Appendix A to the 2015 Utah Growth Model Report
Utah Student Growth Model Fit Plots

October 2015

1 Student Growth Percentile Fit Plots

A goodness of fit plot is produced for each unique analysis run in 2015. 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 10^{th} through 90^{th} quantiles of the Student Growth Percentile (SGP) distribution represented as dashed white lines (with the exception of the solid white line for the median/50^{th} 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 10^{th}, 20^{th}, 30^{th}, 40^{th}, 50^{th}, 60^{th}, 70^{th}, 80^{th}, and 90^{th} 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 2015 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 Fit Plots

2.1 ELA

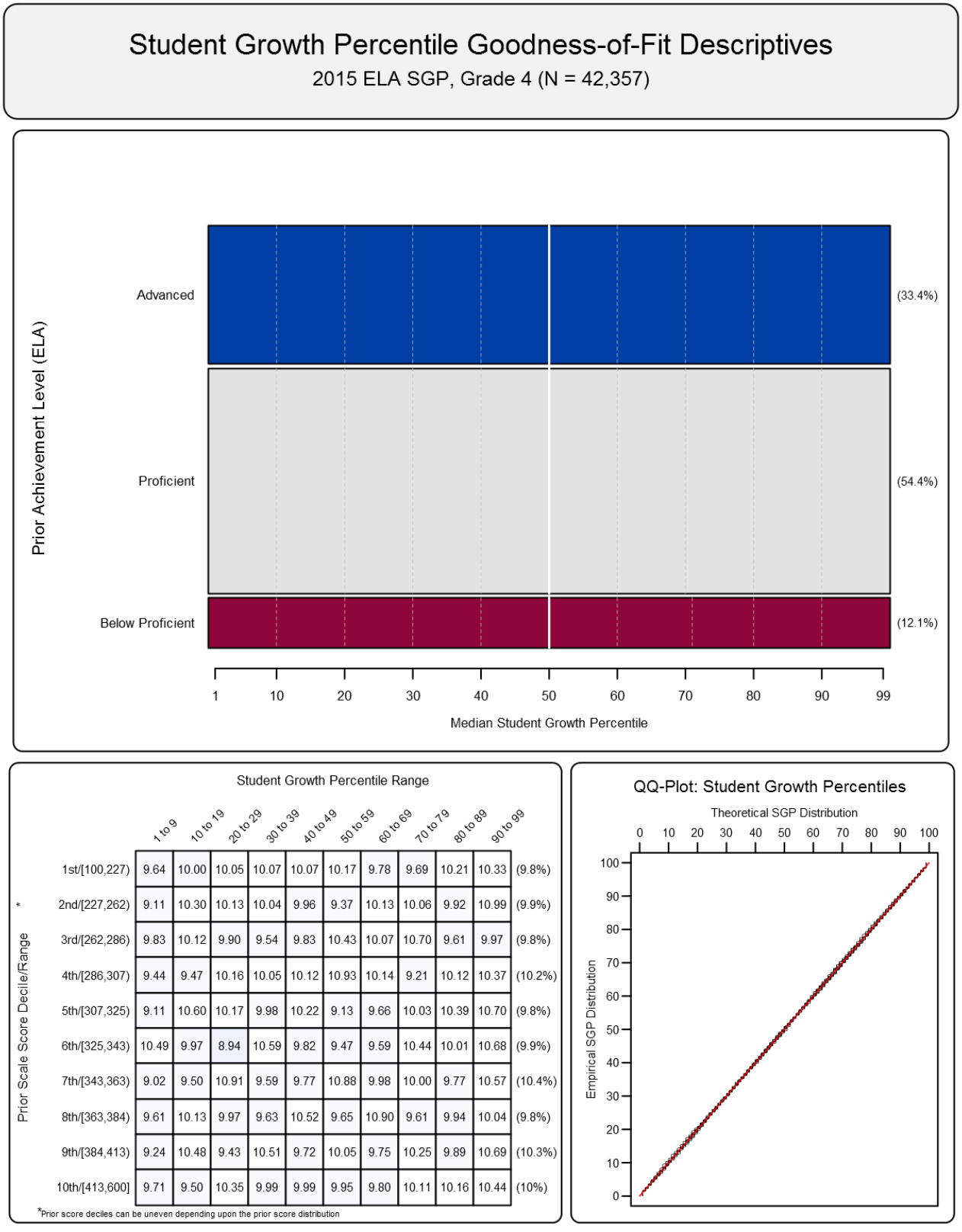


Figure 1: Goodness of Fit Plot for Grade 4 ELA, 2015.

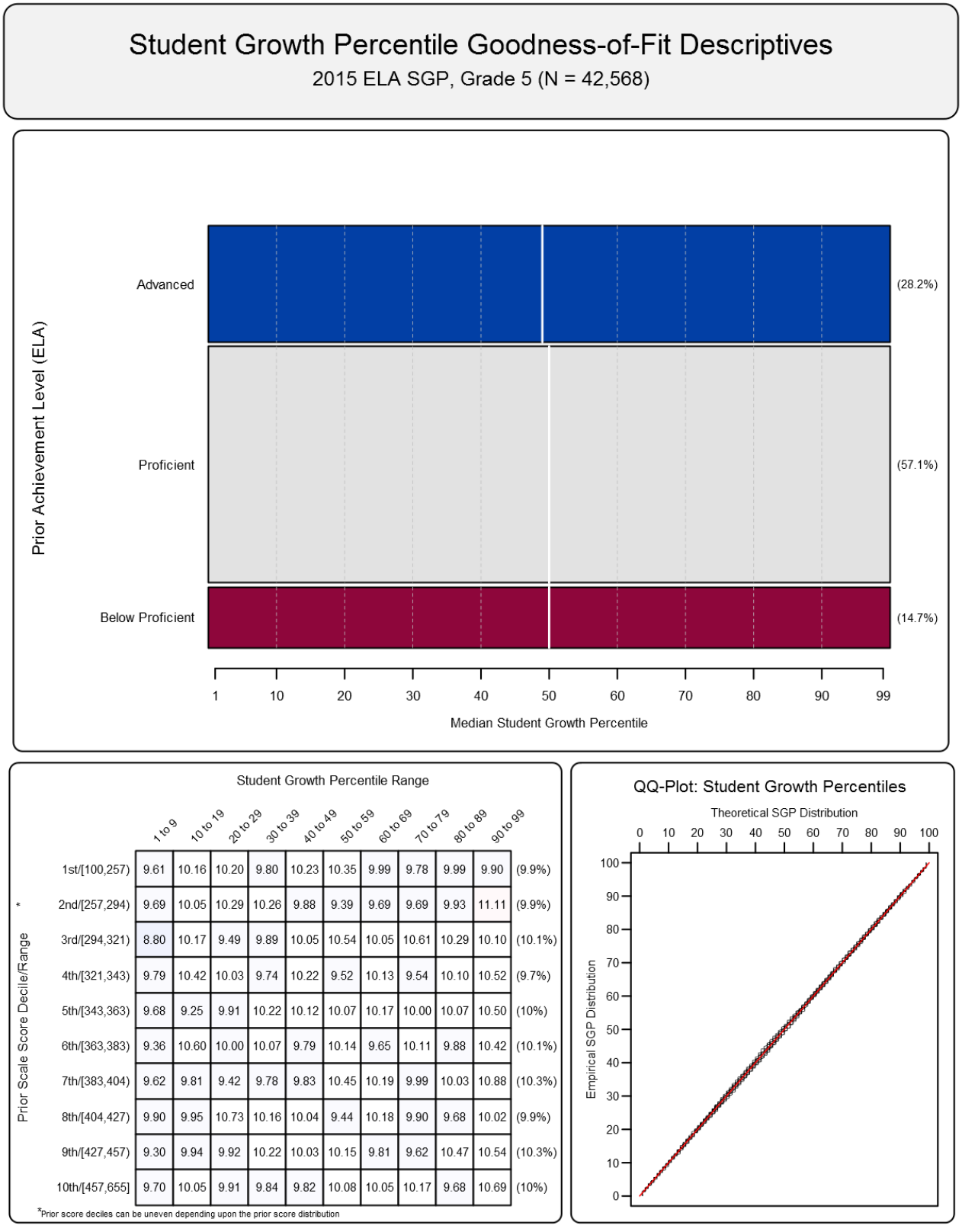


Figure 2: Goodness of Fit Plot for Grade 5 ELA, 2015.

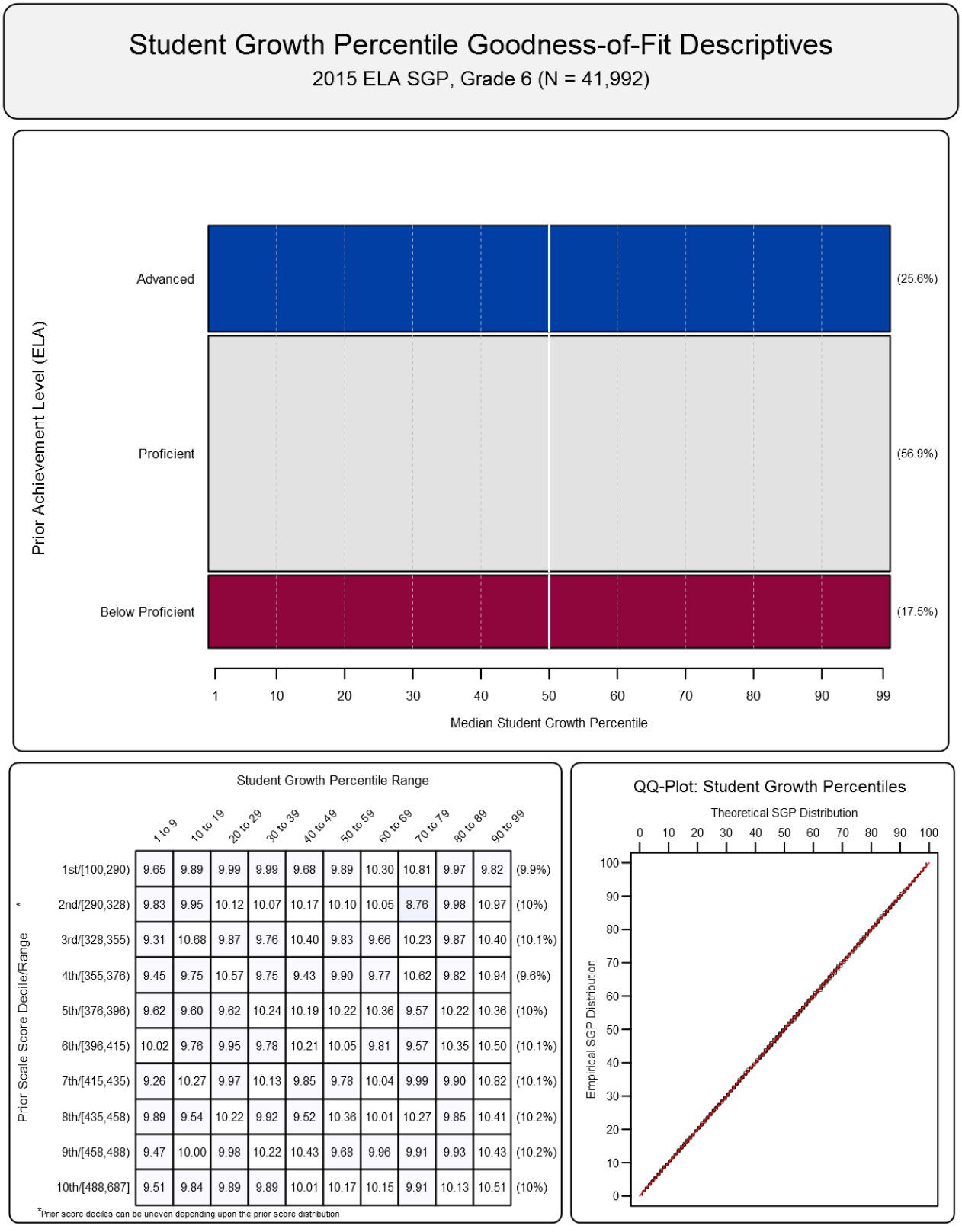


Figure 3: Goodness of Fit Plot for Grade 4 ELA, 2015.

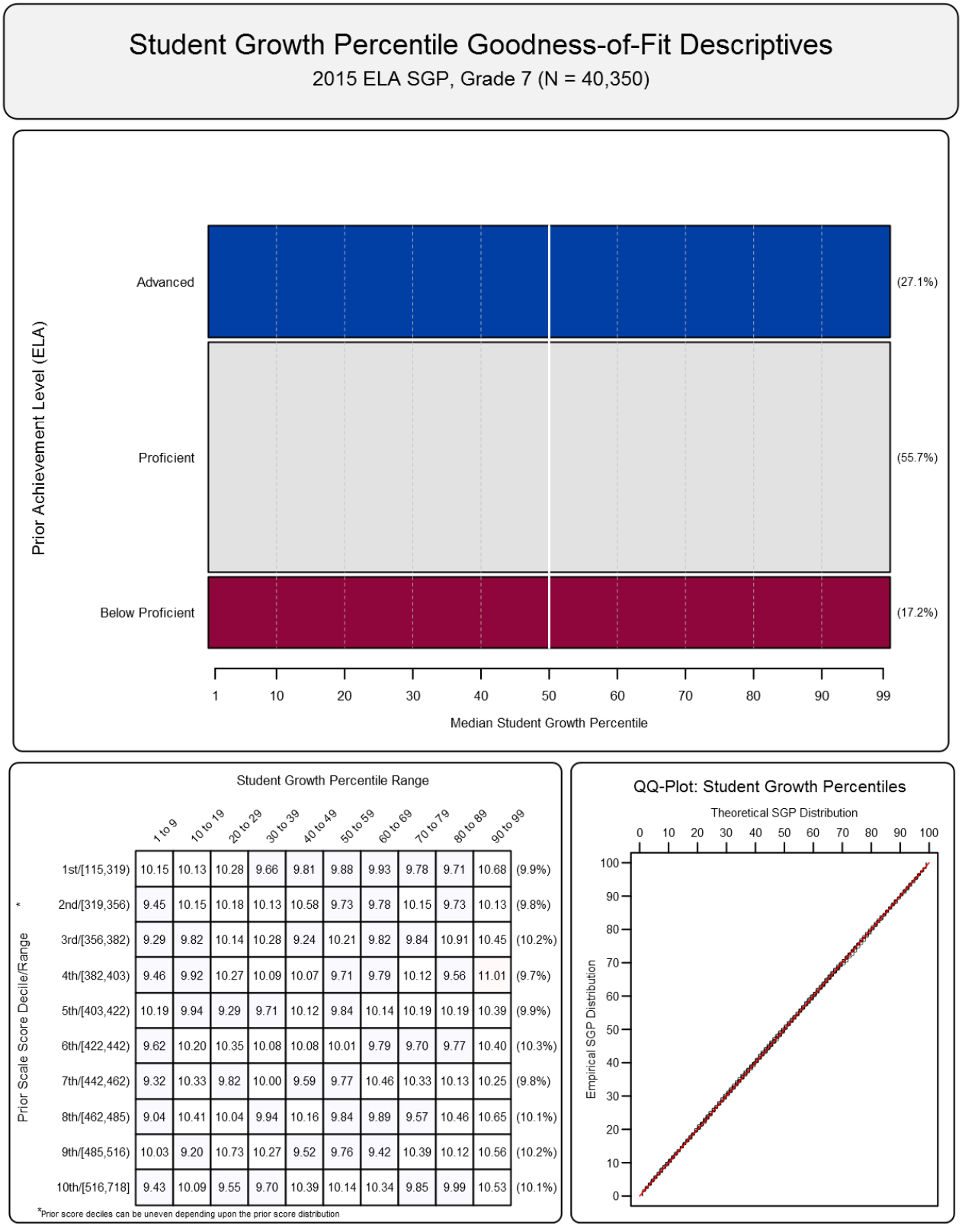


Figure 4: Goodness of Fit Plot for Grade 7 ELA, 2015.

