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Predicting High School Graduation and Dropout Using a Hierarchical Generalized Linear Model Approach

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Introduction

High school graduation and dropout are important outcome measures for the school systems. These outcome measures can be predicted using important variables or predictors that have day-to-day application in educational settings. Several researchers have predicted high school graduation and dropout using relevant predictors (see Rumberger and Larson, 1998; Ensminger and Slusarcick, 1992). For example, Ensminger and Slusarcick (1992) predicted high school graduation and dropout using background and demographic variables such as low grades, aggressive behavior, student poverty, and parents' education level. Similarly, Rumberger and Larson (1998) predicted high school dropout using low grades, misbehavior, and high absenteeism in the model.

Initially, this study used simple correlation analysis to show the relationship between number/percent of students at each achievement level of reading/mathematics and the number/percent of graduation/dropout. In addition, a logistic regression analysis was used in order to analyze the strength and direction of prediction due to potential predictors at the student level to predict the student's status of graduation/dropout. The significant correlation between school poverty and the status of graduation/dropout further suggested using school poverty to predict the student's status of graduation/dropout employing a hierarchical generalized linear model (HGLM).

Thus, this paper predicts high school graduation and dropout using important predictors, such as student achievement, discipline, absenteeism, and student/school poverty, which are of interest for a large Florida school District. The study results would be helpful for school systems to improve student chances for graduation by means of intervening potential predictors such as discipline and absenteeism associated with the students at-risk of graduation and dropout.

Background

School districts in Florida have been searching for an appropriate technique for predicting high school graduation and dropout in order to empirically predict these important measures based on a theoretical model. Such a model not only can identify important predictors in estimating a student's likelihood of high school graduation and dropout, but also can establish an appropriate and valid statistical technique for prediction.

The reasonably strong correlation between high school graduation /dropout and student achievement, student poverty, and other variables provides a strong basis to suspect that these variables can substantially predict student's high school graduation and dropout using an appropriate model.

Predicting High School Graduation and Dropout

SDBPC is one of largest districts in the State of Florida, with approximately 165,000 students in grades K-12. The Department of Research and Evaluation (DRE) in the School District of Palm Beach County (SDPBC) decided to predict high school graduation and dropout in 2006 (school year 2005-2006) using data/predictors for seventh graders in 2001.

In order to be consistent with published indicators, DRE decided to use the definition of graduation rate as developed and calculated by the Florida Department of Education (FLDOE). The Florida High School Graduation Rate, Technical Guide (FLDOE, 2006) provides guidelines to calculate high school graduation (HSG) rate. The HSG rate is calculated annually and begins with a group of first-time ninth graders, say those who are in ninth grade in SY2003 (i.e., school year 2002-2003). The computation tracks these students to determine which of them have graduated in a four-year period (i.e., SY2006). Students who leave the district are removed from the cohort, and students who transfer in to the district are added to the cohort that corresponds to their year of first-time entry into ninth grade.

The State of Florida graduation (or State graduation) rate places all of the students in the cohort into one of three categories:

1. Graduates (GRAD) – those students who graduated in four years or less (e.g., SY2003 to SY2006).
2. Dropout (DROP) – those students whose withdrawal codes indicated they dropped out of the educational system during these four years (e.g., SY2003 to SY2006).
3. Not graduated (NGRAD) – the remaining students who are still enrolled in the district, but have not graduated or dropped out at the end of the four year period.

The State graduation rate has the advantage of being a commonly calculated indicator within Florida. Further, the State calculation is an actual graduation rate (following the same students over a four year period), as opposed to other calculations of graduation rate used elsewhere that are only estimates of actual graduation rate. The State graduation rate has the unusual characteristic of having the “Not graduated (NGRAD)” category; that is, students who have neither graduated nor dropped out during the four years.

The SY2006 cohort data used for this study in the SDPBC had the following proportions.

Table 1: Counts and Percentages for Student's Status of Dropout, Graduation, and Non-Graduation for SY2006 Cohort Data

Category	N	Percent
Graduation (GRAD)	8459	69.0%
Dropout (DROP)	977	8.0%
Not Graduation (NGRAD)	2779	23.0%
Total	12215	100.0%

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The objectives of this study are to:

1. Explore descriptive analysis based relationship between each Florida Comprehensive Assessment Test (FCAT¹) achievement level and graduation/dropout status.
2. Identify potential seventh-grade predictors, including FCAT scores, influencing high school graduation and dropout using logistic regression (LR) and HGLM analyses.

