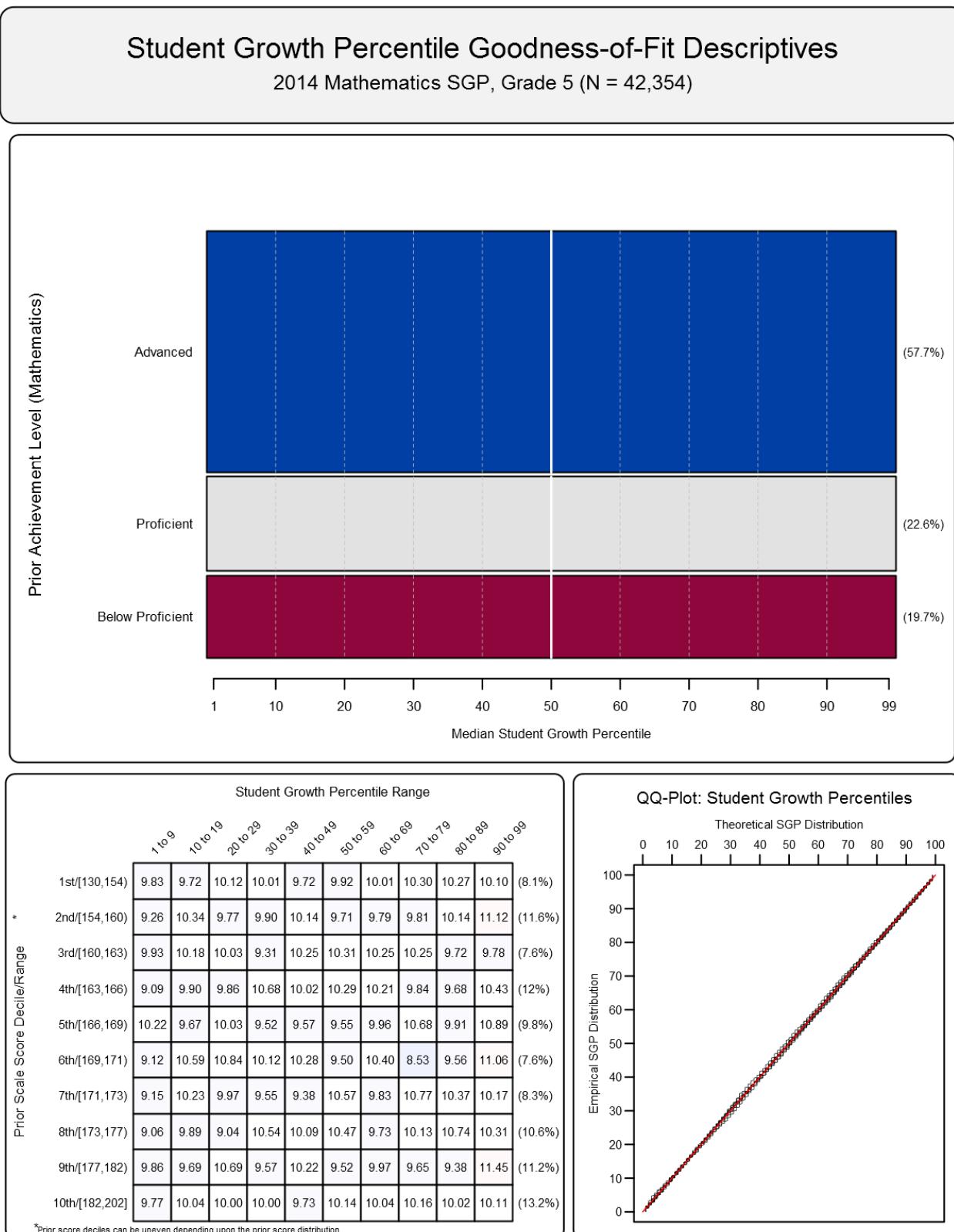


Figure 10: Goodness of Fit Plot for Grade 5 Mathematics, 2014.

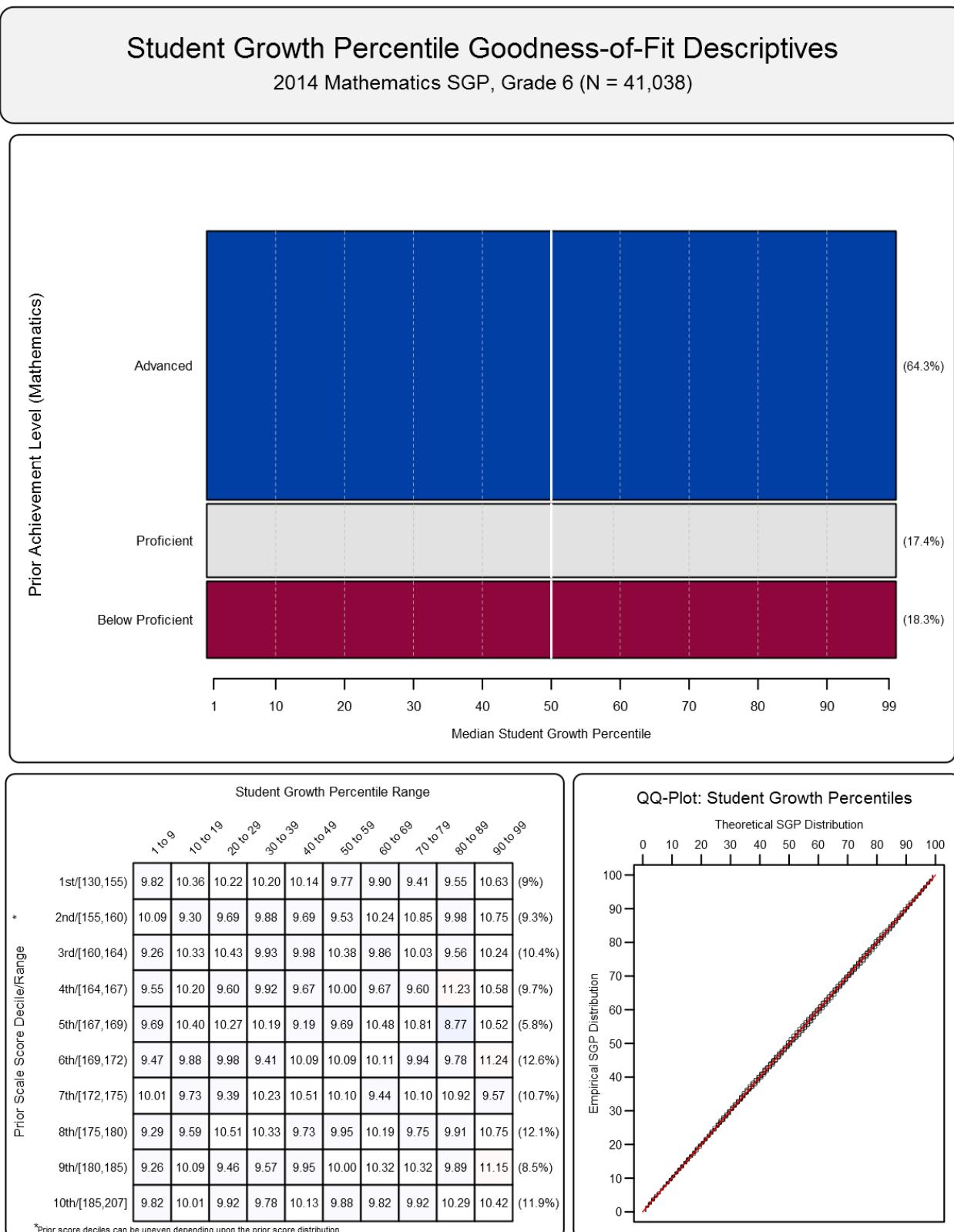


Figure 11: Goodness of Fit Plot for Grade 6 Mathematics, 2014.

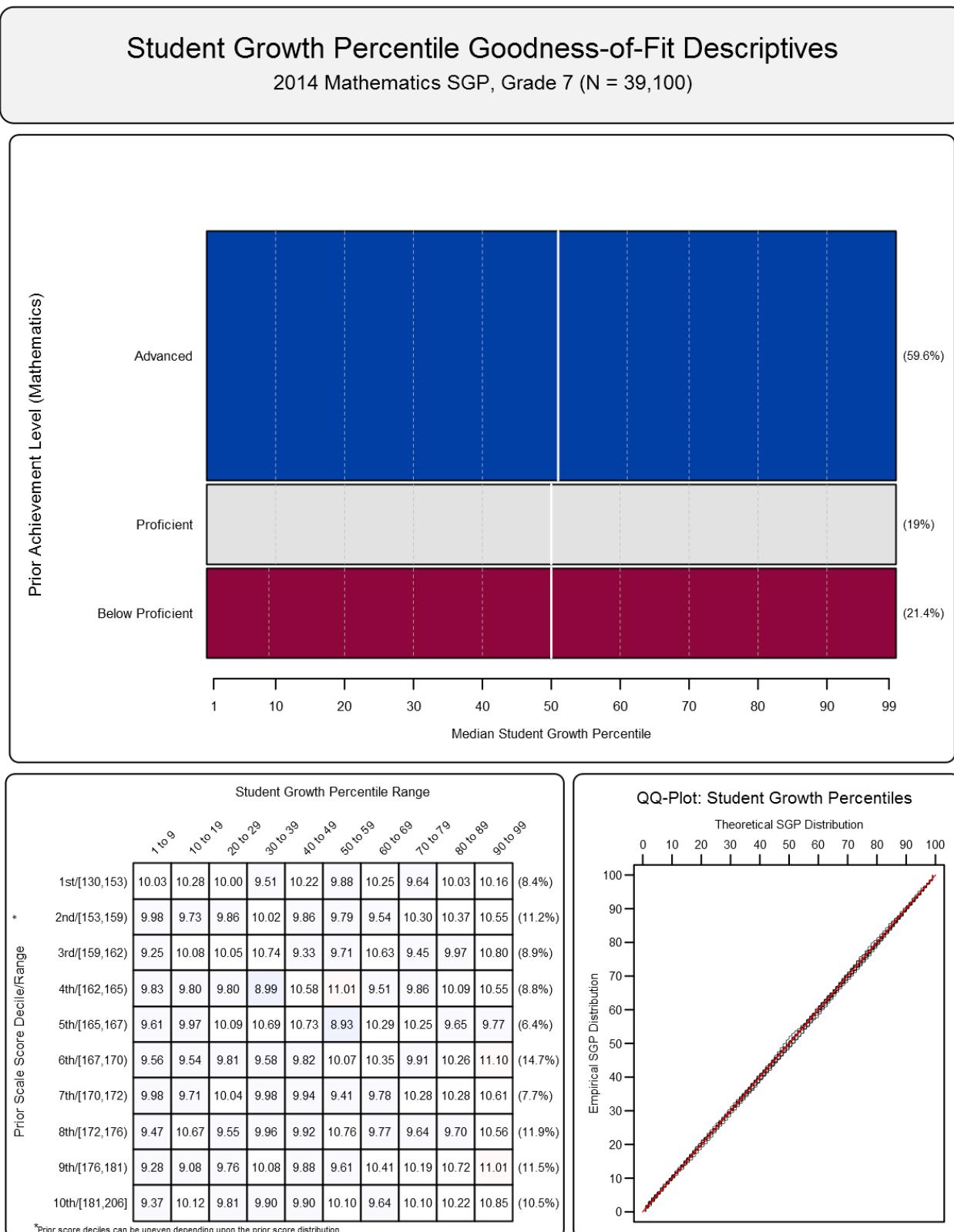


Figure 12: Goodness of Fit Plot for Grade 7 Mathematics, 2014.

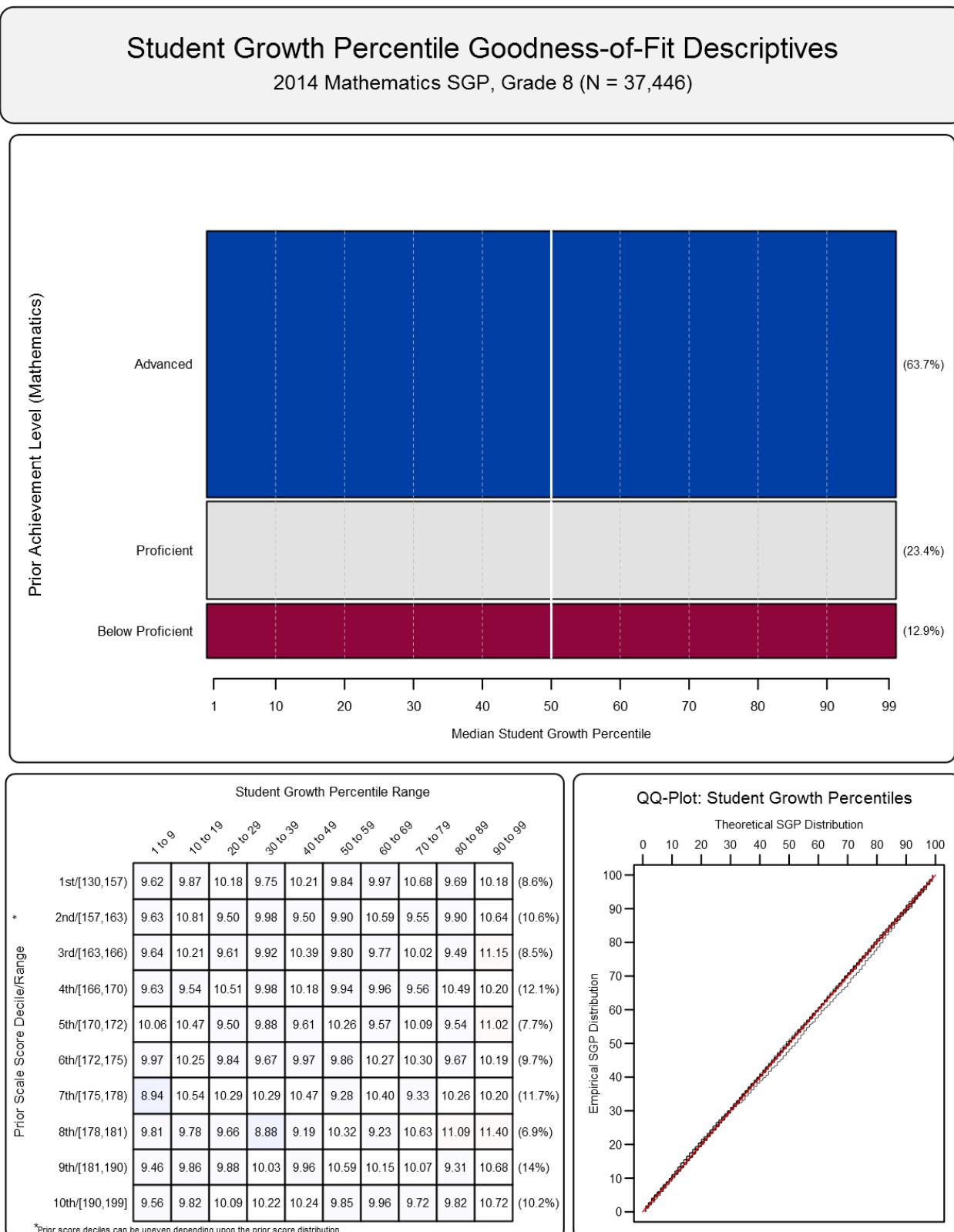


Figure 13: Goodness of Fit Plot for Grade 8 Mathematics, 2014.

2.3 Science

3 EOCT Goodness of Fit Plots

3.1 Earth Science

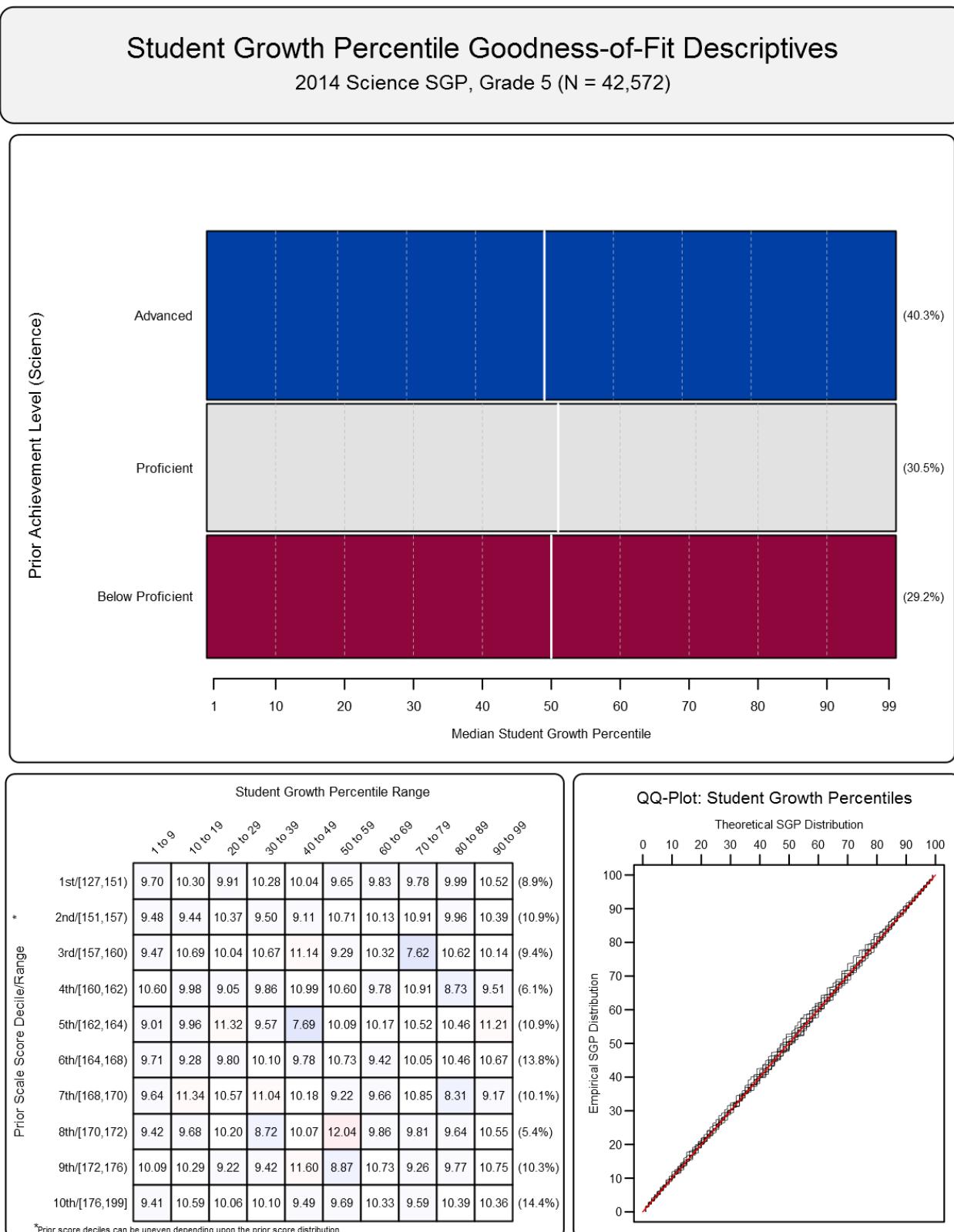


Figure 14: Goodness of Fit Plot for Grade 5 Science, 2014.

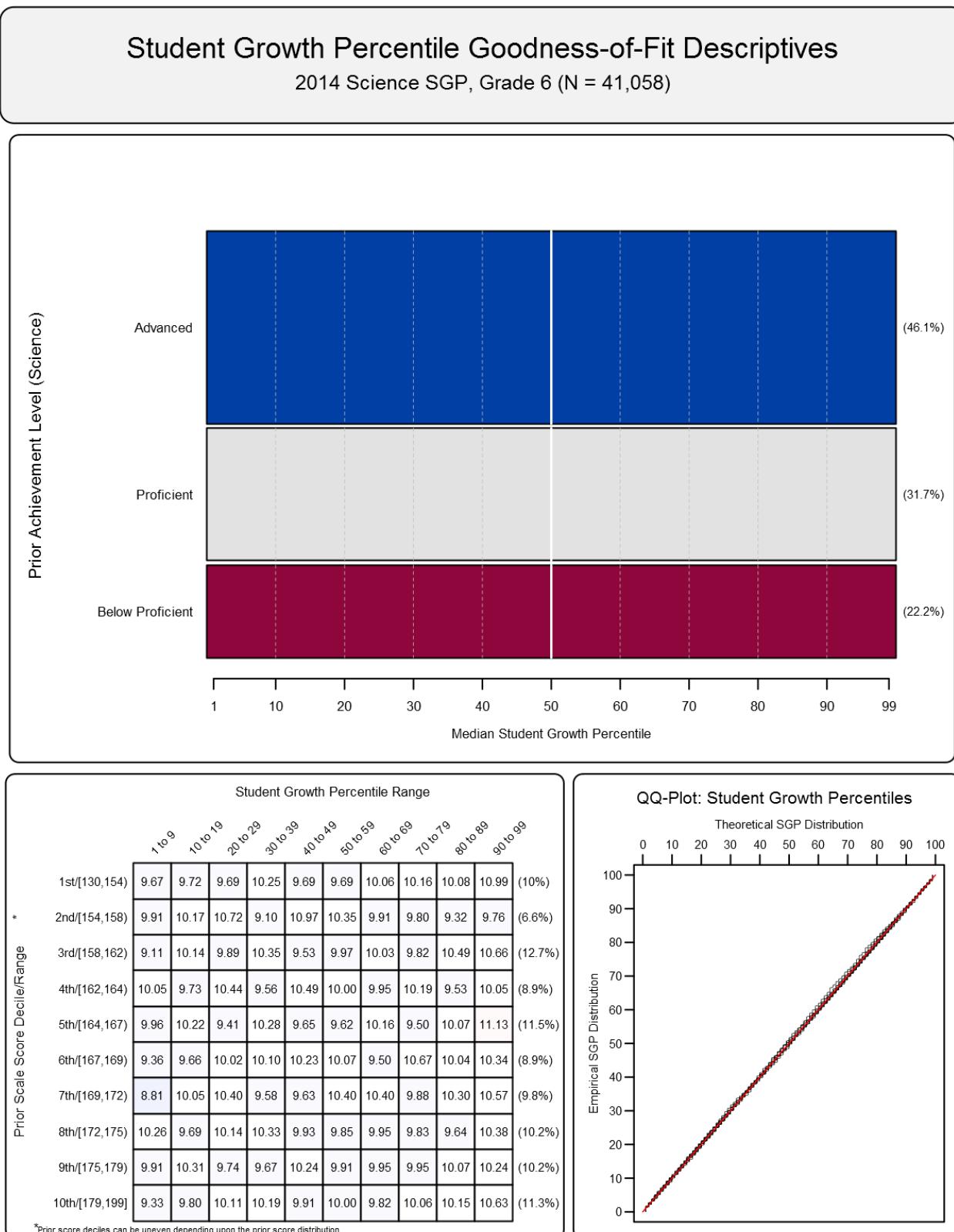
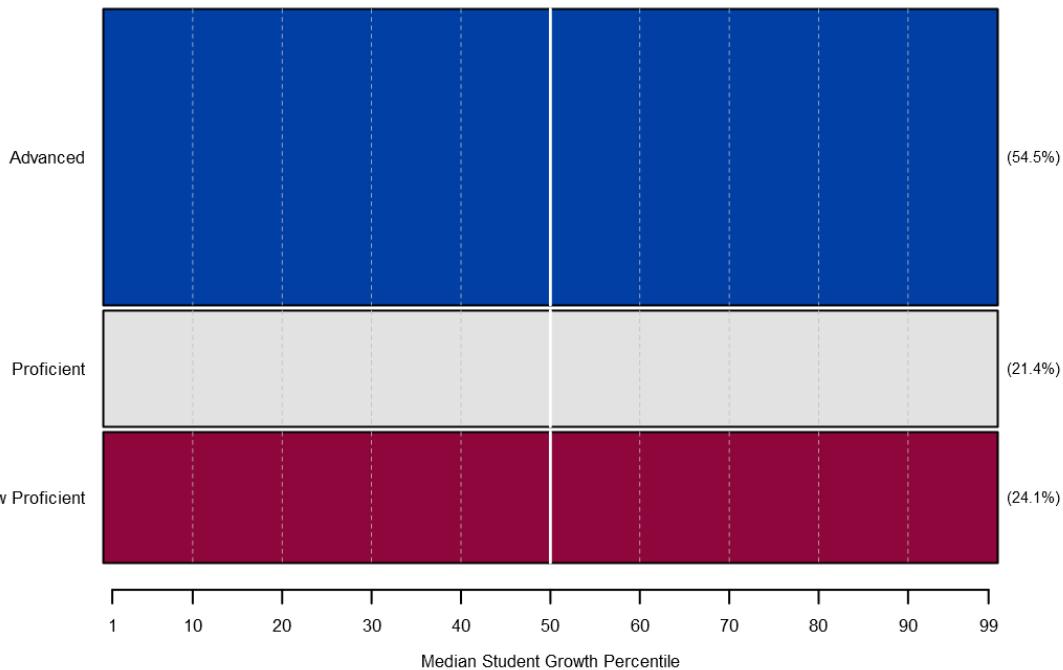


Figure 15: Goodness of Fit Plot for Grade 6 Science, 2014.

