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A comparison of two methods of identifying beating-the-odds high schools in Puerto Rico

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Summary

The 2013 National Assessment of Educational Progress results showed that 5 percent of grade 8 students in Puerto Rico performed at or above the basic level in math and that less than 1 percent scored at or above the proficient level (U.S. Department of Education, n.d. b). Only 62 percent of students who entered public high school in Puerto Rico graduated on time in 2011/12, compared with a national average of 82 percent (Stetser & Stillwell, 2014).

Given widespread low academic success, turning around low-performing high schools has become one of the top priorities of educators and policymakers in Puerto Rico. One response has been the Puerto Rico Research Alliance for Dropout Prevention's focus on reducing the territory's dropout rate. The alliance members are interested in identifying beating-the-odds high schools in Puerto Rico—schools that are performing better than expected, given the prior performance and characteristics of the students enrolled—so that they can later identify the organizational factors and instructional practices used in these schools in order to improve performance in others.

This study compares two methods of identifying beating-the-odds schools in Puerto Rico. It fits with a growing body of research on identifying beating-the-odds schools across contexts and through various statistical methods (Abe et al., 2015; Koon, Petscher, & Foorman, 2014). The considerations presented here on selecting statistical procedures to accurately identify beating-the-odds schools can inform policy work among both Puerto Rico stakeholders and a broader national audience.

School-level data for 2011/12 and 2012/13 from national and territory databases were used to identify beating-the-odds public high schools in Puerto Rico from a sample of 159 schools with at least 40 percent of students from low-income households (high-poverty schools). Schools were identified using two methods: a status method that ranked high-poverty schools on the basis of their current observed performance and an exceeding achievement expectations method that ranked schools on the basis of the extent to which their observed performance exceeded (or fell short of) their expected performance. Graduation rates, reading proficiency rates, and math proficiency rates were analyzed to identify schools for each method. The schools identified using each method were then compared to determine agreement rates (amount of overlap) in schools identified using each method. This report presents descriptive information from comparisons of three groups of schools —those identified using the status method, those identified using the exceeding achievement expectations method, and all high-poverty public high schools in Puerto Rico.

The status method identified 17 beating-the-odds schools out of 159 high-poverty schools in the analysis sample, and the exceeding achievement expectations method identified 15. Six schools were identified using both methods, for a 38 percent agreement rate between the two methods. Both groups of beating-the-odds high schools appeared similar to all high schools in the sample in average enrollment, student racial/ethnic composition, and student–teacher ratio. However, beating-the-odds high schools identified using the status method had a lower average percentage of students from households living below the poverty line and a lower average percentage of students with disabilities than did beating-the-odds high schools identified using the exceeding achievement expectations method and all schools in the sample. In addition, some of the schools identified using the status

method ranked low when the exceeding achievement expectations method was used (and when school poverty rate and other student and school characteristics were statistically controlled for).

The analyses suggest that identifying schools with relatively high percentages of students from households living below the poverty line and relatively high performance (the status method) is a straightforward method but one that can result in the identification of schools that are not achieving at levels higher than expected given their demographics. By contrast, the exceeding achievement expectations method can identify schools exceeding expectations but with low achievement. The relatively low agreement rate for schools identified using the two methods illustrates how the methods affect the school identification results. Thus, leveraging both methods is a good strategy to identify schools that are both performing at higher overall levels and exceeding achievement expectations.

Contents

Why this study?

During the past decade states and school districts have focused increasingly on turning around persistently low-performing schools (Duke, Tucker, Salmonowicz, Levy, & Saunders, 2007; Herman et al., 2008; Murphy & Meyers, 2008). As of 2012, there were approximately 5,000 chronically low-performing schools nationwide that were not providing students with an education that prepares them for lifelong success (U.S. Department of Education, 2012). Students in these schools have lower scores on assessments and graduate at lower rates than students at other schools. At the secondary school level these low-performing schools are sometimes described as "dropout factories" (Balfanz and Legters, 2004, 2006). Federal initiatives have demonstrated a commitment to turning around those schools, through programs such as School Improvement Grants and Race to the Top, which provide funding to support improving academic outcomes, in particular for the lowest performing schools (Council of the Great City Schools, 2015). In turn, state education agencies have been under pressure to identify and improve their lowest performing schools by developing and implementing supports and interventions to raise academic performance (Le Floch et al., 2014). Many of these efforts seem to operate under the assumption that successful supports, initiatives, and interventions in high-performing schools are transferable to demographically similar low-performing schools (Murphy & Meyers, 2008).

This study may be useful for Puerto Rico stakeholders and national education leaders as they consider how to develop and establish statistical methods that reliably identify schools that are beating the odds

The challenge of turning schools around is also prevalent in Puerto Rico, where according to the 2013 National Assessment of Educational Progress, only 5 percent of grade 8 students performed at or above the basic level in math and less than 1 percent scored at or above the proficient level (U.S. Department of Education, n.d. b). Moreover, only 62 percent of students who entered public high school in Puerto Rico graduated on time in 2011/12, compared with a national average of 82 percent (Stetser & Stillwell, 2014). Thus, turning around low-performing schools is increasingly a priority for educators and policymakers in Puerto Rico. The Puerto Rico Research Alliance for Dropout Prevention has been developing a research agenda focused on reducing the territory's dropout rate. As a part of this broad agenda, alliance members partnered with Regional Educational Laboratory (REL) Northeast & Islands to identify beating-the-odds high schools in Puerto Rico—schools that are performing better than expected given high poverty rates—so that they can later identify the organizational factors and instructional practices used in these schools.

In alliance meetings, some members of the Puerto Rico Department of Education expressed the hope of improving education outcomes by identifying and disseminating information on the practices of beating-the-odds schools. The Puerto Rico Department of Education does not currently identify beating-the-odds schools. In response to the Puerto Rico Research Alliance for Dropout Prevention's request, REL Northeast & Islands conducted this study to identify beating-the-odds schools in Puerto Rico using two methods: a status method and an exceeding achievement expectations method. The study team and members of the Puerto Rico Department of Education agreed that a comparison of methods would be useful for the department as it weighs methods of identifying beating-the-odds schools and gathering lessons from those schools. Considering the methods by which those schools are identified is a critical initial step.

This study may be useful for Puerto Rico stakeholders and national education leaders as they consider how to develop and establish statistical methods that reliably identify schools

that are beating the odds. Accurate statistical identification of beating-the-odds schools is necessary to ensure that lessons from those schools are worth learning and basing policy creation and professional development on. The identification of beating-the-odds schools in this report can provide initial information to the Puerto Rico Department of Education as it plans how to examine processes and practices of schools that are beating the odds.

What the study examined

This report presents the results of analyses that incorporated school-level data to identify beating-the-odds public high schools in Puerto Rico using two analytic methods and compares the resulting lists of schools. It then compares the characteristics of schools on both lists and of all schools (including beating-the-odds schools) in the sample of high-poverty high schools (schools with at least 40 percent of students from low-income households).

Two research questions guided the study:
- What is the agreement rate of Puerto Rican public high schools identified as beating the odds using the status method and using the exceeding achievement expectations method?
- What are the characteristics of public high schools (for example, poverty rates and student–teacher ratios) that are identified as beating the odds using each method?

Puerto Rican high schools traditionally enroll students in grades 10–12. This study focused on the performance of the cohort of students who were expected to graduate in the 2012/13 school year. Under the status method, schools were ranked on their observed performance on two outcome measures: 2012/13 graduation rates and 2011/12 grade 11 combined proficiency rates on reading and math assessments. Under the exceeding achievement expectations method, schools were ranked on the basis of the extent to which their observed performance on these outcome measures exceeded (or fell short of) their expected performance on the same two outcome measures (see box 1 and appendix A for a description of these methods).