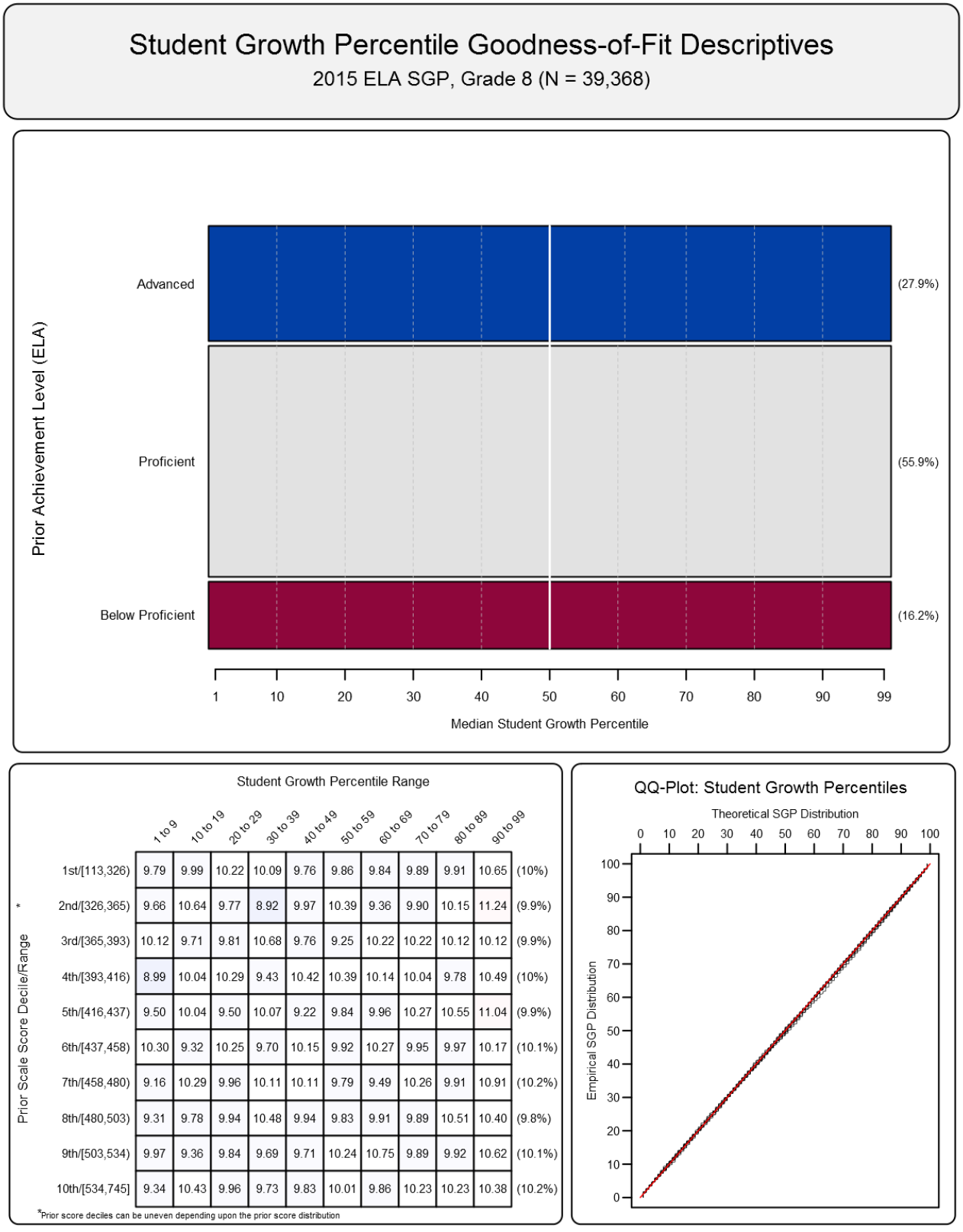
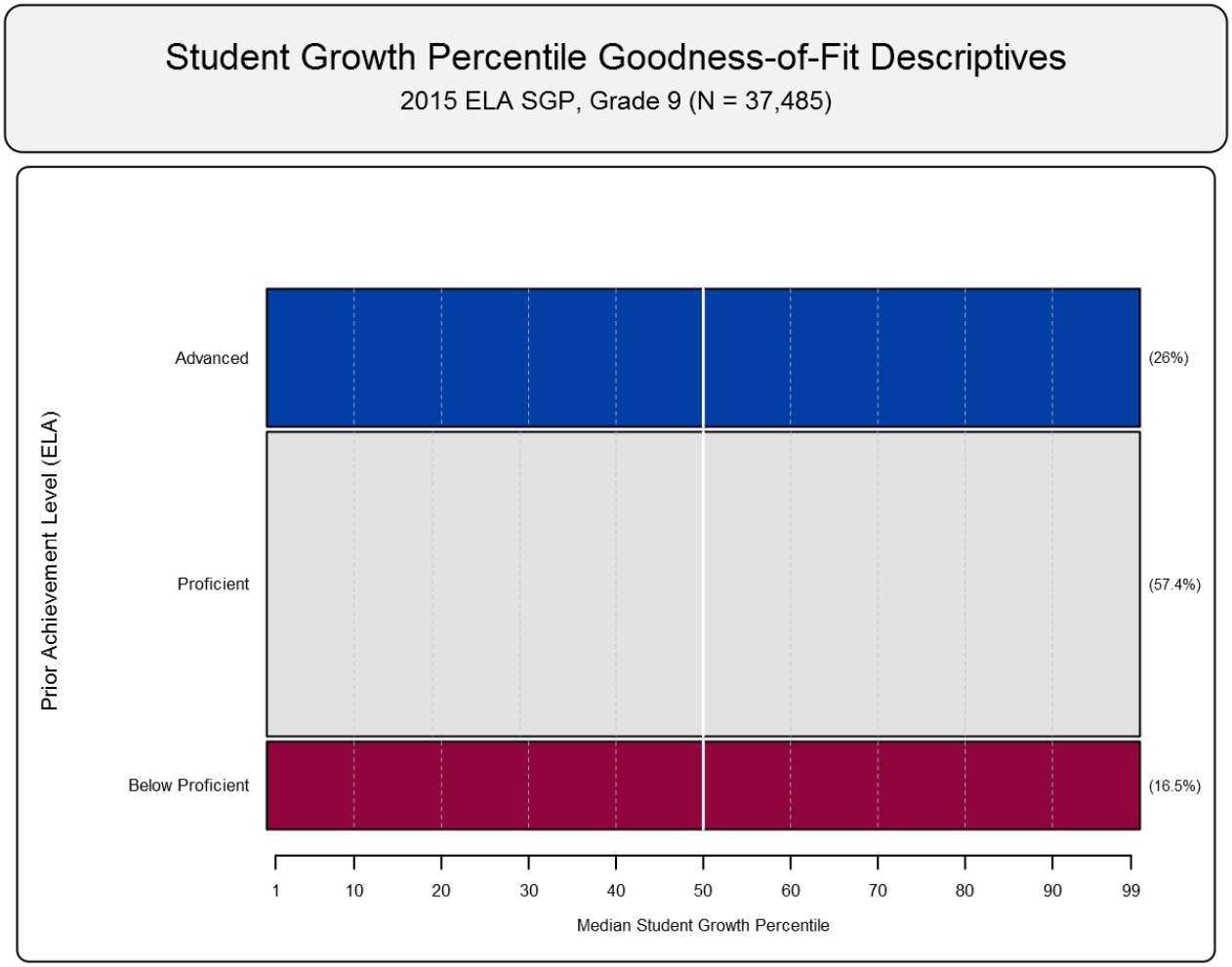


Figure 5: Goodness of Fit Plot for Grade 8 ELA, 2015.



Student Growth Percentile Range

Prior Scale Score Decile/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/[106,336)	10.20	10.04	9.88	9.96	9.94	10.10	10.04	9.91	9.51	10.42	(10%)
* 2nd/[336,377)	9.71	9.71	10.12	10.36	9.93	9.36	10.55	9.85	9.93	10.50	(9.8%)
3rd/[377,407)	9.83	11.04	9.94	9.05	10.15	9.81	9.18	9.52	10.78	10.70	(10.2%)
4th/[407,431)	9.35	10.45	9.82	10.86	9.76	10.09	10.23	10.09	9.13	10.23	(9.8%)
5th/[431,454)	10.49	9.04	10.19	9.58	9.74	9.98	9.60	10.11	10.33	10.94	(10%)
6th/[454,476)	9.19	10.44	10.41	9.91	10.12	9.29	10.15	10.31	9.80	10.39	(10%)
7th/[476,498)	10.18	10.13	9.78	10.31	9.70	10.10	9.67	9.56	10.02	10.55	(10%)
8th/[498,523)	8.71	10.15	9.89	9.75	9.73	10.88	10.59	10.12	10.12	10.07	(10.2%)
9th/[523,555)	10.23	9.88	9.72	10.28	10.12	9.99	9.91	9.32	10.07	10.49	(10.1%)
10th/[555,782]	9.95	9.71	10.14	9.58	10.16	9.76	9.87	10.32	10.00	10.51	(10%)

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

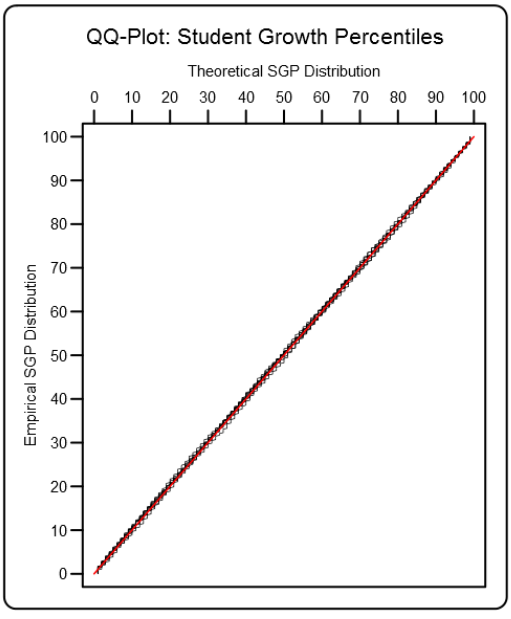
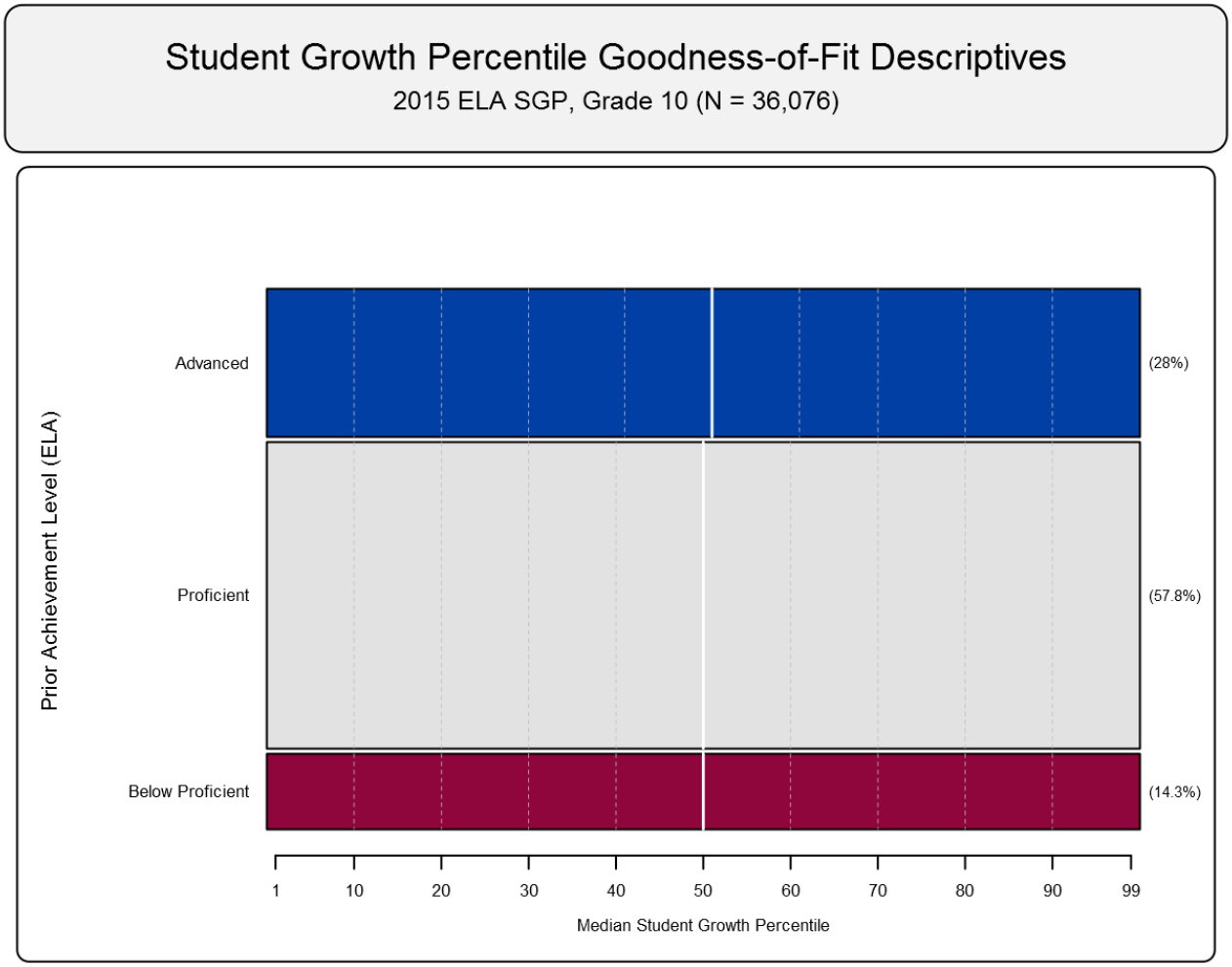
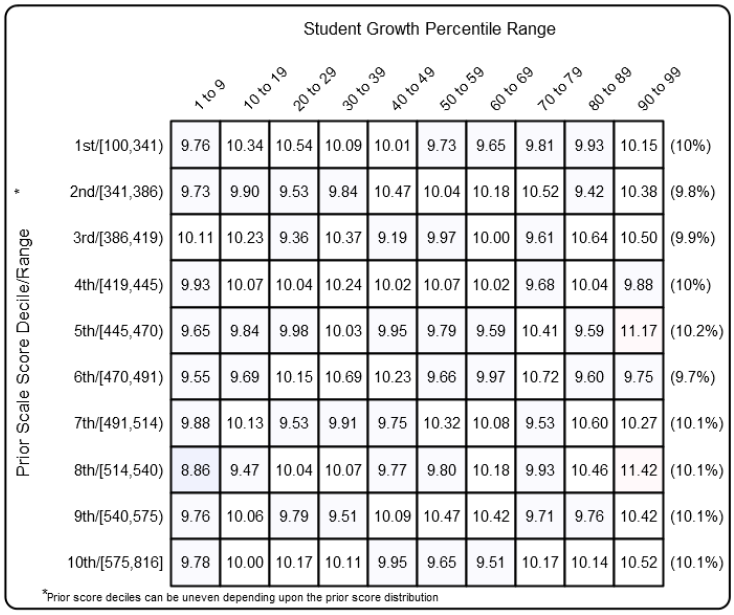


Figure 6: Goodness of Fit Plot for Grade 9 ELA, 2015.





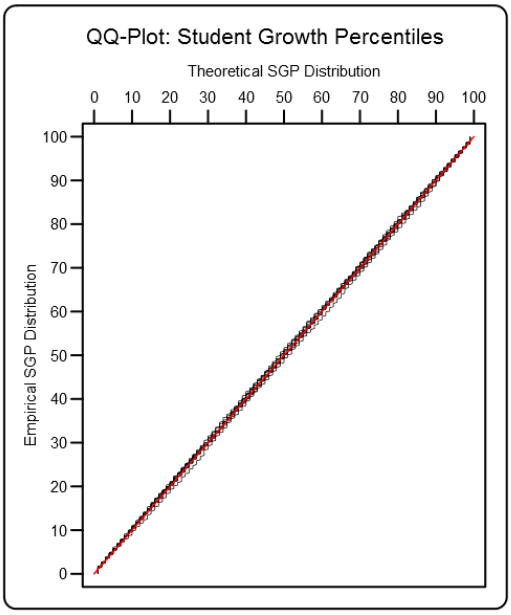


Figure 7: Goodness of Fit Plot for Grade 10 ELA, 2015.

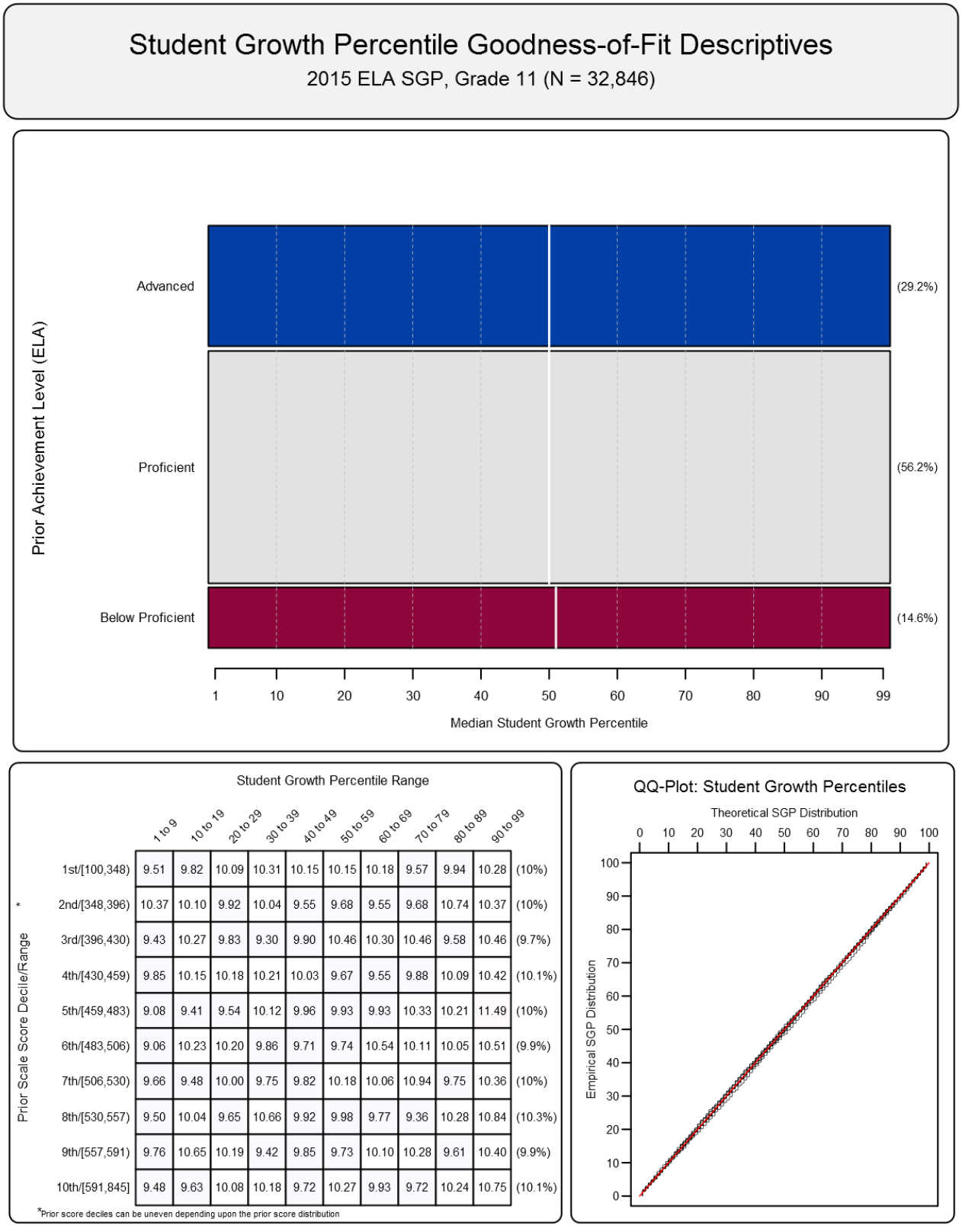


Figure 8: Goodness of Fit Plot for Grade 11 ELA, 2015.

