

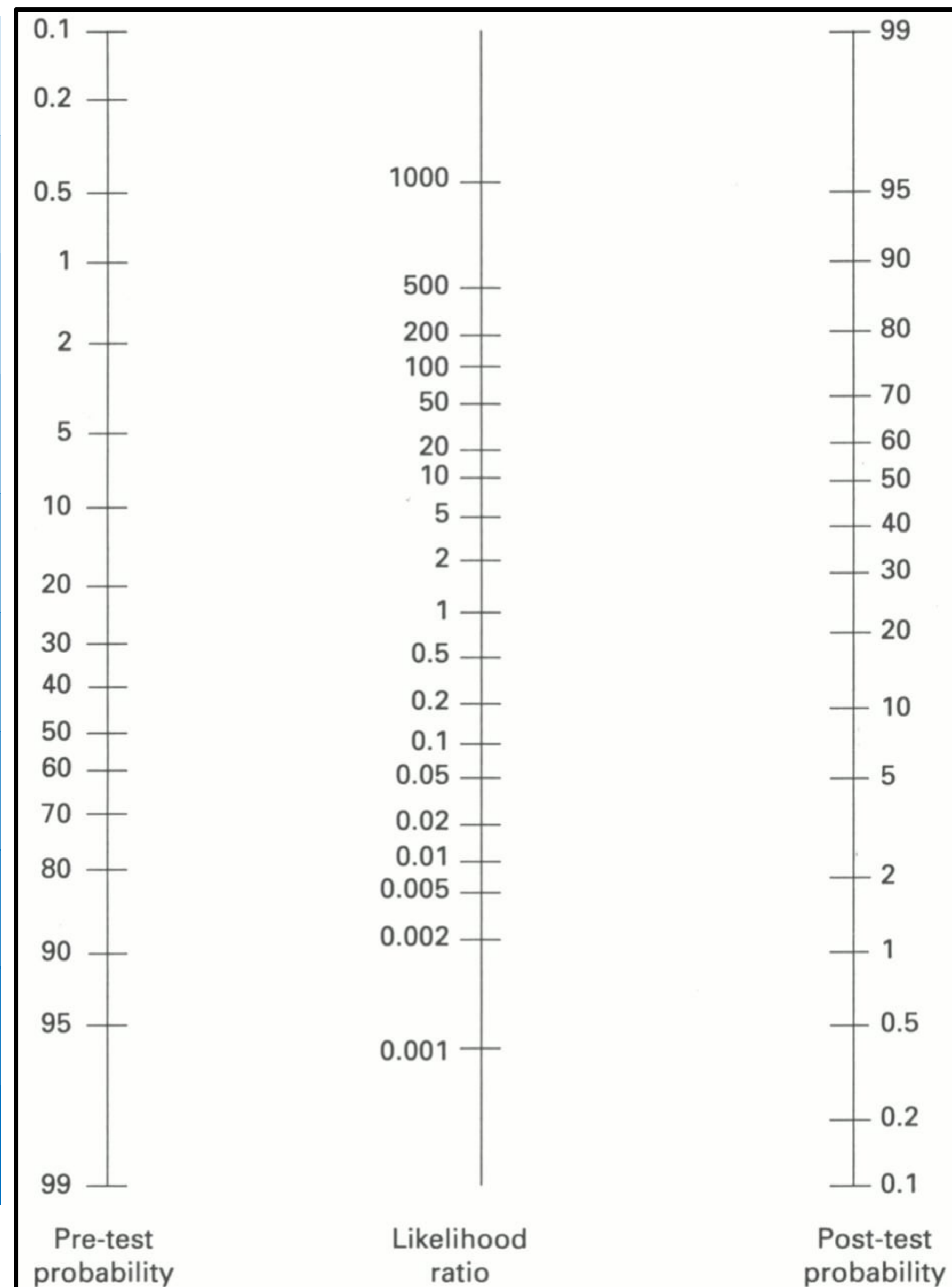
David A. Klingbeil, Alexander D. Latham, Madeline C. Schmitt, Jessica S. Kim

INTRODUCTION

- Making screening decisions based on post-test probabilities may require that schools administer multiple screeners, depending on their base rate of risk.
- Can make decision based on single measure when base rates range from 25% to 45% (when sensitivity = .90 and specificity = .70)
- Base rates of risk can change year-over-year, and large fluctuations may require schools to have flexible screening procedures that change from year to year.