Student Growth Percentile Goodness-of-Fit Descriptives

2014 Science SGP, Grade 7 (N = 36,818)

Prior Achievement Level (Science)



Prior Scale Score Decile/Range

Student Growth Percentile Range										
	1 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99
1st/[128,153]	9.42	10.29	9.95	10.47	9.81	10.15	9.76	9.90	9.81	10.44
* 2nd/[153,158]	9.68	9.40	9.97	9.81	10.09	9.93	10.59	10.00	9.72	10.81
3rd/[158,161]	9.92	9.69	10.10	9.65	10.27	9.89	9.82	10.37	10.44	9.86
4th/[161,165]	9.39	10.10	9.93	9.81	10.12	10.01	9.78	9.99	10.03	10.84
5th/[165,167]	9.66	10.41	9.84	10.06	9.08	9.75	11.74	9.44	10.10	9.92
6th/[167,170]	9.35	9.35	9.67	10.43	10.01	10.78	9.45	10.09	10.56	10.31
7th/[170,173]	10.27	10.27	10.35	9.23	10.27	9.73	10.25	9.75	9.17	10.72
8th/[173,176]	8.87	10.50	10.50	10.16	10.36	9.90	9.24	10.22	10.07	10.19
9th/[176,181]	9.15	9.61	9.30	10.16	9.76	10.06	10.58	9.79	10.70	10.88
10th/[181,208]	9.54	9.97	9.86	9.88	9.69	10.42	9.97	10.23	9.67	10.77

*Prior score deciles can be uneven depending upon the prior score distribution

QQ-Plot: Student Growth Percentiles

Theoretical SGP Distribution

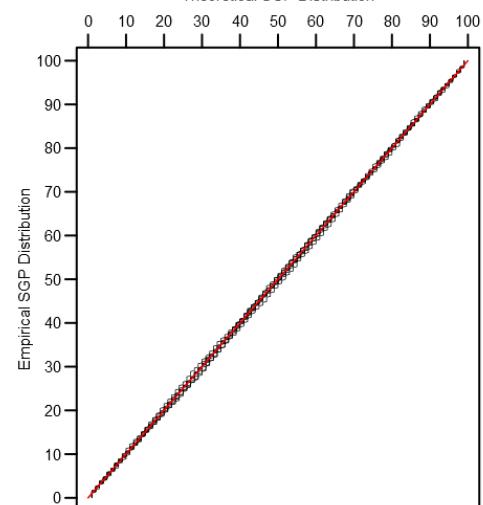


Figure 16: Goodness of Fit Plot for Grade 7 Science, 2014.

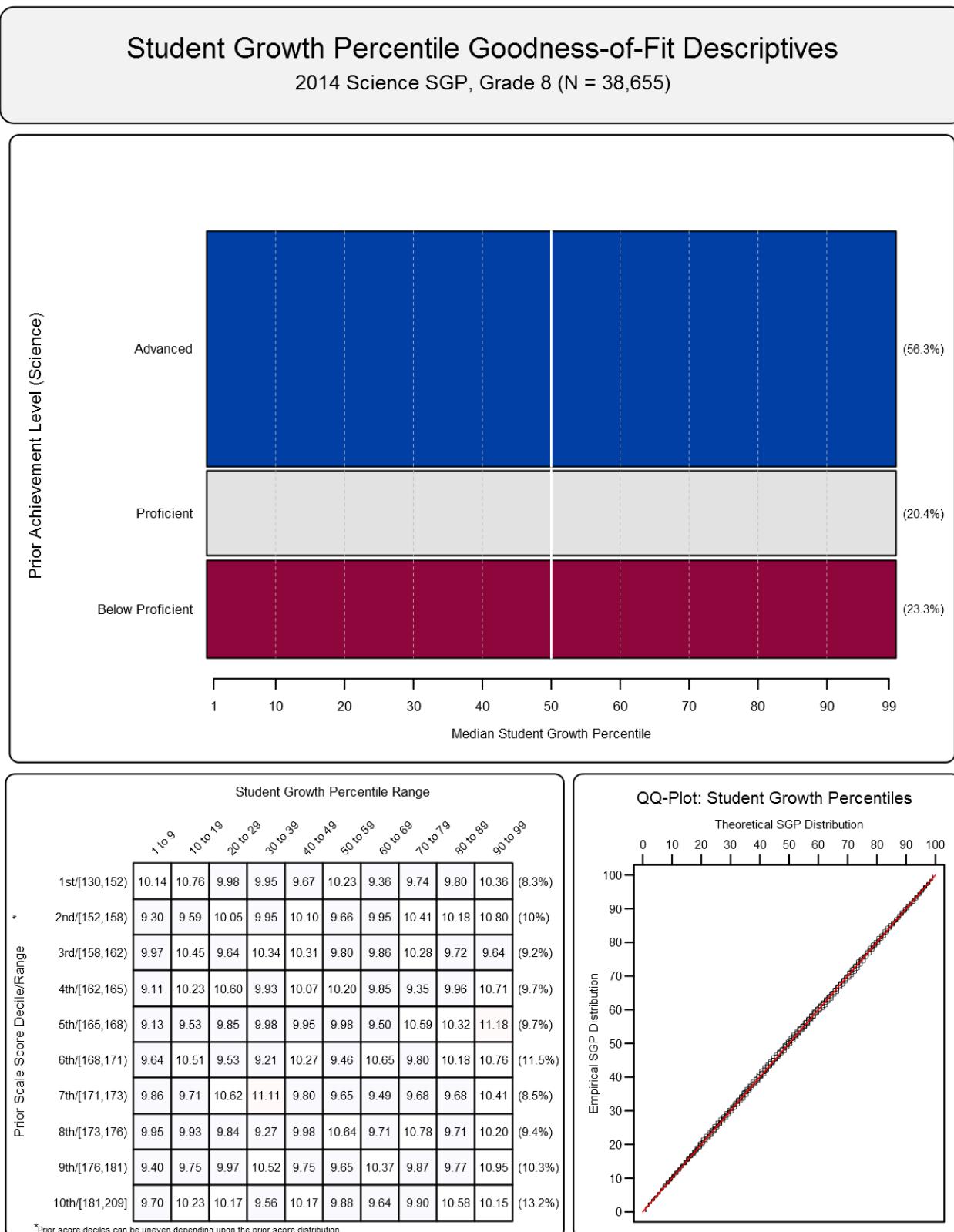


Figure 17: Goodness of Fit Plot for Grade 8 Science, 2014.

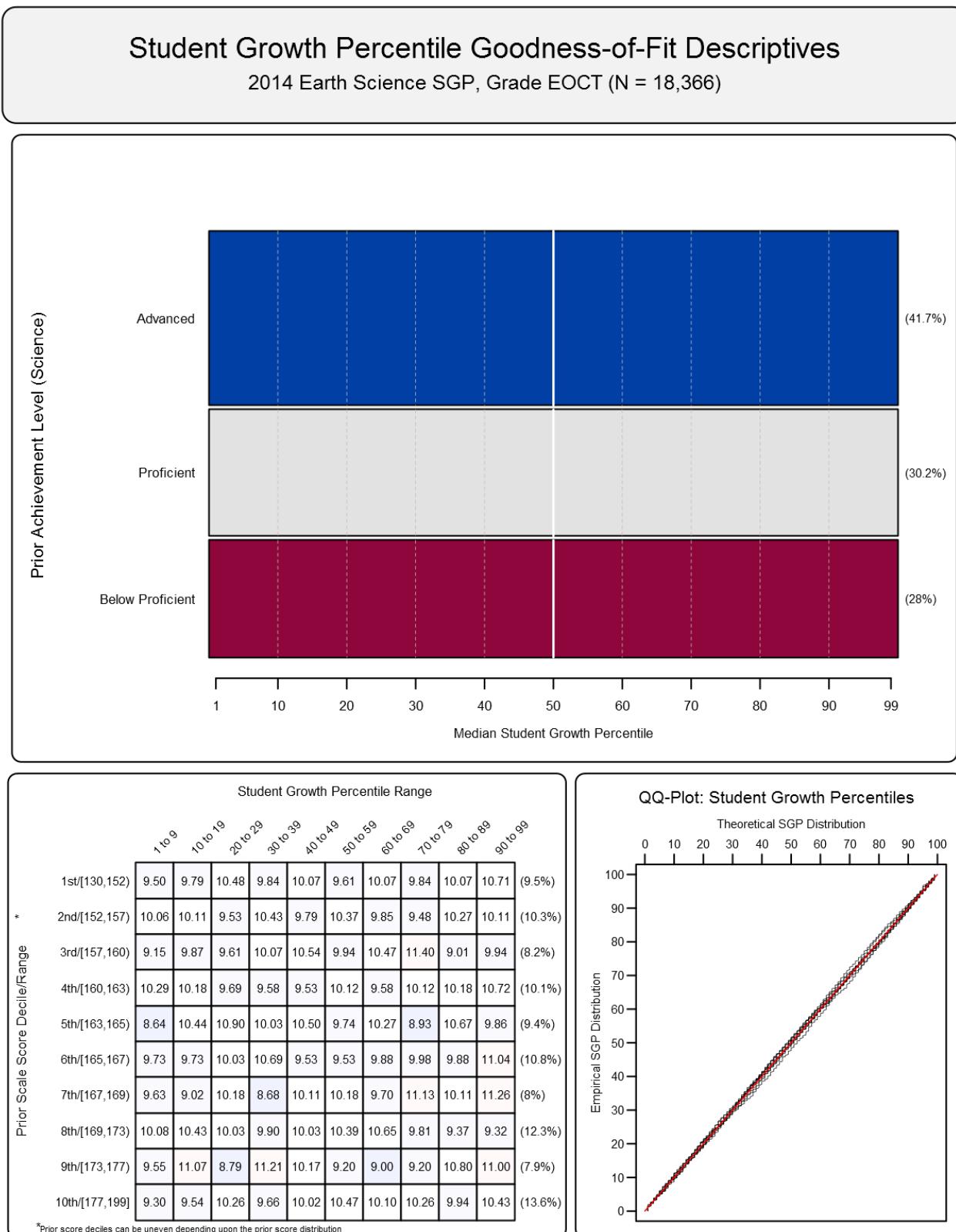


Figure 18: Goodness of Fit Plot for 2014 Earth Science (Priors - 2013 Science Grade 8, 2012 Science Grade 7, 2011 Science Grade 6, 2010 Science Grade 5, 2009 Science Grade 4)

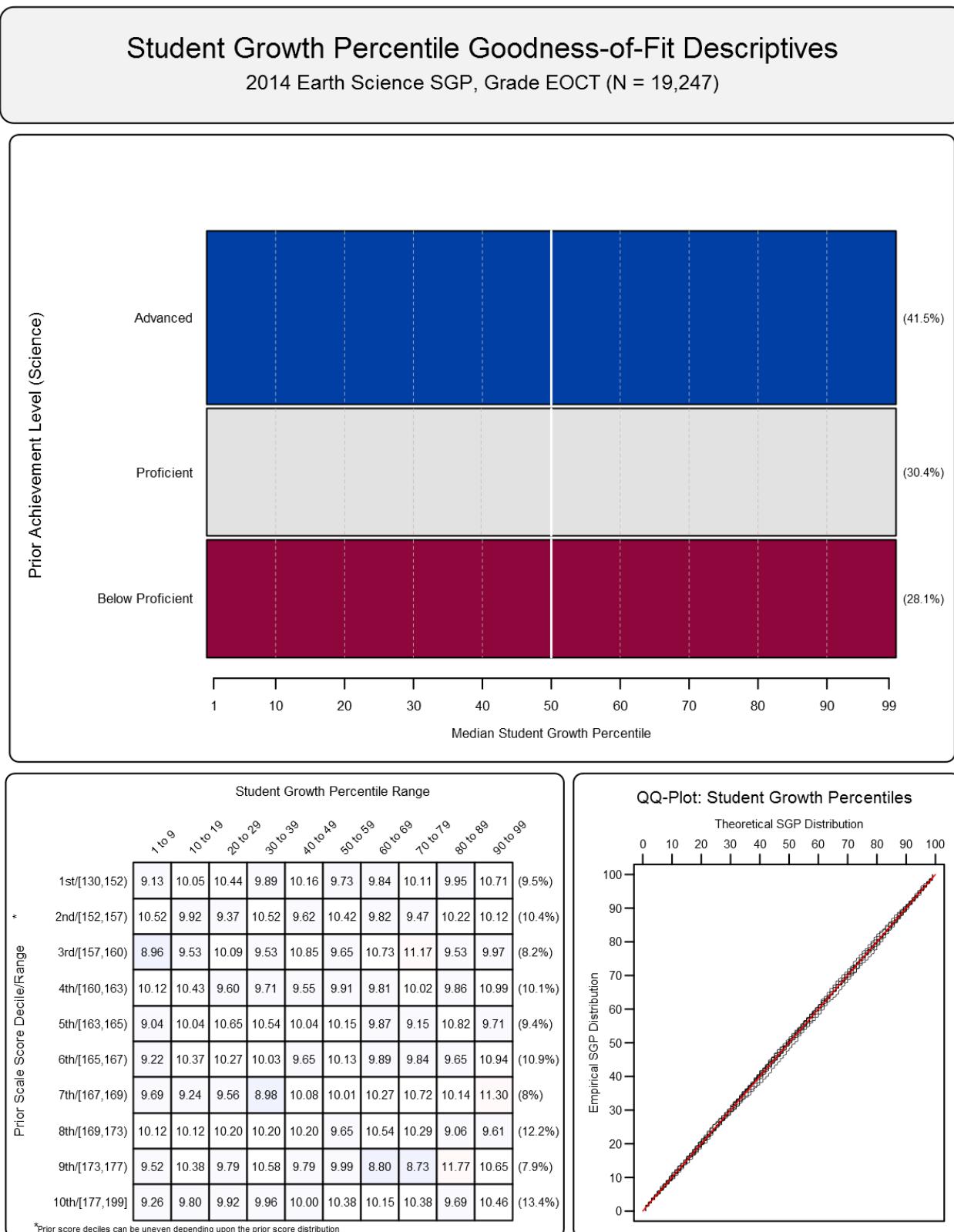


Figure 19: Goodness of Fit Plot for 2014 Earth Science (Priors - 2013 Science Grade 8, 2012 Science Grade 7, 2011 Science Grade 6, 2010 Science Grade 5)

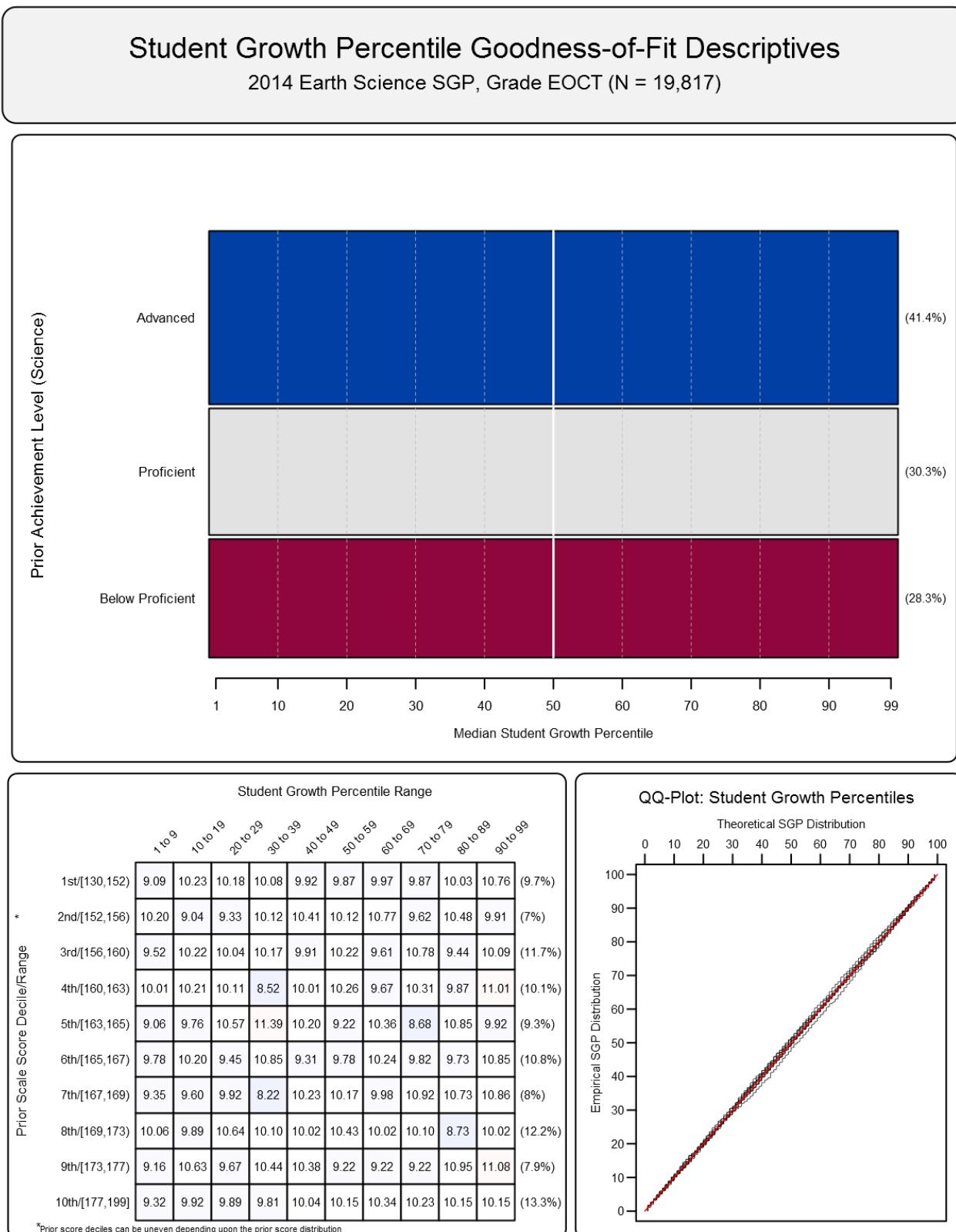
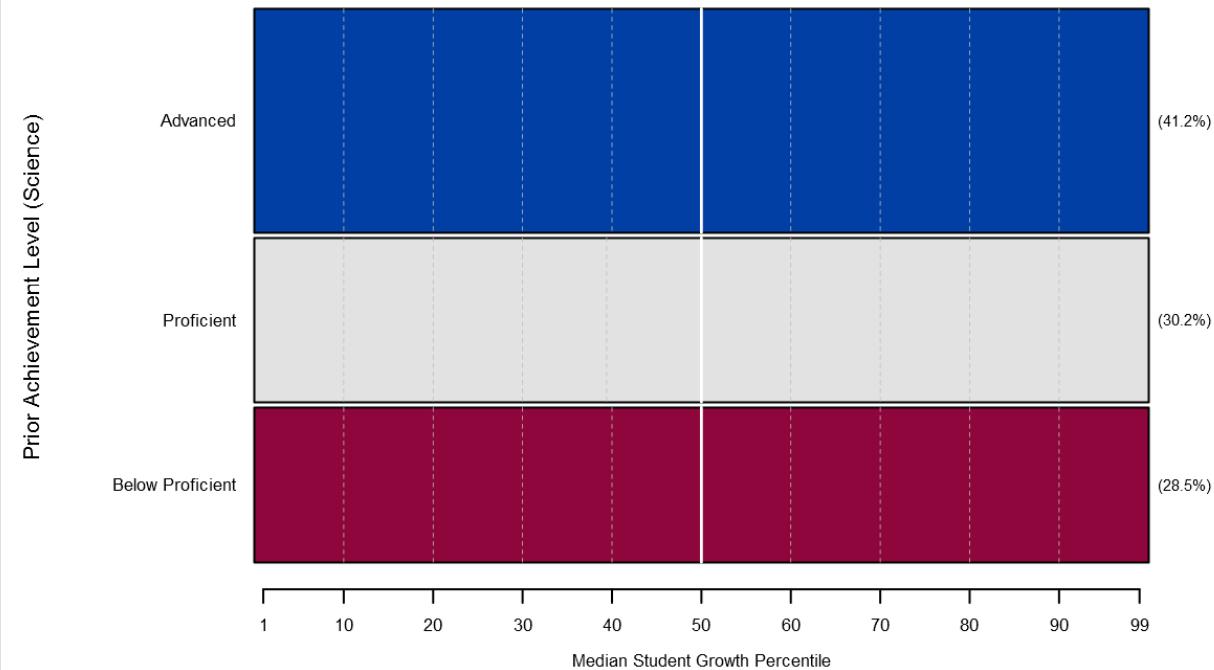


Figure 20: Goodness of Fit Plot for 2014 Earth Science (Priors - 2013 Science Grade 8, 2012 Science Grade 7, 2011 Science Grade 6)

Student Growth Percentile Goodness-of-Fit Descriptives

2014 Earth Science SGP, Grade EOCT (N = 20,513)



Student Growth Percentile Range											
	1 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	
* Prior Scale Score Decile/Range	1st/[130,152)	9.18	10.42	9.72	10.17	9.62	10.52	9.52	10.22	10.07	10.57
	2nd/[152,156)	10.15	8.91	10.15	9.74	10.91	9.67	10.29	9.53	10.57	10.08
	3rd/[156,160)	9.33	10.17	10.09	10.05	10.05	9.42	10.84	10.30	9.50	10.26
	4th/[160,163)	10.36	10.02	9.01	9.78	9.98	10.60	9.45	9.98	10.07	10.75
	5th/[163,165)	8.83	10.19	11.25	10.46	9.62	10.25	9.46	9.30	10.40	10.25
	6th/[165,167)	9.53	9.80	10.66	10.16	9.80	9.13	10.48	10.43	9.62	10.39
	7th/[167,169)	9.64	10.13	8.66	9.03	9.70	10.31	10.25	10.80	9.76	11.71
	8th/[169,173)	10.06	9.90	10.43	9.98	10.47	10.55	9.50	9.50	9.82	9.78
	9th/[173,177)	9.02	10.45	10.20	9.95	10.57	9.02	9.89	9.76	10.95	10.20
	10th/[177,199]	9.42	9.86	9.79	10.16	9.61	10.27	10.31	10.23	9.68	10.67

*Prior score deciles can be uneven depending upon the prior score distribution

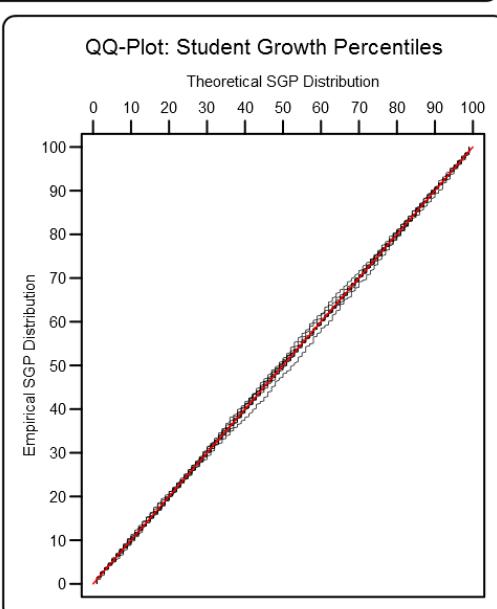


Figure 21: Goodness of Fit Plot for 2014 Earth Science (Priors - 2013 Science Grade 8, 2012 Science Grade 7)

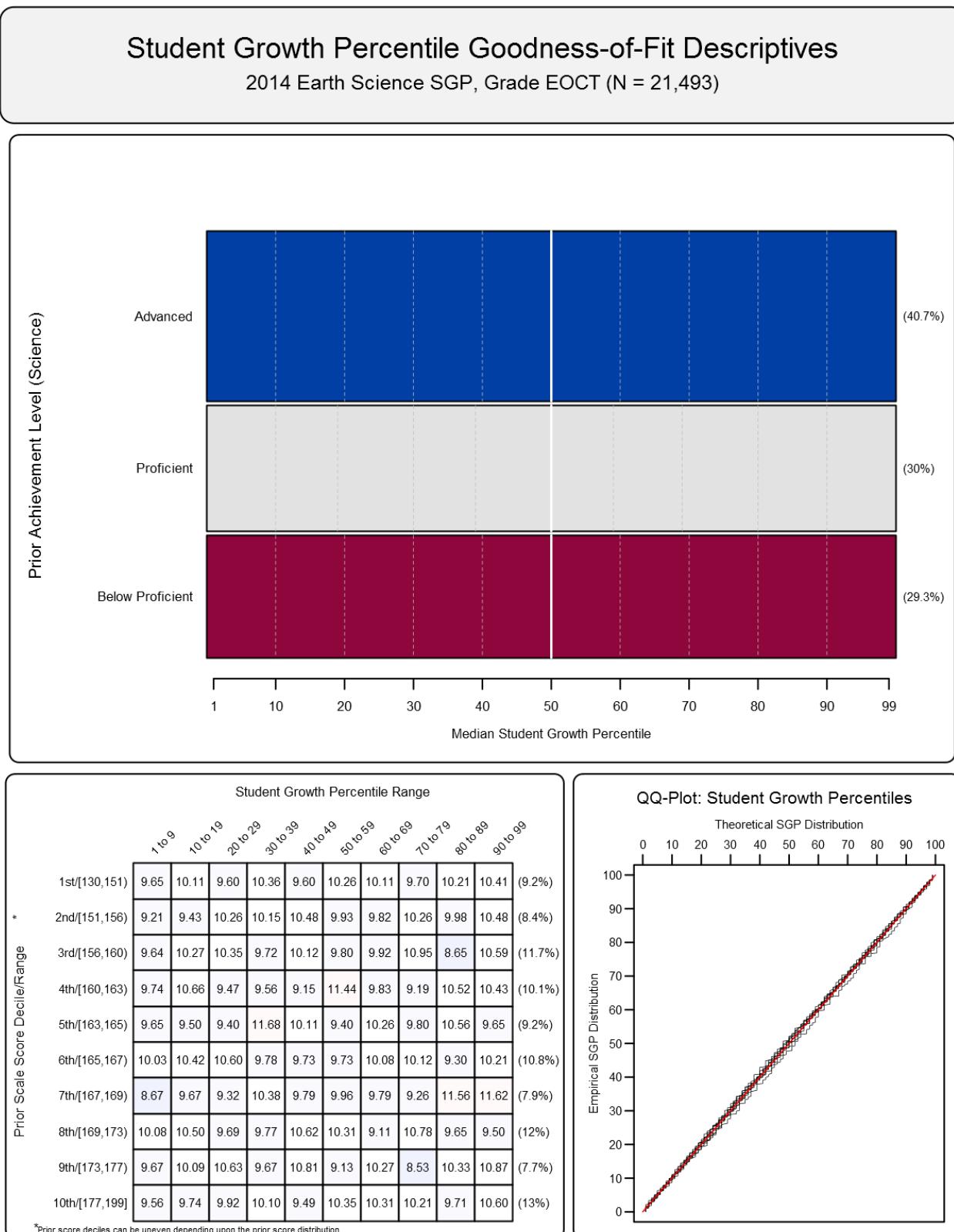


Figure 22: Goodness of Fit Plot for 2014 Earth Science (Priors - 2013 Science Grade 8)