2.2 Mathematics

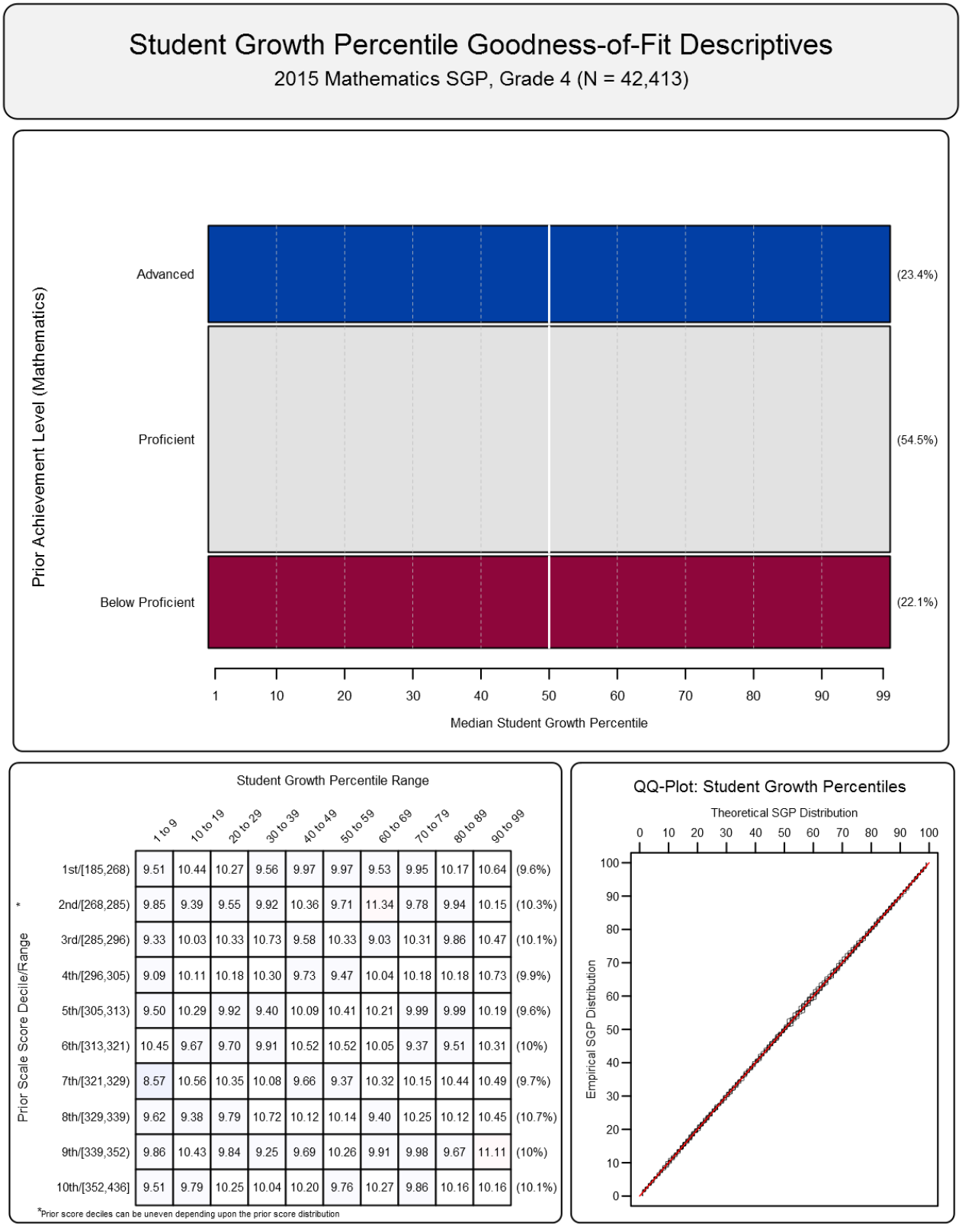


Figure 9: Goodness of Fit Plot for Grade 4 Mathematics, 2015.

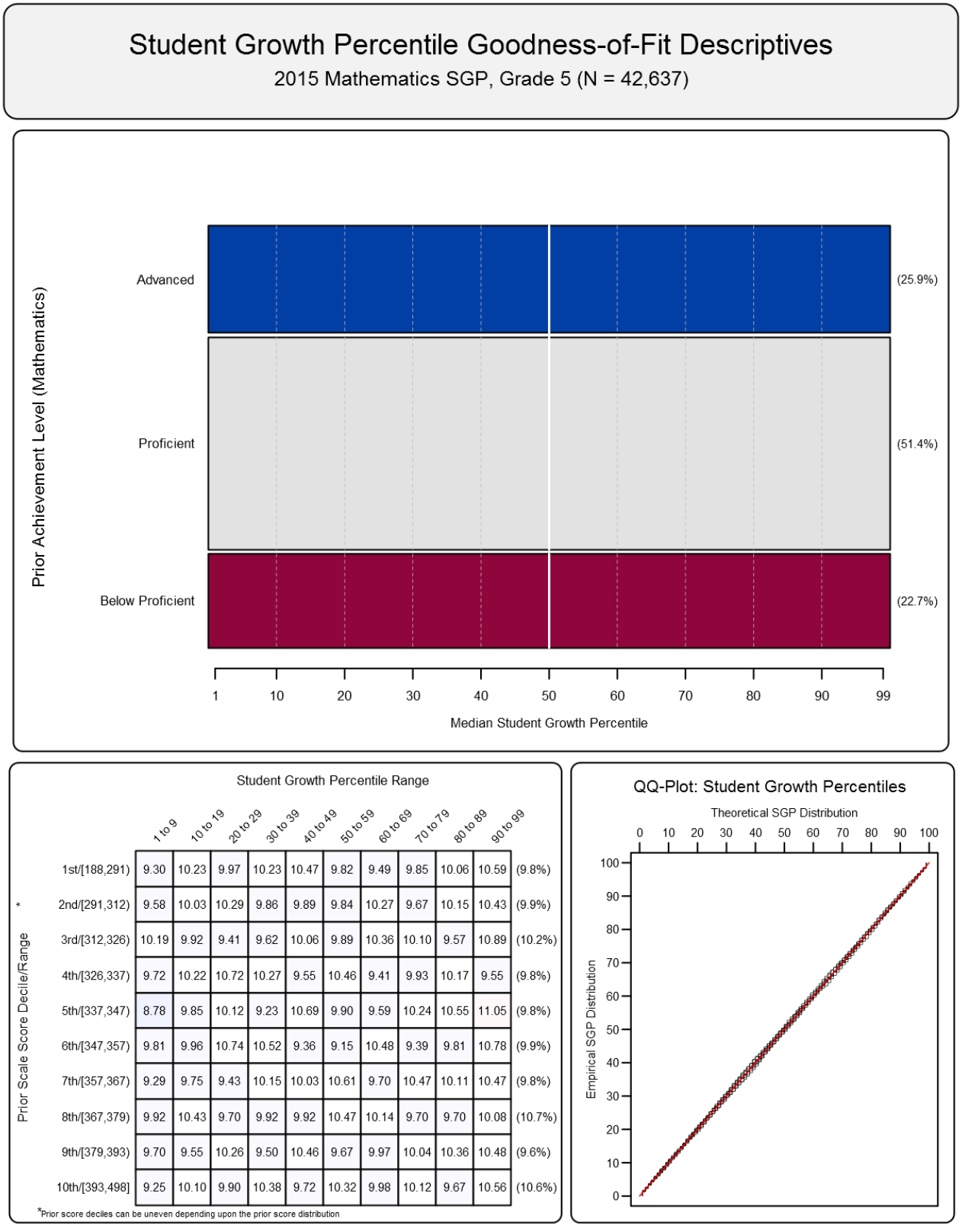


Figure 10: Goodness of Fit Plot for Grade 5 Mathematics, 2015.

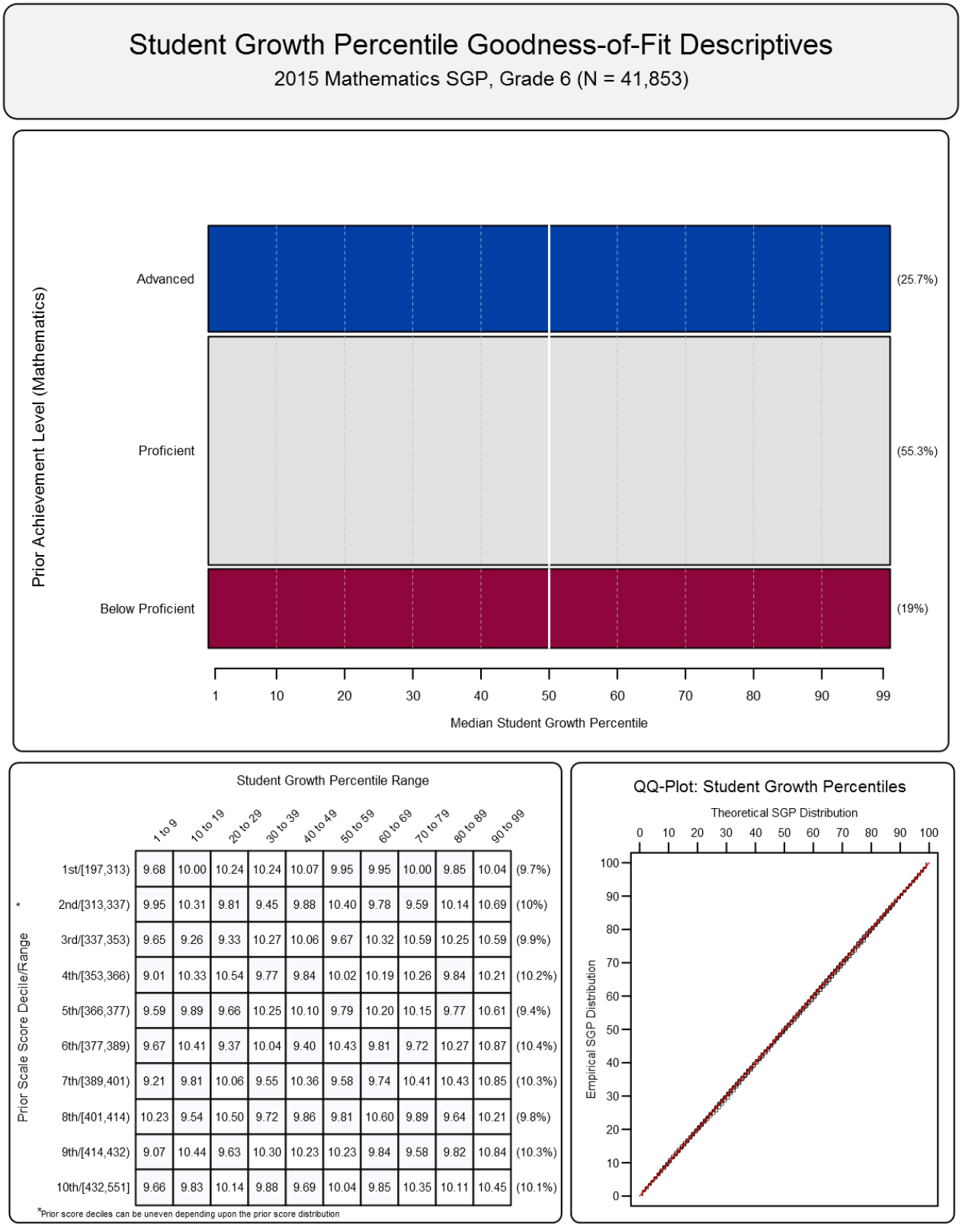


Figure 11: Goodness of Fit Plot for Grade 6 Mathematics, 2015.

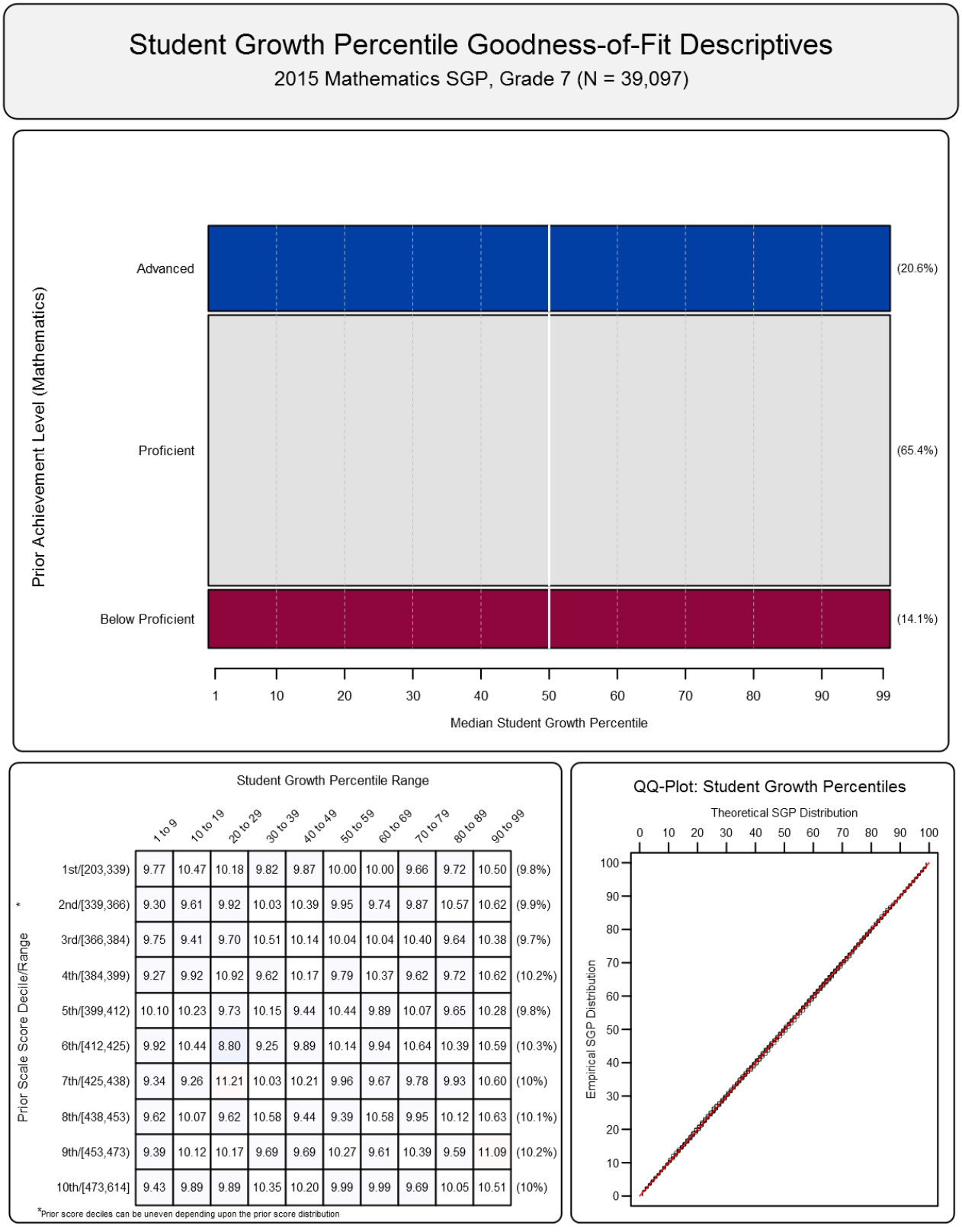


Figure 12: Goodness of Fit Plot for Grade 7 Mathematics, 2015.