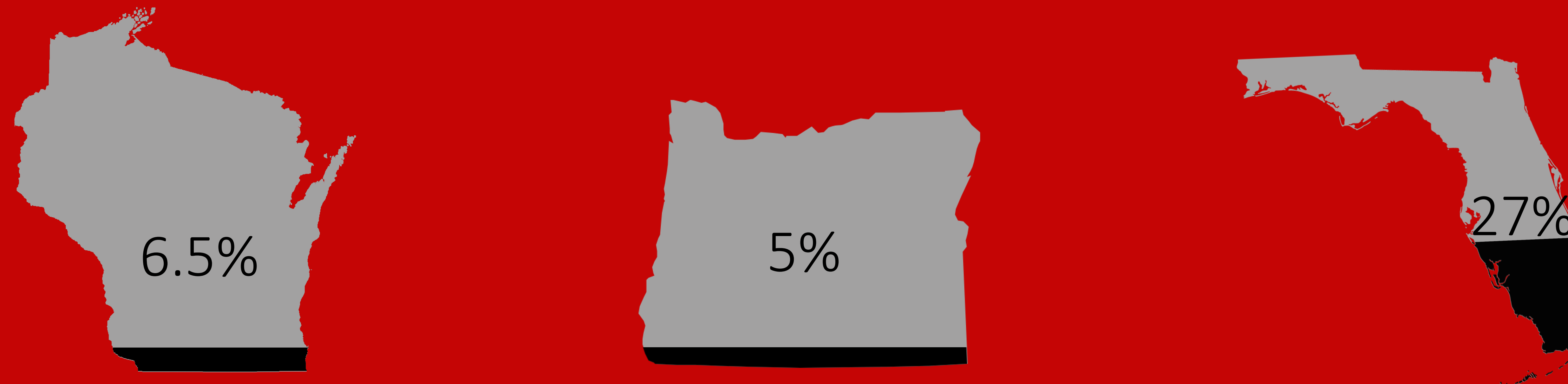
METHODS

Using district-level state test data from three states across 2016-2019, we calculated a) base rates of reading failure for each grade within each district, b) the year-to-year change in these base rates, and c) the number of districts where risk was within 25% to 45%.



Very few districts could adopt an EBA approach without administering multiple screeners.