3.2 Biology

3.2.1 Earth Science as Imediate Prior

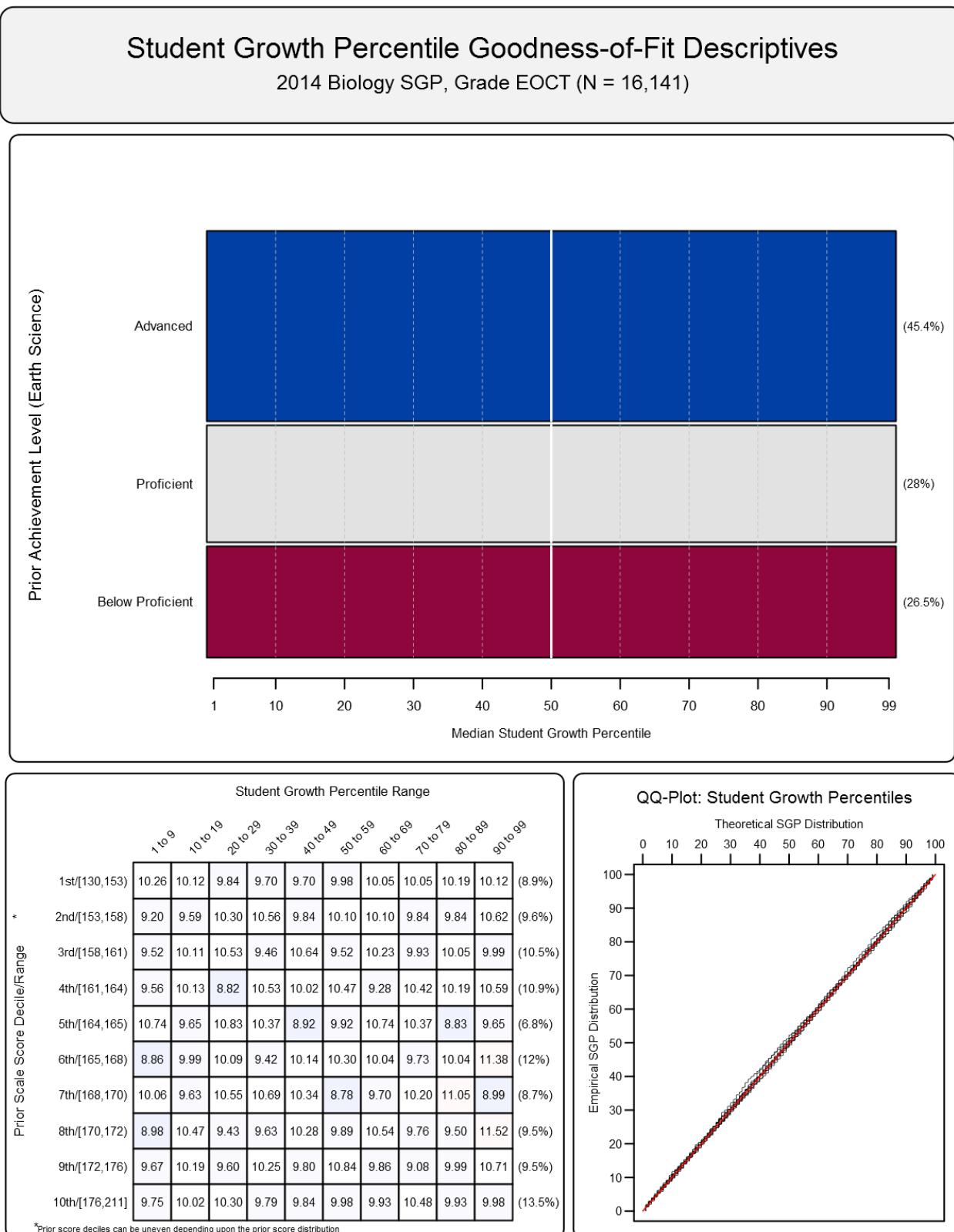


Figure 23: Goodness of Fit Plot for 2014 Biology (Priors - 2013 Earth Science, 2012 Science Grade 8, 2011 Science Grade 7, 2010 Science Grade 6, 2009 Science Grade 5)

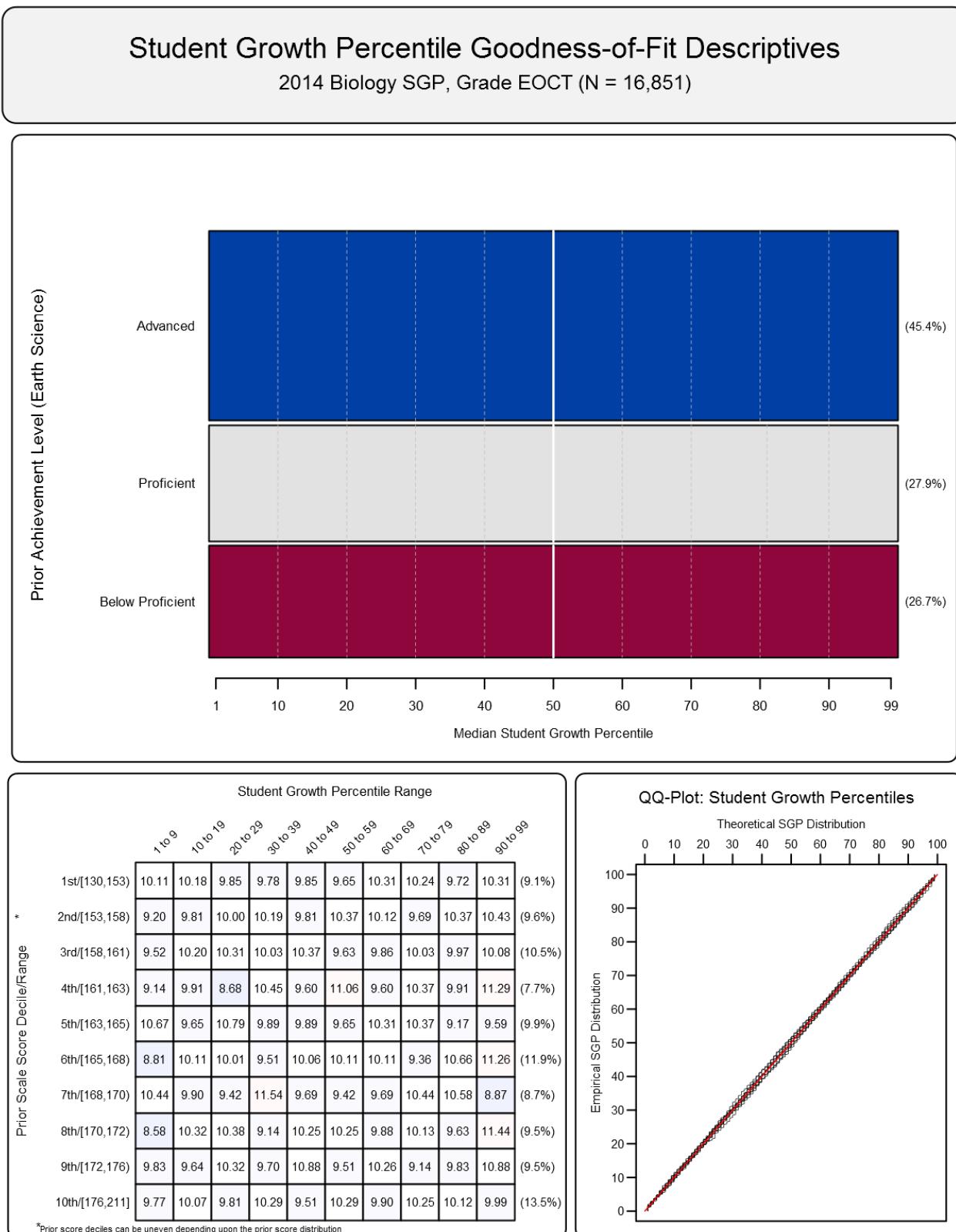


Figure 24: Goodness of Fit Plot for 2014 Biology (Priors - 2013 Earth Science, 2012 Science Grade 8, 2011 Science Grade 7, 2010 Science Grade 6)

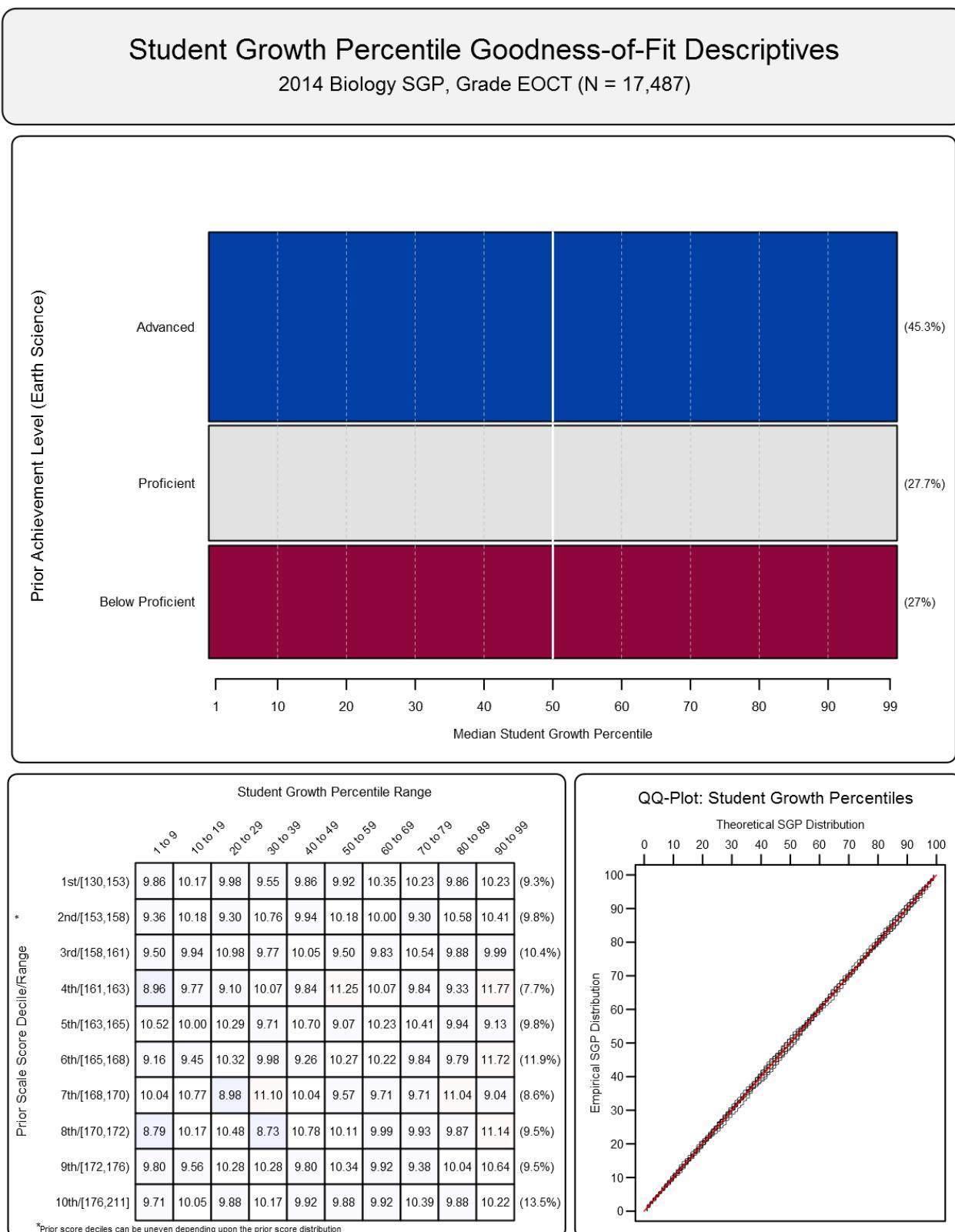


Figure 25: Goodness of Fit Plot for 2014 Biology (Priors - 2013 Earth Science, 2012 Science Grade 8, 2011 Science Grade 7)

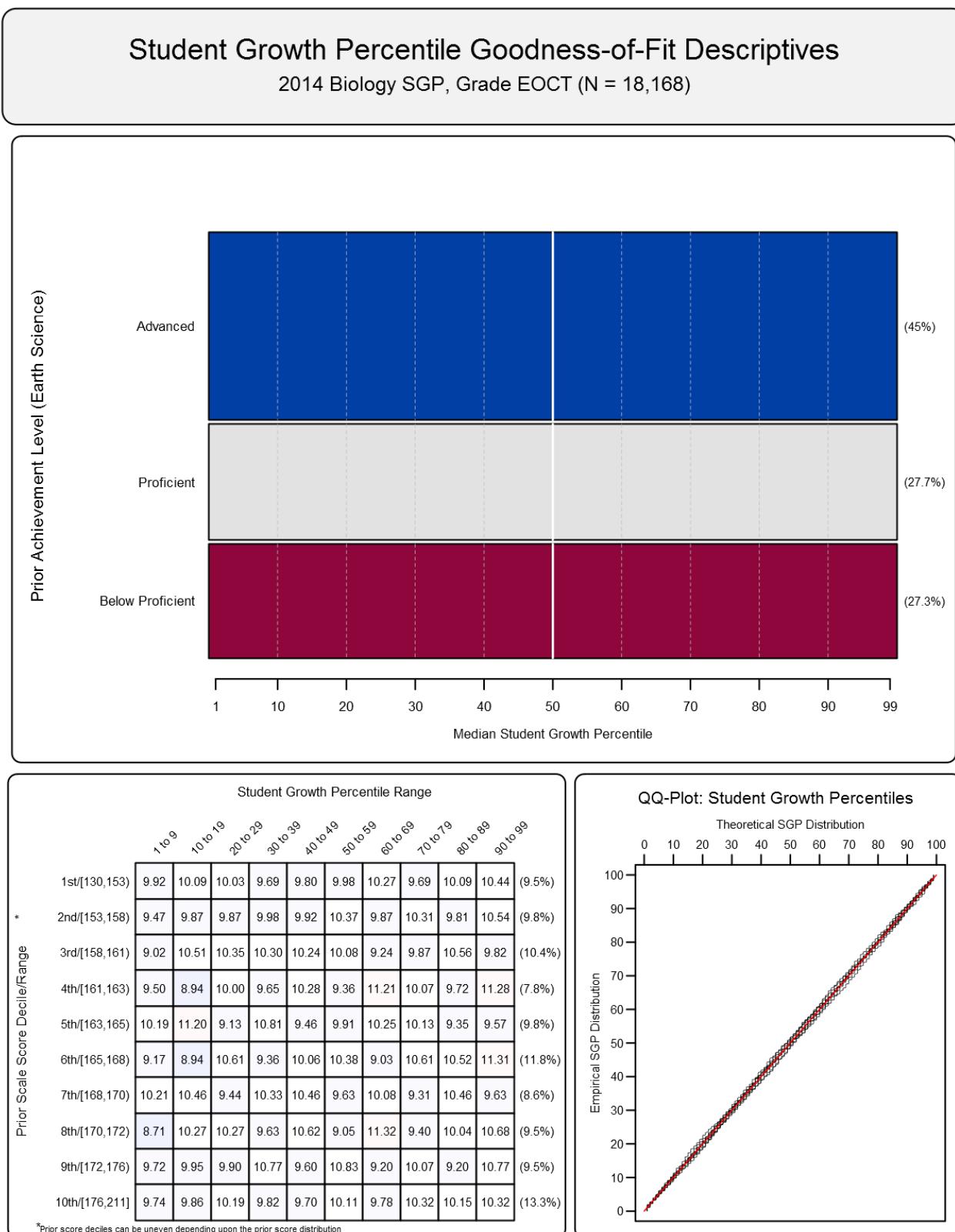


Figure 26: Goodness of Fit Plot for 2014 Biology (Priors - 2013 Earth Science, 2012 Science Grade 8)

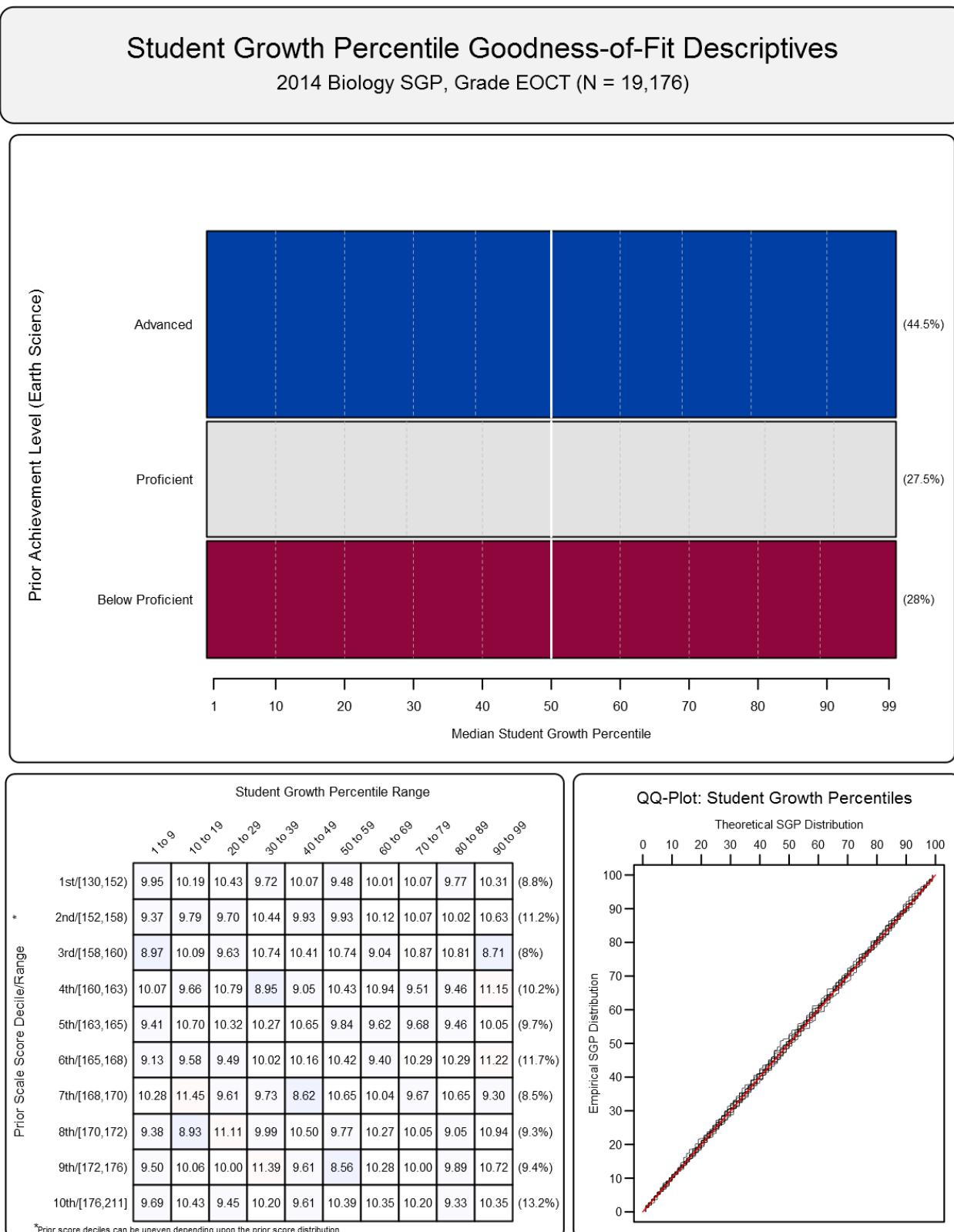


Figure 27: Goodness of Fit Plot for 2014 Biology (Priors - 2013 Earth Science)

3.2.2 Grade 8 Science as Immediate Prior

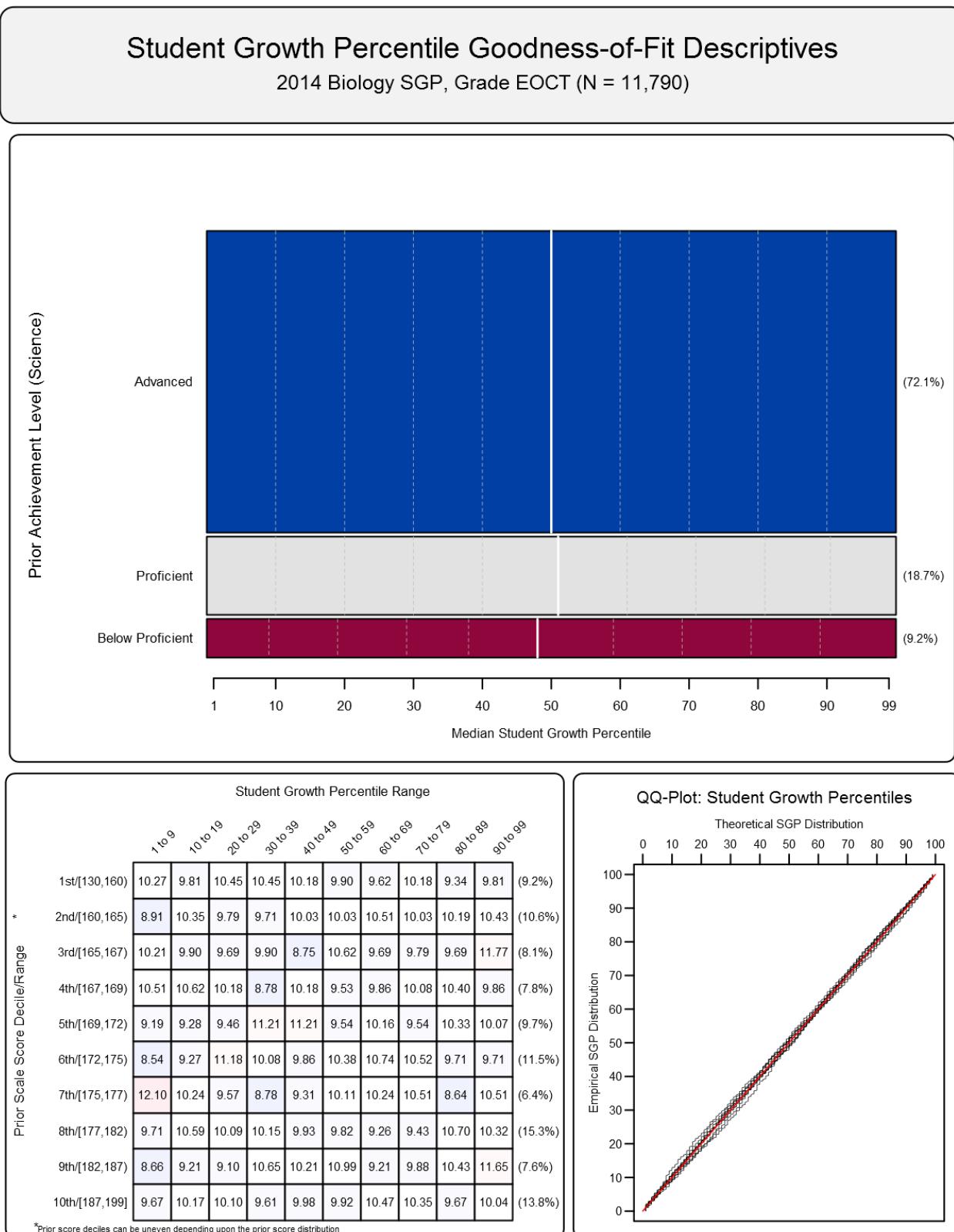


Figure 28: Goodness of Fit Plot for 2014 Biology (Priors - 2013 Science Grade 8, 2012 Science Grade 7, 2011 Science Grade 6, 2010 Science Grade 5, 2009 Science Grade 4)