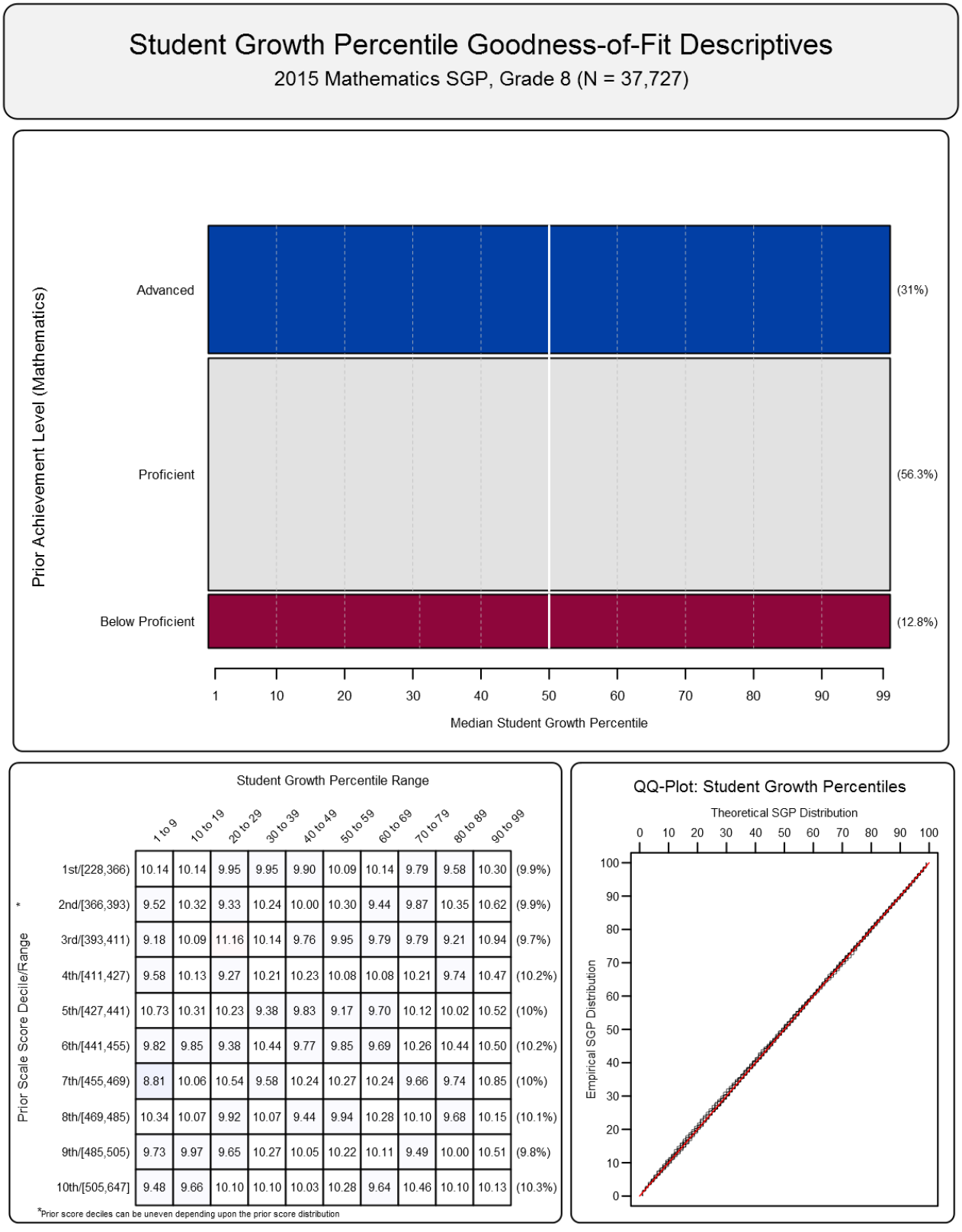


Figure 13: Goodness of Fit Plot for Grade 8 Mathematics, 2015.

2.3 Science

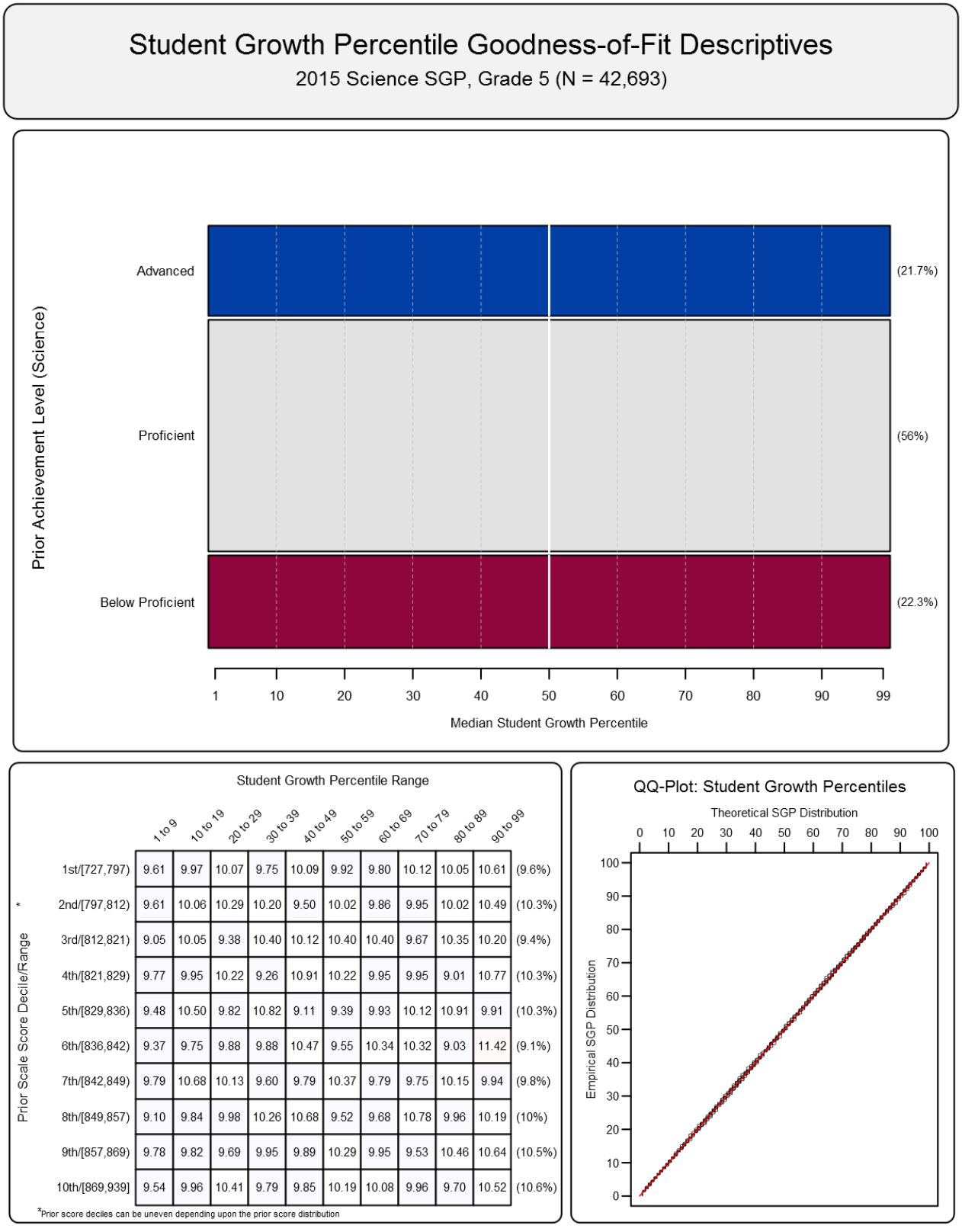
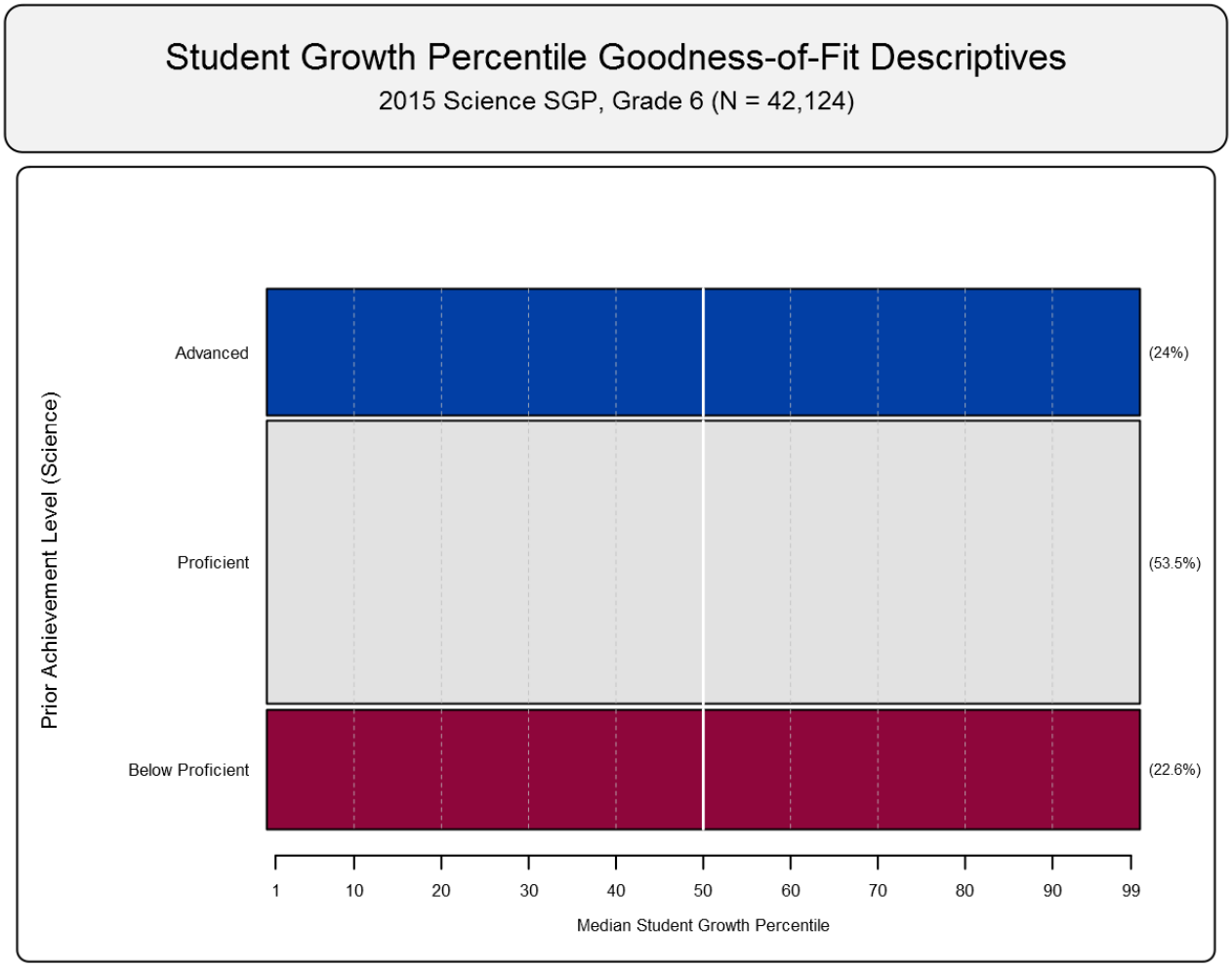


Figure 14: Goodness of Fit Plot for Grade 5 Science, 2015.



Student Growth Percentile Range

Prior Scale Score Decile/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/[742,804)	9.65	9.83	9.98	10.42	10.02	10.12	9.90	9.83	9.75	10.50	(9.6%)
* 2nd/[804,816)	9.91	9.91	9.74	9.33	10.00	9.69	10.48	10.29	10.29	10.34	(9.9%)
3rd/[816,824)	9.00	10.42	10.49	10.16	9.99	10.32	10.01	9.31	9.71	10.59	(9.4%)
4th/[824,831)	9.83	9.90	9.38	9.78	10.23	10.32	9.78	10.08	10.46	10.25	(10.1%)
5th/[831,837)	9.38	9.91	10.52	10.11	9.64	10.14	10.06	10.24	9.41	10.59	(9.4%)
6th/[837,844)	9.35	10.54	9.45	9.88	9.74	9.26	10.36	9.84	10.58	10.99	(11.5%)
7th/[844,850)	9.67	9.85	10.31	10.44	10.62	9.47	9.91	9.50	9.75	10.47	(9.3%)
8th/[850,858)	9.25	9.39	10.17	9.88	9.59	11.45	9.72	10.71	9.84	9.99	(10.6%)
9th/[858,868)	9.92	10.51	9.72	9.49	9.92	9.57	10.81	9.72	10.11	10.24	(9.5%)
10th/[868,929]	9.22	9.89	9.98	10.20	10.24	9.86	9.62	9.91	10.20	10.89	(10.7%)

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

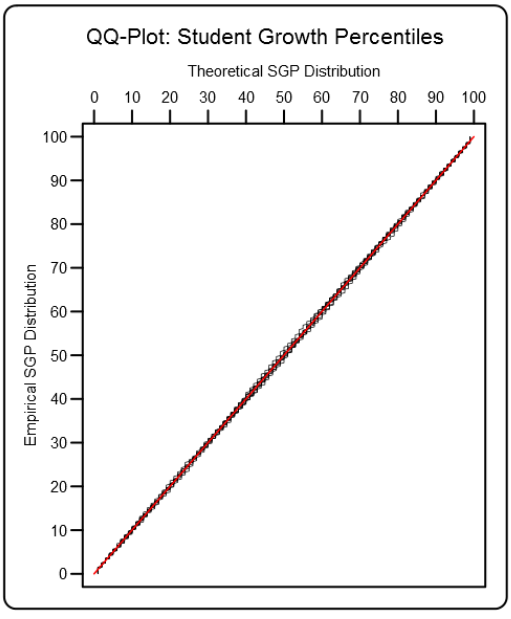
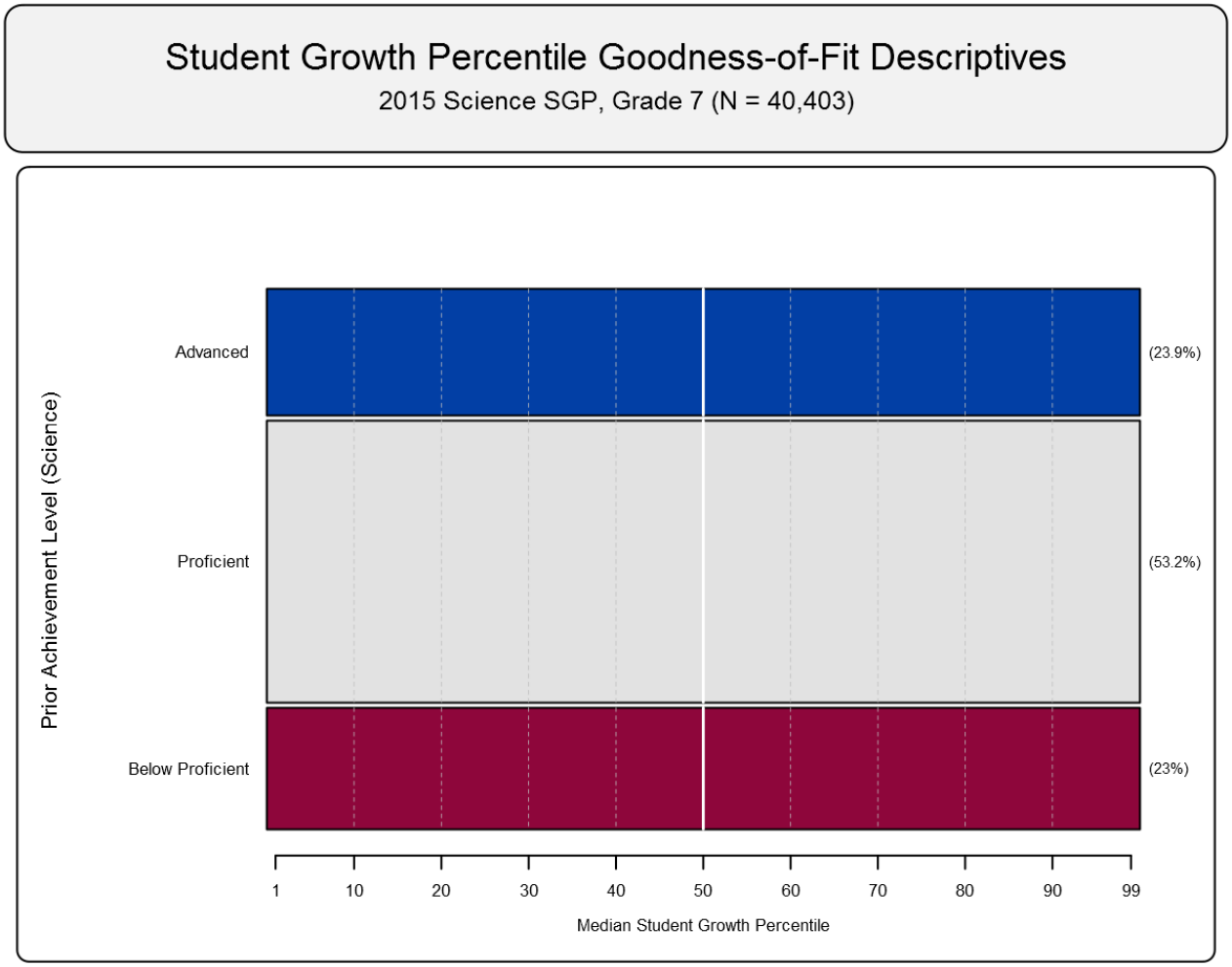


Figure 15: Goodness of Fit Plot for Grade 6 Science, 2015.