Percent of Districts with Perennial Base Rates Between 25-45% in Grades 3-5

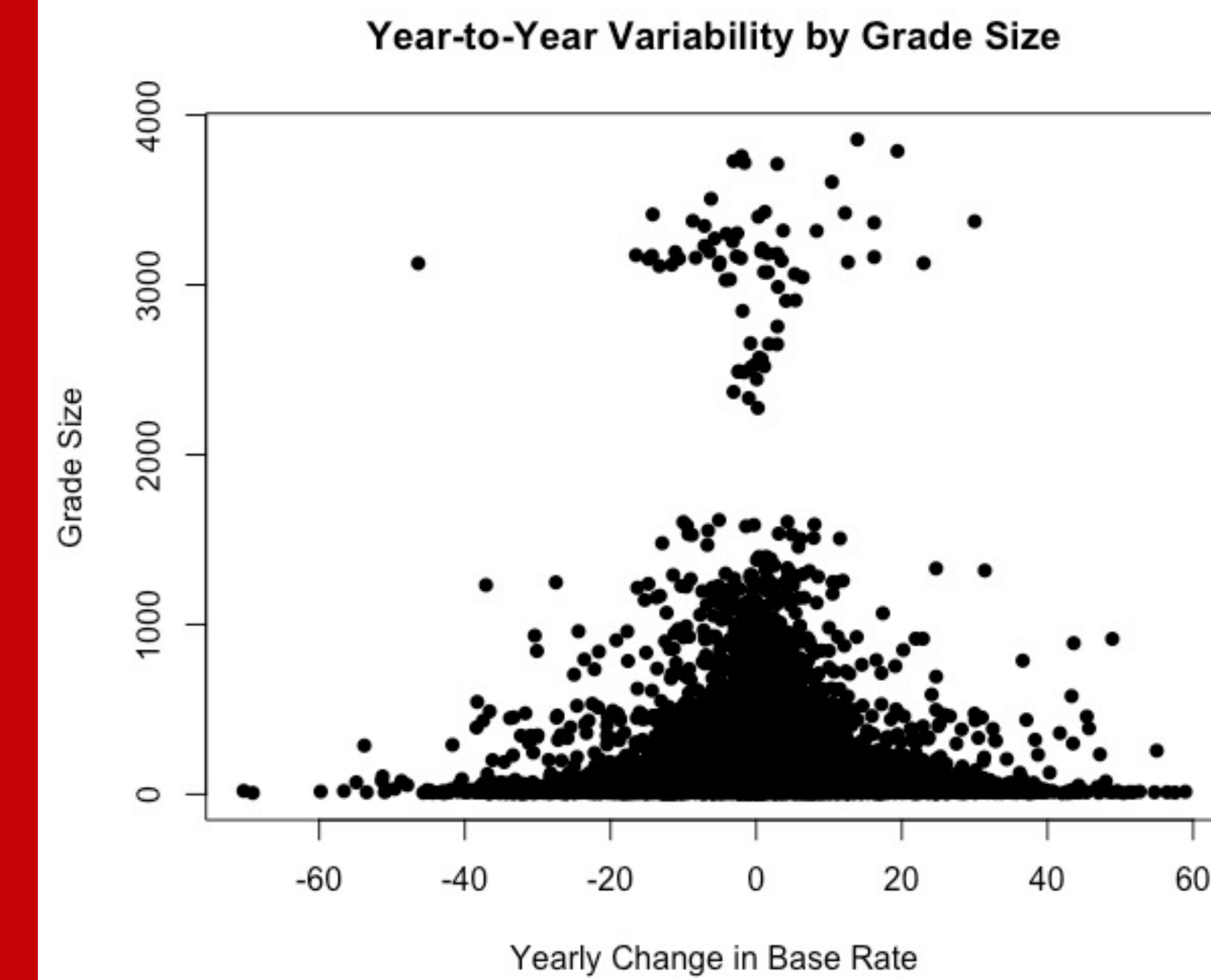


Percent of Districts with Perennial Base Rates Between 25-45% in Grades 6-8



RESULTS

- Only 26% of base rates fell within 25-45%
- Nearly 72% of data points were > 45%
- The mean year-to-year change was 0.24% with a standard deviation of 11.81 and range of -70.34 to 58.93



DISCUSSION

- Most base rates of risk were outside of the mathematically required range, thus most schools would need to administer multiple measures to make decisions.
- Base rates were variable in many districts, requiring flexible procedures that change annually.
- Larger school districts may need less year-to-year flexibility in screening processes.
- More common sensitivity and specificities would shrink the range of base rates for which a single screener would suffice.

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For supplemental materials visit : bit.ly/TowardEBA

Toward an Evidence Based Assessment Approach to Academic
Screening in Schools
Supplemental Materials

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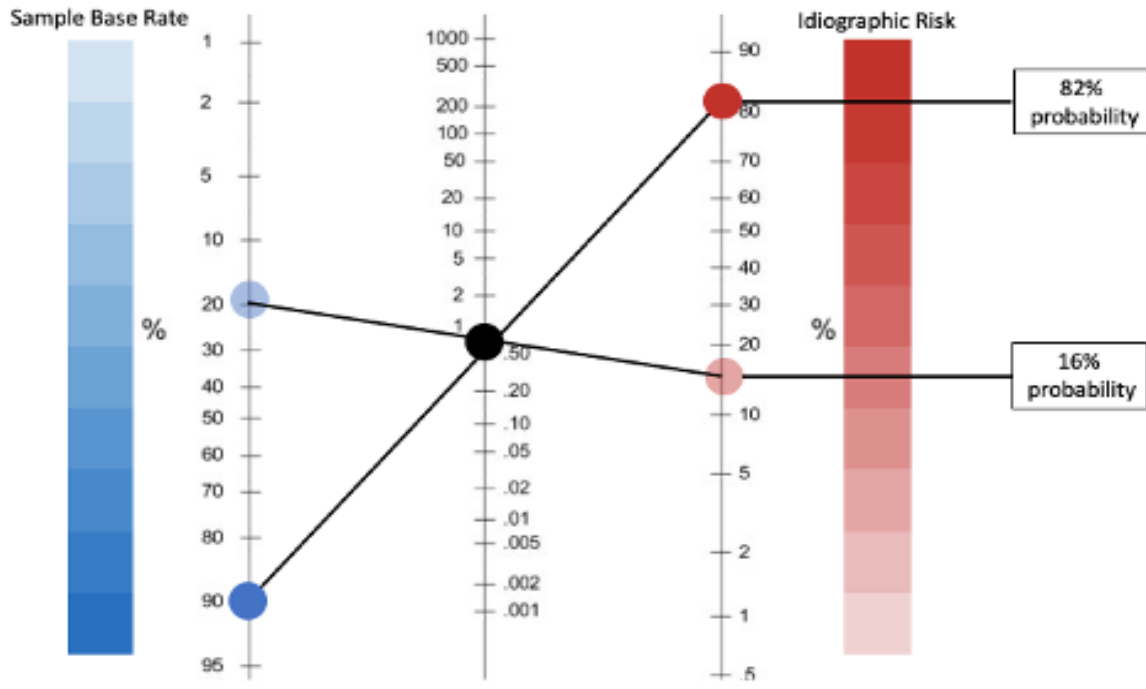
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Figure 1