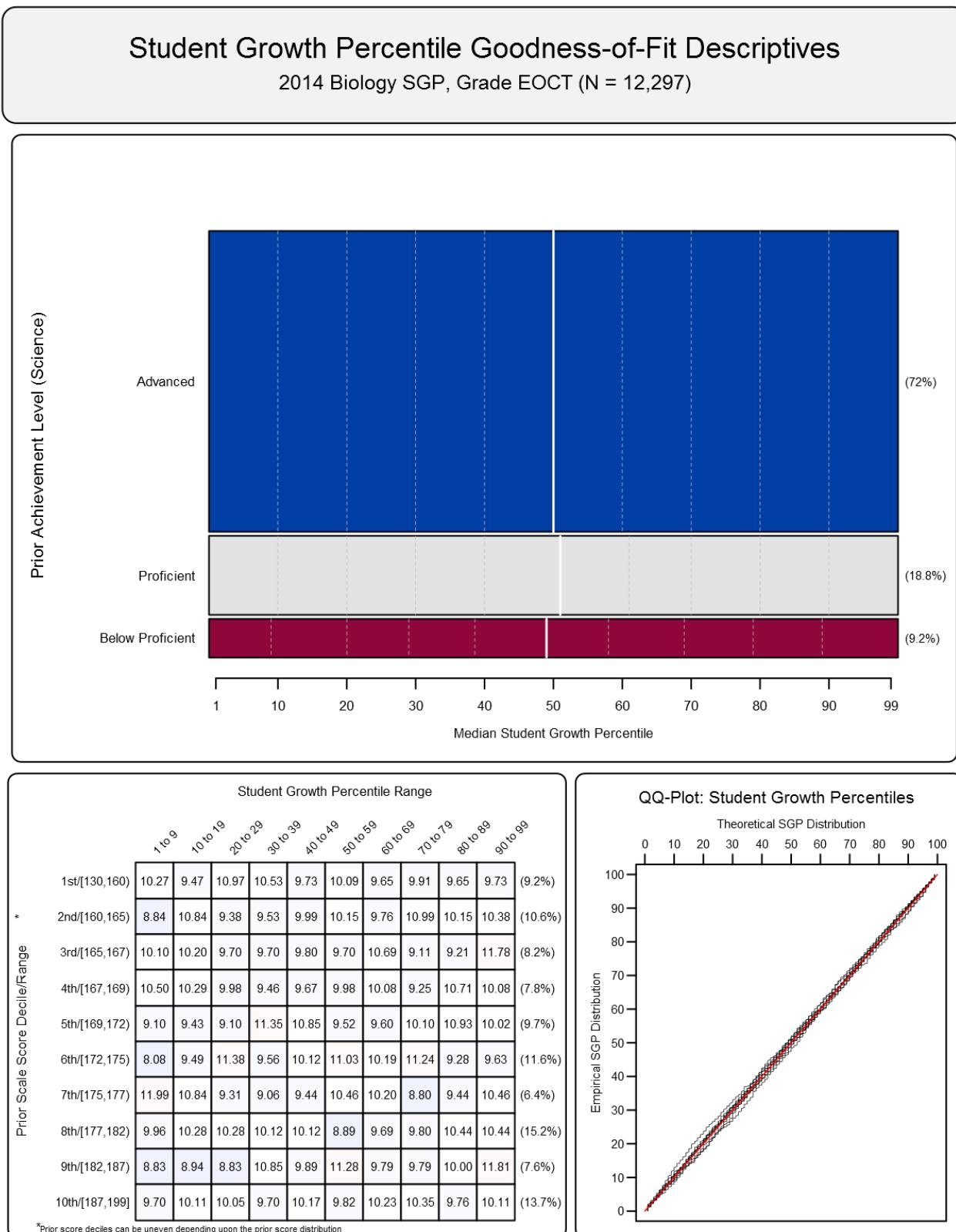


Figure 29: Goodness of Fit Plot for 2014 Biology (Priors - 2013 Science Grade 8, 2012 Science Grade 7, 2011 Science Grade 6, 2010 Science Grade 5)

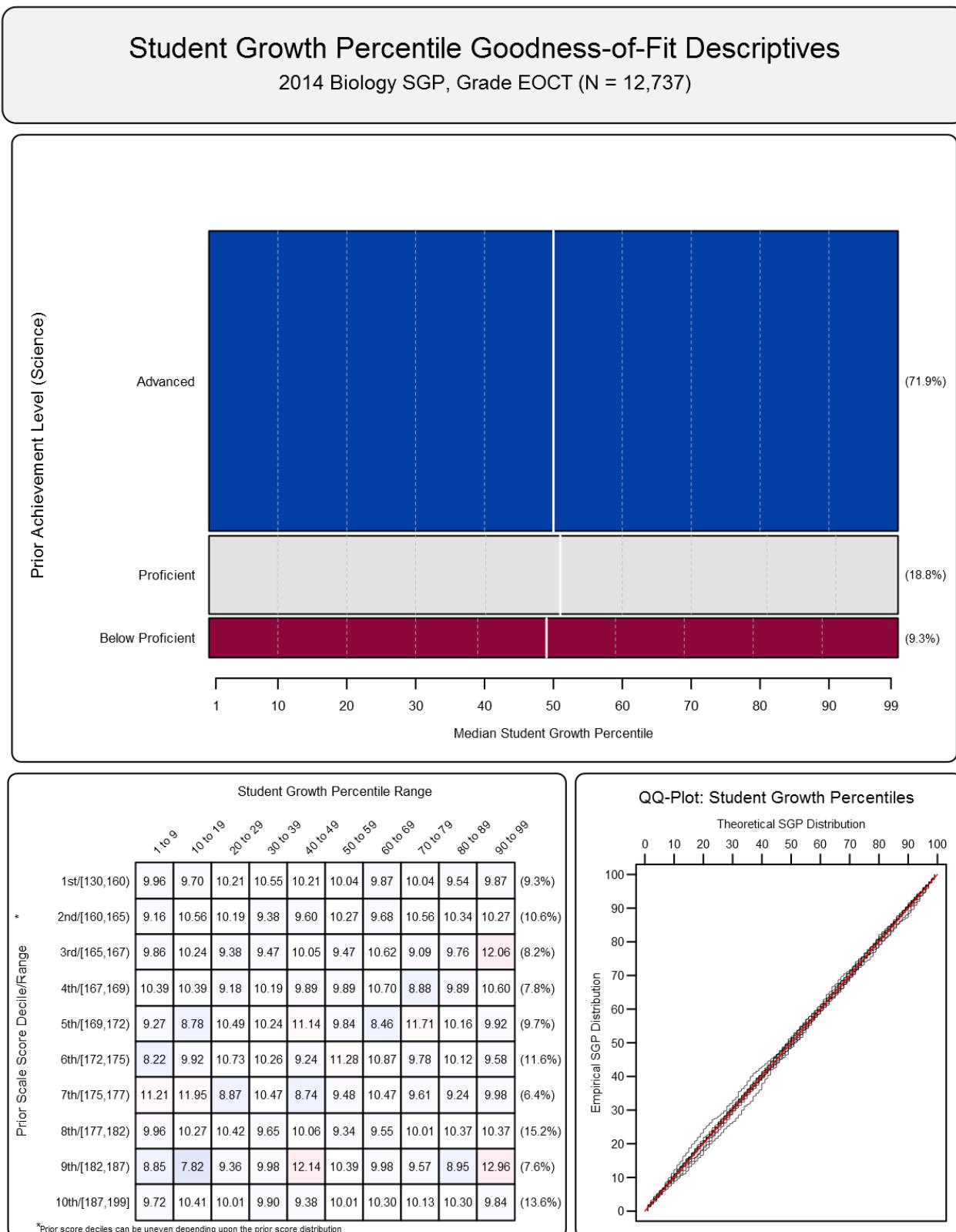


Figure 30: Goodness of Fit Plot for 2014 Biology (Priors - 2013 Science Grade 8, 2012 Science Grade 7, 2011 Science Grade 6)

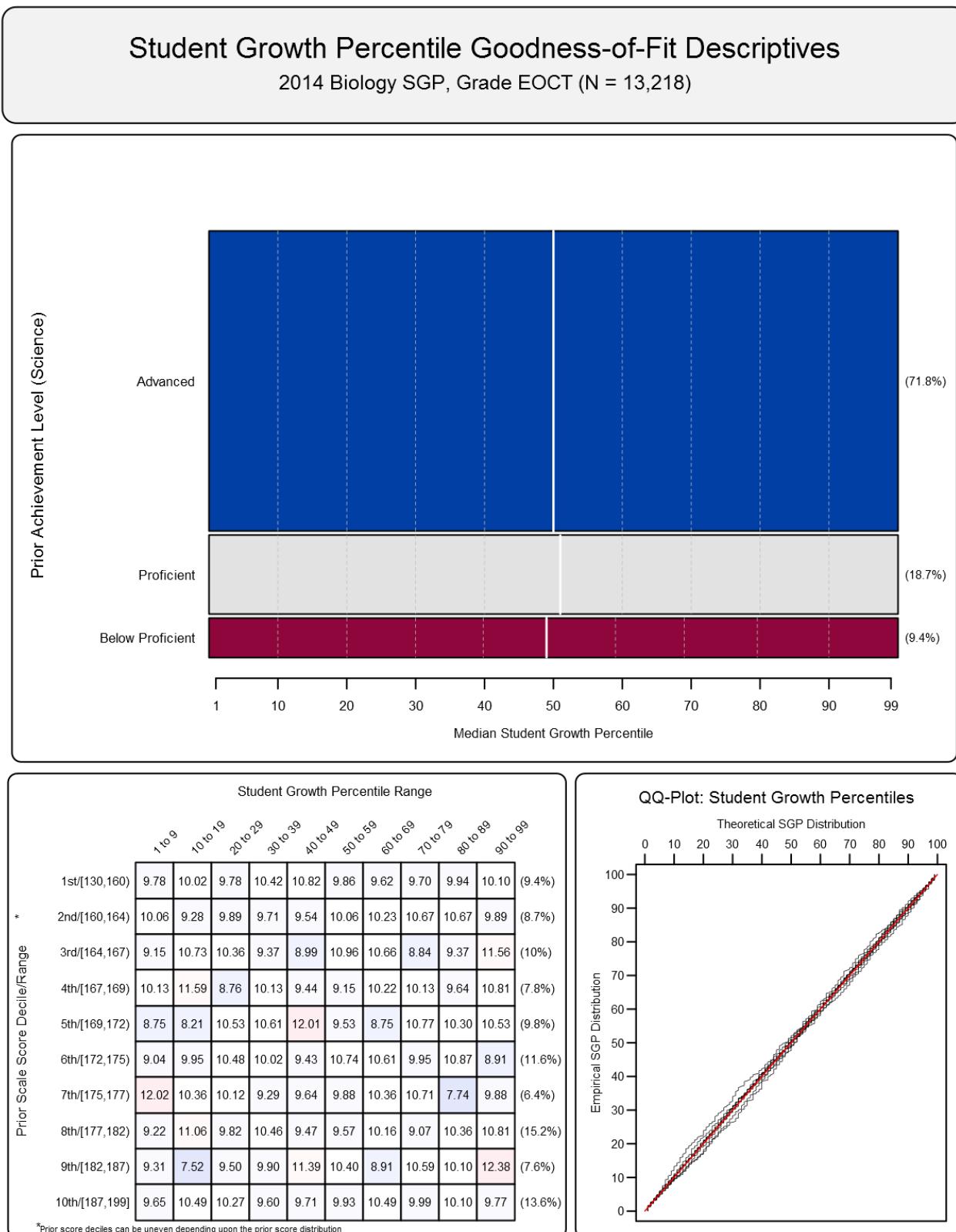


Figure 31: Goodness of Fit Plot for 2014 Biology (Priors - 2013 Science Grade 8, 2012 Science Grade 7)

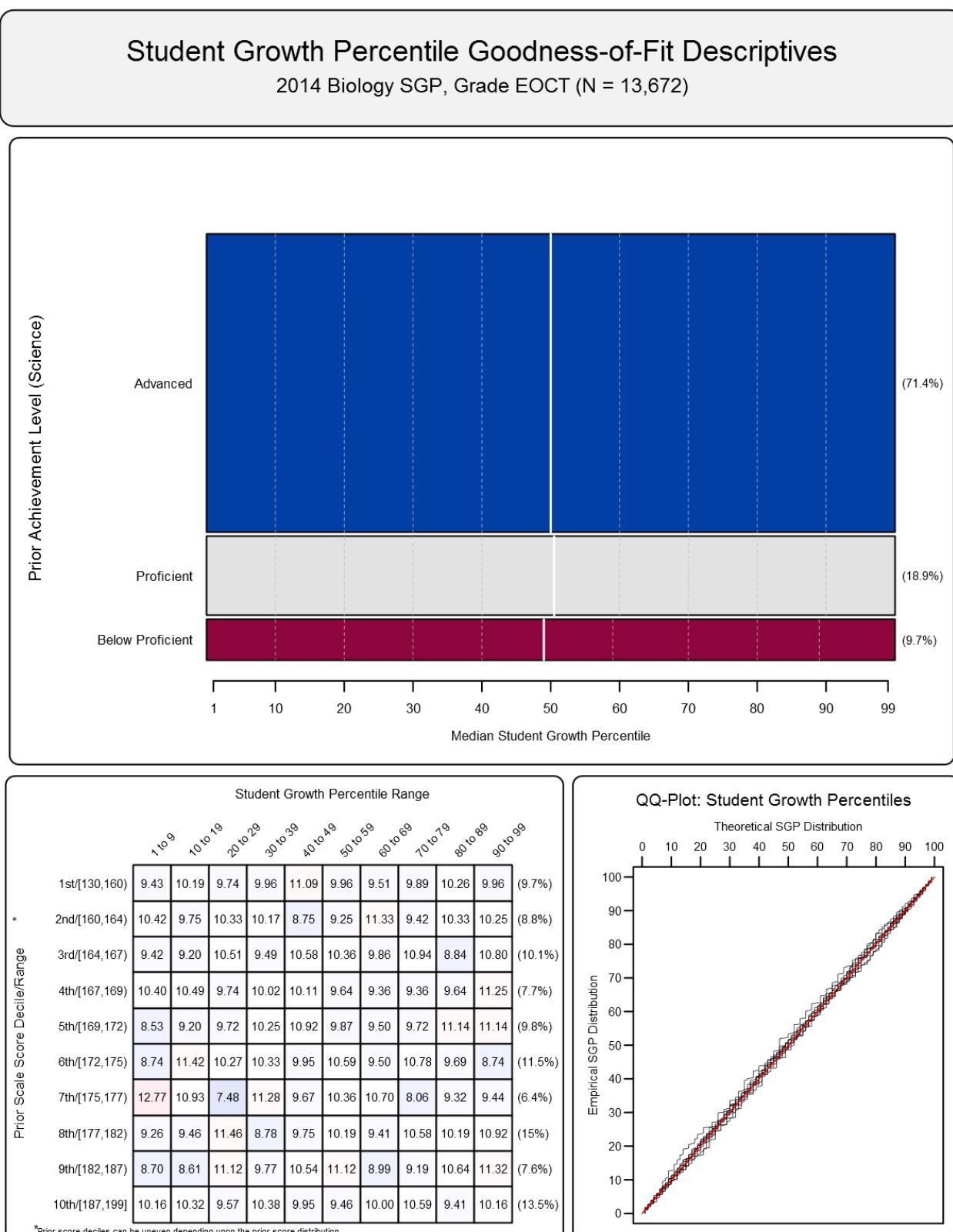


Figure 32: Goodness of Fit Plot for 2014 Biology (Priors - 2013 Science Grade 8)

3.3 Chemistry

3.3.1 Biology as Immediate Prior, Grade 8 Science Secondary

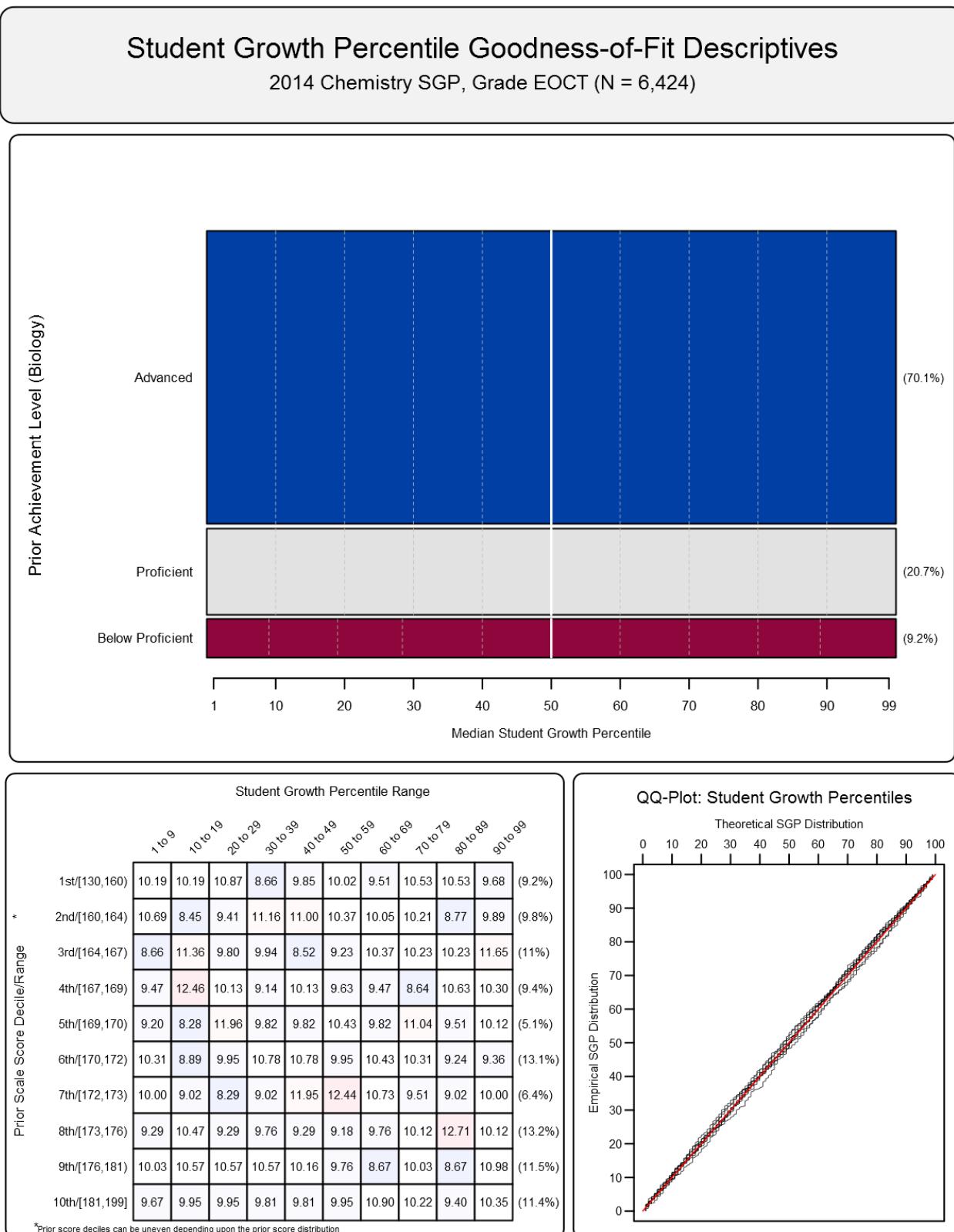


Figure 33: Goodness of Fit Plot for 2014 Chemistry (Priors - 2013 Biology, 2012 Science Grade 8, 2011 Science Grade 7, 2010 Science Grade 6, 2009 Science Grade 5)

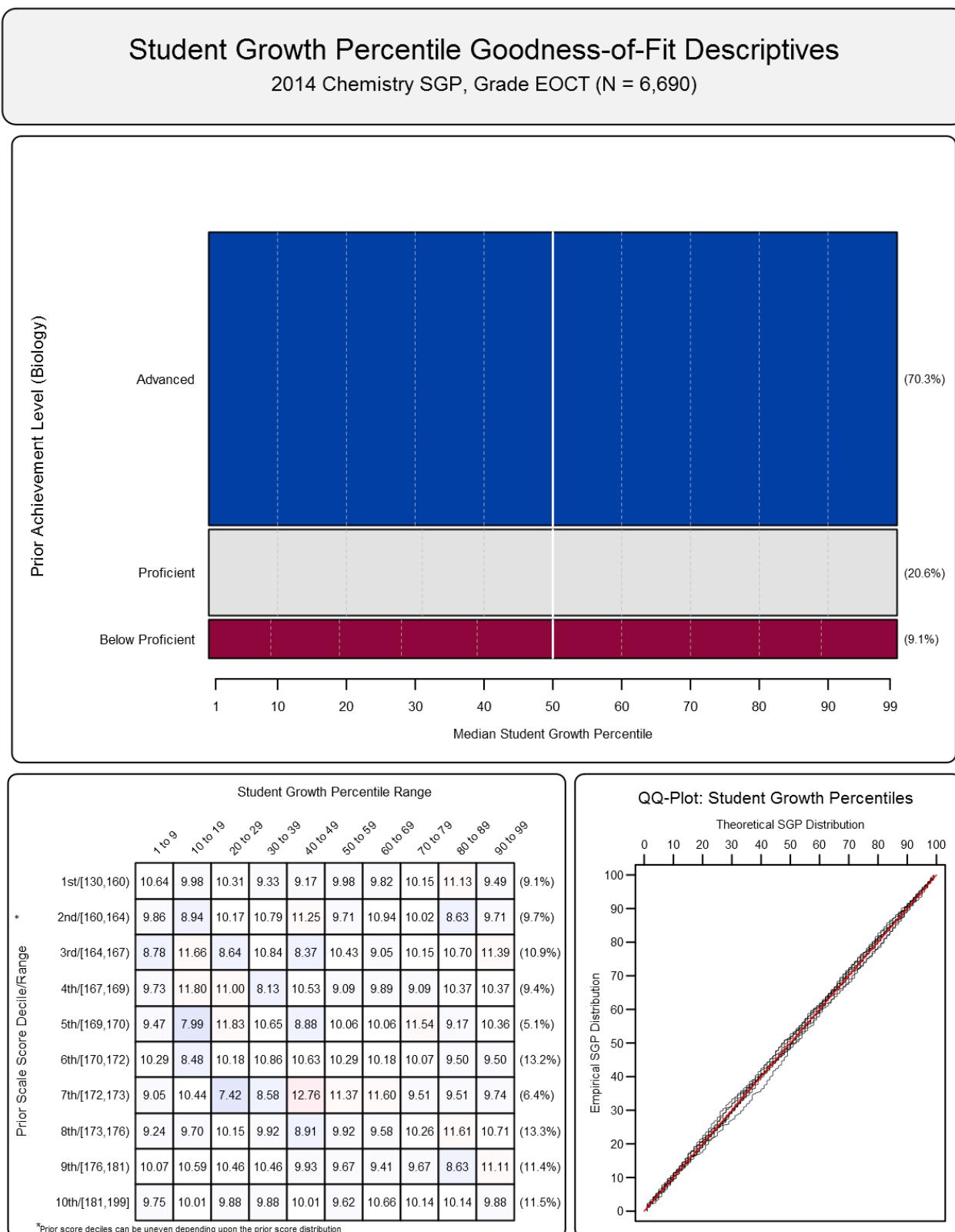


Figure 34: Goodness of Fit Plot for 2014 Chemistry (Priors - 2013 Biology, 2012 Science Grade 8, 2011 Science Grade 7, 2010 Science Grade 6)