Student Growth Percentile Range

Prior Scale Score Decile/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/[694,789)	9.82	9.95	10.38	9.77	9.90	9.87	10.21	9.92	9.87	10.31	(9.7%)
2nd/[789,806)	9.72	9.92	9.45	9.87	9.72	10.22	9.80	10.02	10.47	10.81	(10%)
3rd/[806,818)	9.43	9.98	10.17	9.48	10.10	9.96	10.22	10.46	9.69	10.51	(10.3%)
4th/[818,828)	9.51	9.84	10.04	10.56	10.06	10.01	9.66	10.31	10.34	9.66	(9.9%)
5th/[828,837)	9.05	10.44	9.92	9.92	10.10	10.20	9.63	9.80	9.55	11.39	(10%)
6th/[837,846)	9.84	10.26	9.66	9.46	10.38	9.34	10.80	9.37	10.51	10.38	(10%)
7th/[846,855)	10.14	9.44	9.84	10.48	10.22	10.00	9.36	10.61	9.79	10.11	(9.3%)
8th/[855,867)	8.90	10.06	9.94	9.92	9.70	10.32	10.53	10.13	9.99	10.51	(10.5%)
9th/[867,883)	9.49	9.84	10.46	9.69	9.79	10.51	9.57	9.77	10.21	10.66	(9.9%)
10th/[883,975]	9.66	9.88	9.78	9.97	10.30	9.62	10.06	9.95	10.18	10.61	(10.5%)

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

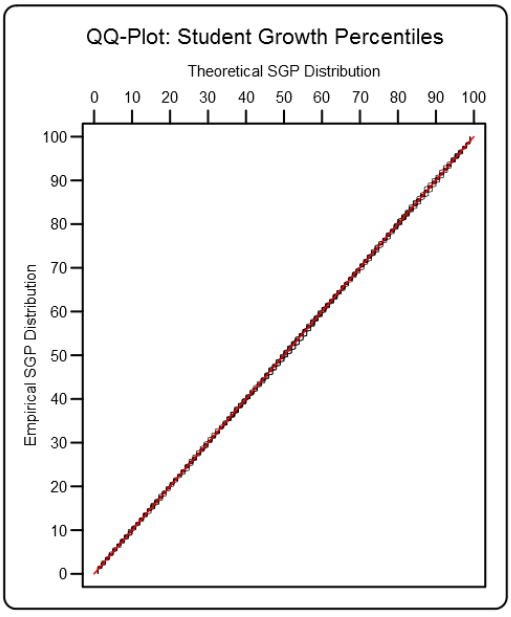
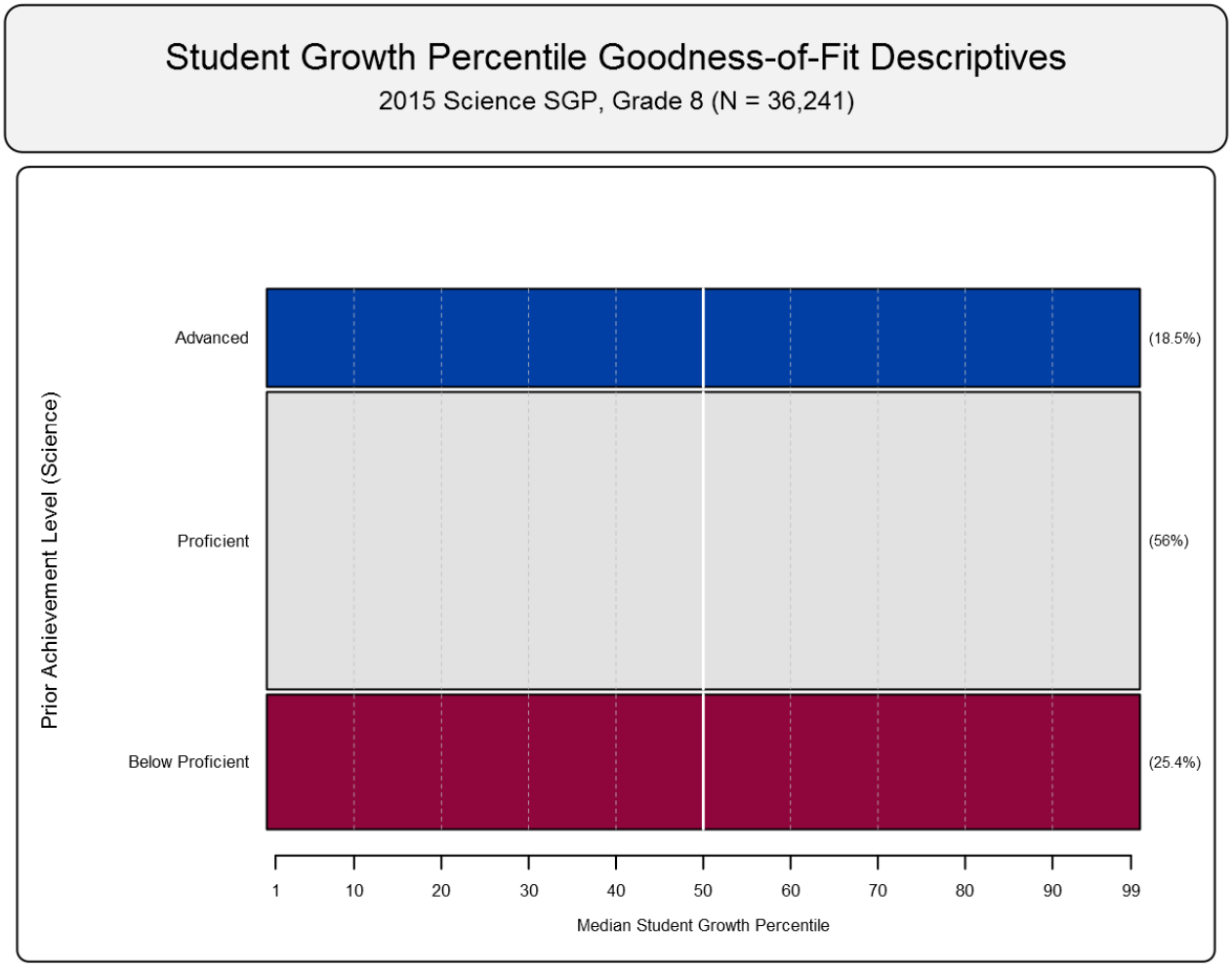


Figure 16: Goodness of Fit Plot for Grade 7 Science, 2015.



Student Growth Percentile Range

Prior Scale Score Decile/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/[721,795)	10.03	10.44	10.18	10.15	10.18	9.40	9.43	9.86	10.12	10.21	(9.5%)
2nd/[795,810)	9.25	10.18	9.69	10.24	9.94	9.99	9.96	10.65	9.72	10.38	(10.1%)
3rd/[810,820)	10.37	9.94	9.19	9.40	10.72	10.89	10.13	8.89	9.70	10.75	(10.2%)
4th/[820,828)	9.32	9.21	10.61	10.84	9.18	9.49	9.88	10.08	10.81	10.59	(9.8%)
5th/[828,835)	9.35	10.37	10.14	9.61	10.05	10.40	9.70	10.08	9.88	10.43	(9.5%)
6th/[835,842)	9.21	9.74	10.22	9.88	10.02	9.46	10.30	10.25	9.94	10.98	(9.8%)
7th/[842,850)	9.84	9.92	9.71	9.74	10.18	9.61	10.18	10.42	10.23	10.16	(10.6%)
8th/[850,858)	9.78	10.38	10.15	9.92	9.57	10.33	9.63	9.49	9.43	11.31	(9.5%)
9th/[858,870)	9.23	9.30	9.51	10.29	10.36	10.31	10.11	10.44	9.87	10.57	(10.7%)
10th/[870,943]	9.66	10.17	10.14	10.12	9.93	9.66	9.85	9.82	10.12	10.52	(10.3%)

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

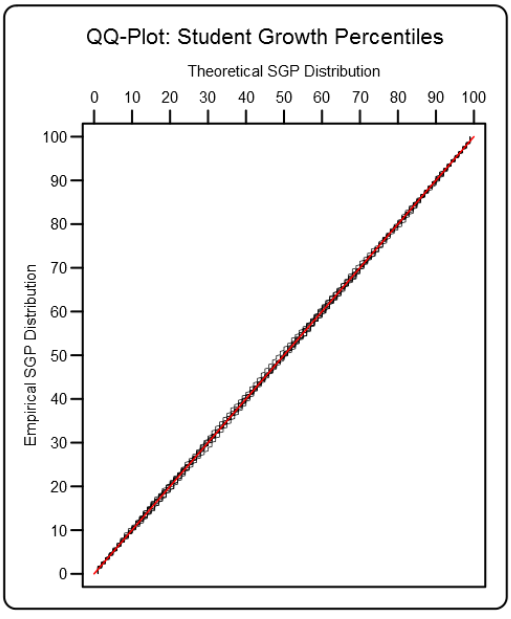


Figure 17: Goodness of Fit Plot for Grade 8 Science, 2015.

3 SAGE EOCT Fit Plots

3.1 Earth Science

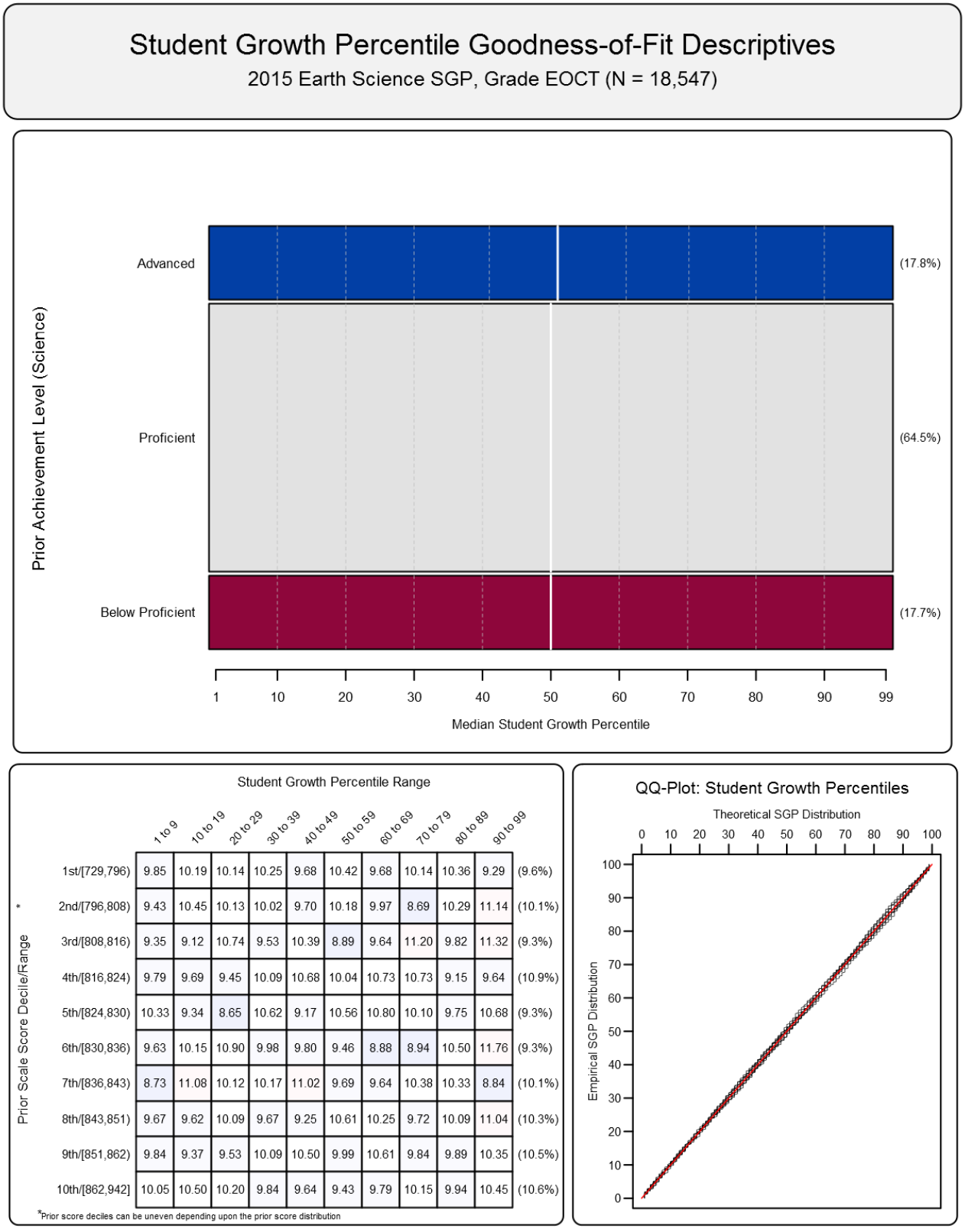


Figure 18: Goodness of Fit Plot for 2015 Earth Science (Priors - 2014 Science Grade 8, 2013 Science Grade 7, 2012 Science Grade 6, 2011 Science Grade 5, 2010 Science Grade 4)

3.2 Biology

3.2.1 Earth Science as Imediate Prior

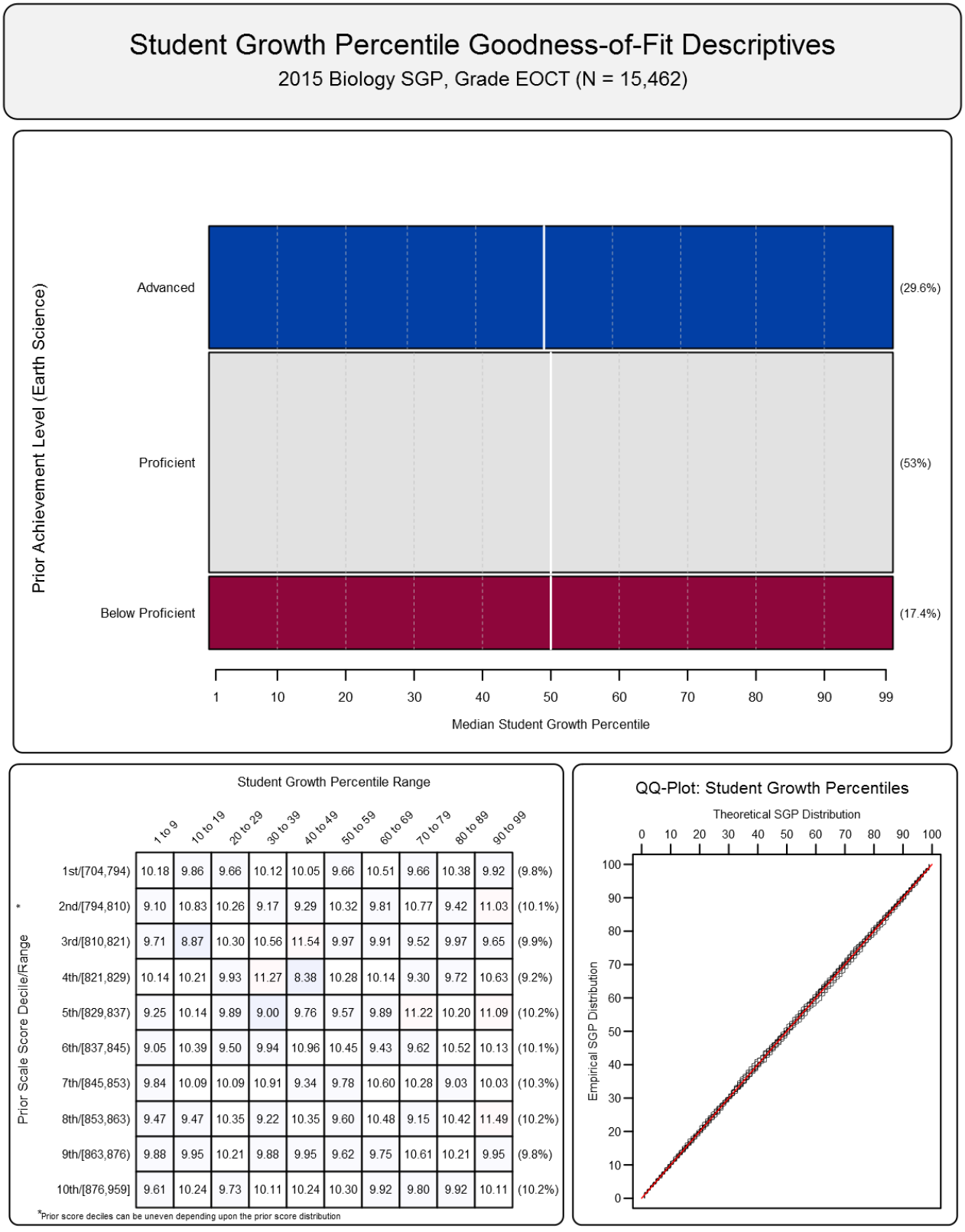


Figure 19: Goodness of Fit Plot for 2015 Biology (Priors - 2014 Earth Science, 2013 Science Grade 8, 2012 Science Grade 7, 2011 Science Grade 6, 2010 Science Grade 5)