Such models will enable intervention for those students who are at-risk of not graduating or dropping out. Thus, any theoretically based model developed in SDBPC might be useful for other school districts in the State with similar demographic and ethnic composition of students.

Methods

At the outset, simple predictive analysis (based on correlation) and logistic regression were used to predict student graduation and dropout in the District. The meaningful correlation between school poverty and student graduation/dropout suggested the use of a hierarchical model to analyze the data. For this reason, a two-level HGLM, based on a multilevel model, was used in order to predict the status of graduation and dropout in high school. Researchers in past have employed similar models either for predicting student's graduation/dropout status or for predicting a dichotomous outcome (see Rumberger, 1995; Bryk, & Thum, 1989; Subedi, 2007). The analysis used SAS PROC MIXED to estimate individual and interaction effects of predictors, similar to the approach used by Singer (1998).

Data

The study used data for seventh grade students in SY2001 to predict their graduation and dropout in SY2006. A six-year data structure is presented in Table 2, which provides the grade levels for different years in the high school graduation cohort file.

Table 2: The High School Graduation and Dropout Data Layout

School Year (SY)	SY2001	SY2002	SY2003	SY2004	SY2005	SY2006
Grade	7	8	9	10	11	12

¹ The FCAT, a criterion-referenced test measuring selected benchmarks in Mathematics, Reading, Science, and Writing from the Sunshine State Standards (SSS), is administered to the students in grades 3-11 and is part of Florida's overall plan to increase student achievement by implementing higher standards.

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All of the students in the cohort were ninth graders at the beginning of SY2003. However, not all students in the original data file would have followed this grade-level sequence for other years. For example, some students were found as retained in SY2004. For the purposes of this study, the SDPBC cohort was reduced to only those students who were enrolled in the seventh grade in SY2001.

The large sample size of the SDBPC ensured the reliability of the results of the study. The findings of this study can be generalized to the population having similar demographic composition in the State of Florida.

Variables

Outcome variables

Graduation status. This is the high school graduation status of students, coded as 1 and 0 for graduation and non-graduation, respectively. According to the State of Florida the “graduation” definition involved the codes W06, W07, W10, W27, WGD, W43, W45, WFW, WFT, W6A, W6B, WFA, and WFB.

Dropout status. This is the high school dropout status of the students, coded as 1 and 0 for dropout and non-dropout, respectively. According to the State of Florida the “dropout” definition included the codes DNE, W05, W11, and W13-23.

Predictors

Total achievement. This predictor was measured using the total of FCAT reading and mathematics scores.

Absenteeism. This predictor, measured as a total percent of days absent, was calculated as total days of absent divided by the total days absent plus total days present.

Free and reduced lunch. This predictor is the student’s participation in free and reduced lunch, coded as 1 and 0 for participation and non- participation, respectively.

In-school and out-of-school suspension. This predictor was measured as the sum of the in-school suspension (ISS) and out-of-school suspension (OSS) percentages. The ISS/OSS percentage was calculated as the total number of ISS/OSS days divided by the total days absent plus present.

White. This predictor is coded as 1 for White and 0 for non-White.

Haitian. This predictor is coded as 1 for Haitian and 0 for non-Haitian.

School poverty. This is a school level predictor defined as the percent of students participating in free and reduced lunch program in a school.

This paper used above predictors in logistic regression models in order to predict student’s status of graduation and dropout. A stepwise regression was performed and all predictors significant at .001 level were considered in the model. Also, this study used a two-level HGLM to predict student’s status of graduation and dropout. Student level

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predictors (e.g., total achievement, free and reduced lunch) were used in level-1 model and school level predictor (i.e., school poverty) was used in level-2 model.

Results

Descriptive Relationship-based Analysis

The preliminary analysis investigated the relationship between the percentage of graduates/dropout and percentage of students at each achievement level in seventh grade FCAT reading and mathematics. Table 3 shows the percentage of students who graduated or dropped out by their seventh grade FCAT level in reading.