Student Growth Percentile Goodness-of-Fit Descriptives

2014 Chemistry SGP, Grade EOCT (N = 6,941)

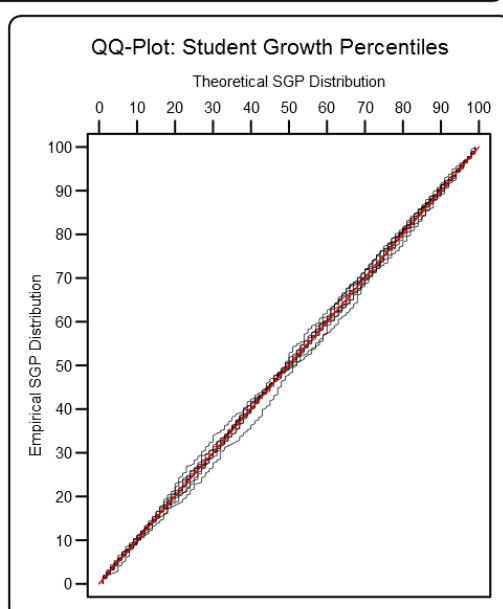
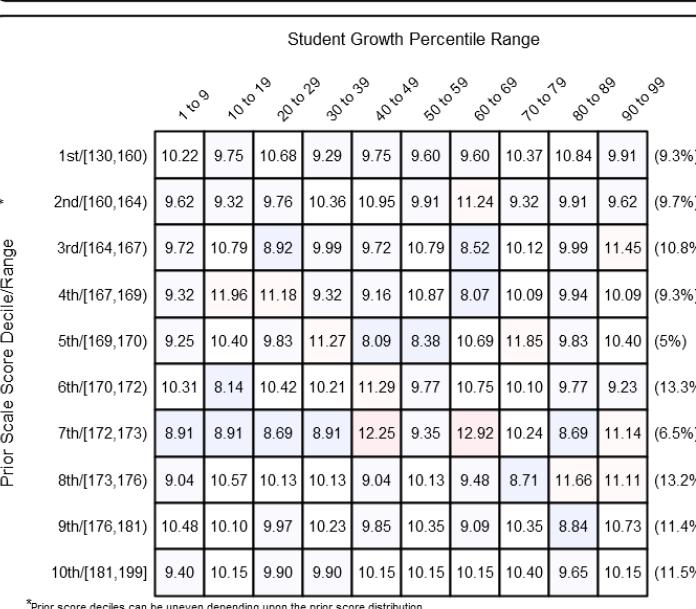
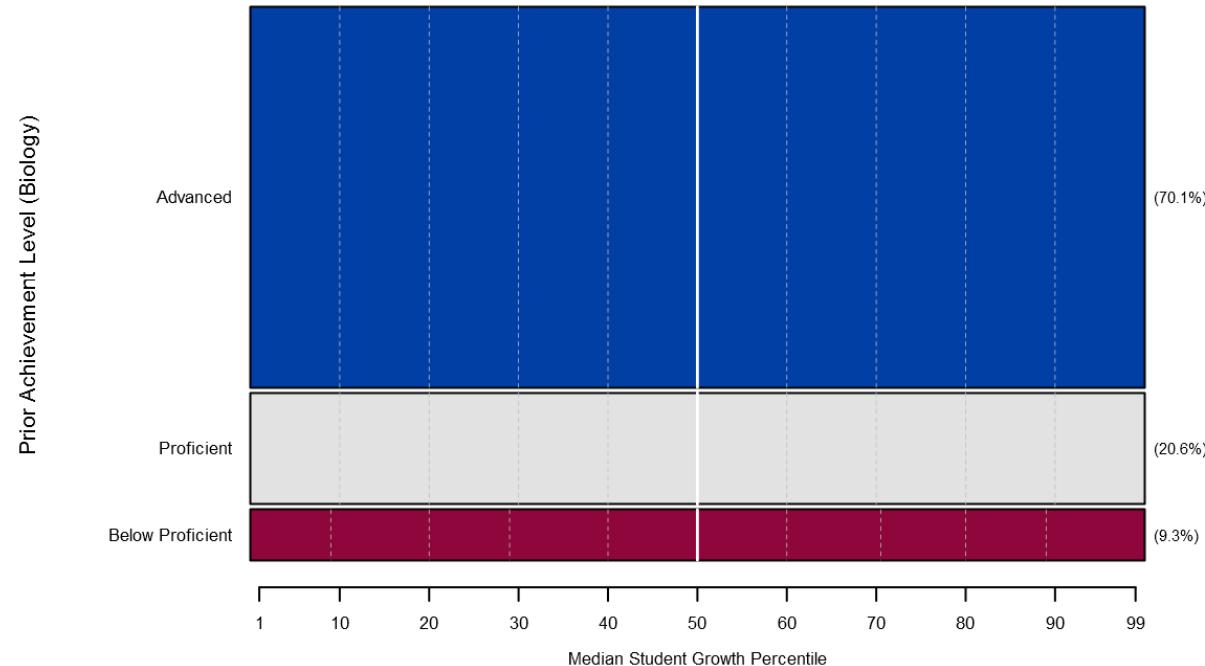


Figure 35: Goodness of Fit Plot for 2014 Chemistry (Priors - 2013 Biology, 2012 Science Grade 8, 2011 Science Grade 7)

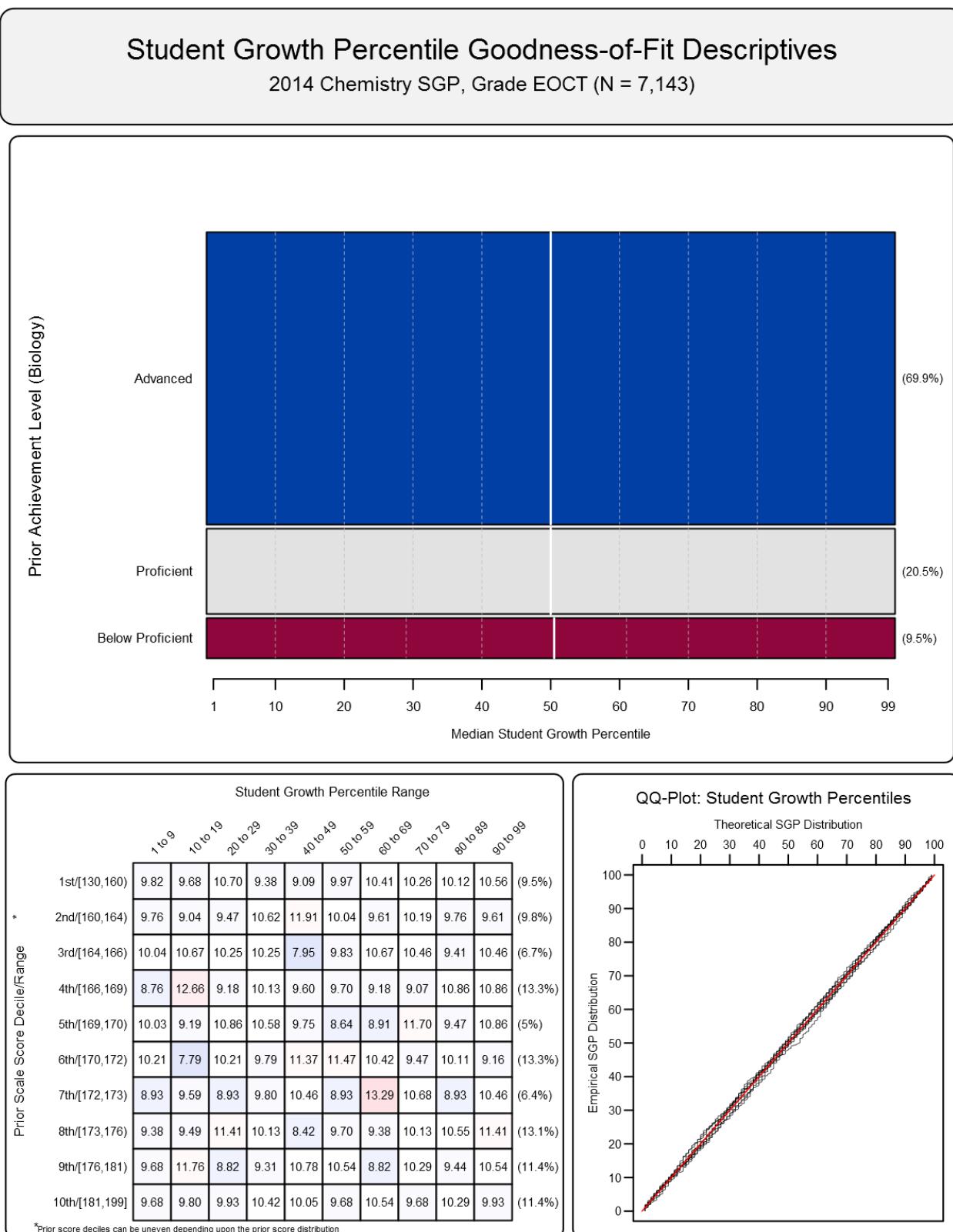


Figure 36: Goodness of Fit Plot for 2014 Chemistry (Priors - 2013 Biology, 2012 Science Grade 8)

3.3.2 Biology as Immediate Prior, Earth Science Secondary

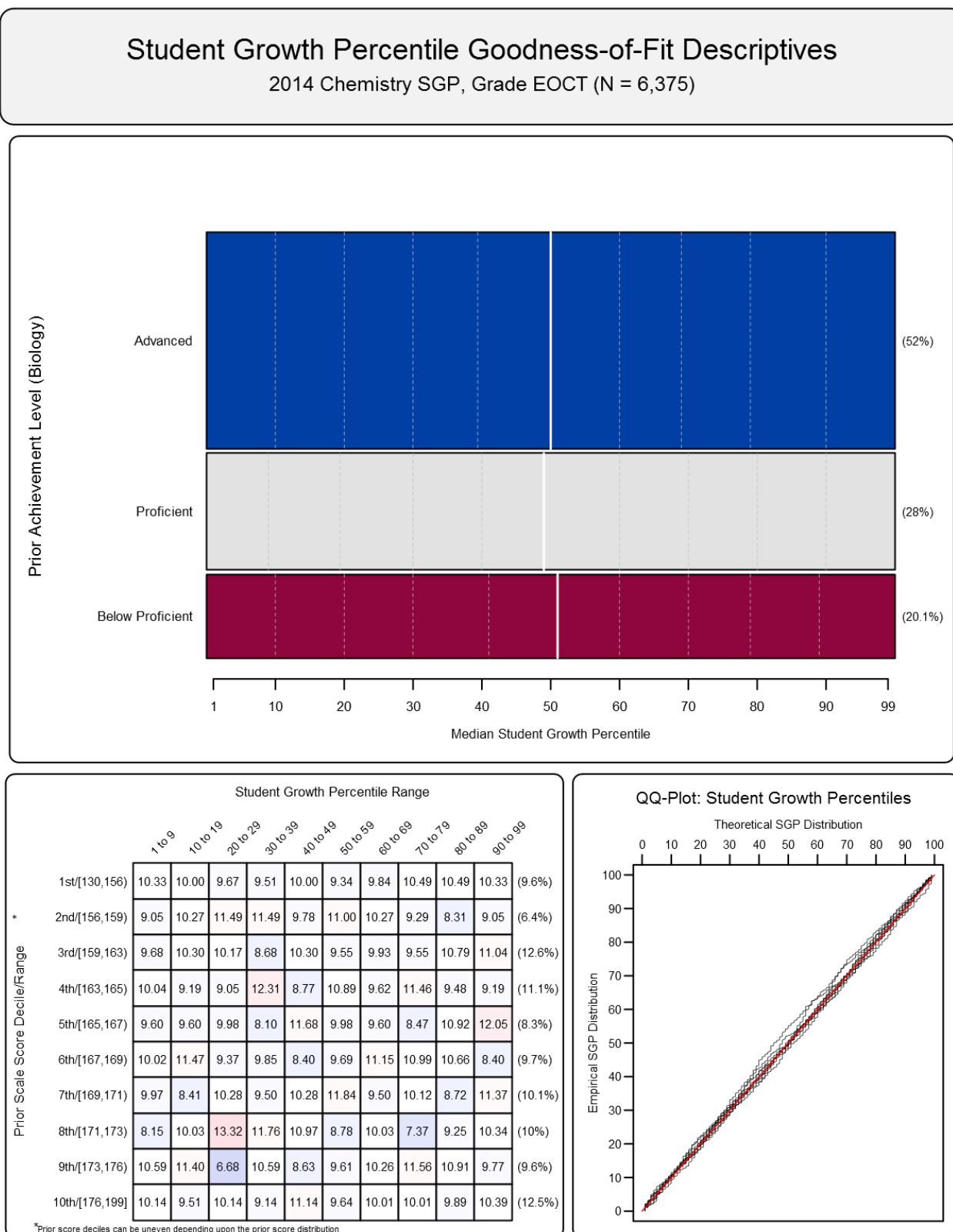


Figure 37: Goodness of Fit Plot for 2014 Chemistry (Priors - 2013 Biology, 2012 Earth Science, 2011 Science Grade 8, 2010 Science Grade 7, 2009 Science Grade 6)

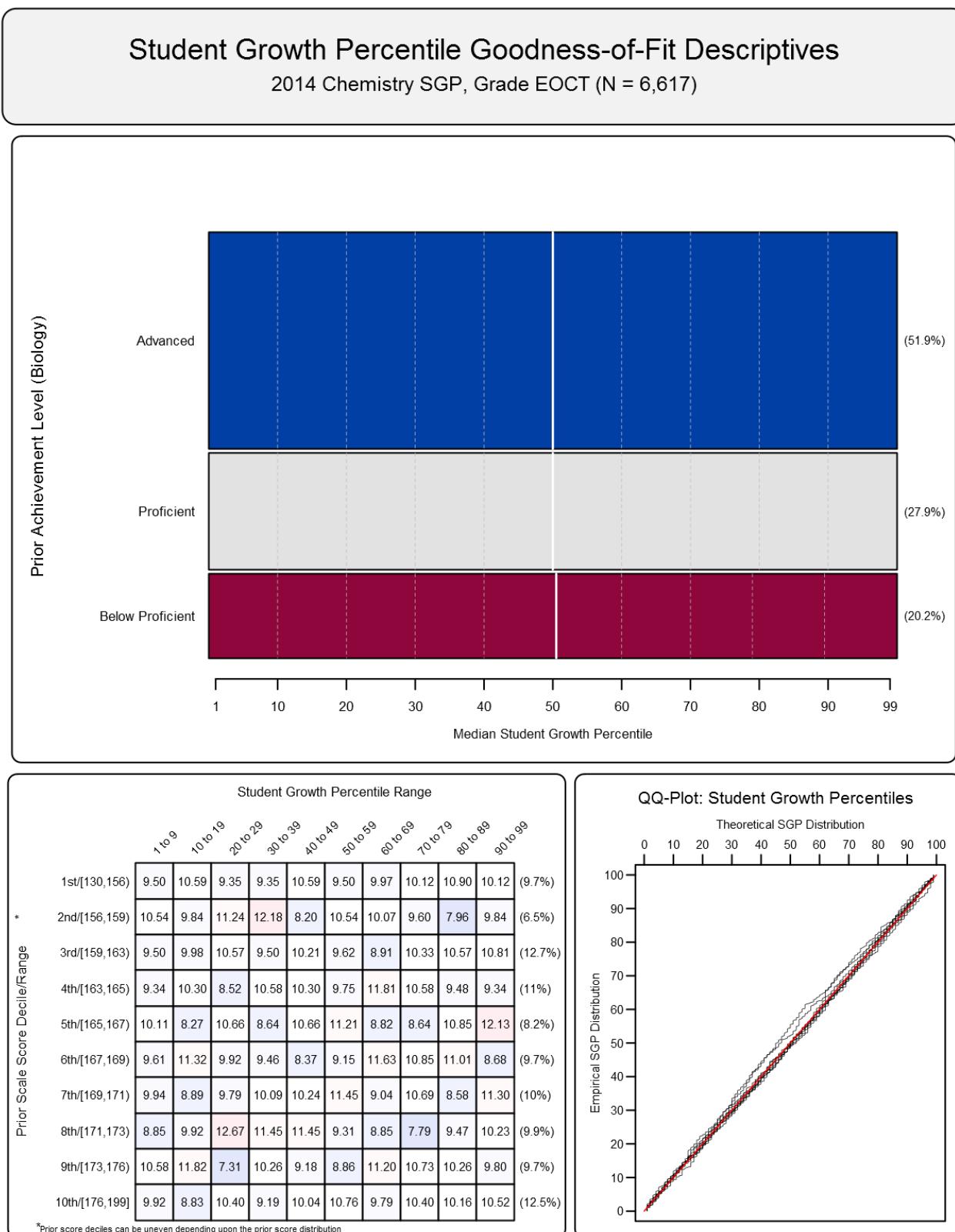


Figure 38: Goodness of Fit Plot for 2014 Chemistry (Priors - 2013 Biology, 2012 Earth Science, 2011 Science Grade 8, 2010 Science Grade 7)

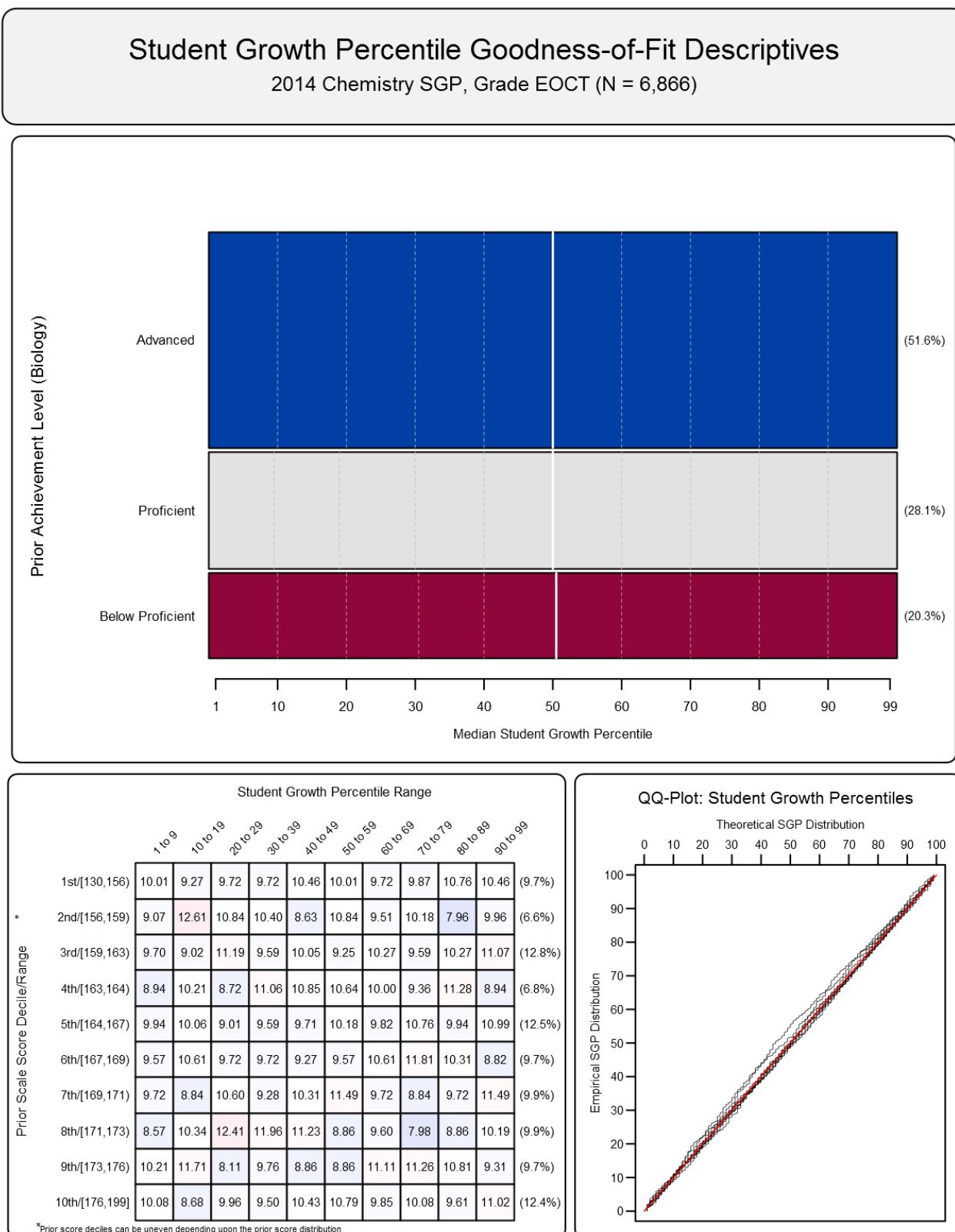


Figure 39: Goodness of Fit Plot for 2014 Chemistry (Priors - 2013 Biology, 2012 Earth Science, 2011 Science Grade 8)

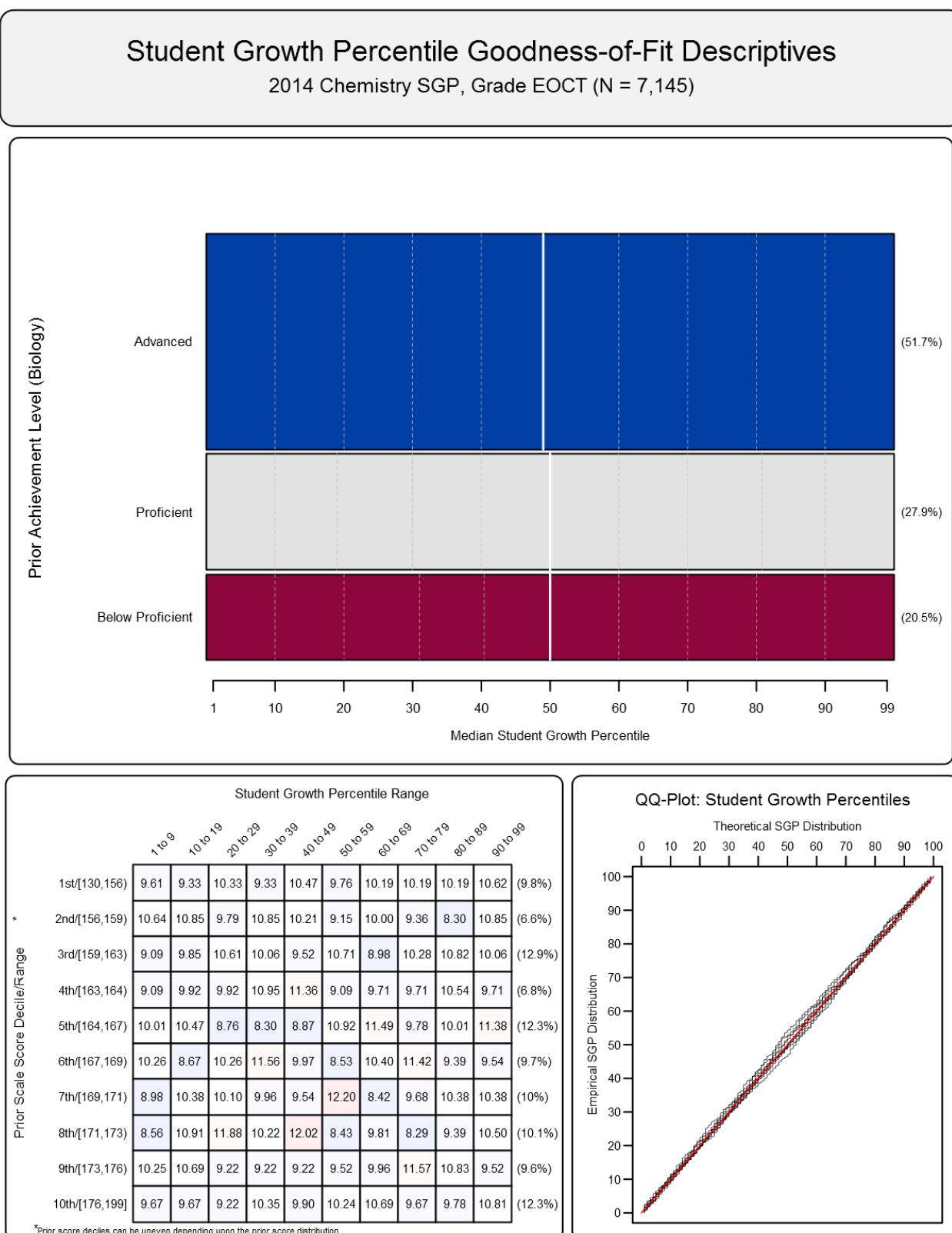


Figure 40: Goodness of Fit Plot for 2014 Chemistry (Priors - 2013 Biology, 2012 Earth Science)

3.4 Physics

3.4.1 Biology as Imediate Prior

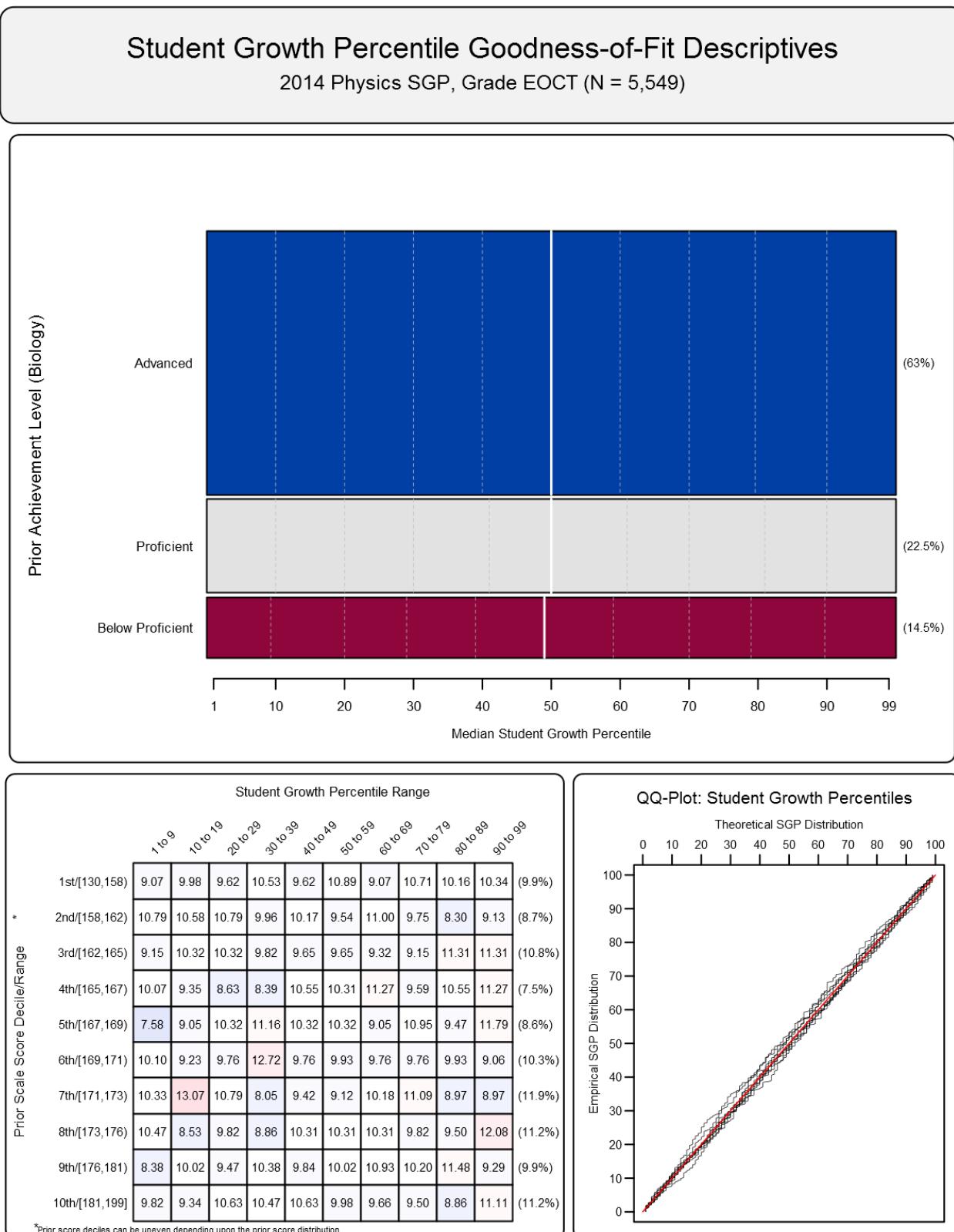


Figure 41: Goodness of Fit Plot for 2014 Physics (Priors - 2013 Biology)