3.2.2 Grade 8 Science as Imediate Prior

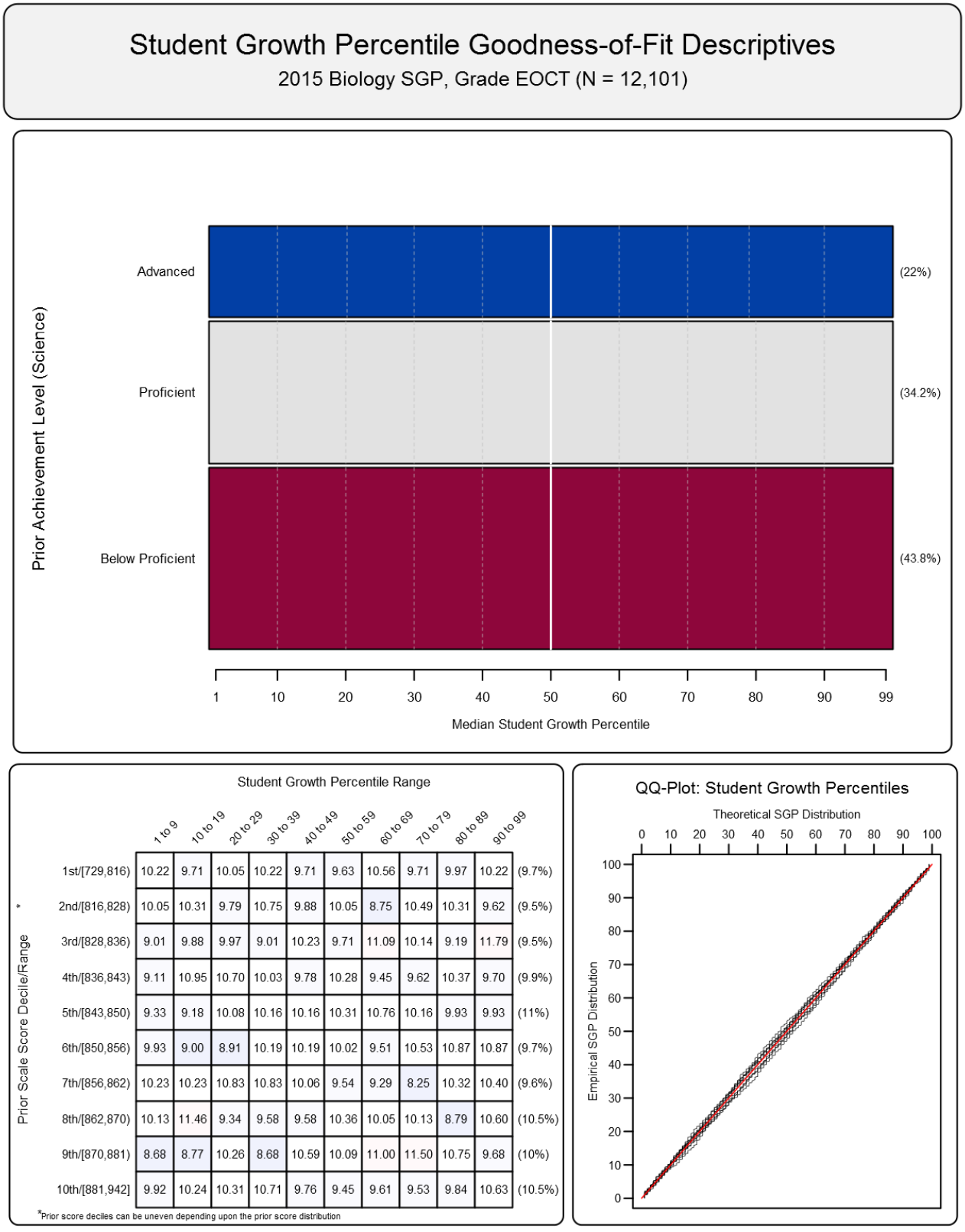


Figure 20: Goodness of Fit Plot for 2015 Biology (Priors - 2014 Science Grade 8, 2013 Science Grade 7, 2012 Science Grade 6, 2011 Science Grade 5, 2010 Science Grade 4)

3.3 Chemistry

3.3.1 Biology as Imediate Prior, Grade 8 Science Secondary

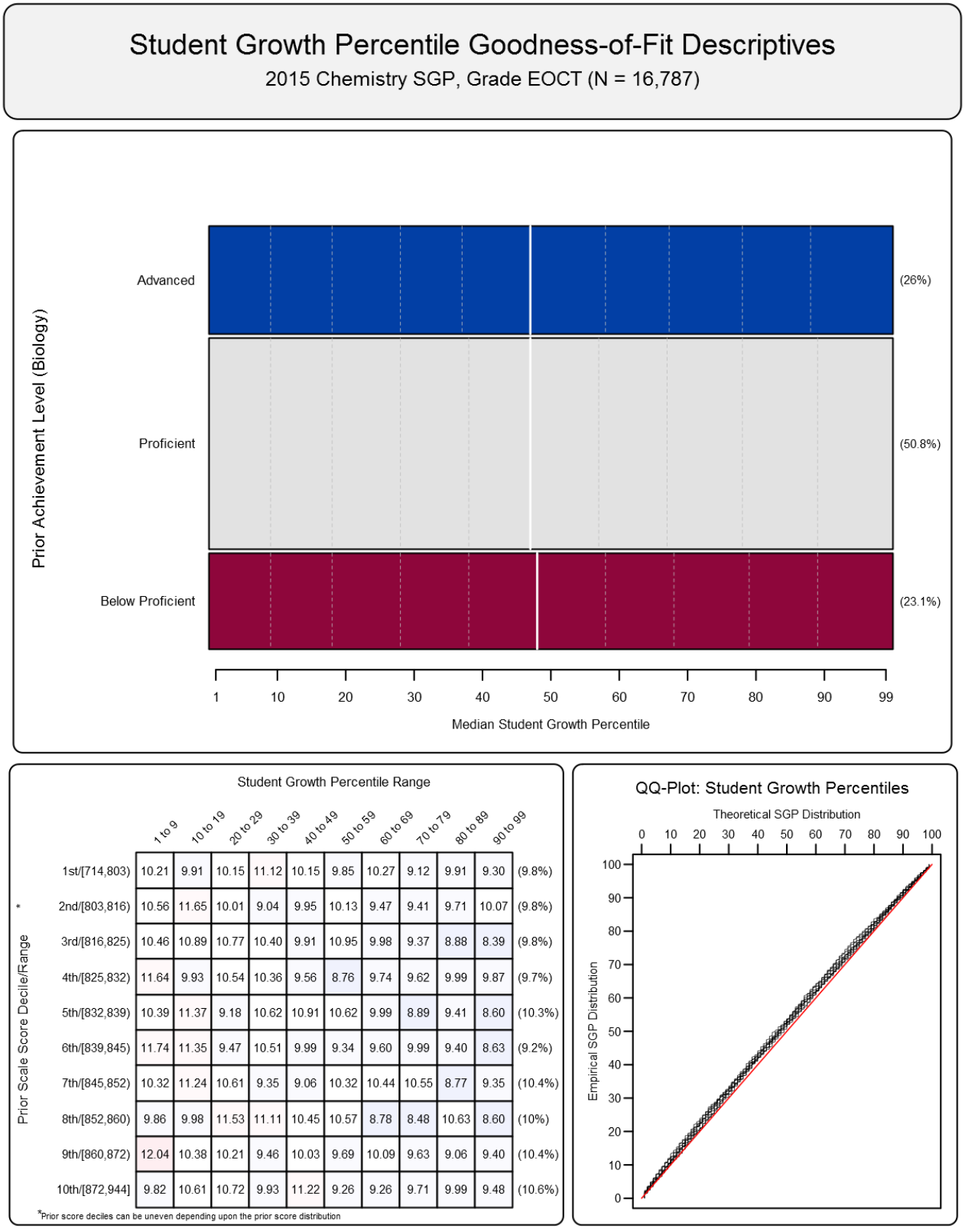


Figure 21: Goodness of Fit Plot for 2015 Chemistry (Priors - 2014 Biology, 2013 Science Grade 8, 2012 Science Grade 7, 2011 Science Grade 6, 2010 Science Grade 5)

3.3.2 Biology as Imediate Prior, Earth Science Secondary

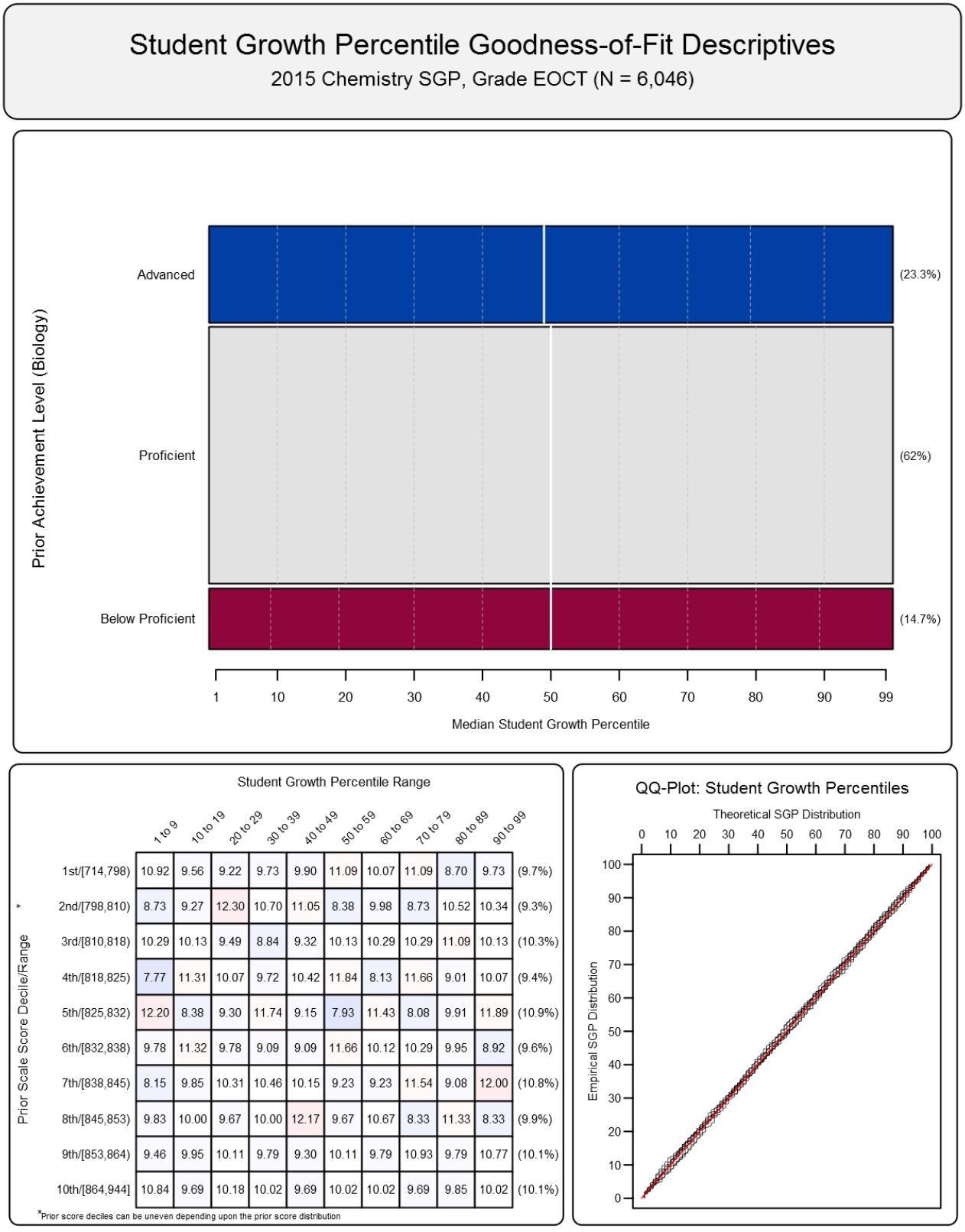


Figure 22: Goodness of Fit Plot for 2015 Chemistry (Priors - 2014 Biology, 2013 Earth Science, 2012 Science Grade 8, 2011 Science Grade 7, 2010 Science Grade 6)

3.4 Physics

3.4.1 Biology as Imediate Prior

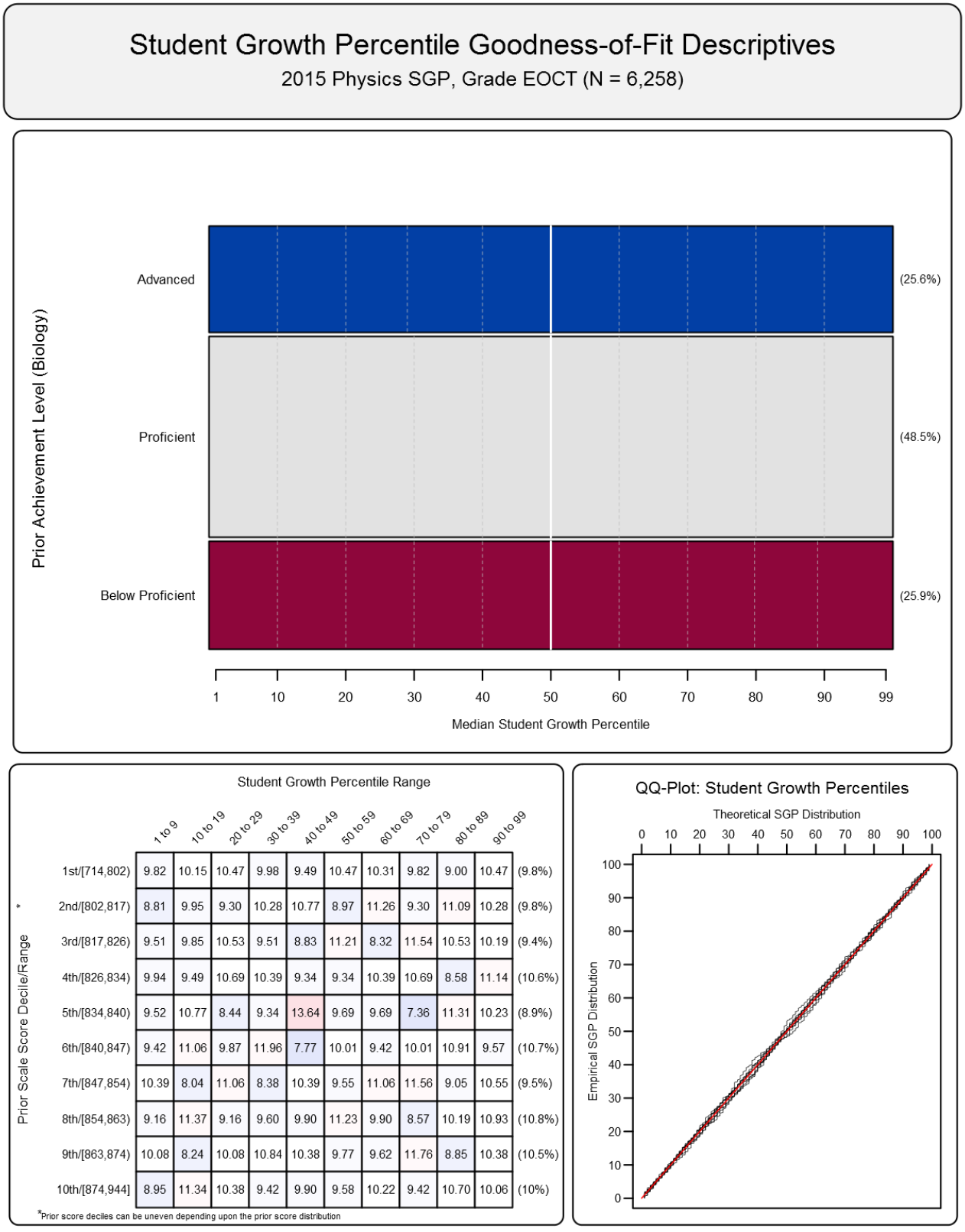


Figure 23: Goodness of Fit Plot for 2015 Physics (Priors - 2014 Biology, 2013 Earth Science, 2012 Science, 2011 Science, 2010 Science)

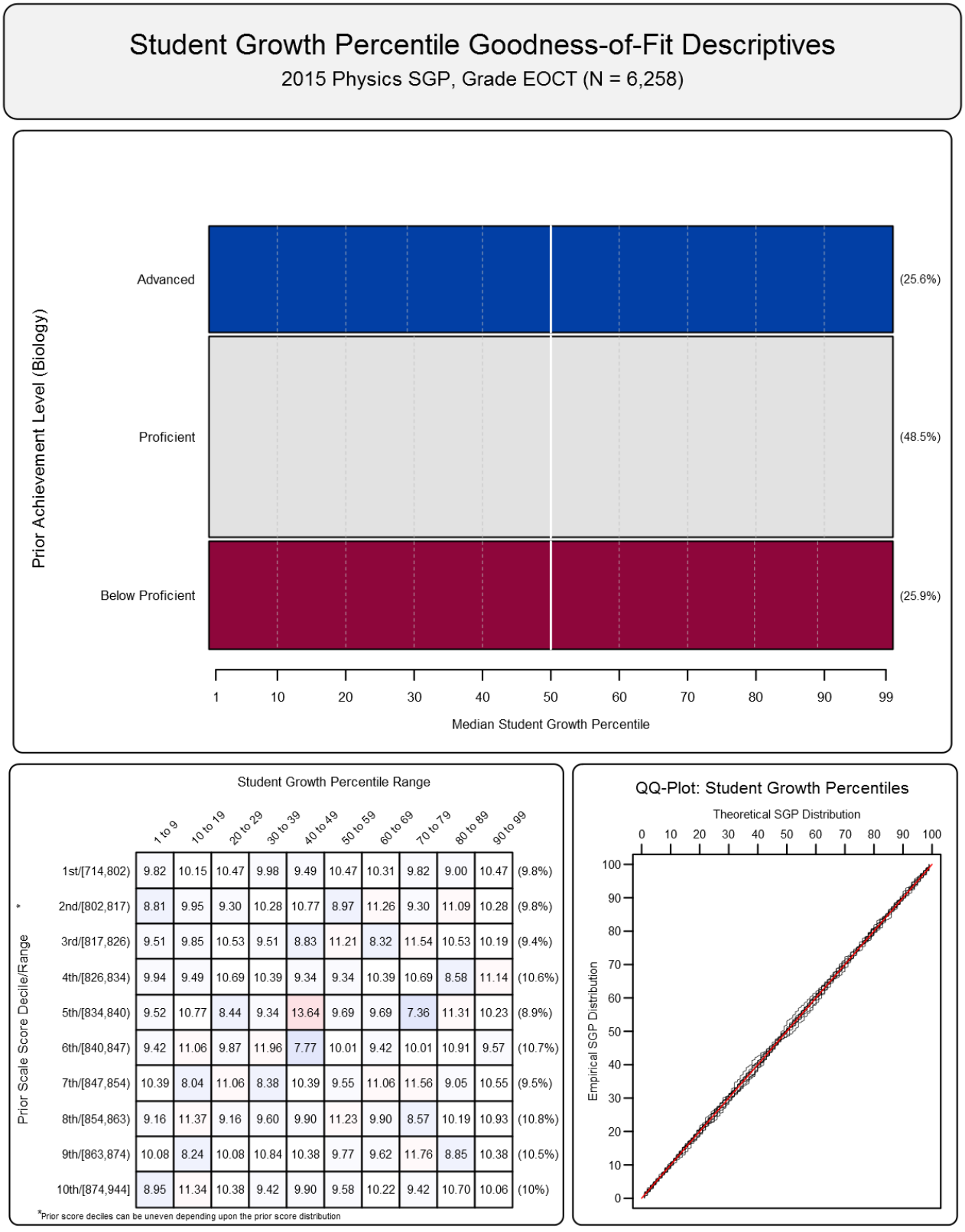


Figure 24: Goodness of Fit Plot for 2015 Physics (Priors - 2014 Biology, 2013 Science, 2012 Science, 2011 Science, 2010 Science)