Table 3: Counts and Percentages of Graduates/Dropouts Associated with Seventh-Grade FCAT Achievement Levels in Reading

Level	Dropouts		Graduates		Non-Graduates		Total
	N	Pct	N	Pct	N	Pct	N
Level 1	223	10.6%	1051	50.0%	827	39.4%	2101
Level 2	96	6.0%	1246	78.2%	252	15.8%	1594
Level 3	93	4.2%	1903	86.8%	196	8.9%	2192
Level 4	14	1.1%	1146	93.5%	66	5.4%	1226
Level 5	5	1.1%	430	94.1%	22	4.8%	457
Total	431	5.7%	5776	76.3%	1363	18.0%	7570

In reading, the overall dropout rate was 5.7%. The dropout rates for students of various FCAT reading levels varied from 10.6% for Level 1 students to 1.1% for Level 5 students. This data indicates that Students in FCAT Reading and math achievement levels 1 and 2 have more than double dropout rates than those in levels 3, 4, and 5 combined

In reading, graduation rates varied more widely, from 50.0% for Level 1 students to 94.1% for Level 5 students. However, it is interesting to note that about half of the Level 1 students (in both reading math) graduated in four years after first-time ninth grade enrollment, given the previous belief that Level 1 students were severely behind grade level and therefore would be unlikely to graduate.

Table 4 shows the percentage of students who graduated or dropped out by their seventh graders FCAT levels in mathematics.

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Table 4: Counts and Percentages of Graduates/Dropouts Associated with Seventh-Grade FCAT Achievement Levels in Mathematics

Level	Dropout		Graduation		Non-Graduation		Total
	N	Pct	N	Pct	N	Pct	N
Level 1	239	11.2%	1047	49.2%	841	39.5%	2127
Level 2	86	6.2%	1048	75.8%	249	18.0%	1383
Level 3	62	3.1%	1785	88.3%	174	8.6%	2021
Level 4	35	2.5%	1271	91.7%	80	5.8%	1386
Level 5	4	0.6%	628	97.7%	11	1.7%	643
Total	426	5.6%	5779	76.4%	1355	17.9%	7560

The dropout and graduation rates for students of various FCAT mathematics levels were similar to the results for reading.

Further, the same data was broken out by sublevels to investigate the possibility that students in the lower levels (particularly Level 1) may not be homogenous. Students in Level 1 were divided into two groups of roughly equal size, with the lower group being designated as Level 1a and the upper group as Level 1b. Level 2 was divided in similar manner. The results for reading and mathematics are given below.

Table 5: Counts and Percentages of Graduates/Dropouts Associated with Seventh-Grade FCAT Achievement Sub-Levels in Reading

Sub-level	Dropout		Graduation		Non-Graduation		Total
	N	Pct	N	Pct	N	Pct	N
Level 1a	119	11.4%	440	42.2%	484	46.4%	1043
Level 1b	104	9.8%	611	57.8%	343	32.4%	1058
Level 2a	49	6.0%	614	75.5%	150	18.5%	813
Level 2b	47	6.0%	632	80.9%	102	13.1%	781
Level 3	93	4.2%	1903	86.8%	196	8.9%	2192
Level 4	14	1.1%	1146	93.5%	66	5.4%	1226
Level 5	5	1.1%	430	94.1%	22	4.8%	457
Total	431	5.7%	5776	76.3%	1363	18.0%	7570

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Table 6: Counts and Percentages of Graduates/Dropouts Associated with FCAT Achievement Sub-Levels in Mathematics

Sub-level	Dropout		Graduation		Non-Graduation		Total
	N	Pct	N	Pct	N	Pct	N
Level 1a	121	11.3%	442	41.4%	504	47.2%	1067
Level 1b	118	11.1%	605	57.1%	337	31.8%	1060
Level 2a	47	6.8%	503	73.1%	138	20.1%	688
Level 2b	39	5.6%	545	78.4%	111	15.9%	695
Level 3	62	3.1%	1785	88.3%	174	8.6%	2021
Level 4	35	2.5%	1271	91.7%	80	5.8%	1386
Level 5	4	0.6%	628	97.7%	11	1.7%	643
Total	426	5.6%	5779	76.4%	1355	17.9%	7560

Logistic Regression based Analysis

As a second method of analysis, stepwise logistic regression was used to select important student level predictors to predict the status of graduation and dropout. Table 7 provides the list of predictors selected for predicting graduation and dropout.