3.4.2 Chemistry as Imediate Prior

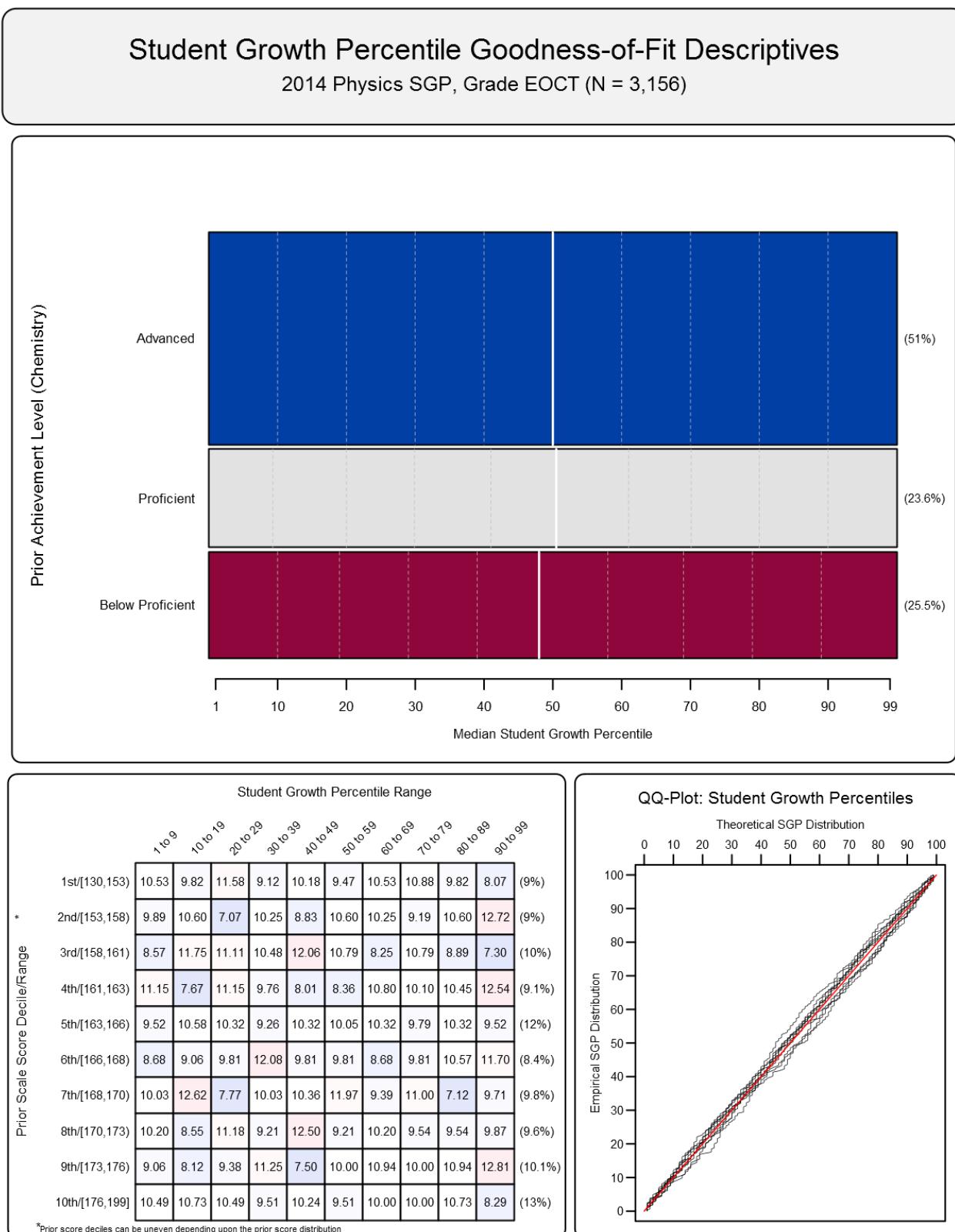


Figure 42: Goodness of Fit Plot for 2014 Physics (Priors - 2013 Chemistry, 2012 Biology, 2011 Science Grade 8)

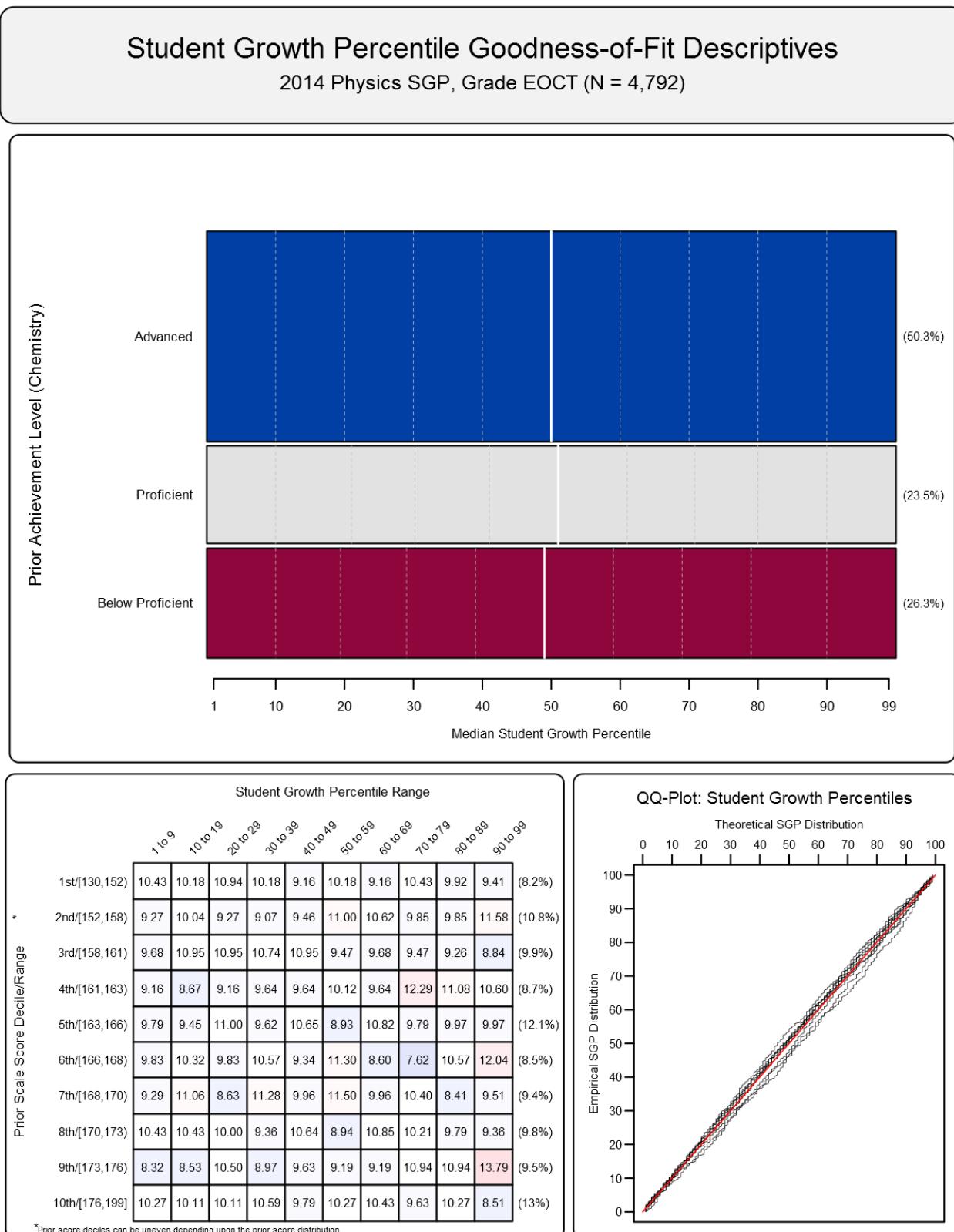


Figure 43: Goodness of Fit Plot for 2014 Physics (Priors - 2013 Chemistry, 2012 Biology)

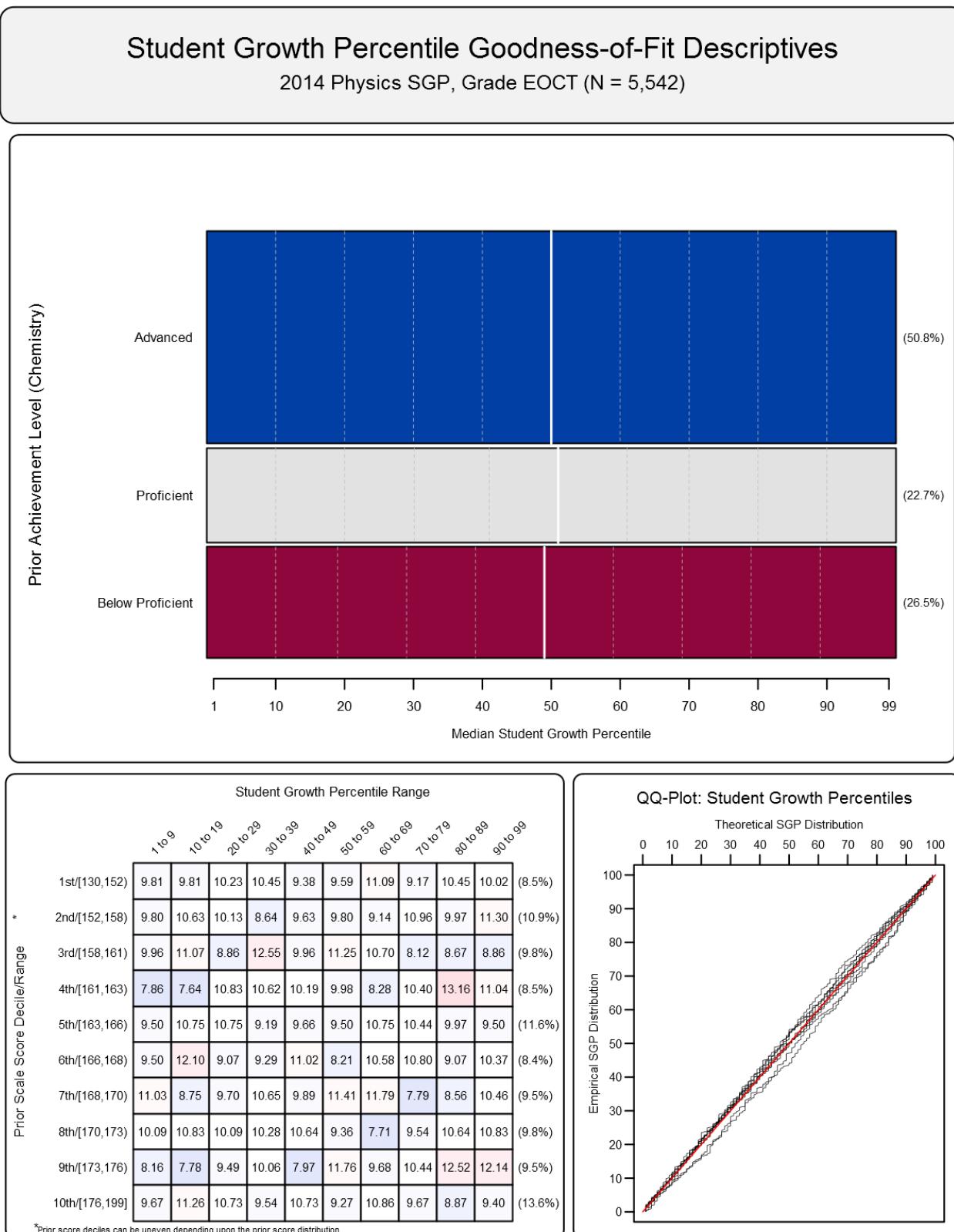


Figure 44: Goodness of Fit Plot for 2014 Physics (Priors - 2013 Chemistry)

3.5 Secondary Math I

Student Growth Percentile Goodness-of-Fit Descriptives

2014 Sec Math I SGP, Grade EOCT (N = 14,228)

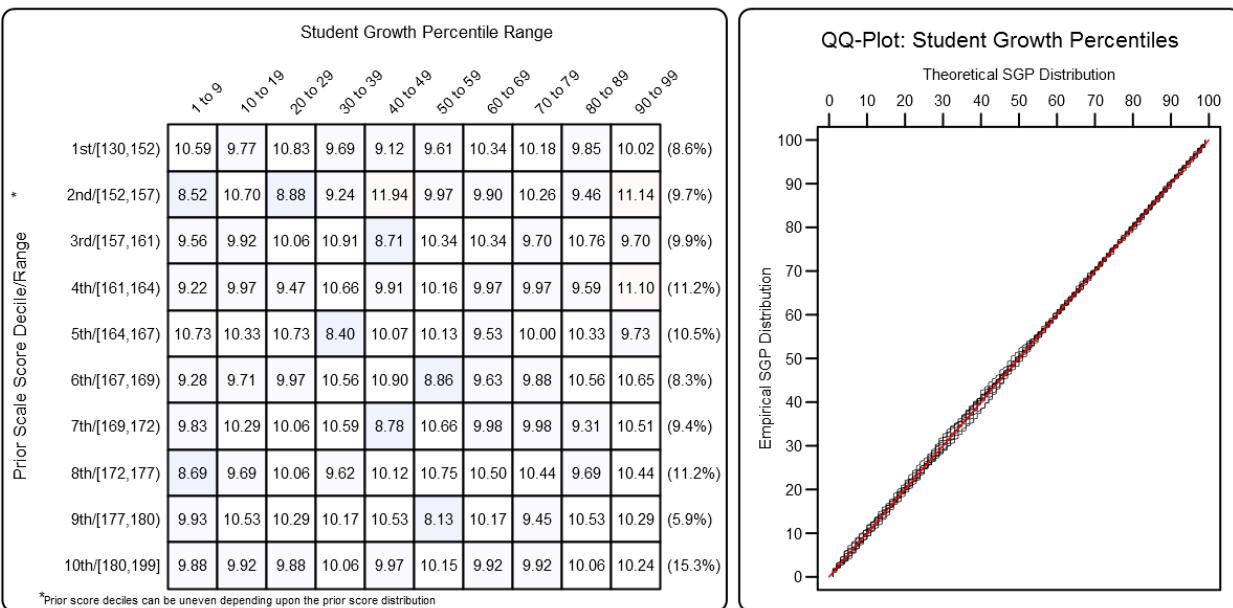
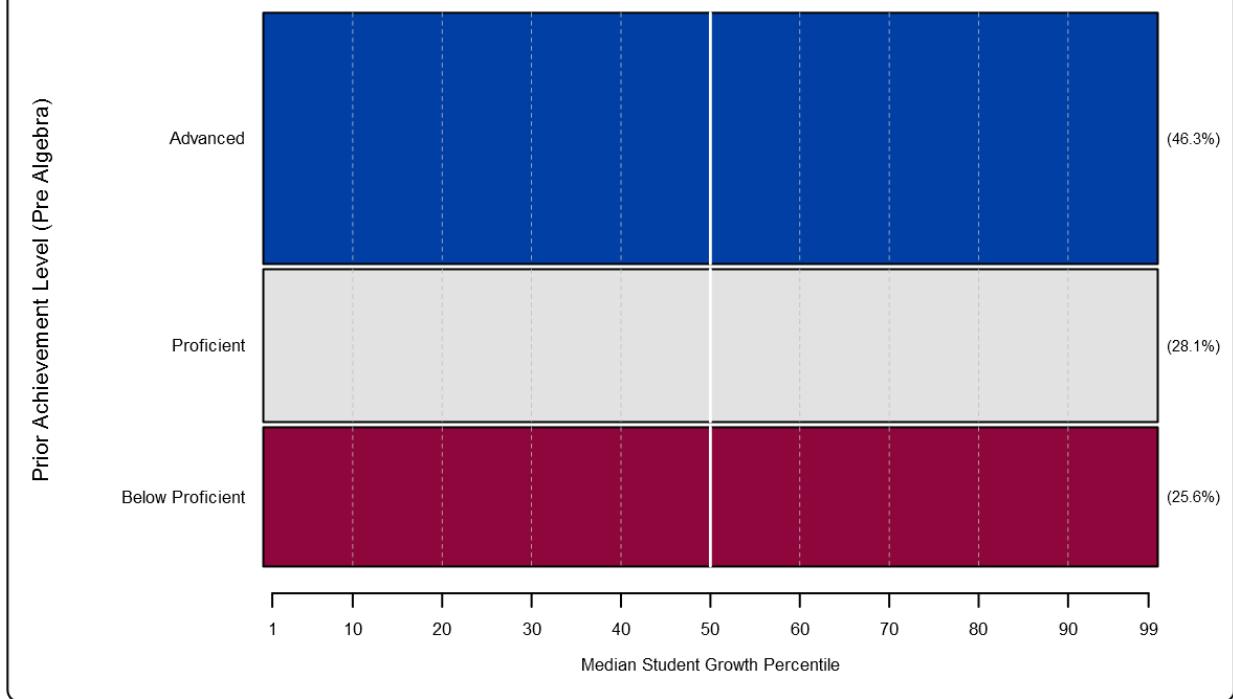


Figure 45: Goodness of Fit Plot for 2014 Secondary Math I (Priors - 2013 Pre Algebra EOCT, 2012 Math Grade 7, 2011 Math Grade 6, 2010 Math Grade 5, 2009 Math Grade 4)

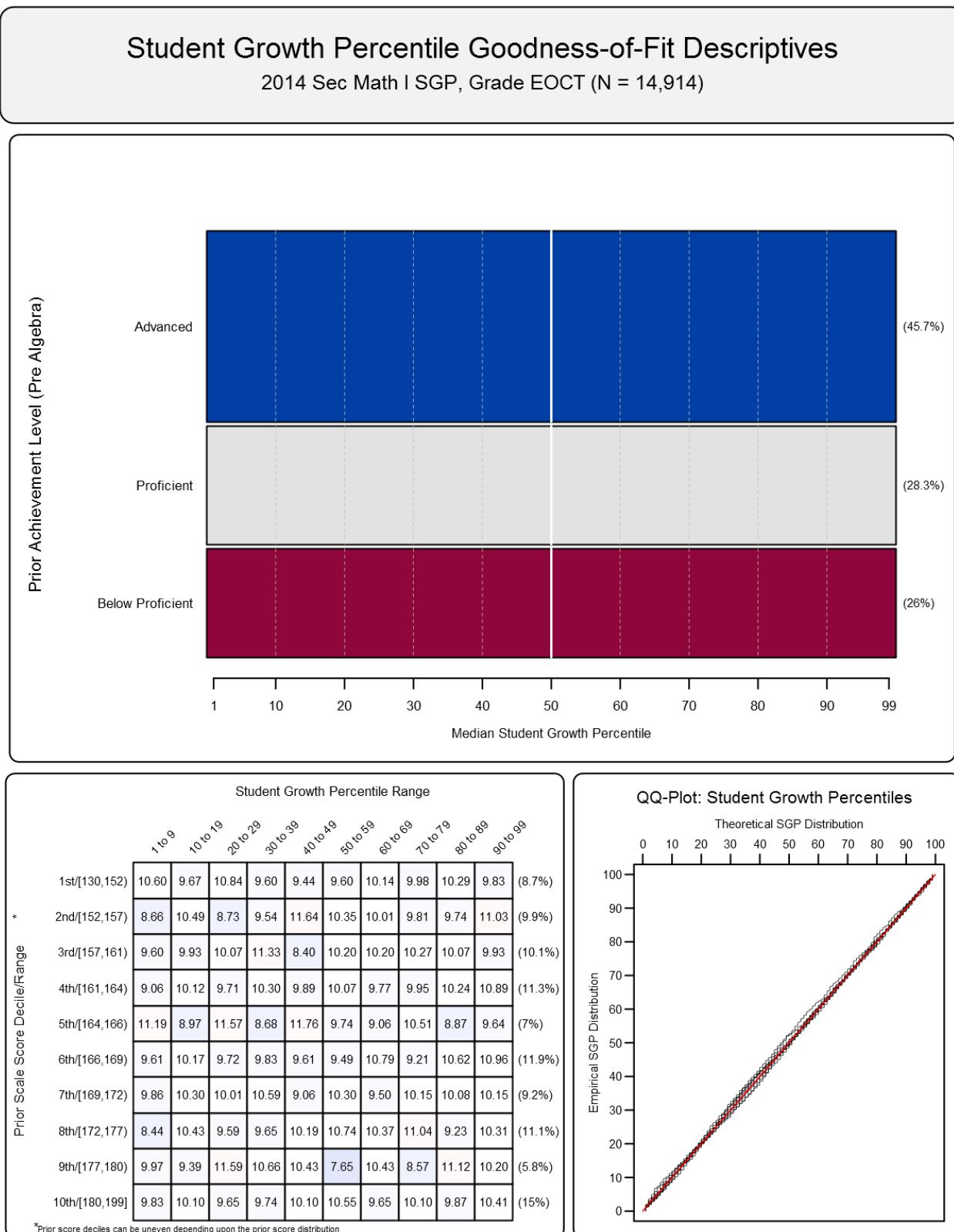
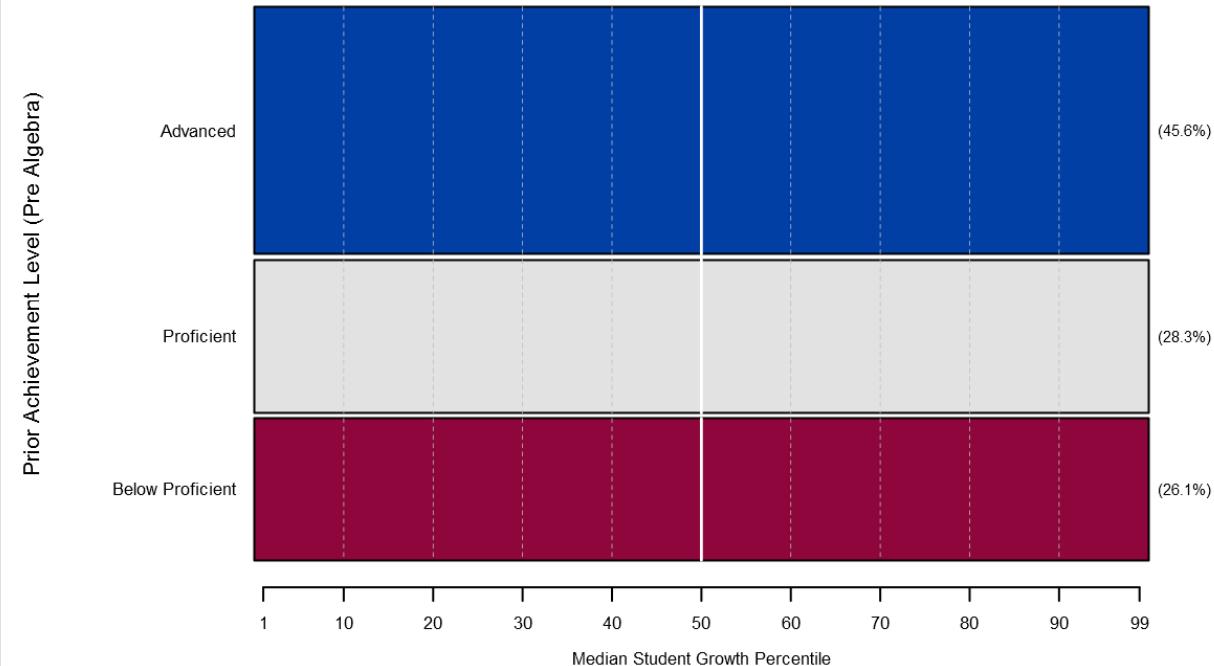


Figure 46: Goodness of Fit Plot for 2014 Secondary Math I (Priors - 2013 Pre Algebra EOCT, 2012 Math Grade 7, 2011 Math Grade 6, 2010 Math Grade 5)