The sample included only high-poverty schools, which includes about 95 percent of public schools in Puerto Rico. The schools identified using each method were compared on the basis of their agreement rate, defined as "a ratio of the number of schools that appear on both sets of the lists to the average number of schools across the two lists" (Abe et al., 2015, p. B-7). This report presents descriptive information from comparisons of three school groups—those identified using each method and all high-poverty public high schools in Puerto Rico (see box 1).

What the study found

The two methods resulted in two different lists of beating-the-odds schools. The ranking by status method identified 17 beating-the-odds schools, and the exceeding achievement expectations method identified 15 schools; 6 schools were identified using both methods. The agreement rate between the two lists of beating-the-odds schools was 38 percent. Schools' rankings on individual measures show varied correlations.

Beating-the-odds schools are similar to all high-poverty schools in the sample in student race/ethnicity composition, average enrollment, and average student–teacher ratio. But

Under the status method, schools were ranked on their observed performance on two outcome measures: 2012/13 graduation rates and 2011/12 grade 11 combined proficiency rates on reading and math assessments. Under the exceeding achievement expectations method, schools were ranked on the basis of the extent to which their observed performance on these outcome measures exceeded (or fell short of) their expected performance on the same two outcome measures

Box 1. Data and methods

Data. This study used school-level data from two sources to identify public high schools in Puerto Rico that were beating the odds based on the performance of the cohort of students expected to graduate during the 2012/13 school year, the most recent cohort for which graduation and achievement data were available at the time of this study. Publicly available school-level demographic data were retrieved from the Common Core of Data, maintained by the U.S. Department of Education (U.S. Department of Education, 2010, 2013, 2014). Data on school-level graduation rates, assessment results, and poverty rates were provided by the Puerto Rico Department of Education.

Sample. The sample included 159 schools that met all of the following criteria: were identified as regular public high schools in the Common Core of Data (vocational schools and alternative schools were not included), had valid data on 2011/12 grade 11 reading and math assessment results and 2012/13 graduation rates, were in operation in both 2011/12 and 2012/13, and had at least 40 percent of students who were from households living below the poverty line (as defined by U.S. Census Bureau, n.d.) in 2009/10.

Methods of identifying and comparing beating-the-odds schools. The analysis focused on the performance of the 2012/13 graduation cohort on two outcome measures: the 2012/13 cohort graduation rate and the 2011/12 grade 11 proficiency rate for reading (in Spanish, the language of instruction in Puerto Rico) and math combined, weighted by the number of students tested in each subject. (Weighting is detailed in appendix A.)

Two methods were used to identify beating-the-odds schools:

- The status method ranked schools on the basis of their observed performance on each of the outcome measures. Schools that ranked among the top 25 percent on both outcome measures were identified as beating-the-odds schools.[1]
- The exceeding achievement expectations method estimated schools' expected performance on the two outcome measures (the 2012/13 graduation rate and the 2011/12 grade 11 combined reading and math proficiency rate) using ordinary least squares regressions that controlled for grade 8 achievement levels, school poverty rate, and other student and school characteristics that might be related to school performance.

To adjust for grade 8 school achievement levels, possible feeder schools were identified for each high school in the sample using information on region, district, school location, and distance between schools. As a proxy for prior achievement, the study used the weighted average school-level proficiency rate in grade 8 reading and math of feeder schools from 2008/09—the year the 2012/13 graduating cohort was in grade 8—as an independent variable. The differences between schools' observed performance and expected performance were calculated, and schools were ranked on the basis of differences. Schools that ranked in the top 25 percent on both outcome measures were identified as beating-the-odds schools.

To compare the school identification results, this report presents the two lists of beating-the-odds schools and reported rankings for each school on each measure—the 2012/13 graduation rate and the 2011/12 combined proficiency rate in reading and math—in both methods. To illustrate why the lists of beating-the-odds schools identified using each method do or do not agree, the report presents correlations of the outcomes across methods. Spearman rank-order correlation coefficients were calculated between outcome measures across methods. To measure the differences and similarities between the two lists of beating-the-odds schools, an agreement rate (the ratio of the number of schools that appear on both lists to the average number of schools across the two lists) was computed. Finally, the report compares the characteristics of four groups of schools: all beating-the-odds schools identified using the status method, all beating-the-odds schools identified using the exceeding achievement expectations method, beating-the-odds schools identified using both methods, and all schools in the sample of high-poverty high schools (including the beating-the-odds schools). The report presents basic descriptive information for the graduation rate outcome, achievement outcome, student demographics, school locale, enrollment, size of teaching staff, and student–teacher ratio.

See appendix A for more details on the data, sample, and methods.

Note

1. The 25 percent cutpoint for performance measures was an arbitrary decision by the study team. Different numbers of beating-the-odds schools would be identified if different cutpoints were applied; more stringent criteria would result in fewer identified schools. The study team conducted sensitivity analysis using different cutpoints for outcome measures (see appendix B).

beating-the-odds schools had higher graduation rates and math achievement averages than all high-poverty high schools in the sample. However, some beating-the-odds schools that were identified using the status method (those that ranked at the top on observed performance) ranked low—two were in the bottom 10 percent—when analyzed using the exceeding achievement expectations method, which accounted for the demographic characteristics of their students. Although a few of the beating-the-odds schools that were identified using the exceeding achievement expectations method had lower rankings when analyzed using the status method, those differences were not as large.

The ranking by status method and ranking by exceeding achievement expectations method resulted in different lists of beating-the-odds schools

The status method identified 17 beating-the-odds schools (table 1). The exceeding achievement expectations method identified 15 schools. Six schools were identified as beating the odds using both methods. Eleven schools were uniquely identified using the status method.[1] However, when the exceeding achievement expectations method was applied to these schools, their rankings ranged from the 3rd to 97th percentile. This suggests that the ranking of schools identified as beating the odds by the status method ranged widely after prior performance and demographic differences were statistically controlled for. Some of the beating-the-odds schools identified using the status method ranked low on the two outcome measures: two schools (schools P and Q) ranked below the 10th percentile on the combined reading and math proficiency rate measure; one (school O) ranked in the 27th percentile on the proficiency rate measure and another school (school I) ranked in the 26th percentile on the graduation rate measure. Nine schools were uniquely identified using the exceeding achievement expectations method. Their rankings on the two outcome measures under the status method ranged from the 34th to the 98th percentile.

The status method identified 17 beating-the-odds schools. The exceeding achievement expectations method identified 15 schools. Six schools were identified as beating the odds using both methods

Comparisons of the lists of schools that met each criterion (top 25 percent on the 2012/13 graduation rate and top 25 percent on the 2011/12 grade 11 proficiency rate) show that the agreement rate between the two methods for schools that met the criteria for the same measure was 58 percent for the 2012/13 graduation rate measure and 68 percent for the 2011/12 proficiency rate measure (table 2). But when the lists of schools that met all criteria for each method (the beating-the-odds schools) are compared, the agreement rate is 38 percent. The relatively low agreement rate for schools identified using the two methods illustrates how the methods—ranking by status versus ranking by exceeding achievement expectations—affect the school identification results.

Comparisons of schools' rankings on individual measures between methods show low to moderate correlations

For each outcome measure the correlation[2] between schools' rankings across methods was .76 for the graduation rate measure and .51 for the percent proficiency rate (table 3).