Depiction of Using a Nomogram



Note. The likelihood ratio associated with a specific test result determines where the line intersects with the middle column. When screening results are classified as either (a) at-risk or (b) not at-risk, we apply the positive likelihood ratio (used when a student was at-risk on the screener) or the negative likelihood ratio (used when a student was not at-risk on the screener).

Table 1

Glossary of Terms Used in Tables 2 through 4

Term	Definition
Base Rate	Overall Base Rate of Risk (i.e., percent not reaching proficiency on statewide test)
Yearly Change	Average Change in Base Rate Across All Four Years
Base Rate DATE	Base Rate of Risk Across all Grades on the Statewide Test in YEAR
Yearly Change DATE	Change in Base Rate from Preceding Year to Listed Year (e.g., Yearly Change 2017 represents the change from 2016 to 2017).
Base Rate Grade #	Base Rate of Risk Across All Years in a Specific Grade #
Yearly Change Grade #	Average Change in Base Rate Across All Four Years in Grade #

Table 2

Descriptive Statistics - State of Wisconsin - Base Rates of Non-Proficiency

	<i>n</i>	Mean	<i>SD</i>	Range
Base Rate	9827	54.21	14.26	0-97.50
Yearly Change	7326	-0.75	12.39	-70.37 - 58.93
Base Rate 2016	2465	53.94	14.19	0 - 97.44
Base Rate 2017	2457	52.38	14.51	0 - 97.5
Base Rate 2018	2454	54.25	13.92	0 - 97.37
Base Rate 2019	2451	56.27	14.13	7.7 - 96.97
Yearly Change 2017	2429	1.59	13.15	-70.37 - 58.93
Yearly Change 2018	2454	-1.88	12.06	-49.6 - 49.68
Yearly Change 2019	2443	-1.95	11.59	-50.59 - 50.43
Base Rate Grade 3	1640	54.82	14.3	0 - 96.97
Base Rate Grade 4	1641	51.54	13.64	0 - 94.74
Base Rate Grade 5	1639	53.53	14.12	0 - 93.75
Base Rate Grade 6	1638	53.81	14.35	11.76 - 96.92
Base Rate Grade 7	1634	53.31	14.04	0 - 97.44
Base Rate Grade 8	1635	58.27	14.19	13.96 - 97.5
Yearly Change Grade 3	1193	-1.54	12.43	-70.37 - 58.93
Yearly Change Grade 4	1193	-0.19	11.66	-49.6 - 51.28
Yearly Change Grade 5	1193	-1.02	12.36	-50.59 - 52.66
Yearly Change Grade 6	1193	-0.58	11.75	-42.08 - 48.9
Yearly Change Grade 7	1193	0.85	12.39	-69.12 - 49.68
Yearly Change Grade 8	1192	-2.01	12.3	-45.71 - 56.43