Table 7: Descriptive Statistics of Variables Used in Logistic Regression

Predictor	N	Mean	SD	Min	Max
Total achievement	7766	3481	555	1256	5339
Percent of days absent	8333	4.0%	5.0%	0%	72%
Total ISS & OSS percent	8333	0.2%	0.7%	0%	18%
Free and reduced lunch	12215	0.28	0.45	0	1.00
White	12215	0.37	0.48	0	1.00
Haitian	12215	0.05	0.22	0	1.00

Total achievement was entered as the sum of the FCAT developmental scale scores for reading and mathematics.² The variables involved in the logistic regressions had the following correlations.

² Initial investigations utilized total achievement as well as reading and mathematics FCAT developmental scale scores; but total achievement always entered first due to a higher correlation with the outcome variables.

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Table 8: Bivariate Correlation Between Predictors Used in Logistic Regression

Predictor	Total achievement	Percent days absent	Total ISS & OSS percent	Free and reduced lunch	White	Math Achievement	Haitian
Total achievement	1.00	-0.11	-0.21	-0.43	0.39	0.92	-0.21
Percent days absent	-0.11	1.00	0.41	0.07	0.00	-0.12	-0.04
Total ISS & OSS percent	-0.21	0.41	1.00	0.15	-0.14	-0.21	0.05
Free and reduced lunch	-0.43	0.07	0.15	1.00	-0.28	-0.41	0.25
White	0.39	0.00	-0.14	-0.28	1.00	0.38	-0.18
Math Achievement	0.92	-0.12	-0.21	-0.41	0.38	1.00	-0.21
Haitian	-0.21	-0.04	0.05	0.25	-0.18	-0.21	1.00

The logistic regression selected all variables having $p < .0001$. The table below gives the variables used for predicting graduation status.

Table 9: Standardized Estimates, R-square, and Confidence Intervals of Variables Used for Predicting Graduation Status

Predictor	Step	Standardized estimates	R ²	R ² Change	Odds Ratio	Confidence Interval LL UL
Total achievement	1	0.541	0.168	-	1.72	1.72 1.79
Percent days absent	2	-0.251	0.204	0.036	0.78	0.78 0.79
Free and reduced lunch	3	-0.125	0.210	0.006	0.88	0.87 0.89
Total ISS & OSS	4	-0.126	0.215	0.005	0.88	0.88 0.90

Notes: a. All estimates were significant at 0.001.

b. LL = Lower Limit, UL = Upper Limit

The key predictor, total achievement, had positive effect on graduation status, with an R-square of approximately 17%. The remaining predictors (percent days absent, free and reduced lunch, and total ISS and OSS) had negative effect on graduation status. These predictors added a small R-square to the R-square associated with total achievement. The standardized estimates of coefficients in the final equation show that free and reduced lunch and ISS/OSS each had about half the weight of days absent, and days absent had about half the weight of total achievement.

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Table 10 below gives the variables used for predicting dropout status.

Table 10: Standardized Estimates, R-square, and Confidence Intervals of Variables Used for Predicting Dropout Status

Predictor	Step	Standardized estimates	R ²	R ² Change	Odds Ratio	Confidence Interval	
						LL	UL
Percent days absent	1	0.2561	0.029	-	1.2919	1.29	1.39
Total achievement	2	-0.2930	0.047	0.017	0.7460	0.75	0.77
Hispanic	3	0.1022	0.049	0.002	1.1076	1.11	1.19

Notes: a. All estimates were significant at 0.001.

b. LL = Lower Limit, UL = Upper Limit

The primary variable for predicting dropout was percent of days absent, which had significant positive effect with a low R-square of approximately 3%. The remaining variables added little additional R-square. Overall, the ability of seventh-grade variables to predict dropout was greatly lower than that for graduation.

The above logistic regressions analyses produced predicted graduation and dropout rates with the characteristics given in Table 11.