Although schools' rankings on the graduation rate measure under the two methods tend to be related (correlation of .76), schools that ranked high on the proficiency rate outcome measure under one method did not necessarily rank high on that measure under the other method (.51). The statistical analyses found that the school background factors included in the exceeding achievement expectations method together explained higher proportions of variances in the proficiency rate outcome measure (36 percent) than in the graduation rate

Table 1. Percentile rankings on outcome measures for beating-the-odds high schools in Puerto Rico, by identification method, 2011/12 and 2012/13

School	School poverty rate (percent)	Status method (percentile ranking[a])		Exceeding achievement expectations method (percentile ranking[a])	
		Graduation rate, 2012/13	Grade 11 combined reading and math proficiency rate, 2011/12	Graduation rate, 2012/13	Grade 11 combined reading and math proficiency rate, 2011/12
Identified by both methods					
School A	82	99	92	99	96
School B	79	85	83	79	84
School C	65	97	96	96	97
School D	69	97	91	98	92
School E	77	84	79	89	88
School F	69	89	87	89	82
Identified by the status method only					
School G	45	100	99	52	96
School H	52	94	92	81	34
School I	44	92	99	26	97
School J	74	86	94	67	95
School K	52	92	97	65	94
School L	63	82	85	58	85
School M	67	80	78	43	77
School N	65	96	77	90	45
School O	41	98	89	91	27
School P	53	99	84	93	4
School Q	44	91	94	39	3
Identified by the exceeding achievement expectations method only					
School R	73	68	98	77	100
School S	82	57	95	88	98
School T	54	95	68	100	93
School U	83	50	85	91	91
School V	85	35	34	96	87
School W	78	63	37	84	85
School X	77	43	70	75	81
School Y	67	91	60	95	80
School Z	75	79	58	85	75

Note: The total sample size is 159 schools. The number of students in the cohort by school ranged from 7 to 357. The analyses used data on the 2012/13 graduation rate, 2011/12 grade 11 combined reading and math proficiency rate, 2008/09 grade 8 combined reading and math proficiency rate, 2009/10 school poverty rate, and data on several other school characteristics for the 2012/13 school year.

a. A percentile ranking is the percentage of high-poverty high schools in Puerto Rico that fall at or below a given score. For instance, if a school's performance on an outcome measure was greater than or equal to the performance of 88 percent of the high-poverty schools, the percentile ranking for that school would be 88.

Source: Authors' analysis based on data from U.S. Department of Education (2010, 2013, 2014) and the Puerto Rico Department of Education.

outcome measure (23 percent; see table A2 in appendix A for details). School poverty rate, percentage of students with disabilities, and grade 8 proficiency rate in Spanish were found to be statistically significant in both outcome measures. The low to moderate correlations between schools' rankings on individual outcome measures between methods may have contributed to the low agreement rate between the two lists of beating-the-odds schools.

Table 2. Agreement rate on outcome measures for beating-the-odds high schools in Puerto Rico, by identification method, 2011/12 and 2012/13

Outcome measure	Criterion	Beating-the-odds schools			Agreement rate between methods (percent)
		Identified using the status method	Identified using the exceeding achievement expectations method	Identified using both methods	
Graduation rate, 2012/13	Top 25 percent	40	40	23	58
Grade 11 proficiency rate (reading and math combined), 2011/12	Top 25 percent	40	40	27	68
Both measures (beating-the-odds schools)	Met all criteria	17	15	6	38

Note: The total sample size is 159 schools. The number of students in the cohort by school ranged from 7 to 357. The analyses used data on the 2012/13 graduation rate, 2011/12 grade 11 combined reading and math proficiency rate, 2008/09 grade 8 combined reading and math proficiency rate, 2009/10 school poverty rate, and data on several other school characteristics for the 2012/13 school year.

Source: Authors' analysis based on data from U.S. Department of Education (2010, 2013, 2014) and the Puerto Rico Department of Education.

Table 3. Correlations of rankings on outcome measures for beating-the-odds high schools in Puerto Rico, by identification methods, 2011/12 and 2012/13

		Ranking by exceeding achievement expectations method	
		Graduation rate, 2012/13	Combined reading and math proficiency rate, 2011/12
Ranking by status method	Graduation rate, 2012/13	.76**	.19*
	Combined reading and math proficiency rate, 2011/12	.20*	.51**

* Significant at the .05 level (two-tailed); ** significant at the .01 level (two-tailed).

Note: The total sample size is 159 schools. The number of students in the cohort by school ranged from 7 to 357. The analyses used data on the 2012/13 graduation rate, 2011/12 grade 11 combined reading and math proficiency rate, 2008/09 grade 8 combined reading and math proficiency rate, 2009/10 school poverty rate, and data on several other school characteristics for the 2012/13 school year.

Source: Authors' analysis based on data from U.S. Department of Education (2010, 2013, 2014) and the Puerto Rico Department of Education.

The characteristics of beating-the-odds schools varied by method

Geographic location and locale. Beating-the-odds schools identified using the status method were concentrated in the Mayaguez region, with five schools in that region identified as beating the odds (table 4). The Bayamon, Humacao, and San Juan regions each had three schools identified; the Arecibo, Caguas, and Ponce regions each had one school identified. The 15 beating-the-odds schools identified using the exceeding achievement expectations method were scattered among six of the seven regions, with the Bayamon, Humacao, and Ponce regions each having three and the Arecibo, Mayaguez, and San Juan each having two; no school from the Caguas region was identified.

Table 4. Region and locale counts of beating-the-odds high schools, by identification method, and of all high-poverty high schools in Puerto Rico, 2011/12 and 2012/13

Region and locale	Beating-the-odds schools						All high-poverty high schools in Puerto Rico (N = 159)	
	Identified using the status method (n = 17)		Identified using the exceeding achievement expectations method (n = 15)		Identified using both methods (n = 6)			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Region								
Arecibo	1	6	2	13	1	17	20	13
Bayamon	3	18	3	20	1	17	23	15
Caguas	1	6	0	0	0	0	19	12
Humacao	3	18	3	20	1	17	23	15
Mayaguez	5	29	2	13	2	33	23	15
Ponce	1	6	3	20	1	17	23	15
San Juan	3	18	2	13	0	0	28	18
Locale[a]								
City	4	24	4	27	1	17	40	25
Suburb	12	71	8	53	5	83	99	62
Town or rural	1	6	3	20	0	0	20	13

a. The 12 National Center for Education Statistics urban-centric locale codes were collapsed into three categories for this study. See http://nces.ed.gov/ccd/rural_locales.asp for definitions of the locale codes.

Source: Authors' analysis based on data from U.S. Department of Education (2010, 2013, 2014) and the Puerto Rico Department of Education.

Suburban schools had higher representation among beating-the-odds schools identified using the status method (71 percent) than among those identified using the exceeding achievement expectations method (53 percent). In contrast, for schools located in small towns or rural areas a higher percentage of beating-the-odds schools were identified using the exceeding achievement expectations method (20 percent) than the status method (6 percent).

School performance. Beating-the-odds schools identified using the status method had a higher average graduation rate and a higher average proficiency rate than did beating-the-odds schools identified using the exceeding achievement expectations method. The average graduation rate in 2012/13 was 84 percent for beating-the-odds schools identified using the status method and 77 percent for beating-the-odds schools identified using the exceeding achievement expectations method—both higher than the average for all schools in the sample (65 percent; figure 1). The average grade 11 proficiency rate was 47 percent for beating-the-odds schools identified using the status method and 36 percent for beating-the-odds schools identified using the exceeding achievement expectations method, compared with 24 percent for all schools in the sample.

Schools that were identified as beating the odds using the status method were ranked lower when analyzed by the exceeding achievement expectations method. Under the exceeding achievement expectations method, when beating-the-odds schools' observed performance is compared with their expected performance[3] after accounting for students' prior achievement and student demographic characteristics, the average differences (observed graduation rate/proficiency rate minus expected graduation rate/proficiency rate) were 15 percentage points for the graduation rate outcome measure and 16 percentage points for the grade 11 proficiency rate outcome measure (figure 2).