Table 3

Descriptive Statistics - State of Florida - Base Rates of Non-Proficiency

	<i>n</i>	Mean	<i>SD</i>	Range
Base Rate	1752	47.49	11.79	10 - 96
Yearly Change	1308	1.19	4.96	-20 - 22
Base Rate 2016	438	49.32	11.46	16 - 89
Base Rate 2017	438	47.77	12.12	15 - 92
Base Rate 2018	438	47.16	11.67	14 - 96
Base Rate 2019	438	45.69	11.66	10 - 94
Yearly Change 2017	438	1.55	4.49	-20 - 19
Yearly Change 2018	438	0.58	5.01	- 13 - 21
Yearly Change 2019	438	1.47	5.3	-17 - 22
Base Rate Grade 3	292	42.84	11.71	13 - 92
Base Rate Grade 4	292	46.58	11.17	10 - 92
Base Rate Grade 5	292	48.70	11.72	17 - 96
Base Rate Grade 6	292	49.91	11.32	20 - 94
Base Rate Grade 7	292	51.60	11.27	21 - 86
Base Rate Grade 8	292	45.30	11.43	14 - 83
Yearly Change Grade 3	292	1.47	5.09	-18 - 19
Yearly Change Grade 4	292	1.92	5.71	-17 - 22
Yearly Change Grade 5	292	1.56	4.74	-20 - 22
Yearly Change Grade 6	292	0.87	4.80	-15 - 21
Yearly Change Grade 7	292	1.31	4.77	-17 - 16
Yearly Change Grade 8	292	0.07	4.39	- 12 - 16

Table 4

Descriptive Statistics - State of Oregon - Base Rates of Non-Proficiency

	<i>n</i>	Mean	<i>SD</i>	Range
Base Rate	4133	52.02	14.41	5 - 95
Yearly Change	3092	0.35	12.39	-56.6 - 55
Base Rate 2016	1038	51.23	14.83	5 - 95
Base Rate 2017	1034	53.12	14.42	5 - 95
Base Rate 2018	1039	51.54	14.57	5 - 95
Base Rate 2019	1019	52.21	13.73	5 - 95
Yearly Change 2017	1034	1.85	12.55	-56.6 - 48.9
Yearly Change 2018	1039	-1.69	12.62	- 51.4 - 55
Yearly Change 2019	1019	0.93	11.7	-54.9 - 48
Base Rate Grade 3	691	57.43	14.18	5 - 95
Base Rate Grade 4	688	55.2	13.76	9.8 - 92.3
Base Rate Grade 5	684	49.93	13.65	5 - 95
Base Rate Grade 6	686	52.06	14.1	5 - 92.3
Base Rate Grade 7	688	48.18	13.96	5 - 95
Base Rate Grade 8	691	49.32	14.53	5 - 95
Yearly Change Grade 3	513	-0.041	13.5	-51 - 54.7
Yearly Change Grade 4	512	0.2	12.38	-54.9 - 48.9
Yearly Change Grade 5	508	0.71	11.48	-41.7 - 45.7
Yearly Change Grade 6	511	0.44	11.64	-56.6 - 47.2
Yearly Change Grade 7	512	-0.04	12.89	- 53.8 - 55
Yearly Change Grade 8	516	1.23	12.31	-48.7 - 43.6

Table 5

Post-Test Probabilities Across Pre-Test Base Rates: Highly Sensitive Screener

Screening Test with Sensitivity of .90 and Specificity of .70 Positive Likelihood Ratio = 3.0 Negative Likelihood Ratio = 0.14					
Pre-Test Probability of Risk	Pre-Test Odds of Risk	Positive Post-Test Odds	Negative Post-Test Odds	Positive Post-Test Probability	Negative Post-Test Probability
0.15	0.18	0.53	0.03	0.35	0.02
0.16	0.19	0.57	0.03	0.36	0.03
0.17	0.20	0.61	0.03	0.38	0.03
0.18	0.22	0.66	0.03	0.40	0.03
0.19	0.23	0.70	0.03	0.41	0.03
0.20	0.25	0.75	0.04	0.43	0.03
0.21	0.27	0.80	0.04	0.44	0.04
0.22	0.28	0.85	0.04	0.46	0.04
0.23	0.30	0.90	0.04	0.47	0.04
0.24	0.32	0.95	0.05	0.49	0.04
0.25	0.33	1.00	0.05	0.50	0.05
0.26	0.35	1.05	0.05	0.51	0.05
0.27	0.37	1.11	0.05	0.53	0.05
0.28	0.39	1.17	0.06	0.54	0.05
0.29	0.41	1.23	0.06	0.55	0.06
0.30	0.43	1.29	0.06	0.56	0.06
0.31	0.45	1.35	0.06	0.57	0.06
0.32	0.47	1.41	0.07	0.59	0.06
0.33	0.49	1.48	0.07	0.60	0.07