3.4.2 Chemistry as Imediate Prior

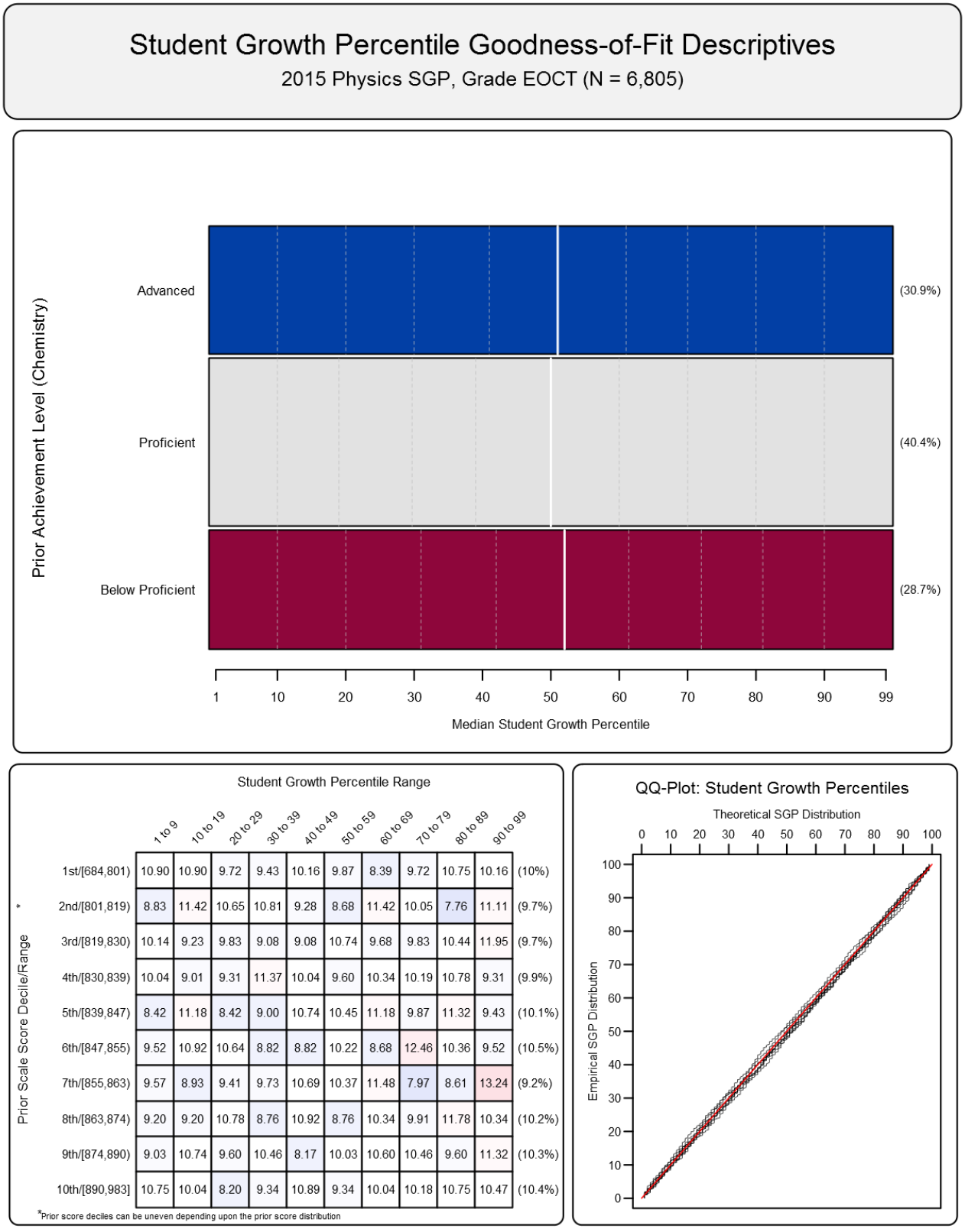


Figure 25: Goodness of Fit Plot for 2015 Physics (Priors - 2014 Chemistry, 2013 Biology, 2012 Earth Science, 2011 Science, 2010 Science)

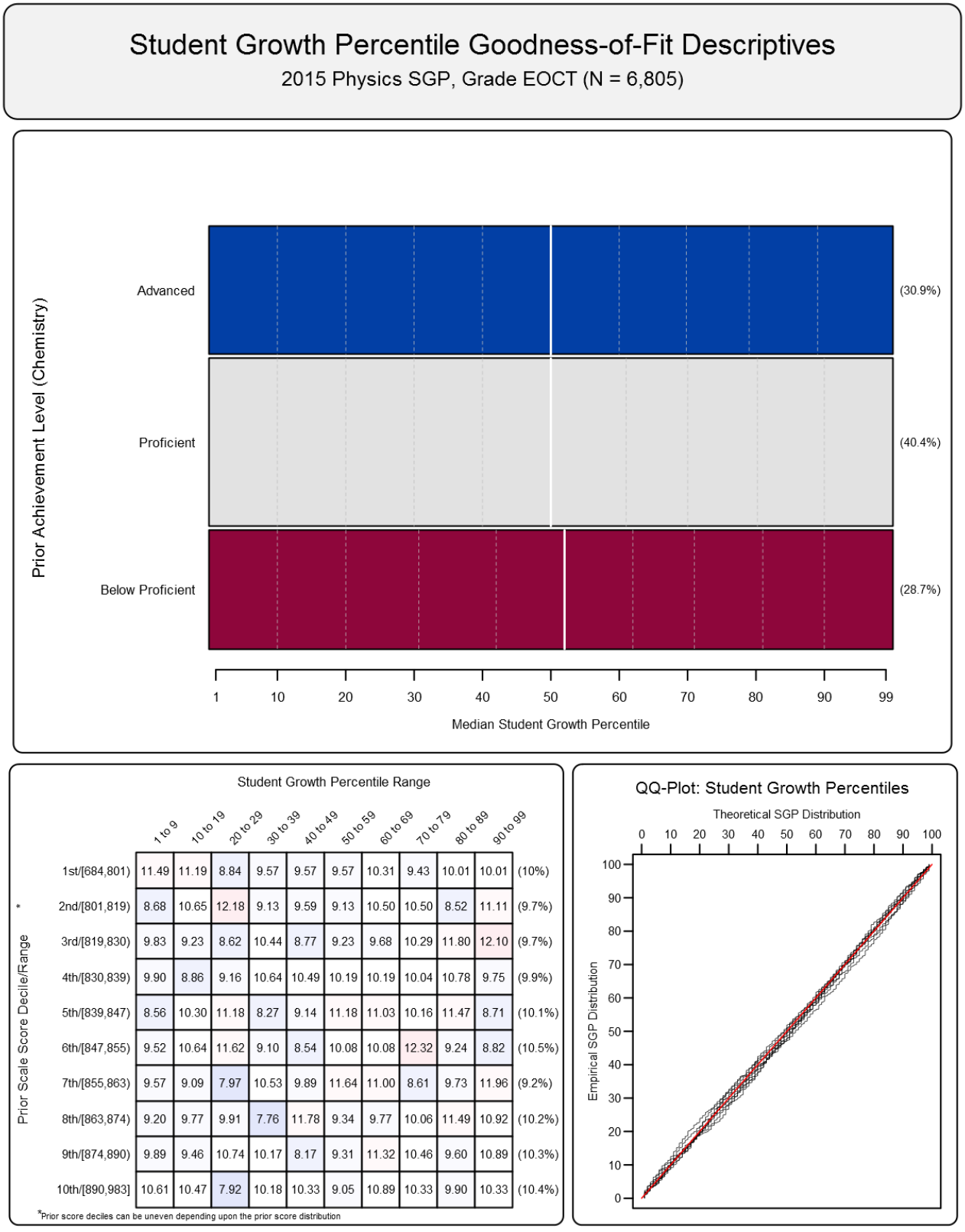


Figure 26: Goodness of Fit Plot for 2015 Physics (Priors - 2014 Chemistry, 2013 Biology, 2012 Science Grade 8, 2011 Science 7, 2010 Science 6)

3.5 Secondary Math I

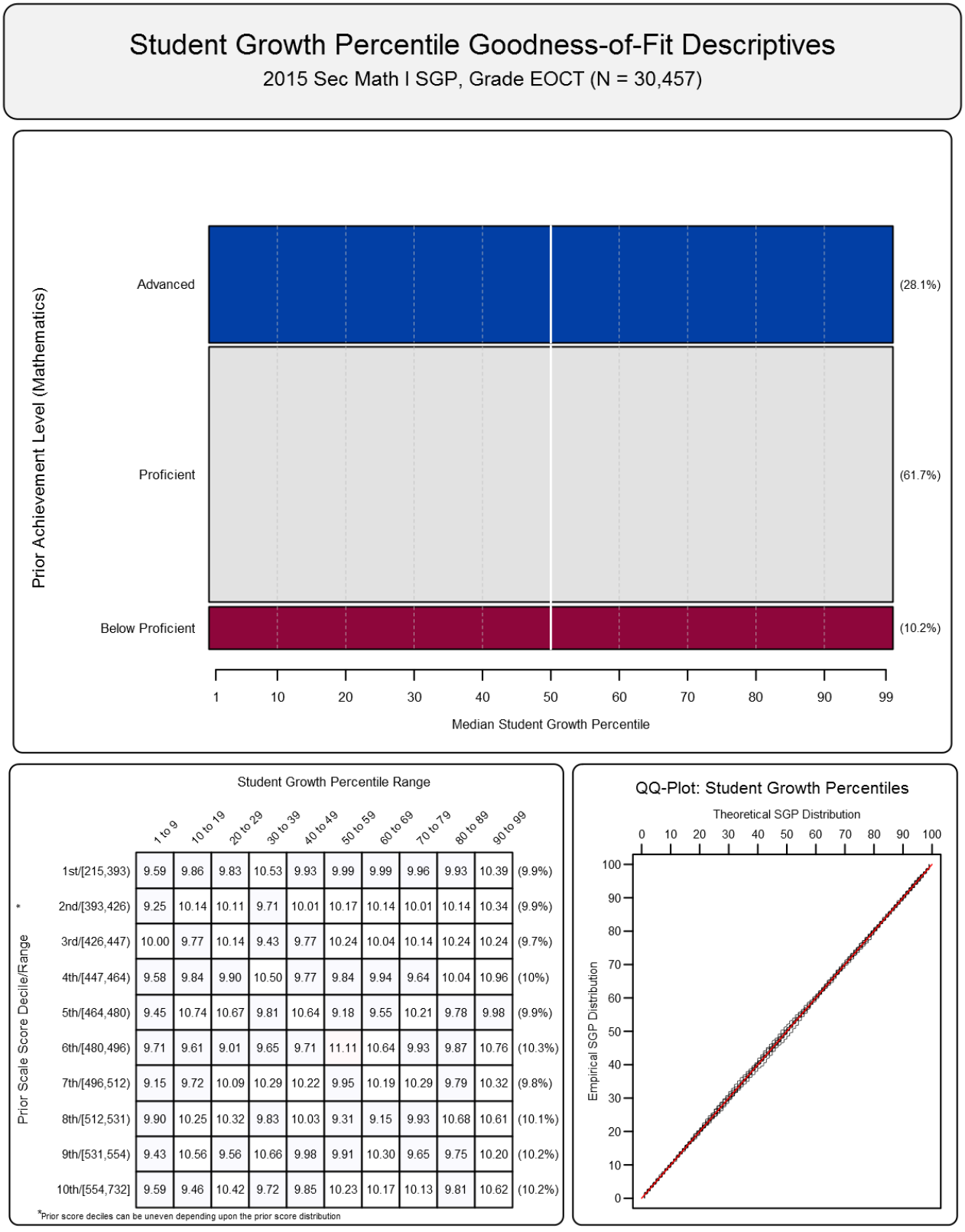


Figure 27: Goodness of Fit Plot for 2015 Secondary Math I (Priors - 2014 Math 8, 2013 Math Grade 7, 2012 Math Grade 6, 2011 Math Grade 5, 2010 Math Grade 4)

3.6 Secondary Math II

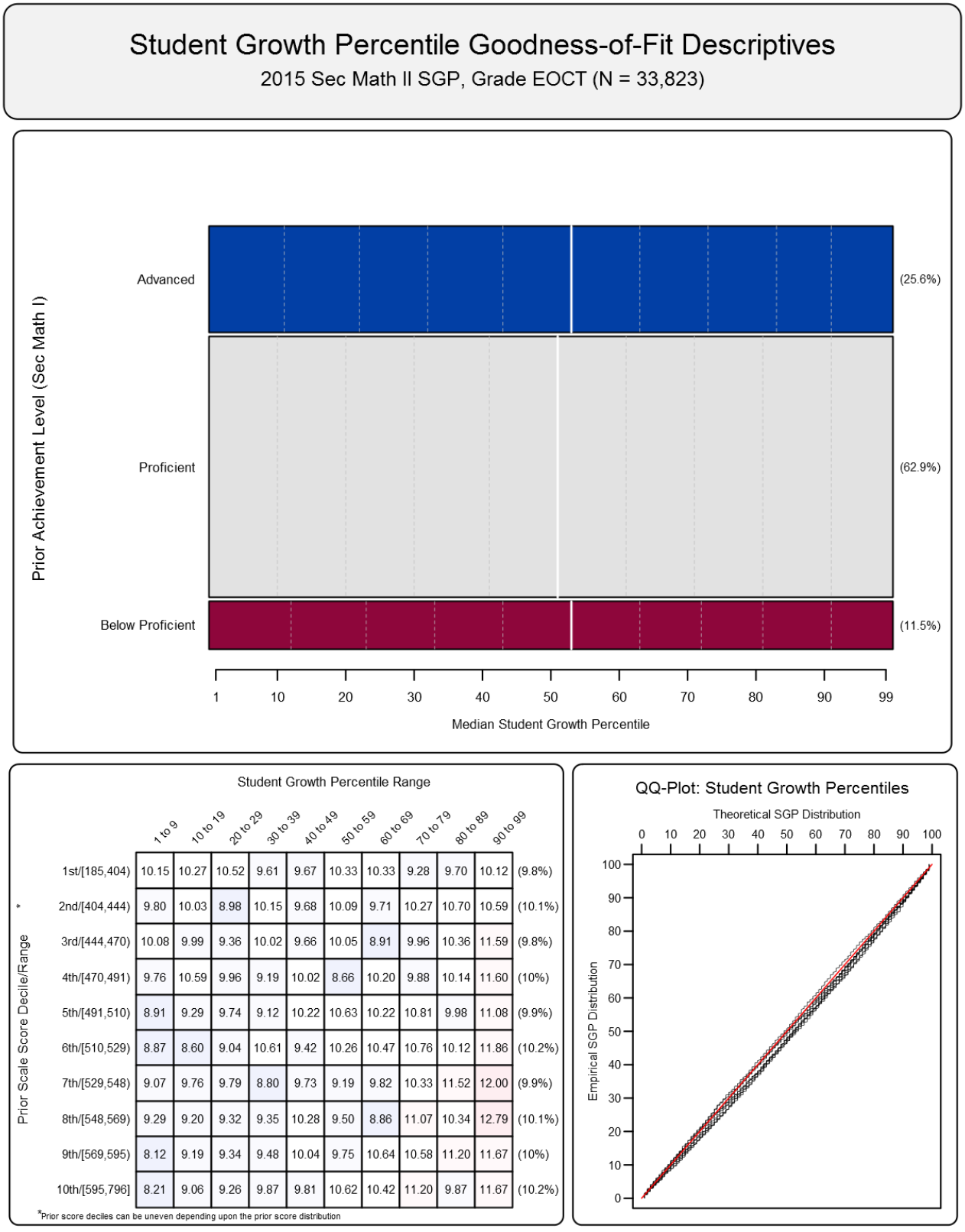


Figure 28: Goodness of Fit Plot for 2015 Secondary Math II (Priors - 2014 Sec Math I, 2013 Pre Algebra, 2012 Math Grade 7, 2011 Math Grade 6, 2010 Math Grade 5)