Beating-the-odds schools identified using the status method had a higher average graduation rate and a higher average proficiency rate than did beating-the-odds schools identified using the exceeding achievement expectations method

Figure 1. Average observed performance of beating-the-odds high schools in Puerto Rico was higher for schools identified using the status method, 2011/12 and 2012/13

Percent

■ Beating-the-odds schools identified using the status method (*n* = 17)
■ Beating-the-odds schools identified using the exceeding achievement expectations method (*n* = 15)
■ Beating-the-odds schools identified using both methods (*n* = 6)
■ All high-poverty high schools in Puerto Rico (*N* = 159)

Source: Authors' analysis based on data from U.S. Department of Education (2010, 2013, 2014) and the Puerto Rico Department of Education.
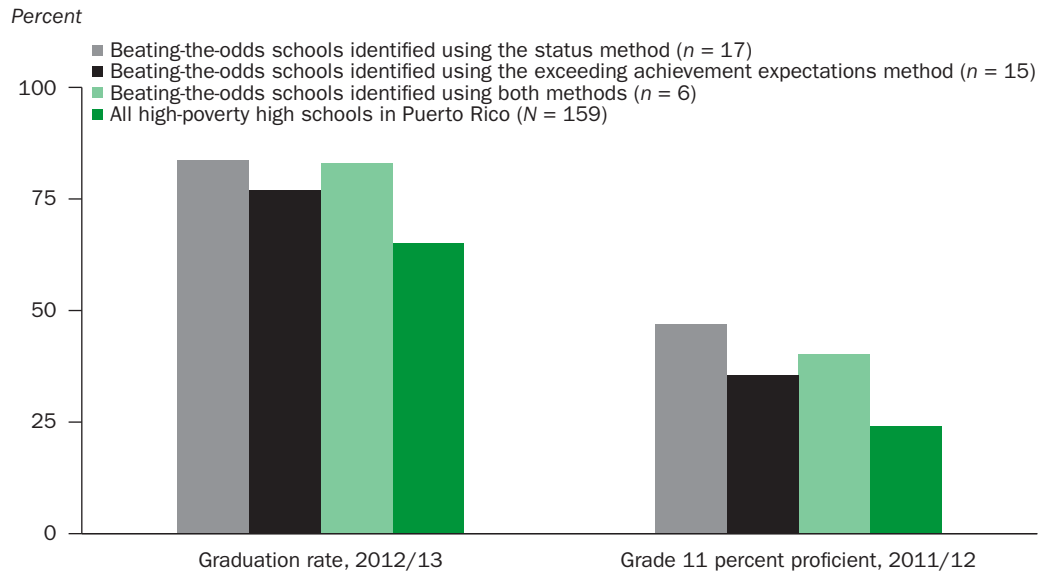
Figure 2. Average differences between observed and expected performance of beating-the-odds high schools in Puerto Rico were higher for the exceeding achievement expectations method, 2011/12 and 2012/13

Difference (percentage points)

■ Beating-the-odds schools identified using the status method (*n* = 17)
■ Beating-the-odds schools identified using the exceeding achievement expectations method (*n* = 15)
■ Beating-the-odds schools identified using both methods (*n* = 6)
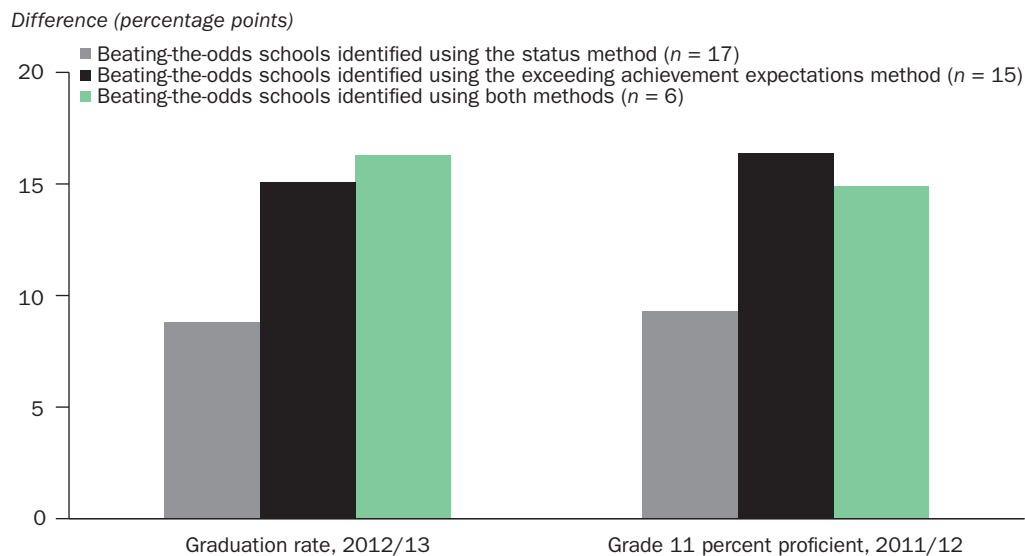
Note: The difference between observed and expected performance indicates how much better or worse a school actually performed than its characteristics suggest it would. The height of the bars indicates the mean difference for each group—that is, on average how much each group of schools performed better than expected. By definition, the mean difference between observed and expected performance for all schools in the sample is zero under the exceeding achievement expectations method.

Source: Authors' analysis based on data from U.S. Department of Education (2010, 2013, 2014) and the Puerto Rico Department of Education.

This difference was to be expected because this method, by definition, identifies schools that ranked at the top on differences in performance net of expectations. The average difference between observed and expected performance was lower for beating-the-odds schools identified using the status method, at 8.8 percentage points for the graduation rate measure and 9.3 percentage points for the proficiency rate measure. This suggests that on average the schools identified using the status method also performed better than expected on the basis of their background characteristics. However, some of the schools (three for the graduation rate measure and five for the proficiency rate measure) performed worse than expected, with the difference between observed and expected performance being as large as 15.4 percentage points for the proficiency rate measure (see table A3 for more details). These findings suggest a potential issue with using the status method: looking at status alone may identify schools that did not perform better (and potentially performed worse) than expected on the basis of their school and student characteristics.

School characteristics. Beating-the-odds schools identified using the two methods appeared similar in average enrollment, student racial/ethnic composition (predominantly Hispanic), and student–teacher ratio (table 5). Beating-the-odds schools identified using the status method had a slightly higher average percentage of female students than did beating-the odds schools identified using the exceeding achievement expectations method.

Beating-the-odds schools identified using the two methods appeared similar in average enrollment, student racial/ ethnic composition, and student– teacher ratio

Table 5. Mean characteristics of beating-the-odds high schools, by identification method, and of all high-poverty high schools in Puerto Rico, 2011/12 and 2012/13

| School and cohort characteristics | Beating-the-odds schools | | | All high-poverty high schools in Puerto Rico (*N* = 159[a]) |
	Identified using the status method (*n* = 17)	Identified using the exceeding achievement expectations method (*n* = 15)	Identified using both methods (*n* = 6)	
School characteristic[b]				
Total enrollment	466	470	451	490
Percentage of female students	55.9	51.2	51.8	52.1
Percentage of Hispanic students	99.7	99.8	99.8	99.8
Percentage of students from households living below the poverty line, 2009/10	61.3	74.4	73.5	71.2
Student–teacher ratio	16.0	15.1	15.0	15.7
Cohort characteristic[c]				
Cohort size	156	174	181	184
Percentage of female students	53.9	53.0	51.9	52.2
Percentage of Puerto Rican students[d]	97.2	98.3	97.6	98.1
Percentage of other Hispanic students[d]	2.6	1.5	1.9	1.8
Percentage of students froom households living below the poverty line, 2009/10	58.3	66.4	69.0	62.9
Percentage of students with disabilities	9.6	17.9	12.9	15.6
Percentage of students with limited Spanish proficiency	0.5	0.6	0.6	0.5

a. Sample size may be slightly smaller for some variables because of missing data.

b. Data are for the 2012/13 school year unless otherwise noted.

c. For the students who were enrolled in grade 10 in 2010/11 and thus were expected to graduate in 2012/13.

d. The percentage of students in other racial/ethnic groups is small and not presented here.