0.34	0.52	1.55	0.07	<i>0.61</i>	<i>0.07</i>
0.35	0.54	1.62	0.08	<i>0.62</i>	<i>0.07</i>
0.36	0.56	1.69	0.08	<i>0.63</i>	<i>0.07</i>
0.37	0.59	1.76	0.08	<i>0.64</i>	<i>0.08</i>
0.38	0.61	1.84	0.09	<i>0.65</i>	<i>0.08</i>
0.39	0.64	1.92	0.09	<i>0.66</i>	<i>0.08</i>
0.40	0.67	2.00	0.10	<i>0.67</i>	<i>0.09</i>
0.41	0.69	2.08	0.10	<i>0.68</i>	<i>0.09</i>
0.42	0.72	2.17	0.10	<i>0.68</i>	<i>0.09</i>
0.43	0.75	2.26	0.11	<i>0.69</i>	<i>0.10</i>
0.44	0.79	2.36	0.11	<i>0.70</i>	<i>0.10</i>
0.45	0.82	2.45	0.12	<i>0.71</i>	<i>0.10</i>
0.46	0.85	2.56	0.12	<i>0.72</i>	0.11
0.47	0.89	2.66	0.13	<i>0.73</i>	0.11
0.48	0.92	2.77	0.13	<i>0.73</i>	0.12
0.49	0.96	2.88	0.14	<i>0.74</i>	0.12
0.50	1.00	3.00	0.14	<i>0.75</i>	0.13

Note. Cells that are italicized represent post-test probabilities that exceed VanDerHeyden's (2013) recommended thresholds. Rows where the positive and negative post-test probability meet VanDerHeyden's (2013) recommendations are bolded for convenience.

Table 6

Post-Test Probabilities Across Pre-Test Base Rates: Balanced Screener

Screening Test with Sensitivity of .80 and Specificity of .80 Positive Likelihood Ratio = 4.0 Negative Likelihood Ratio = 0.25					
Pre-Test Probability of Risk	Pre-Test Odds of Risk	Positive Post-Test Odds	Negative Post-Test Odds	Positive Post-Test Probability	Negative Post-Test Probability
0.15	0.18	0.71	0.04	0.41	0.04
0.16	0.19	0.76	0.05	0.43	0.05
0.17	0.20	0.82	0.05	0.45	0.05
0.18	0.22	0.88	0.05	0.47	0.05
0.19	0.23	0.94	0.06	0.48	0.06
0.20	0.25	1.00	0.06	0.50	0.06
0.21	0.27	1.06	0.07	0.52	0.06
0.22	0.28	1.13	0.07	0.53	0.07
0.23	0.30	1.19	0.07	0.54	0.07
0.24	0.32	1.26	0.08	0.56	0.07
0.25	0.33	1.33	0.08	0.57	0.08
0.26	0.35	1.41	0.09	0.58	0.08
0.27	0.37	1.48	0.09	0.60	0.08
0.28	0.39	1.56	0.10	0.61	0.09
0.29	0.41	1.63	0.10	0.62	0.09
0.30	0.43	1.71	0.11	0.63	0.10
0.31	0.45	1.80	0.11	0.64	0.10
0.32	0.47	1.88	0.12	0.65	0.11
0.33	0.49	1.97	0.12	0.66	0.11

0.34	0.52	2.06	0.13	<i>0.67</i>	0.11
0.35	0.54	2.15	0.13	<i>0.68</i>	0.12
0.36	0.56	2.25	0.14	<i>0.69</i>	0.12
0.37	0.59	2.35	0.15	<i>0.70</i>	0.13
0.38	0.61	2.45	0.15	<i>0.71</i>	0.13
0.39	0.64	2.56	0.16	<i>0.72</i>	0.14
0.40	0.67	2.67	0.17	<i>0.73</i>	0.14
0.41	0.69	2.78	0.17	<i>0.74</i>	0.15
0.42	0.72	2.90	0.18	<i>0.74</i>	0.15
0.43	0.75	3.02	0.19	<i>0.75</i>	0.16
0.44	0.79	3.14	0.20	<i>0.76</i>	0.16
0.45	0.82	3.27	0.20	<i>0.77</i>	0.17
0.46	0.85	3.41	0.21	<i>0.77</i>	0.18
0.47	0.89	3.55	0.22	<i>0.78</i>	0.18
0.48	0.92	3.69	0.23	<i>0.79</i>	0.19
0.49	0.96	3.84	0.24	<i>0.79</i>	0.19
0.50	1.00	4.00	0.25	<i>0.80</i>	0.20