Student Growth Percentile Goodness-of-Fit Descriptives

2014 Sec Math I SGP, Grade EOCT (N = 15,428)



Student Growth Percentile Range										
	1 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99
1st/[130,152)	10.49	9.74	10.26	10.11	9.21	9.89	10.04	9.81	10.34	10.11
2nd/[152,157)	8.80	10.42	9.06	9.45	11.26	10.42	9.64	10.36	9.51	11.07
3rd/[157,161)	9.83	9.63	10.41	10.60	9.05	10.02	10.54	9.63	10.28	10.02
4th/[161,164)	8.73	10.40	9.53	10.34	10.28	9.99	10.11	9.88	10.11	10.63
5th/[164,166)	11.23	9.19	10.96	9.10	10.96	9.75	9.38	10.31	9.38	9.75
6th/[166,169)	9.28	10.31	9.99	9.83	9.55	9.77	9.93	9.99	10.37	10.97
7th/[169,172)	9.90	10.31	10.24	10.52	9.34	9.90	9.97	9.62	10.03	10.17
8th/[172,177)	8.78	10.06	9.31	9.77	10.30	10.65	10.41	10.70	9.95	10.06
9th/[177,180)	9.88	9.88	10.90	10.22	10.33	8.85	9.76	9.65	9.76	10.78
10th/[180,199]	9.67	9.93	9.97	10.10	9.97	10.10	9.89	9.84	10.10	10.41

*Prior score deciles can be uneven depending upon the prior score distribution

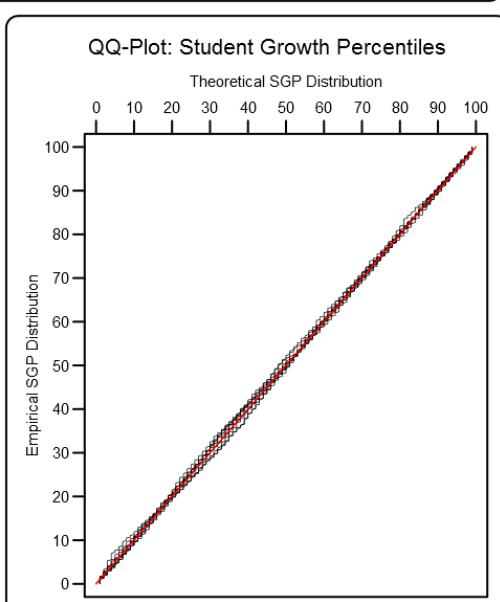


Figure 47: Goodness of Fit Plot for 2014 Secondary Math I (Priors - 2013 Pre Algebra EOCT, 2012 Math Grade 7, 2011 Math Grade 6)

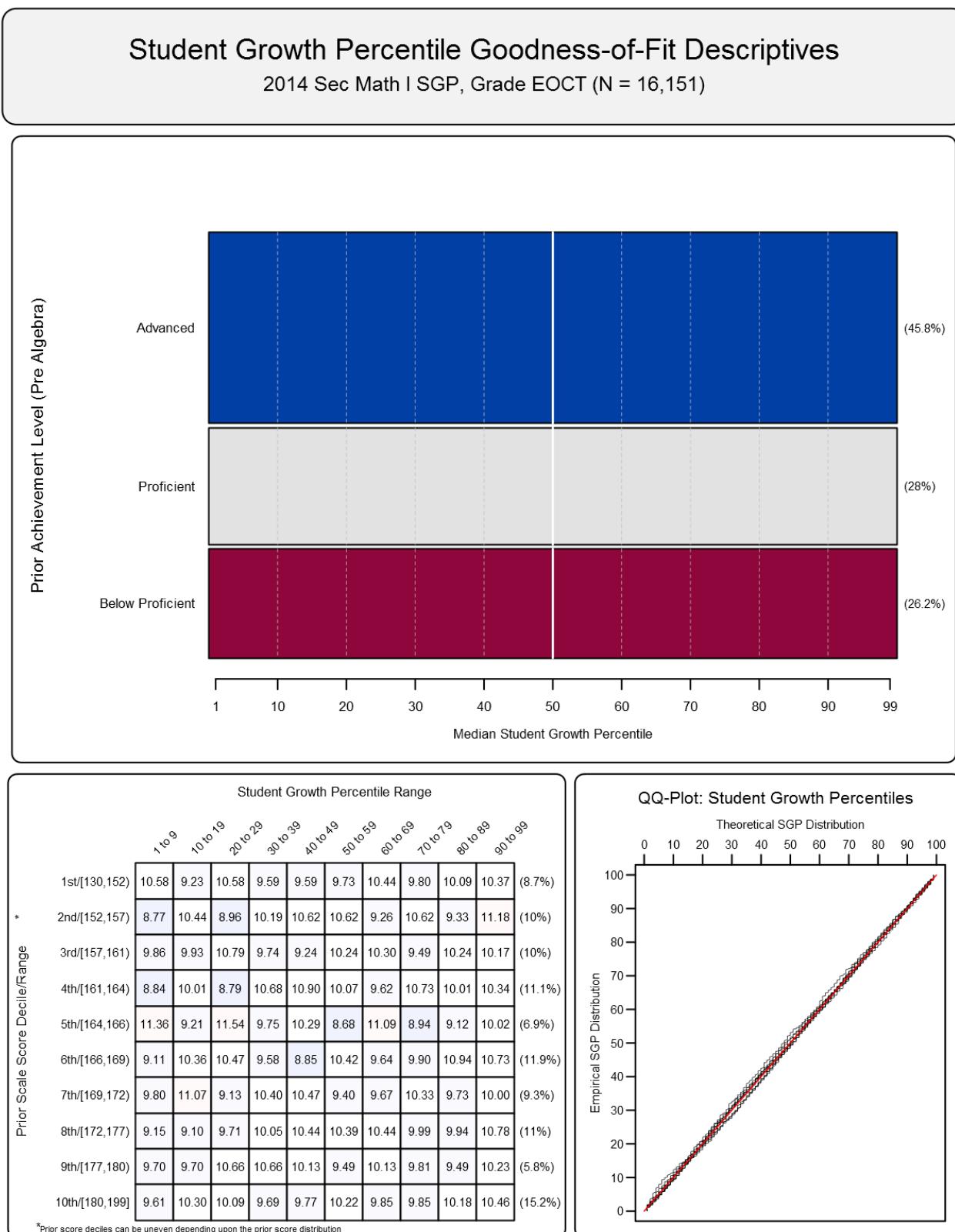


Figure 48: Goodness of Fit Plot for 2014 Secondary Math I (Priors - 2013 Pre Algebra EOCT, 2012 Math Grade 7)

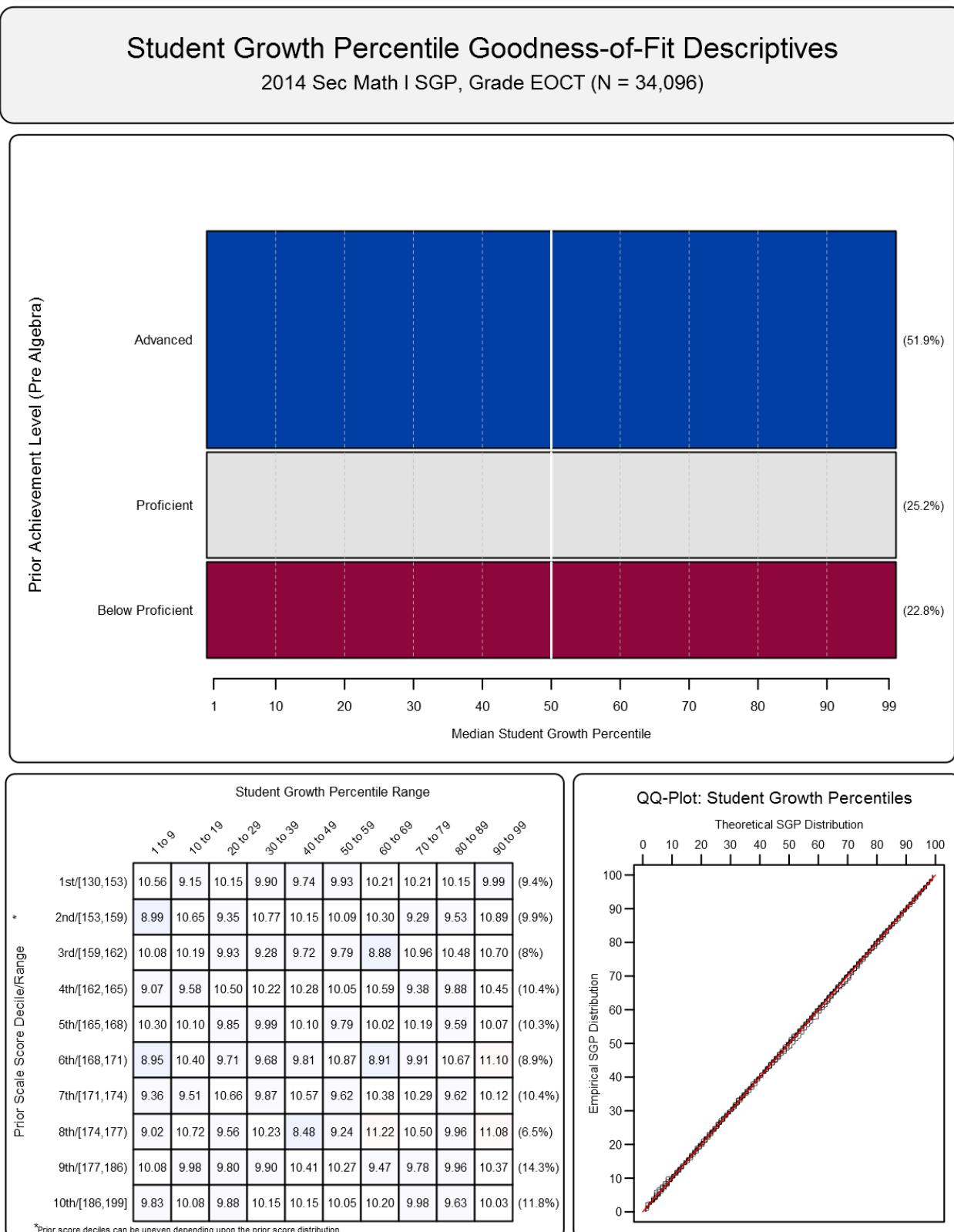


Figure 49: Goodness of Fit Plot for 2014 Secondary Math I (Priors - 2013 Pre Algebra EOCT)

3.6 Secondary Math II

3.6.1 Pre-Algebra as Imediate Prior

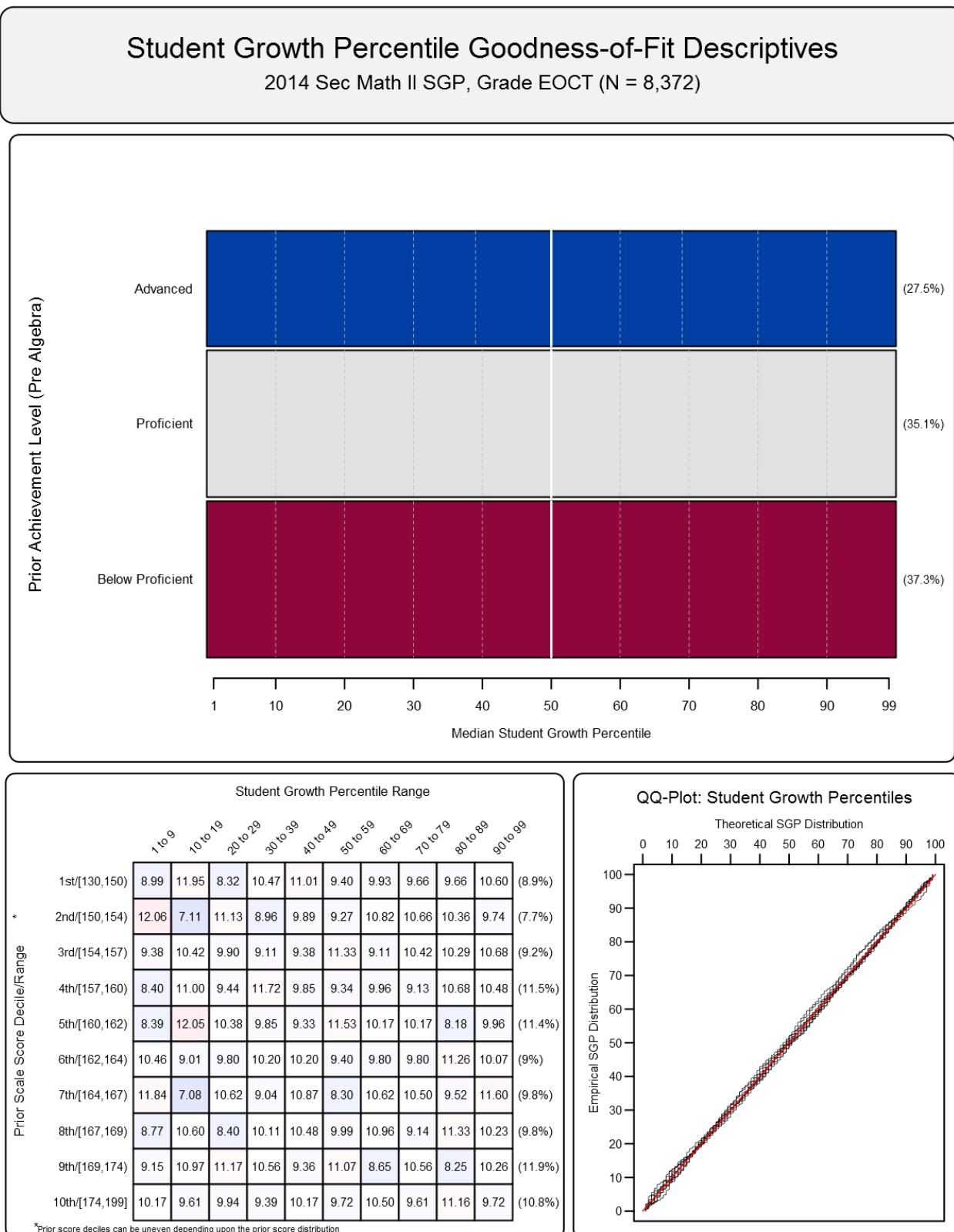


Figure 50: Goodness of Fit Plot for 2014 Secondary Math II (Priors - 2012 Pre Algebra, 2011 Math Grade 7, 2010 Math Grade 6, 2009 Math Grade 5)

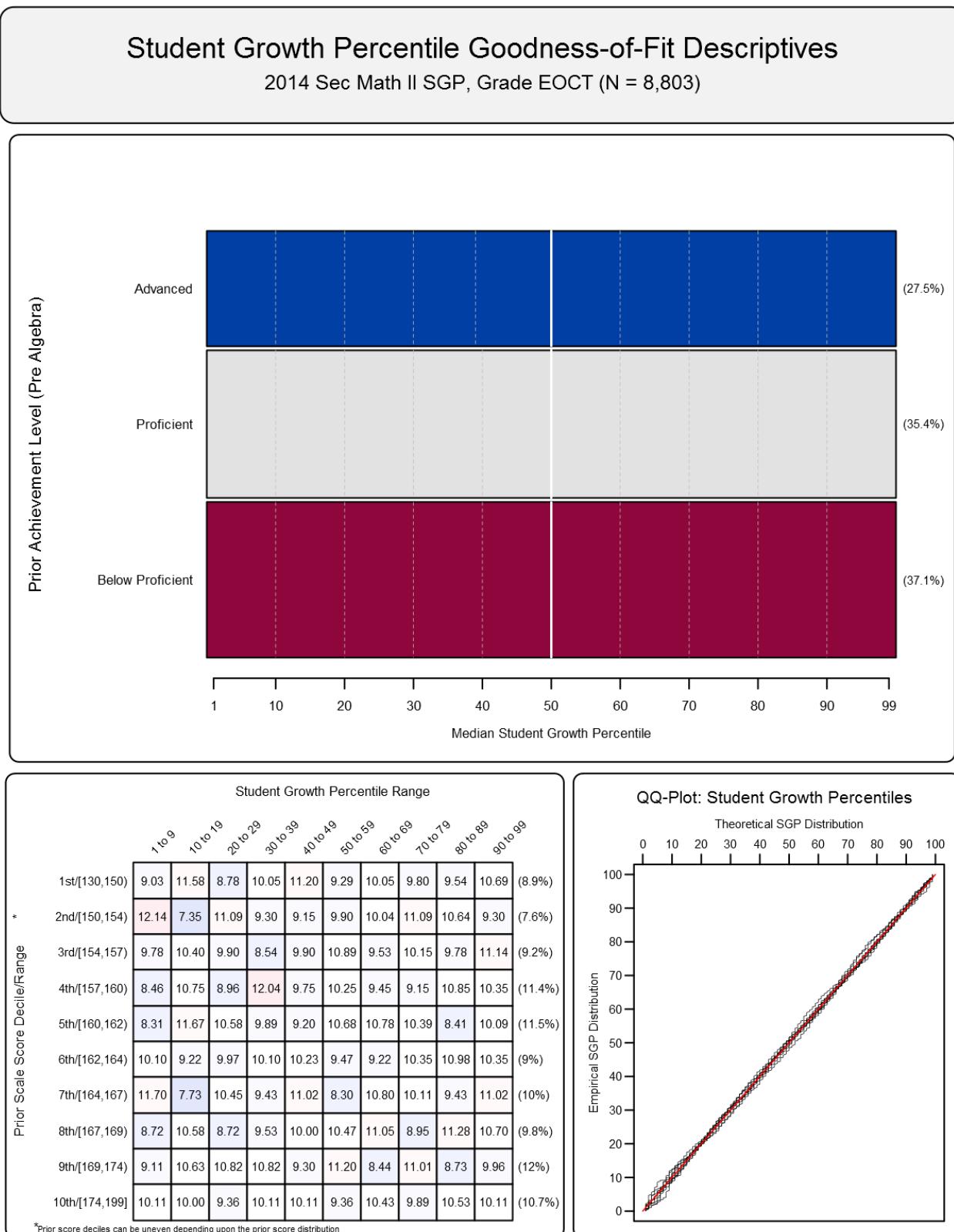
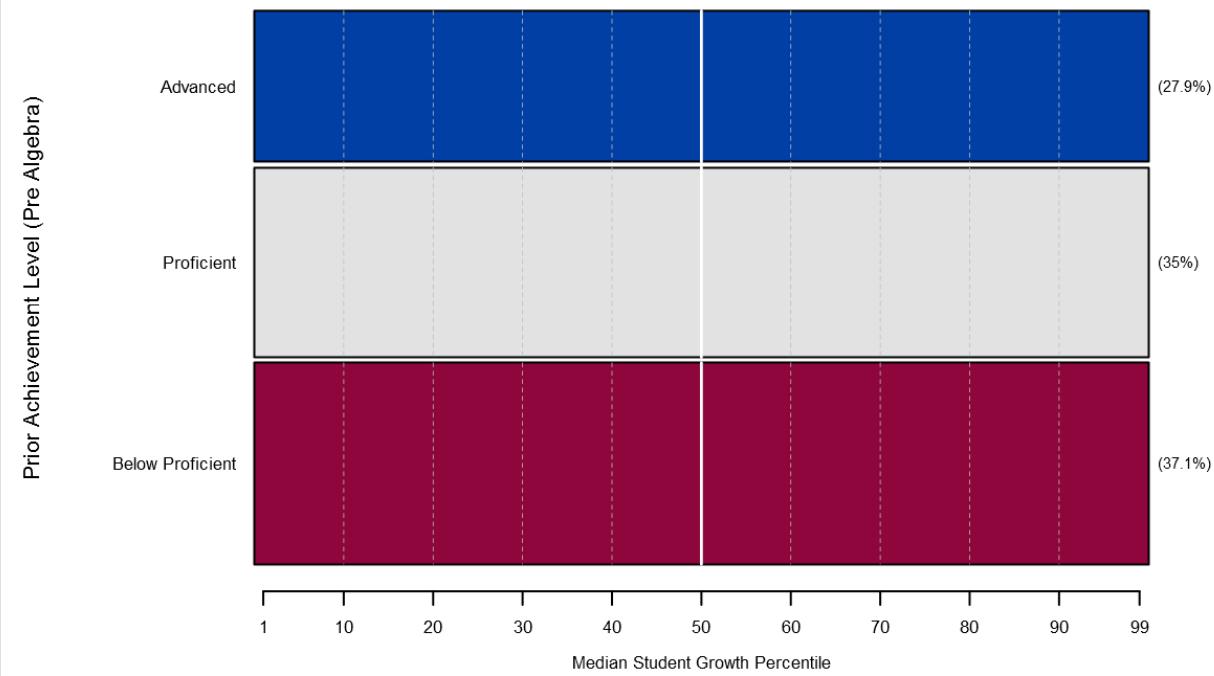


Figure 51: Goodness of Fit Plot for 2014 Secondary Math II (Priors - 2012 Pre Algebra, 2011 Math Grade 7, 2010 Math Grade 6)

Student Growth Percentile Goodness-of-Fit Descriptives

2014 Sec Math II SGP, Grade EOCT (N = 9,230)



Student Growth Percentile Range

	1 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	
1st/[130,150)	8.86	11.26	8.98	10.54	10.30	9.58	10.42	9.70	9.58	10.78	(9%)
2nd/[150,154)	12.39	6.70	11.97	9.54	9.12	10.54	8.55	11.82	10.11	9.26	(7.6%)
3rd/[154,157)	9.87	10.70	9.04	8.68	11.06	9.27	10.23	9.75	9.99	11.41	(9.1%)
4th/[157,160)	8.39	10.58	9.06	10.96	9.63	11.25	10.01	8.77	10.77	10.58	(11.4%)
5th/[160,162)	8.71	11.17	10.70	10.42	9.09	10.61	10.61	10.32	8.81	9.56	(11.4%)
6th/[162,164)	9.44	9.56	10.29	9.44	11.52	8.33	9.44	10.66	10.78	10.54	(8.8%)
7th/[164,167)	11.94	8.21	9.86	10.51	9.20	9.20	10.30	9.64	9.75	11.39	(9.9%)
8th/[167,169)	8.86	10.31	9.08	8.63	10.76	10.99	10.20	9.87	10.76	10.54	(9.7%)
9th/[169,174)	9.19	10.26	11.06	11.15	9.37	10.17	9.63	10.08	9.19	9.90	(12.1%)
10th/[174,199]	9.85	10.35	9.55	9.35	10.15	9.65	10.25	10.05	10.45	10.35	(10.9%)

*Prior score deciles can be uneven depending upon the prior score distribution

QQ-Plot: Student Growth Percentiles

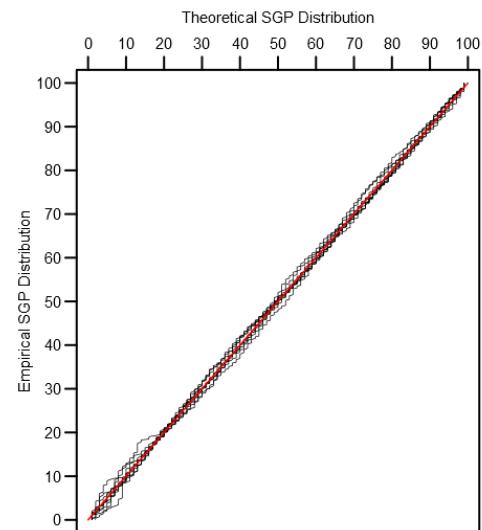


Figure 52: Goodness of Fit Plot for 2014 Secondary Math II (Priors - 2012 Pre Algebra, 2011 Math Grade 7)