Source: Authors' analysis based on data from U.S. Department of Education (2010, 2013, 2014) and the Puerto Rico Department of Education.

The average percentage of students from households living below the poverty line was higher for beating-the-odds schools identified using the exceeding achievement expectations method (74 percent) than for beating-the-odds schools identified using the status method (61 percent—lower than the 71 percent for all schools in the sample).

Cohort characteristics. The 2012/13 graduating cohort in the beating-the-odds schools was also similar in average size, student racial and ethnic composition (predominantly Hispanic), percentage of female students, and percentage of students with limited Spanish proficiency. The average percentage of students with disabilities in the 2012/13 graduating cohort, however, was lower for beating-the-odds schools identified using the status method (10 percent) than for beating-the-odds schools identified using the exceeding achievement expectations method (18 percent). Beating-the-odds schools identified using the status method also had a lower percentage of students from households living below the poverty line in the 2012/13 graduating cohort.

Implications of the study findings

This report highlights how identification of beating-the-odds schools can be affected by methodological choices. Seventeen schools were identified using the status method, and 15 schools were identified using the exceeding achievement expectations method; six schools were identified using both methods (38 percent agreement rate). The characteristics of schools identified as beating-the-odds schools varied depending on which method was used and differed from those of all schools in the sample of high-poverty high schools. Beating-the-odds schools identified using the status method had a lower average percentage of students from households living below the poverty line and a lower average percentage of students with disabilities than did beating-the-odds schools identified using the exceeding achievement expectations method and all schools in the sample. The analyses suggest that identifying schools with relatively high percentages of students from households living below the poverty line and relatively high performance (the status method) is a straightforward method of identifying beating-the-odds schools but that considering the exceeding achievement expectations method as well will ensure that schools that are doing better than other schools with similarly challenging circumstances are identified.

It may be useful to consider both methods of identifying beating-the-odds schools. The high schools identified using both methods demonstrate high levels of performance and appear to be achieving higher graduation rates and proficiency rates than might be expected given their demographics

The exceeding achievement expectations method adjusts for the potential influence of student and school characteristics, including student prior achievement. By statistically controlling for these factors, the exceeding achievement expectations method may produce less-biased estimates of school performance than does the status method. However, some schools identified using the exceeding achievement expectations method have relatively low overall graduation rates or relatively low proficiency rates because schools identified using this method are by design not as highly ranked.

The status method identified schools that ranked in the top 25 percent on observed performance and had at least 40 percent of students from households living below the poverty line. However, some of the schools identified using the status method ranked low in performance when the exceeding achievement expectations method was used (and when school poverty rate and other student and school characteristics were statistically controlled for). These findings suggest that looking at status alone may identify schools that did not perform better (and potentially performed worse) than expected on the basis of their school and student characteristics.

Thus, it may be useful to consider both methods of identifying beating-the-odds schools. The high schools identified using both methods demonstrate high levels of performance and appear to be achieving higher graduation rates and proficiency rates than might be expected given their demographics. These schools could suggest the sample of schools that could be used in conducting a more in-depth study of organizational structures and instructional practices associated with beating-the-odds schools.

As the work of Abe et al. (2015) suggests, policymakers and researchers must develop a rationale for their choices of methods of identifying beating-the-odds schools, with the understanding that those choices will influence which schools are ultimately identified and, subsequently, what lessons can be drawn from those schools. The limitations described in the following section show how challenging it is to identify beating-the-odds schools. The value of any lessons learned from future research on beating-the-odds schools depends in large part on the precision with which those schools are identified. In this case relying solely on either method to identify beating-the-odds schools could confuse policy efforts at the Puerto Rico Department of Education to improve low-performing schools. That is because the beating-the-odds schools identified either may not be overcoming significant odds (identified using the status method only) or may lack overall high levels of achievement (identified using the exceeded achievement expectations method only).

Limitations of the study

The study has six main limitations.

First, the identified schools may not accurately represent beating-the-odds high schools in Puerto Rico. The two methods used to identify beating-the-odds schools are based on a limited set of data. Because of data limitations, the analyses used data on graduation rates for only one cohort and data on their academic achievement in one year. Although school performance tends to show stability over time (Dumay, Coe, & Anumendem, 2014), it may be affected by cohort- or year-specific factors. Future analyses should include multiple years of data.

Second, the size of the 2012/13 graduating cohort for schools in the sample varied from 7 to 357, with two schools having fewer than 20 students in the cohort. Aggregated school-level performance based on a small number of students may have large unexplained variation (noise). The analysis results, therefore, may be driven in part by noise for the schools where few students were used to calculate the outcomes.

Third, the cutpoints were informed by other beating-the-odds studies but were arbitrarily determined. Sensitivity analyses, conducted using different cutpoints, examined the number of schools identified using each method and the agreement between the two methods (see appendix B). The analysis suggests that using different cutpoints changes the number of schools identified as beating the odds. The agreement rate between the two methods ranges from 27 percent to 47 percent as the cutpoint changes. However, the number of schools identified using both methods tends to be stable within certain ranges of cutpoints. For example, six schools are identified using both methods for the range of cutpoints from 21 percent to 31 percent. Using any cutpoint from this range would therefore result in the same six beating-the-odds schools identified using both methods. Using 25 percent as the cutpoint (instead of 21 percent to 31 percent, for example) puts schools

into commonly used and understood categories (that is, quartiles), and beating-the-odds schools were in the top quartile on all outcome measures.

Fourth, the study uses the three-year cohort graduation rate as one of the outcome measures to identify schools. The cohort graduation rate follows each cohort of students through high school and is considered a more accurate measure of school completion than many other methods of calculating graduation rates (Stetser & Stillwell, 2014). The U.S. Department of Education requires states to use this metric when reporting school completion. The three-year cohort graduation rate used in this study does not distinguish between students who moved from public to private schools and students who left school entirely. The difference is important because Puerto Rico has a large share of its students in private schools, and some dropout from public schools is accounted for by a net movement of students from public schools to private schools.[4] This matters because transfer to private schools could be a different, but potentially related, signal that students and parents are dissatisfied with the public school they left. On the other hand, in such cases the transition may indicate only a preference for a private school and not a preference for another public school.

Fifth, the ranking by the exceeding achievement expectations method takes into account the potential impact that students' prior achievement and certain school-level demographic characteristics might have on school performance (graduation rate and grade 11 proficiency rate on state standardized tests). This method may produce a less-biased estimate of school performance than does the status method. But estimates from the exceeding achievement expectations method may also be biased if the regression model leaves out some unknown variable or variables that are correlated with both the outcome (school performance) and some of the control variables included in the regression. The analysis for the exceeding achievement expectations method was limited by the data provided on the characteristics of Puerto Rico high schools. Having data for a more complete set of school factors and having multiple years of data may help address this limitation by improving the model specification. Because longitudinal data that link grade 8 students to their high schools were not available for Puerto Rico, a proxy for grade 8 achievement of the 2012/13 cohort was developed using the average grade 8 achievement from a list of possible feeder schools for each high school. The feeder schools were identified using information on the region, district, school location, and distance between schools. However, the proxy used in this report for students' prior achievement was constructed on the basis of limited data and may not reflect the actual feeder patterns for high schools in Puerto Rico (for more information see appendix A). Additional school and community characteristics not examined in this study, such as parents' education level or parent or community involvement, also might be important factors affecting school success.