Table 11: Descriptive Statistics for Predicted Graduation and Dropout Status

Outcome measures	N	Mean	SD	Min	Max
Dropout Status	12215	8%	27%	0%	1%
Graduation Status	12215	69%	46%	0%	1%

The means of these variables were consistent with their overall percentages. Predicted graduation had a larger standard deviation.

The following figures (i.e., Figure 1 and Figure 2) give the distributions of the predicted graduation and dropout rates.

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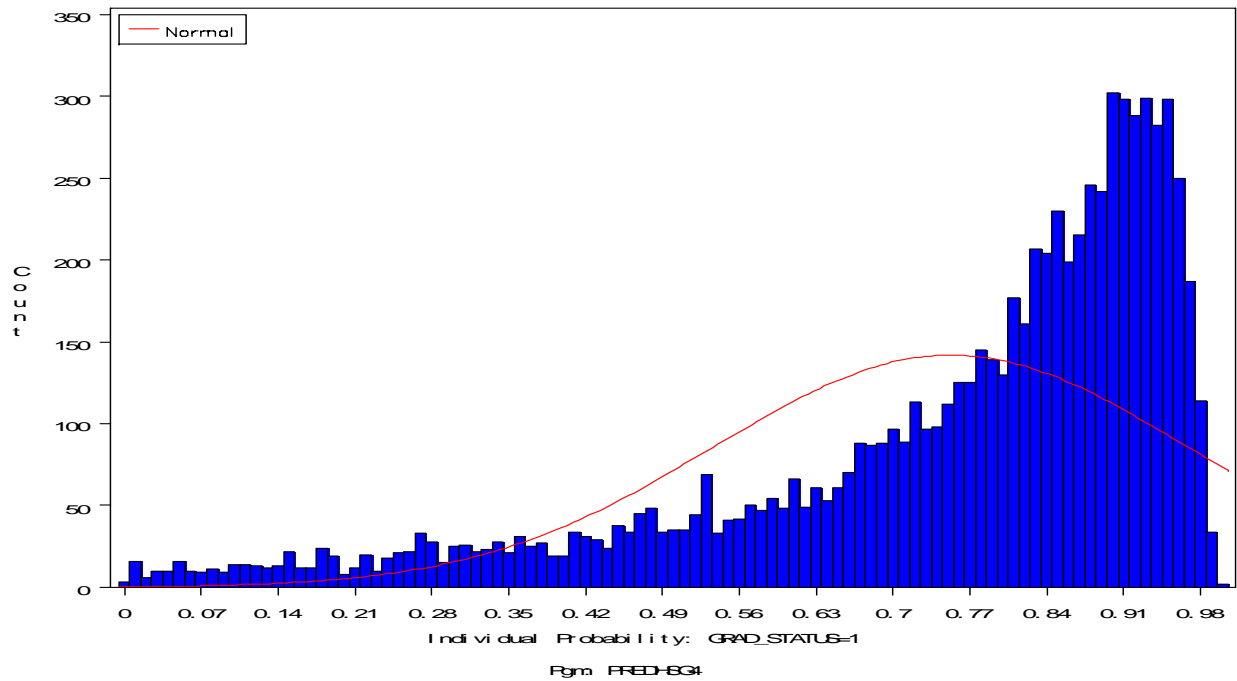


Figure 1: Distribution of Predicted Graduation Probabilities

Here we see that the majority of predicted graduation probabilities occur in the 80% and 90% ranges. Further, there are some predicted probabilities that are lower, even down to nearly zero percent.