Note. Cells that are italicized represent post-test probabilities that exceed VanDerHeyden's (2013) recommended thresholds. Rows where the positive and negative post-test probability meet VanDerHeyden's (2013) recommendations are bolded for convenience.

Table 7

Post-Test Probabilities Across Pre-Test Base Rates: Highly Specific Screener

Screening Test with Sensitivity of .70 and Specificity of .90 Positive Likelihood Ratio = 7.0 & Negative Likelihood Ratio = 0.33					
Pre-Test Probability of Risk	Pre-Test Odds of Risk	Positive Post-Test Odds	Negative Post-Test Odds	Positive Post-Test Probability	Negative Post-Test Probability
0.10	0.11	0.78	0.04	0.44	0.04
0.11	0.12	0.87	0.04	0.46	0.04
0.12	0.14	0.95	0.05	0.49	0.04
0.13	0.15	1.05	0.05	0.51	0.05
0.14	0.16	1.14	0.05	0.53	0.05
0.15	0.18	1.24	0.06	0.55	0.06
0.16	0.19	1.33	0.06	0.57	0.06
0.17	0.20	1.43	0.07	0.59	0.06
0.18	0.22	1.54	0.07	0.61	0.07
0.19	0.23	1.64	0.08	0.62	0.07
0.20	0.25	1.75	0.08	0.64	0.08
0.21	0.27	1.86	0.09	0.65	0.08
0.22	0.28	1.97	0.09	0.66	0.09
0.23	0.30	2.09	0.10	0.68	0.09
0.24	0.32	2.21	0.11	0.69	0.10
0.25	0.33	2.33	0.11	0.70	0.10
0.26	0.35	2.46	0.12	0.71	0.10
0.27	0.37	2.59	0.12	0.72	0.11
0.28	0.39	2.72	0.13	0.73	0.11

0.29	0.41	2.86	0.14	<i>0.74</i>	0.12
0.30	0.43	3.00	0.14	<i>0.75</i>	0.13
0.31	0.45	3.14	0.15	<i>0.76</i>	0.13
0.32	0.47	3.29	0.16	<i>0.77</i>	0.14
0.33	0.49	3.45	0.16	<i>0.78</i>	0.14
0.34	0.52	3.61	0.17	<i>0.78</i>	0.15
0.35	0.54	3.77	0.18	<i>0.79</i>	0.15
0.36	0.56	3.94	0.19	<i>0.80</i>	0.16
0.37	0.59	4.11	0.20	<i>0.80</i>	0.16
0.38	0.61	4.29	0.20	<i>0.81</i>	0.17
0.39	0.64	4.48	0.21	<i>0.82</i>	0.18
0.40	0.67	4.67	0.22	<i>0.82</i>	0.18
0.41	0.69	4.86	0.23	<i>0.83</i>	0.19
0.42	0.72	5.07	0.24	<i>0.84</i>	0.19
0.43	0.75	5.28	0.25	<i>0.84</i>	0.20
0.44	0.79	5.50	0.26	<i>0.85</i>	0.21
0.45	0.82	5.73	0.27	<i>0.85</i>	0.21
0.46	0.85	5.96	0.28	<i>0.86</i>	0.22
0.47	0.89	6.21	0.30	<i>0.86</i>	0.23
0.48	0.92	6.46	0.31	<i>0.87</i>	0.24
0.49	0.96	6.73	0.32	<i>0.87</i>	0.24
0.50	1.00	7.00	0.33	<i>0.88</i>	0.25

Note. Cells that are italicized represent post-test probabilities that exceed VanDerHeyden's (2013) recommended thresholds. Rows where the positive and negative post-test probability meet VanDerHeyden's (2013) recommendations are bolded for convenience.