Finally, the particular identification results reported here cannot be considered conclusive. Policymakers may want to take advantage of other data available on Puerto Rico schools (for example, attendance, student engagement data, and course grades) and use them in combination with lists such as those presented here to identify best practices that drive school improvement.

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Appendix A. Details on data and methods as well as additional findings

Two conceptual methods were used to rank schools: a simple status method and the statistically more sophisticated exceeding achievement expectations method (Raudenbush, 2004). The status method ranks schools by observed performance, which is more straightforward and may be easier to understand. School performance, however, is known to be influenced by numerous factors, including student characteristics, prior student achievement, school resources, and community factors (over which a school has little control). Ranking schools by current performance does not take into account the influence of these factors on school performance. Schools identified using this method could demonstrate high performance, but they may not be beating the odds because school and student characteristics could suggest advantageous conditions.

The exceeding achievement expectations method, which produces a ranking that compares observed performance to expected performance, tries to account for the influence of internal and external factors on performance. This method identifies schools whose performance exceeds expectations or predictions based on prior achievement and the demographic characteristics of schools and students. This study used both methods to rank schools and compare how the lists of identified schools differ between the two methods. This appendix provides details on the data and analyses presented in the report as well as additional findings.

Data sources

Regional Educational Laboratory (REL) Northeast & Islands obtained school-level data from two sources: the Puerto Rico Department of Education and the Common Core of Data maintained by the National Center for Education Statistics (U.S. Department of Education, 2010, 2013, 2014). The data elements obtained from each source are presented in table A1.

Sample

The Puerto Rico Department of Education provided school-level graduation rates for 202 public high schools within the territory as reported for the 2012/13 school year, the most recent year for which graduation data were available at the time of this study. However, the 2011/12 grade 11 assessment file provided by Puerto Rico contains records for 283 schools, and the 2011/12 Common Core of Data file contains records for 196 schools that enrolled at least one grade 11 student. All together these files from different sources contain 290 unique schools that might have been targets for this study.

The following steps were used to construct the analytic sample for this study:
- Eighty-eight schools that are in Puerto Rico's 2011/12 grade 11 assessment file but lack data on 2012/13 graduation rates were removed. These schools might have been mistakenly included for two reasons: all the values (for proficiency rates) for these schools are zero in Puerto Rico's 2011/12 grade 11 assessment file, and the 2011/12 Common Core of Data file shows that these schools enrolled no grade 11 students that year.
- Twenty-eight vocational schools and two alternative schools were removed from the file to focus the study only on regular public schools.

Table A1. School-level data elements and sources for identifying beating-the-odds high schools in Puerto Rico, 2008/09–2012/13

Data element	Year	Source
Three-year graduation rate, overall and by subgroup	2012/13	Puerto Rico Department of Education
Percentage of grade 11 students proficient in reading (Spanish) and math, overall and by subgroup	2011/12	Puerto Rico Department of Education
Percentage of grade 8 students proficient in reading (Spanish) and math, overall and by subgroup	2008/09	Puerto Rico Department of Education
School total enrollment and enrollment by grade	2008/09, 2011/12, and 2012/13	U.S. Department of Education (2010, 2013, 2014)
School enrollment by gender, race/ethnicity, and free- or reduced-price-lunch status	2012/13	U.S. Department of Education (2010, 2013, 2014)
School urban-centric locale codes[a]	2008/09, 2011/12, and 2012/13	U.S. Department of Education (2010, 2013, 2014)
School location and latitude and longitude coordinates	2008/09, 2011/12, and 2012/13	U.S. Department of Education (2010, 2013, 2014)
School type	2008/09, 2011/12, and 2012/13	U.S. Department of Education (2010, 2013, 2014)
School student–teacher ratio	2012/13	U.S. Department of Education (2010, 2013, 2014)

a. The 12 National Center for Education Statistics urban-centric locale codes were collapsed into three categories for this study. See http://nces.ed.gov/ccd/rural_locales.asp for definitions of the locale codes.

Source: Authors' compilation.

- Five schools were not operational in 2012/13 according to the Common Core of Data and were excluded from the analysis.

The sample was further reduced to include only schools with student poverty rates of at least 40 percent. The measure of poverty used in this study is the school-level percentage of school-age children (ages 5–17) who were from households living below the poverty line (as defined by U.S. Census Bureau, n.d.) in 2009/10, the most recent year for which data are available from the Puerto Rico Department of Education. The Census Bureau uses a set of income thresholds that vary by family size and composition. This measure is different from another commonly used proxy measure for the concentration of low-income students, the percentage of students eligible for the school lunch program (U.S. Department of Education, n.d. a).

This study used the percentage of students from households living below the poverty line because there was more variation in this measure (from 28 percent to 87 percent) than in the percentage of students eligible for the federal school lunch program (from 91 percent to 93 percent) among schools in the sample. However, even with the U.S. Census poverty rate, the distribution of schools in the sample concentrates on the high end of the measure. Only a small number of schools are represented on the lower end, which indicates that these schools might be relatively different from the rest of the schools in socioeconomic characteristics. The analysis was therefore limited to the sample of schools with at least 40 percent

of students from households living below the poverty line so only schools with high poverty rates were identified as beating the odds. The final sample included 159 schools.

Outcome measures

The study focuses on two outcome measures related to overall performance of high schools: school graduation rates and percentage of students scoring proficient on grade 11 state standardized tests in reading and math. The emphasis of this study is on identifying schools that consistently perform well across measures: schools with high performance on graduation rates and consistently strong academic performance, given the characteristics of the student populations they serve.

Graduation rate. For graduation outcomes the study focuses on the three-year school-level cohort graduation rates as reported by high schools in Puerto Rico for the 2012/13 school year. This graduation rate measures the percentage of students from a given cohort who graduated in three years. In calculating graduation rates, the cohort of interest is established by identifying the number of students from a given cohort who entered grade 10 for the first time three years earlier at a particular school and then adjusting that number by adding students who subsequently transferred into the cohort and subtracting any students who subsequently transferred out, emigrated to another country, or died. The number of successful graduates (defined as graduating within three years for the measure described here) is then presented as a proportion of the larger cohort, as outlined in the following equation:

3-year cohort graduation rate = number of students in the adjusted cohort who earned a regular high school diploma by August 2013/Number of first-time grade 10 students in 2010/11, adjusted for transfers in and out, emigration to another country, and death × 100

The reported graduation rates for 2012/13 thus reflect the percentages of students who entered grade 10 in the 2010/11 school year and graduated at the end of the 2012/13 school year.

Grade 11 proficiency rates in reading and math in 2011/12. Student achievement outcomes included data on grade 11 proficiency rates in reading (in Spanish, the language of instruction in Puerto Rico) and math in the 2011/12 school year, provided by the Puerto Rico Department of Education. Because Puerto Rico tests students when they are in grade 11, the assessment results reported for the 2011/12 school year reflect the performance of the cohort of students who entered grade 10 in 2010/11 and were in grade 11 when tested —the same cohort that is reflected in the 2012/13 graduation data. The study team calculated an average proficiency rate for reading and math for each school weighted by the number of students tested in each subject and used the weighted average as an outcome measure in the analysis.

Additional notes on ranking schools using the exceeding achievement expectations method

For the exceeding achievement expectations method, the expected performance of each high school was calculated, adjusting for students' prior achievement and various other student and school characteristics. Then each school's observed performance was compared with its expected performance and schools were ranked on the basis of the extent to which their observed performance exceeded (or fell short of) their expected performance.