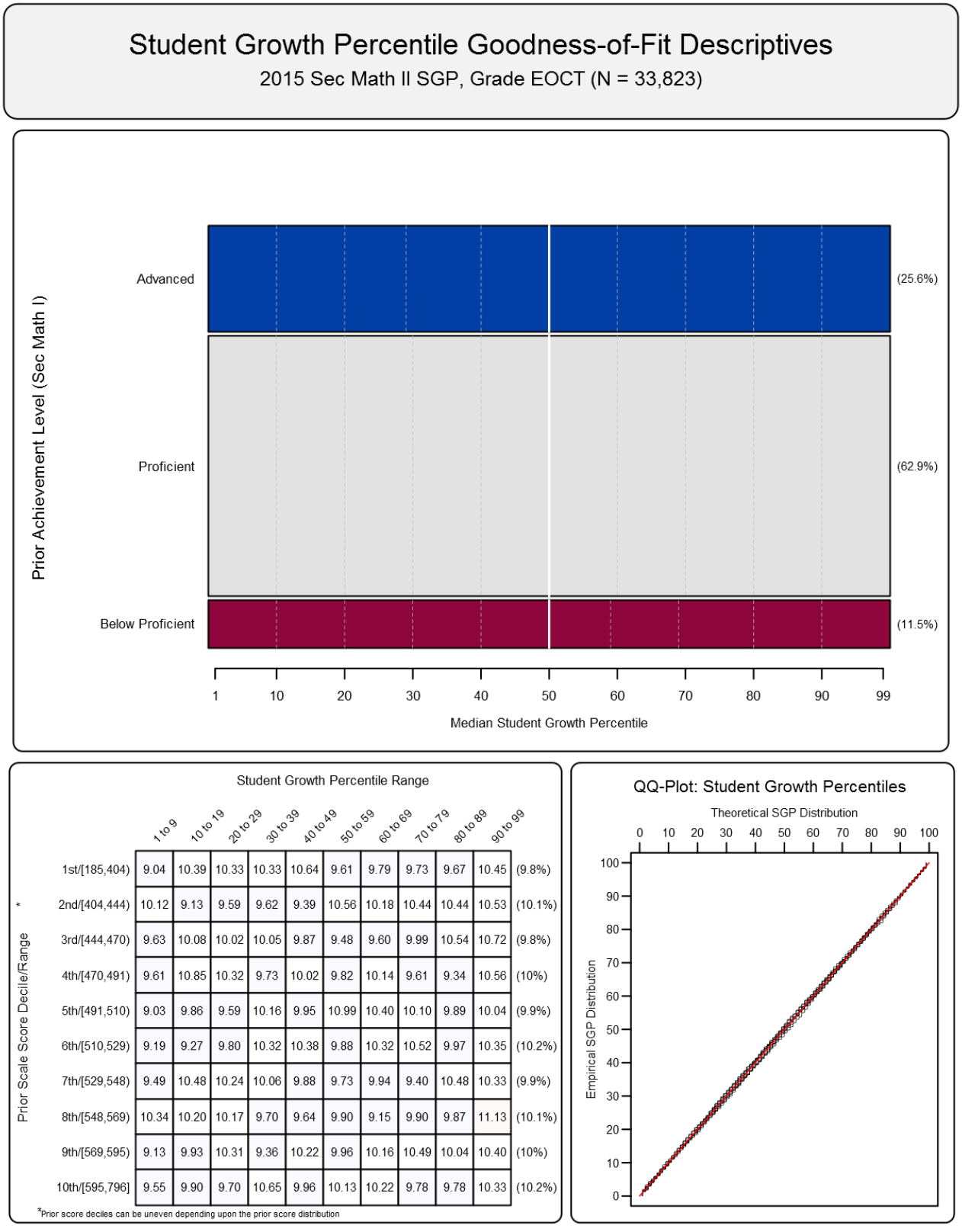


Figure 29: Goodness of Fit Plot for 2015 Secondary Math II (Priors - 2014 Sec Math I)

3.7 Secondary Math III

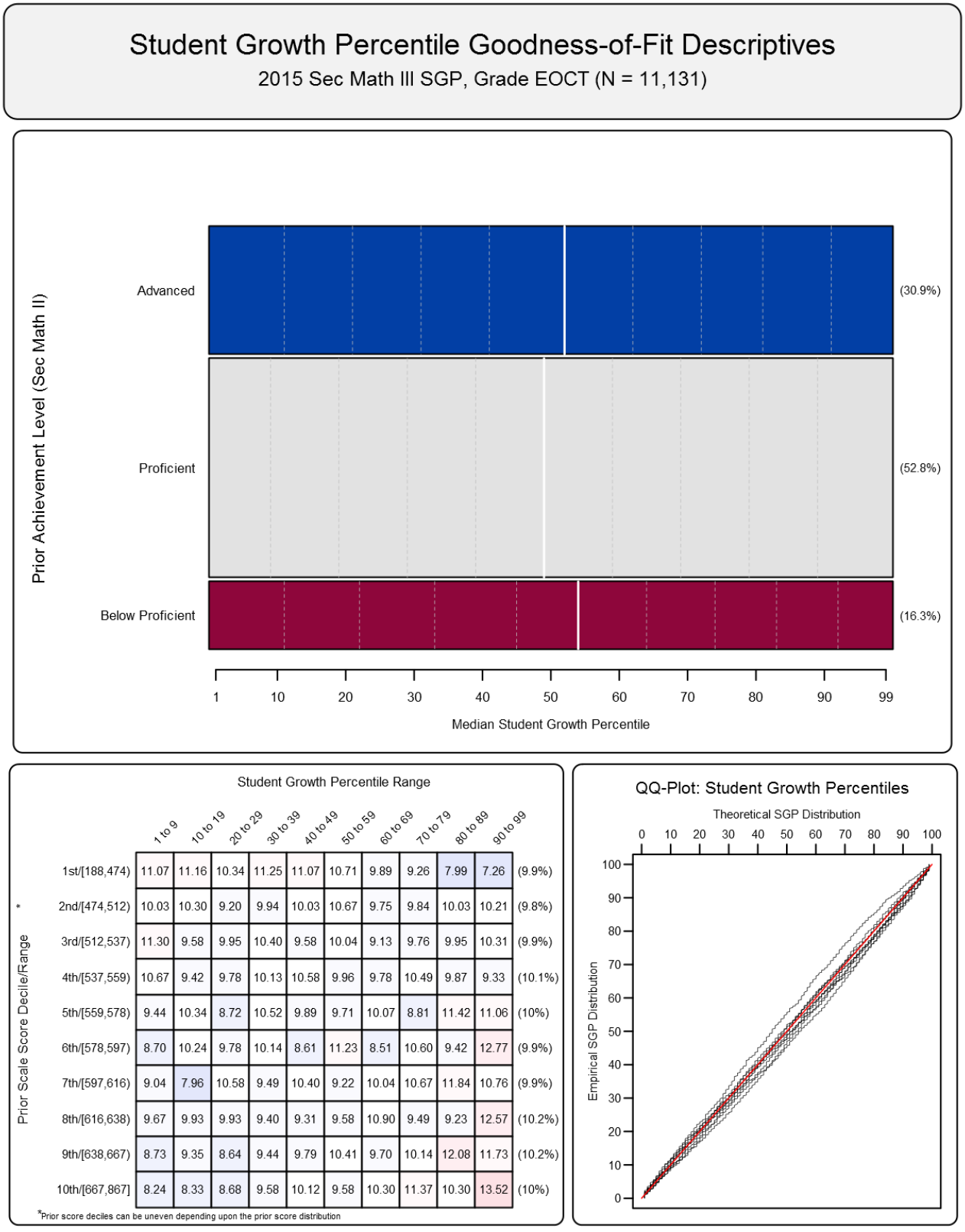


Figure 30: Goodness of Fit Plot for 2015 Secondary Math III (Priors - 2014 Sec Math II, 2012 Algebra I, 2011 Pre Algebra, 2010 Math 6, 2009 Math 5)

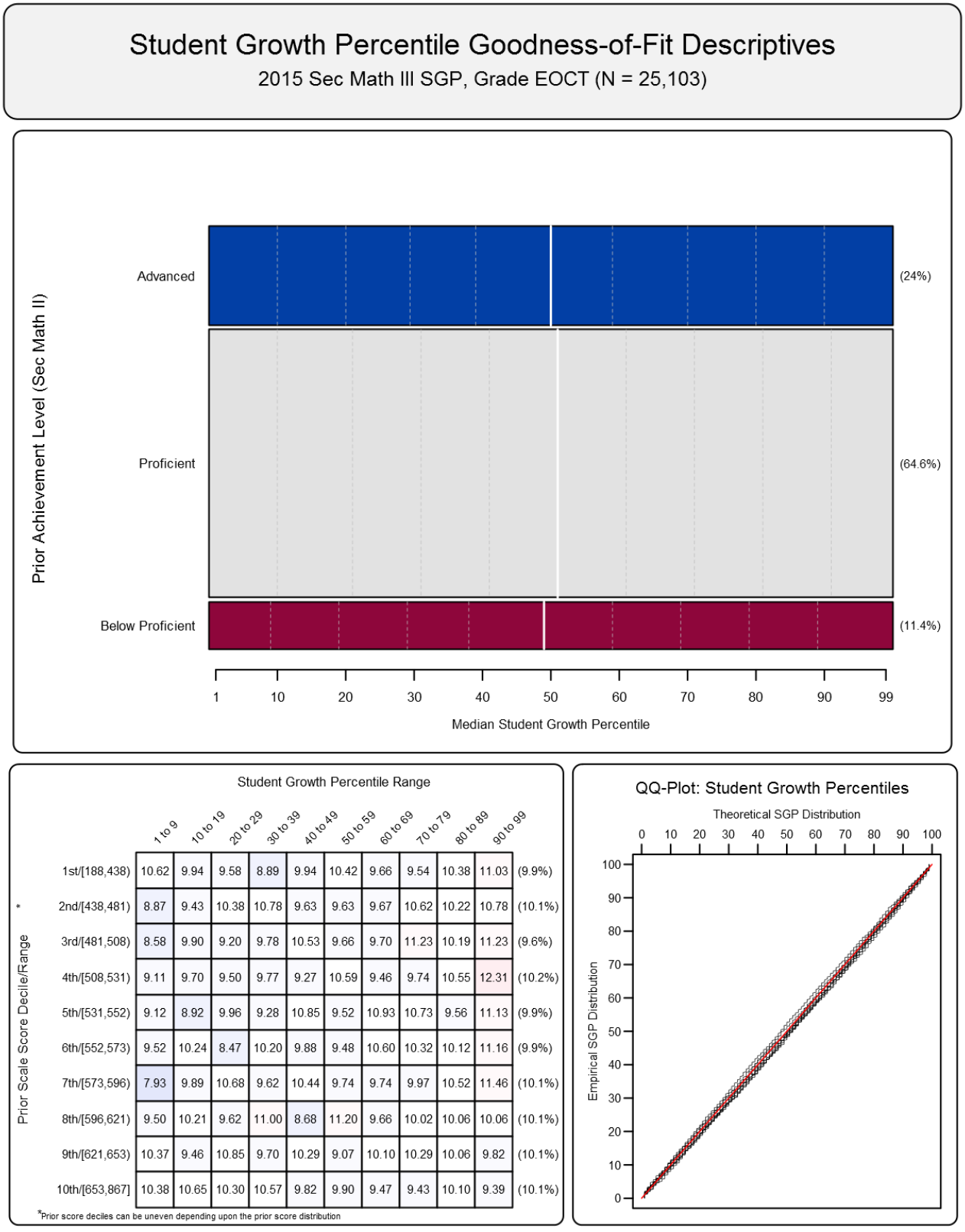


Figure 31: Goodness of Fit Plot for 2015 Secondary Math III (Priors - 2014 Sec Math II, 2012 Pre Algebra, 2011 Math 7, 2010 Math 6, 2009 Math 5)

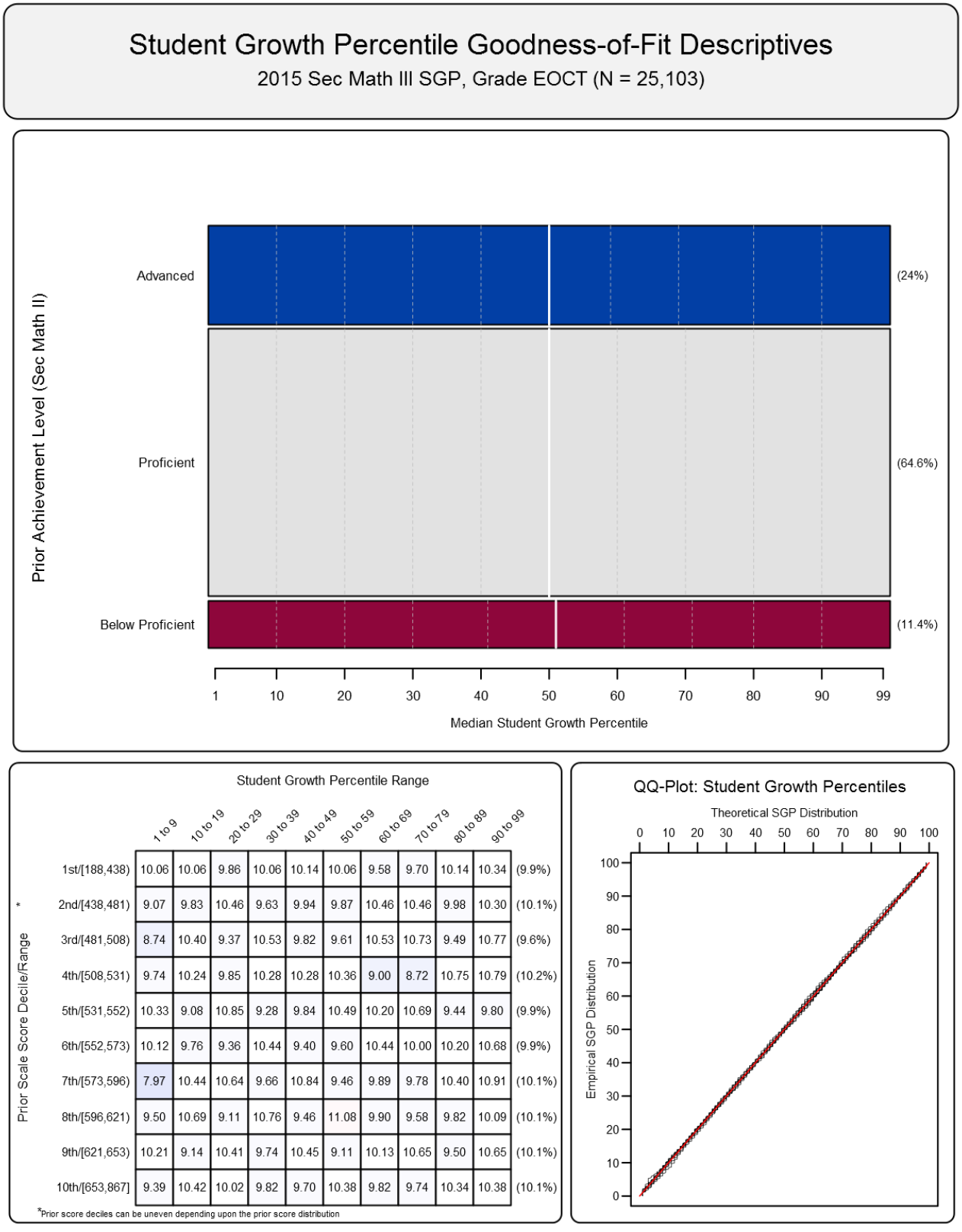


Figure 32: Goodness of Fit Plot for 2015 Secondary Math III (Priors - 2014 Sec Math II)

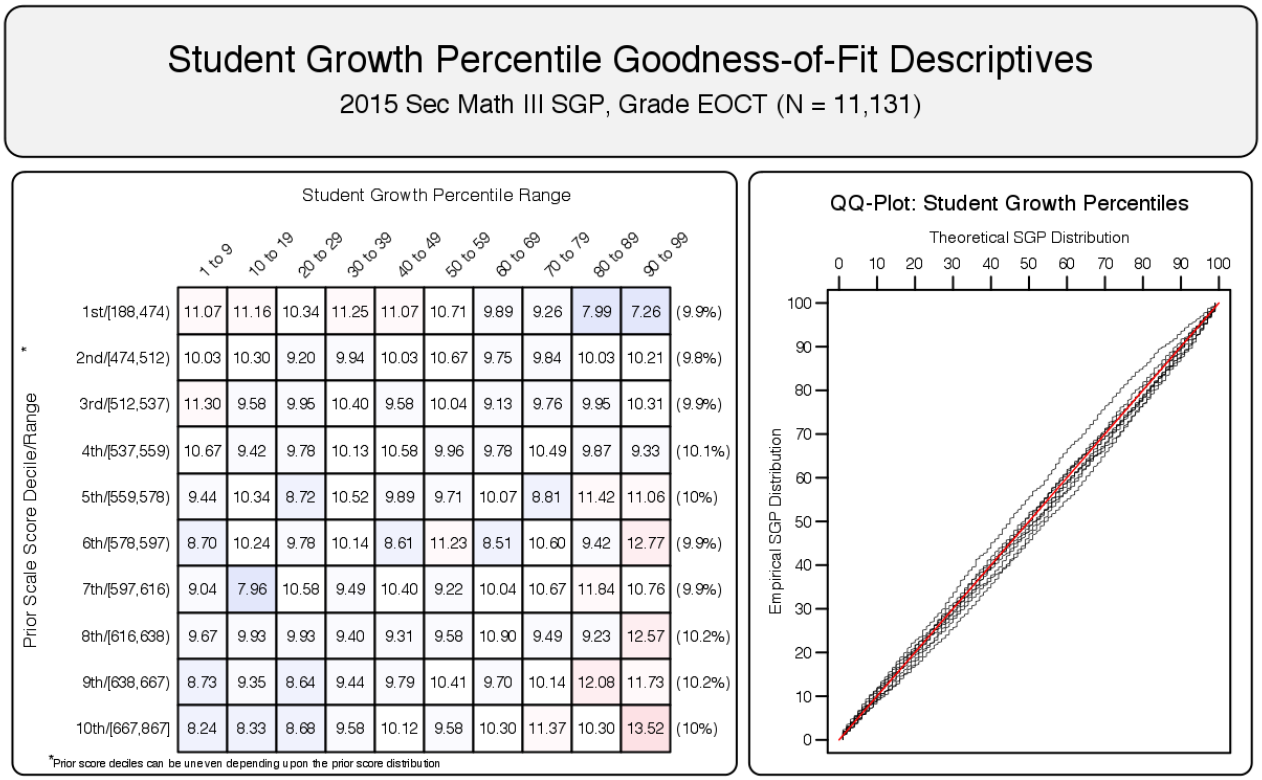


Figure 33: Goodness of Fit Plot for 2015 Secondary Math III (Priors -)