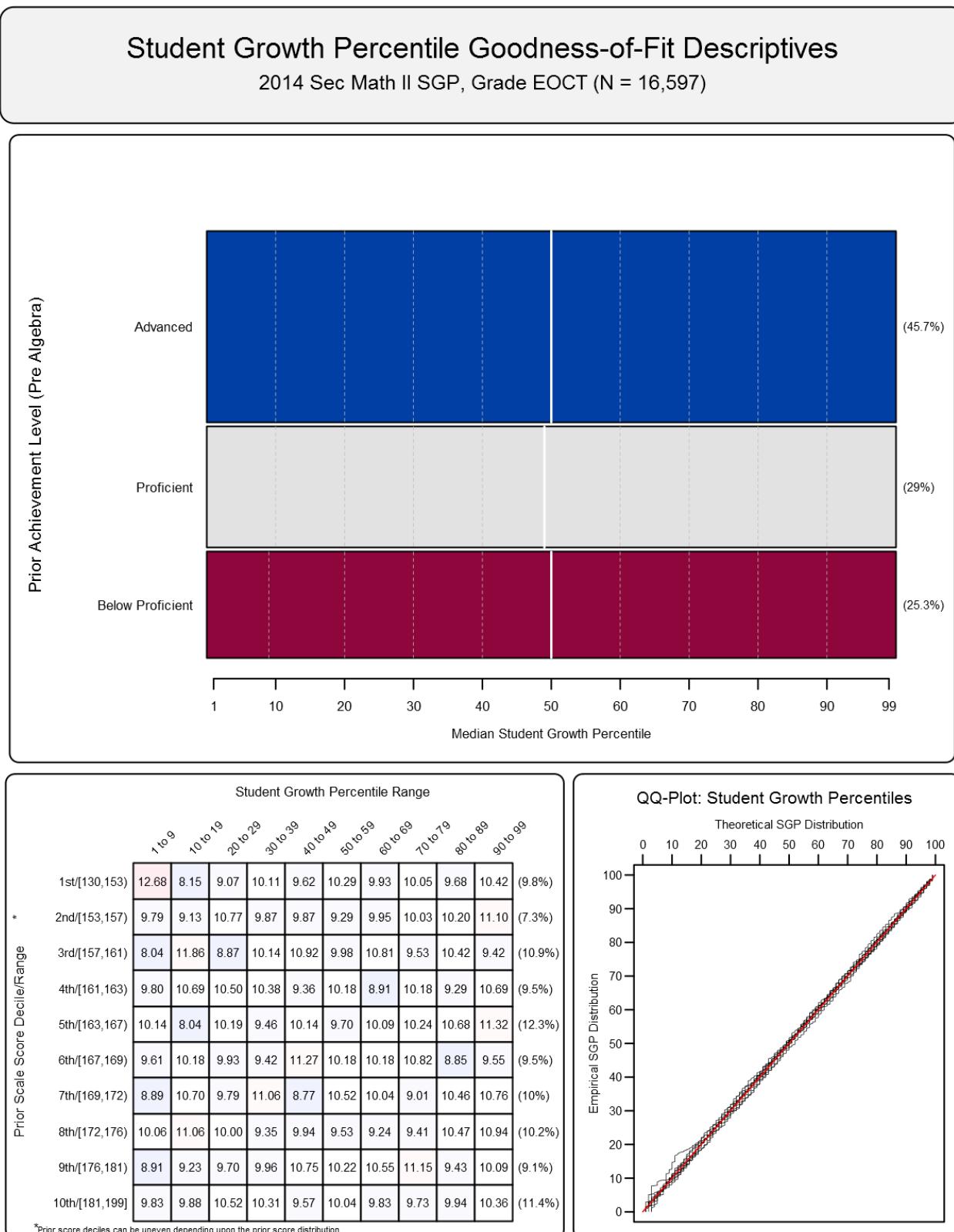


Figure 53: Goodness of Fit Plot for 2014 Secondary Math II (Priors - 2012 Pre Algebra)

3.6.2 Algebra I as Imediate Prior

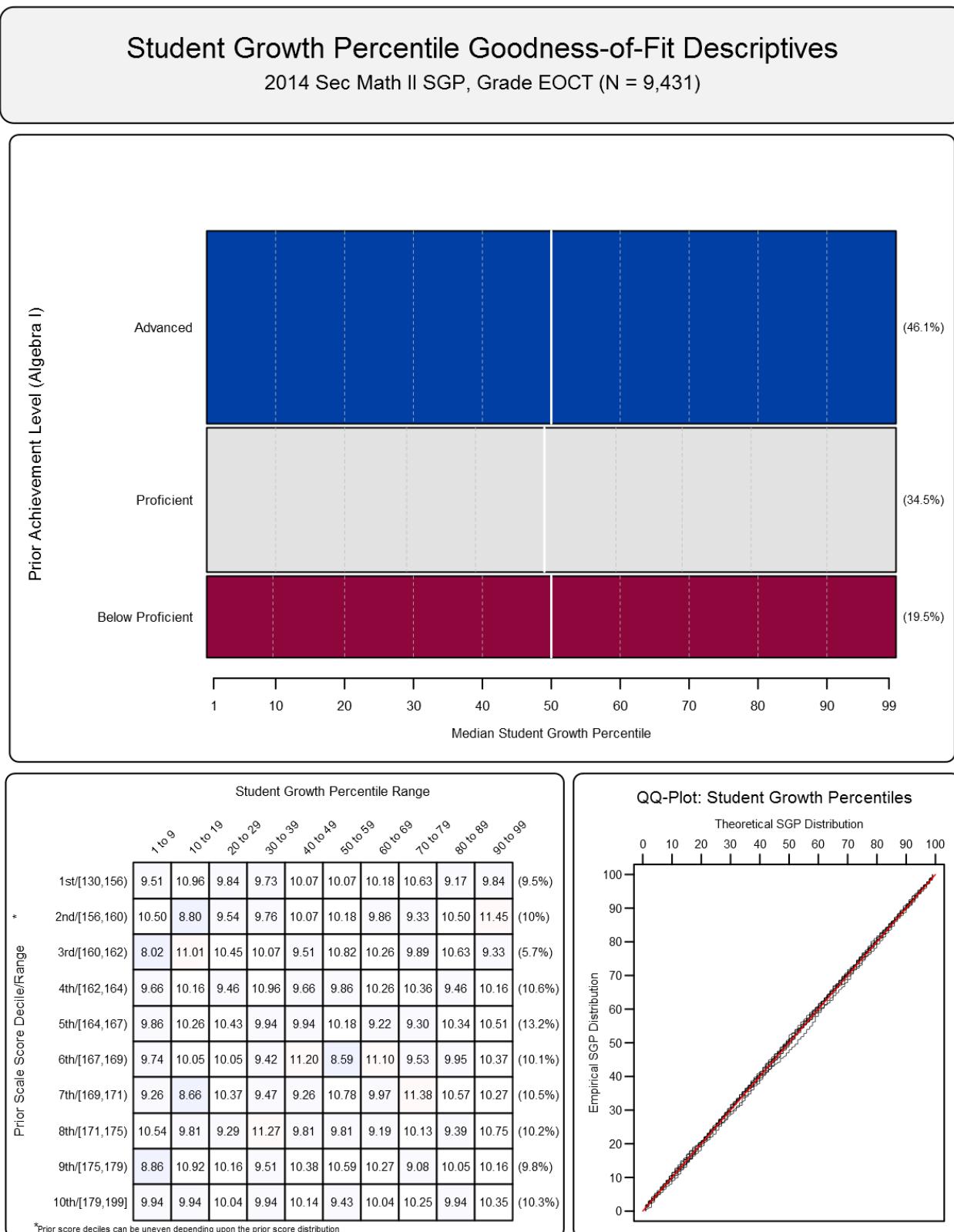


Figure 54: Goodness of Fit Plot for 2014 Secondary Math III (Priors - 2012 Algebra I, 2011 Pre Algebra, 2010 Math Grade 6, 2009 Math Grade 5)

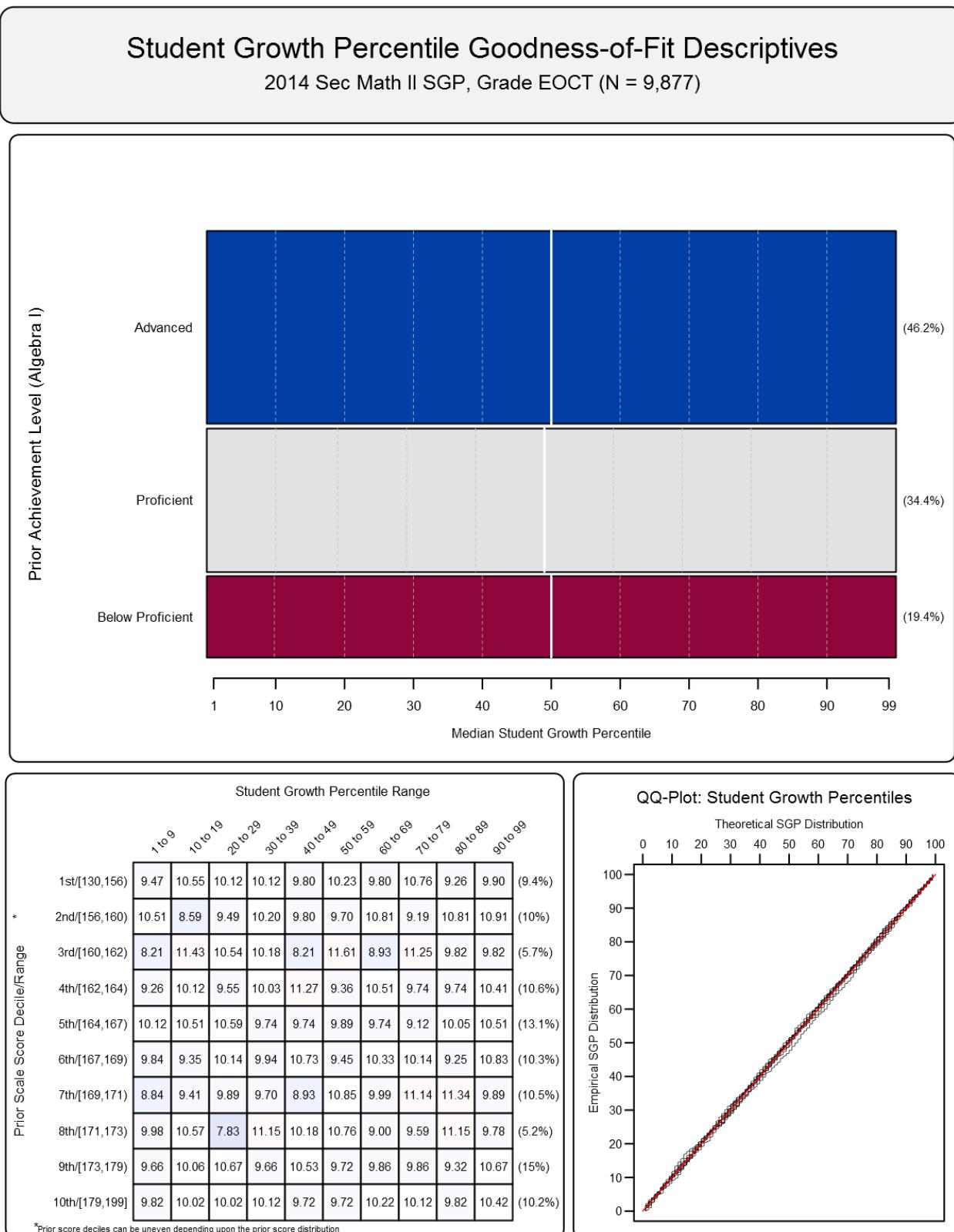


Figure 55: Goodness of Fit Plot for 2014 Secondary Math III (Priors - 2012 Algebra I, 2011 Pre Algebra, 2010 Math Grade 6)

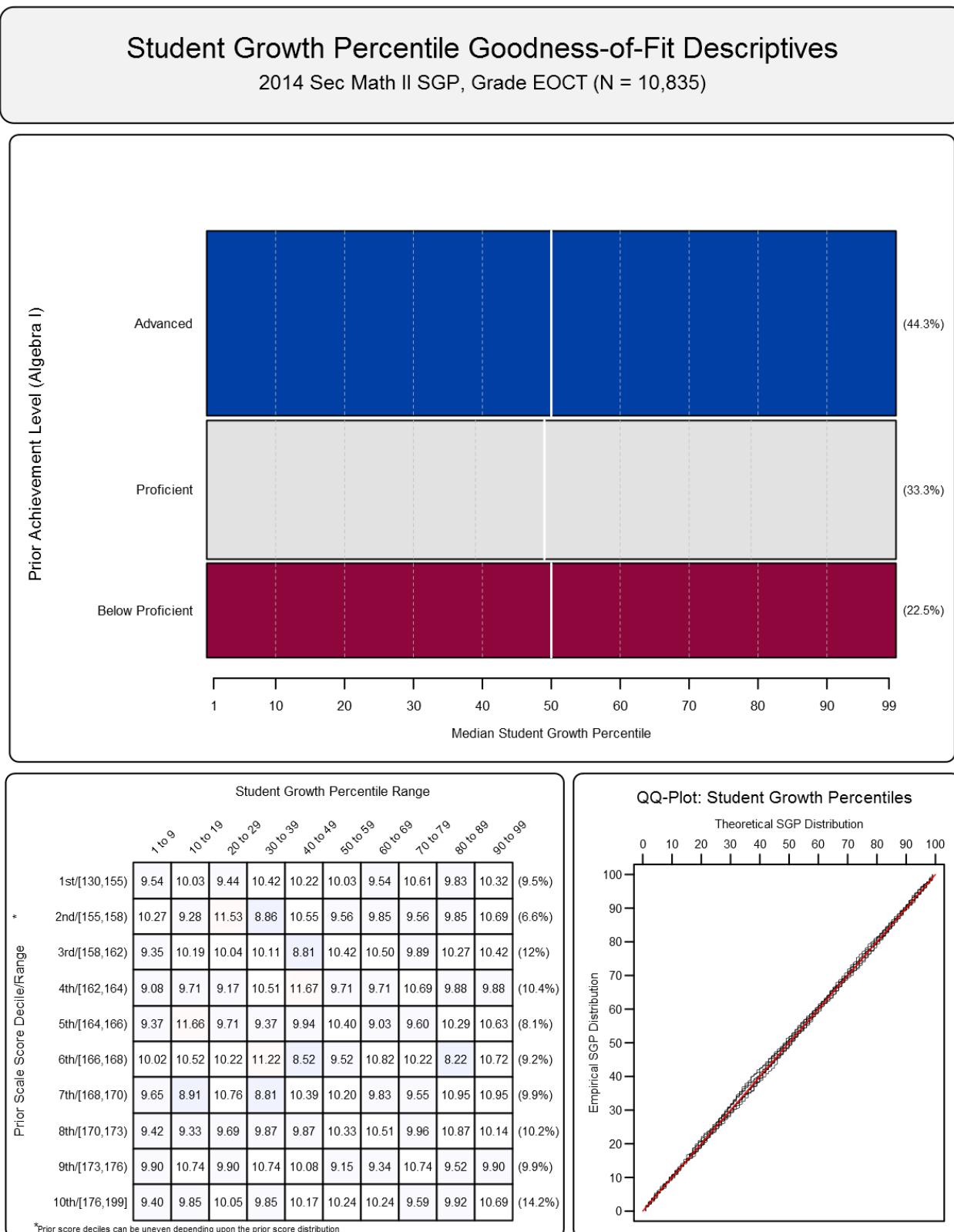


Figure 56: Goodness of Fit Plot for 2014 Secondary Math III (Priors - 2012 Algebra I, 2011 Pre Algebra)

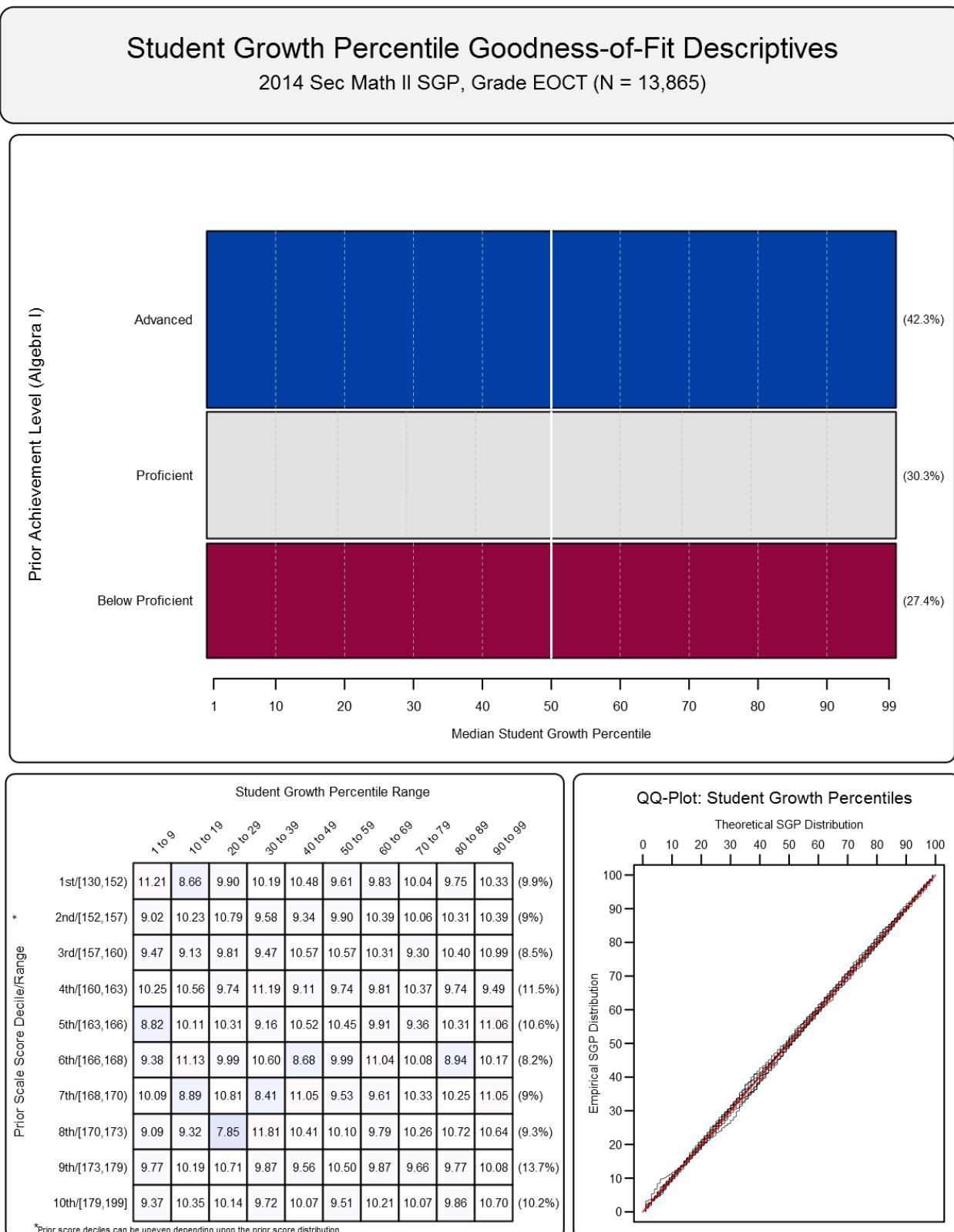


Figure 57: Goodness of Fit Plot for 2014 Secondary Math III (Priors - 2012 Algebra I)

3.7 Secondary Math III

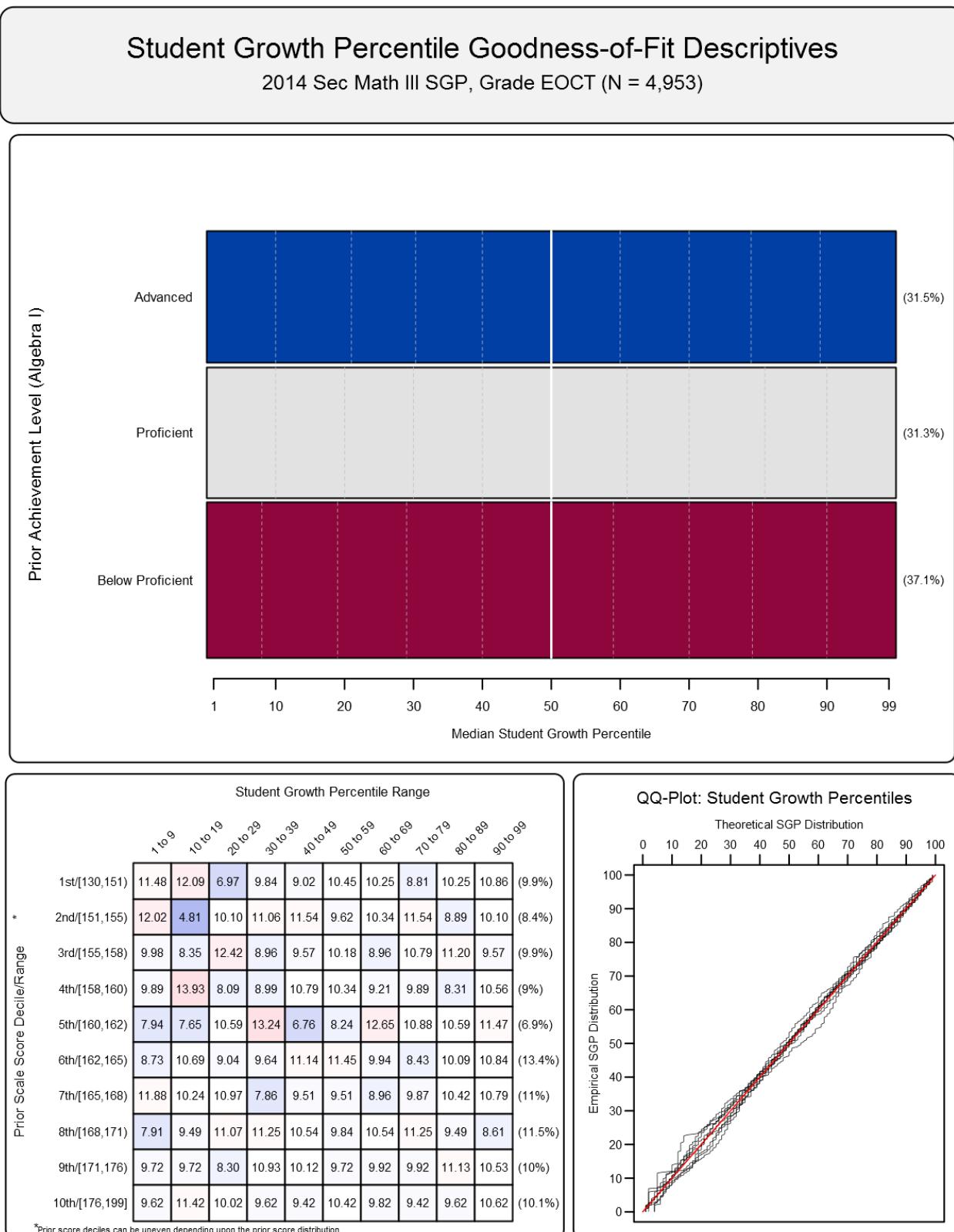


Figure 58: Goodness of Fit Plot for 2014 Secondary Math III (Priors - 2012 Algebra I)

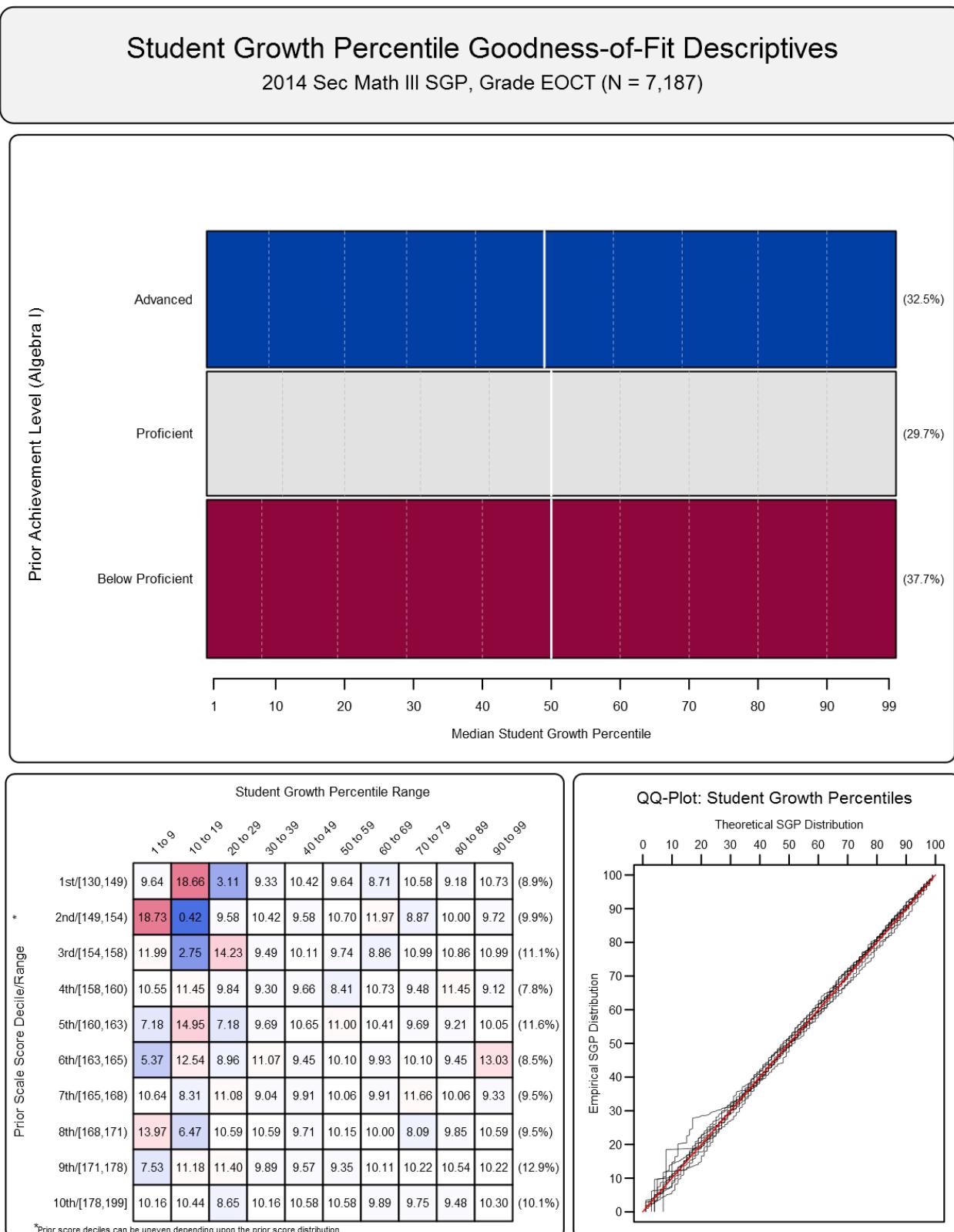


Figure 59: Goodness of Fit Plot for 2014 Secondary Math III (Priors - 2013 Algebra I)