Constructing a proxy for measuring students' prior achievement. The best predictor of students' academic performance is their past performance (Ingels, Curtin, Kaufman, Alt, & Chen, 2002). However, the study team did not have access to data that matched Puerto Rico high school students to their grade 8 scores. Consequently, there was not sufficient data to support a longitudinal analysis that controlled for students' prior achievement in order to rank high schools by exceeding achievement expectations. Grade 8 school means on the state standardized test could not be directly linked to high school (grade 11) test means because school feeder patterns were not known with sufficient certainty. However, possible feeder schools were identified for each high school in the sample using information on region,[5] district,[6] school location (city and ZIP code), and distance between schools. For this analysis, data from the 2008/09 school year were used because that is the year the targeted cohort of students (those who entered grade 10 in the 2010/11 school year) were in grade 8, the pre–high school grade that was tested in state standardized exams. For each high school the following steps were used to identify a set of schools with grade 8 students enrolled and tested in 2008/09 that matched on as many of these characteristics as possible:

1. A total of 403 regular public schools were identified that enrolled at least one grade 8 student according to the 2008/09 Common Core of Data (U.S. Department of Education, 2010) and that reported percentage proficient in reading or math in the Puerto Rico 2008/09 assessment data (hereafter referred to, for simplicity, as middle schools).

2. The distance between each pair of middle schools and high schools was calculated using school latitude and longitude coordinates available from the Common Core of Data.[7]

3. Both the middle schools and the high schools were sorted by region, district, and ZIP code.

4. Middle schools and high schools were matched by region and district. If there was only one high school in a district, all the middle schools in that district were matched to that high school (with the exceptions described in step 6).

5. If there were multiple high schools in a district, middle schools were matched to high schools by taking into account the distance between schools and the cohort size. Each middle school would first be matched to the closest high school. However, if the number of grade 8 students in 2008/09 matched to a high school was considerably larger (for example, two times larger) than the size of the grade 11 cohort in 2011/12, adjustments were made so that some middle schools originally matched to that high school would be matched to the next closest high school in which the number of matched grade 8 students had not reached the size limit. Three middle schools were matched using this approach.

6. For three middle schools the distances between them and the high schools in their districts were unusually large (for example, more than 12 miles), whereas the distance between these middle schools and a high school in a nearby district was rather small (for example, less than 3 miles). These middle schools were matched to the high school in the nearby district instead of a high school in their own district.

Using this approach, the study matched 403 middle schools with the 159 high schools in the sample. The number of middle schools matched to each high school ranged from one to six, with an average of 2.4 schools. For each high school, the study team calculated an average of school-level grade 8 proficiency rate for its matched middle schools, weighted by number of grade 8 students tested in each school. The weighted averages (one for reading and one for math) were then used as proxies for students' prior achievement for each high school.

Comparing observed performance with expected performance. A school's expected performance was calculated given students' prior achievement, socioeconomic background, and other school characteristics, such as region, locale, school size, percentage of female students, percentage of students with disabilities, and percentage of students with limited Spanish proficiency. An example of this approach using graduation rate as the outcome measure follows. First, an expected graduation rate for each high school was estimated given students' prior achievement and characteristics of its student population. This was accomplished by regressing (using ordinary least squares) the outcome measure (2012/13 graduation rate) on a set of predictors, including the weighted averages of grade 8 mean proficiency rate in reading and math and other school-level characteristics of students and school characteristics (table A2). This regression analysis produced a set of coefficients associated with each predictor (or variable) in the model, indicating the relationship between each predictor and the graduation outcome. The coefficients were then used to compute an expected graduation rate for each high school, given its various characteristics. The difference between the observed and expected rates indicates how much better or worse a school performed on graduating students than its characteristics suggested it would. This difference (performance net of expectations) was then used to rank schools.

The same procedures were used to estimate how much better or worse a school performed on the proficiency rate measure given the school's characteristics. The differences between observed and expected performance were used to rank schools for each outcome measure.

Comparing and describing characteristics of beating-the-odds schools

The study team compared the lists of beating-the-odds schools identified using the two methods and computed an agreement rate between the two lists. This agreement rate measures the share of commonly identified schools between two beating-the-odds lists. The agreement rate ranges from 0 percent (if the two lists share no commonly identified schools) to 100 percent (if the two lists have exactly the same schools).

Finally, the characteristics of the two lists of beating-the-odds schools were compared with all high schools in the sample. The report contains basic descriptive information (frequency distribution for categorical variables and minimum, maximum, mean, and standard deviation for continuous variables) for the graduation rate outcome, achievement outcome, student demographic characteristics, school locale, enrollment, number of full-time equivalent teachers, and student–teacher ratio (see tables 4 and 5 in the main text and tables A3 and A4).

Table A2. Predictors used in regression models and regression results for Puerto Rico high-poverty high schools, by geographic region and locale, 2011/12 and 2012/13

Predictor	Graduation rate, 2012/13 (N = 159)		Combined reading and math proficiency rate, 2011/12 (N = 159)	
	Coefficient	p-value	Coefficient	p-value
Region[a]				
Arecibo	0.59	.91	−0.10	.98
Bayamon	2.38	.63	0.67	.89
Caguas	3.65	.42	3.55	.42
Humacao	0.72	.88	−8.46	.08
Mayaguez	2.93	.53	5.99	.20
Ponce	3.84	.40	7.06	.12
Locale[b]				
City	−4.53	.30	−5.08	.23
Suburb	2.94	.38	1.72	.60
Other predictors				
Size of grade 11 cohort	0.00	.92	−0.03	.05
School percentage of female students	0.02	.91	0.31	.14
School percentage of students from households living below the poverty line	−0.44**	.00	−0.63**	.00
Cohort-level percentage of students with disabilities[c]	−0.38*	.01	−0.35*	.02
Cohort-level percentage of students with limited Spanish proficiency[c]	−0.45	.71	0.66	.58
Grade 8 mean proficiency rate in math	0.13	.40	−0.03	.84
Grade 8 mean proficiency rate in reading (Spanish)	0.20*	.02	0.26**	.00
Adjusted R^2	.23		.36	

* Significant at the .05 level (two-tailed); ** significant at the .01 level (two-tailed).

Note: The total sample size is 159 schools. The number of students in the cohort by school ranged from 7 to 357. The analyses used data on the 2012/13 graduation rate, 2011/12 grade 11 combined reading and math proficiency rate, 2008/09 grade 8 combined reading and math proficiency rate, 2009/10 school poverty rate, and data on several other school characteristics for the 2012/13 school year.

a. San Juan is the reference category.

b. The 12 National Center for Education Statistics urban-centric locale codes were collapsed into three categories for this study. See http://nces.ed.gov/ccd/rural_locales.asp for definitions of the locale codes.

c. Data are available at the cohort level only.

Source: Authors' analysis based on data from U.S. Department of Education (2010, 2013, 2014) and the Puerto Rico Department of Education.

Table A3. Performance of beating-the-odds high schools in Puerto Rico, by identification method and outcome measure, and of all high-poverty high schools in Puerto Rico, 2011/12 and 2012/13

Outcome measure	Identified using the status method (n = 17)				Identified using the exceeding achievement expectations method (n = 15)				Identified using both methods (n = 6)				All schools in sample (N = 159)			
	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation
Observed performance (percent)																
Graduation rate, 2012/13	74.7	100.0	83.7	7.2	63.2	90.6	76.5	8.8	75.6	90.6	83.1	6.5	0.0	100.0	65.2	14.4
Grade 11 proficiency rate (reading and math combined), 2011/12	27.0	94.0	46.5	20.1	17.0	80.0	35.6	17.3	27.0	59.0	40.3	11.4	0.0	97.0	24.1	15.4
Difference between observed and expected performance (percentage points)																
Graduation rate, 2012/13	−4.6	31.1	8.8	8.7	7.8	44.7	15.1	10.1	8.6	31.1	16.3	8.4	−58.6	44.7	0.0	12.0
Grade 11 proficiency rate (reading and math combined), 2011/12	−15.4	34.8	9.3	15.0	3.0	57.8	16.4	14.7	5.3	27.5	14.9	9.2	−22.1	57.8	0.0	11.7

Beating-the-odds-schools

Source: Authors' analysis based on data from U.S. Department of Education (2010, 2013, 2014) and the Puerto Rico Department of Education.

Table A4. Characteristics of beating-the-odds high schools in Puerto Rico, by identification method, and of all high-poverty high schools in Puerto Rico, 2011/12 and 2012/13

Outcome measure	Identified using the status method (n = 17)				Identified using the exceeding achievement expectations method (n = 15)				Identified using both methods (n = 6)				All schools in sample (N = 159)			
	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation
School characteristic[a]																
Total enrollment	126	823	466	225	127	750	470	200	152	750	451	232	98	934	490	192
Percentage of female students	46.9	95.2	55.9	11.0	45.7	55.7	51.2	3.1	46.9	55.7	51.8	3.3	38.6	95.2	52.1	5.4
Percentage of Hispanic students	98.1	100.0	99.7	0.5	98.4	100.0	99.8	0.4	99.3	100.0	99.8	0.2	97.8	100.0	99.8	0.4
Percentage of students from households living below the poverty line, 2009/10	41.3	82.1	61.3	13.3	54.2	85.4	74.4	8.4	64.8	82.1	73.5	6.9	5.0	23.0	15.5	3.3
Student–teacher ratio	7.0	21.0	16.0	4.1	7.0	20.0	15.1	3.8	64.8	82.1	73.5	6.9	8.0	19.0	15.0	4.2
Cohort characteristic[b]																
Cohort size	10	357	156	112	7	357	174	100	32	357	181	115	7	357	184	89
Percentage of female students	37.0	90.0	53.9	11.9	44.9	71.4	53.0	7.4	44.9	62.5	51.9	6.9	22.9	90.0	52.2	6.9
Percentage of Puerto Rican students[c]	85.2	100.0	97.2	3.8	93.9	100.0	98.3	2.1	93.9	100.0	97.6	2.5	81.1	100.0	98.1	2.8
Percentage of other Hispanic students[c]	0.0	14.8	2.6	3.9	0.0	6.1	1.5	2.1	0.0	6.1	1.9	2.6	0.0	19.0	1.8	2.8
Percentage of students from households living below the poverty line	17.7	82.1	58.3	16.8	9.9	85.5	66.4	18.5	56.8	82.1	69.0	9.9	2.9	90.1	62.9	17.1
Percentage of students with disabilities	0.0	19.6	9.6	5.7	0.0	71.4	17.9	15.7	0.0	19.6	12.9	7.0	0.0	71.4	15.6	7.8
Percentage of students with limited Spanish proficiency	0.0	3.2	0.5	0.8	0.0	1.6	0.6	0.6	0.0	1.4	0.6	0.6	0.0	6.7	0.5	0.9

a. Data are for the 2012/13 school year unless otherwise noted.

b. Data are for the cohort of students who entered grade 10 in 2010/11 and were expected to graduate in 2012/13.

c. The percentage of students in other racial/ethnic groups is small and not presented here.

Source: Authors' analysis based on data from U.S. Department of Education (2010, 2013, 2014) and the Puerto Rico Department of Education.

Appendix B. Sensitivity analysis results

This appendix presents the results from the sensitivity analysis that was conducted using different cutpoints for the outcome measures. The analysis shows that as the cutpoint expanded from the top 10 percent of schools to include the top 40 percent, the number of beating-the-odds high schools identified expanded from 8 to 33 for the status method and from 5 to 32 for the exceeding achievement expectations method, and the agreement rate between the two methods fluctuated between 27 percent and 47 percent (table B1).

Table B1. Number of beating-the-odds high schools in Puerto Rico identified using different cutpoints for outcome measures, by identification method, 2011/12 and 2012/13

Cutpoint (percent)	Beating-the-odds schools (N = 159)			Agreement rate (percent)
	Identified using the status method	Identified using the exceeding achievement expectations method	Identified using both methods	
10	8	5	3	46
11	9	5	3	43
12	9	6	3	40
13	10	8	3	33
14	11	8	3	32
15	11	8	3	32
16	12	8	3	30
17	12	9	3	29
18	13	9	3	27
19	14	10	4	33
20	14	11	4	32
21	15	12	6	44
22	16	12	6	43
23	16	12	6	43
24	17	13	6	40
25	17	15	6	38
26	18	16	6	35
27	19	16	6	34
28	20	17	6	32
29	20	18	6	32
30	21	18	6	31
31	22	20	6	29
32	22	21	7	33
33	24	22	9	39
34	24	25	11	45
35	25	26	12	47
36	26	26	12	46
37	28	27	12	44
38	30	29	13	44
39	31	30	14	46
40	33	32	15	46

Note: The analyses used data on the 2012/13 graduation rate, 2011/12 grade 11 reading and math proficiency rate, 2008/09 grade 8 reading and math proficiency rate, 2009/10 school poverty rate, and data on several other school characteristics for the 2012/13 school year.

Source: Authors' analysis based on data from U.S. Department of Education (2010, 2013, 2014) and the Puerto Rico Department of Education.

Notes

1. These schools ranked in the 76th percentile or higher on each measure for the status method, meaning that they performed better than at least 75 percent of schools on a specific measure.

2. There is no absolute guide for the magnitude of correlation coefficients that indicates when two variables have a low or high degree of correlation. Hinkle, Wiersma, and Jurs (2003) suggest interpreting a correlation coefficient of .90 to 1.00 (−.90 to −1.00) as a very high positive (negative) correlation, a correlation coefficient of .70 to .90 (−.70 to −.90) as a high positive (negative) correlation, a correlation coefficient of .50 to .70 (−.50 to −.70) as a moderate positive (negative) correlation, a correlation coefficient of .30 to .50 (−.30 to −.50) as a low positive (negative) correlation, and a correlation coefficient of .0 to .30 (.0 to −.30) as little if any correlation.

3. The expected performance for a school indicates the average performance for a school with a particular set of characteristics that are included as variables in the regression model. The difference between the observed and expected performance indicates how much better or worse a school actually performed than its characteristics predicted it would. A positive difference indicates that the school performed better than expected, given its characteristics. A negative difference indicates that the school performed worse than expected.

4. According to the U.S. Census Bureau's 2012 American Community Survey, 77 percent of all kindergarten to grade 12 students in Puerto Rico attended public schools.

5. The seven regions identified in the data are Arecibo, Bayamon, Caguas, Humacao, Mayaguez, Ponce, and San Juan.

6. It is not clear how districts are defined in the data provided by the Puerto Rico Department of Education. By comparing data provided by Puerto Rico and the Common Core of Data, it appears that "districts" in the files provided by Puerto Rico largely overlap with municipalities or counties in the Common Core of Data. For U.S. Census purposes, the municipalities are equivalent to counties. Puerto Rico has 78 municipalities or "municipios."

7. The study team used the haversine formula to calculate the distance between two schools. This formula gives the great-circle distances between two points on a sphere from their longitudes and latitudes.

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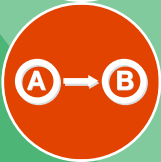
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