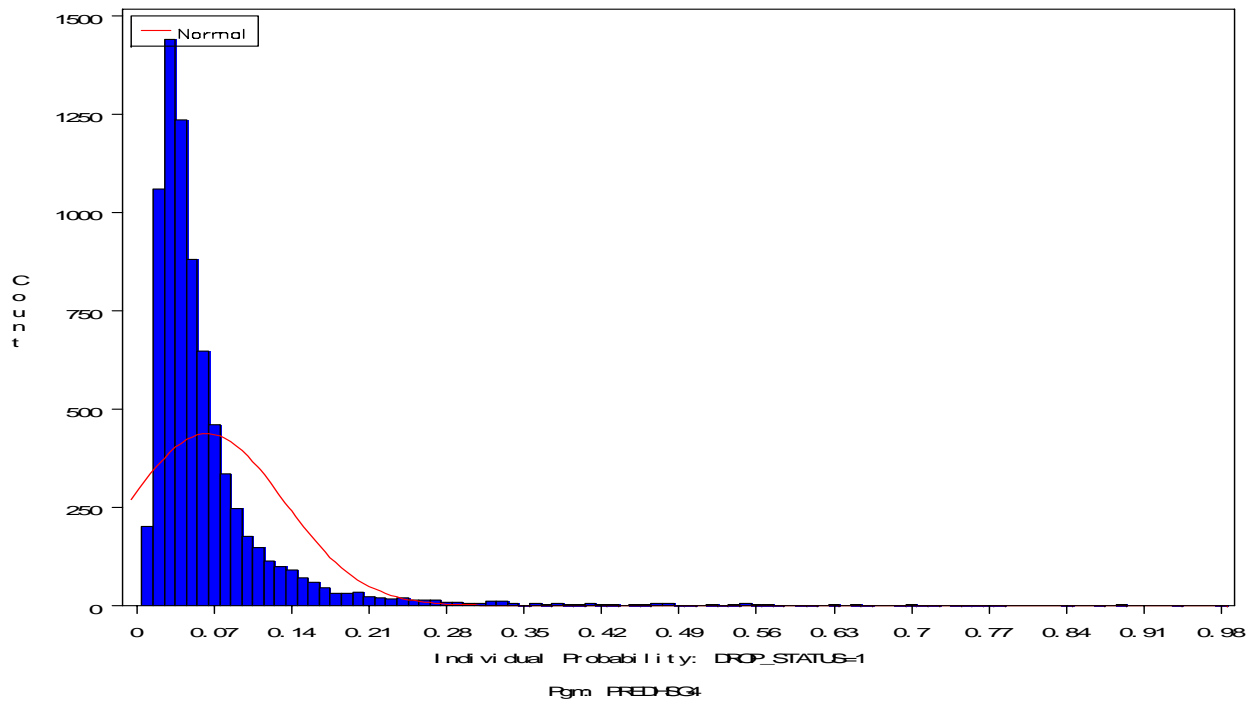


Figure 2: Distribution of Predicted Dropout Probabilities

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The majority of predicted dropout probabilities range less than 7%. There were very few predicted probabilities above 20%, and virtually none above 40%. Therefore, it appears that these predictor variables have little ability to predict dropout (as the total R-square of about 5% would seem to indicate).

Because of the lack of power of these variables to predict dropout for individual students, the remainder of the study focused on only predicting graduation status.

Since the variables predicting graduation status were capable of predicting students in the very low ranges of probabilities, a further breakdown was performed. In the table below, the graduation probabilities were divided into ranges of 20%, and the characteristics of students in each range were noted.

Table 12: Number of Students (N) and Mean of Different Predictors by Various Classes of Graduation Probability

Variable	Probability of graduation				
	0-20%	21-40%	41-60%	61-80%	81-100%
N	259	437	800	1850	4304
Total achievement	2385	2637	2912	3267	3838
Percent days absent	12%	6%	4%	3%	2%
Total ISS & OSS percent	2%	1%	0%	0%	0%
ESE	48%	34%	27%	11%	2%
Free and reduced lunch	81%	80%	74%	56%	16%
White	17%	20%	23%	38%	66%
LEP	17%	20%	15%	9%	2%
Hispanic	15%	20%	20%	20%	13%
Black	66%	59%	55%	39%	15%
Haitian	17%	16%	13%	9%	3%
Male	60%	55%	52%	48%	49%
Female	40%	45%	48%	52%	51%

The largest of these groups had graduation probability of 81-100%. This group shows relatively low percentages (compared to the lowest group) for absenteeism, ESE, free/reduced lunch, LEP, Black, and Haitian, and relatively high percentages for white.

The lowest and smallest group was for graduation probability of 0-20%. This group shows relatively high absenteeism, ESE, free/reduced lunch, LEP, Black, and Haitian, and relatively low percentages for white. The high percentages for ESE (48%) and free/reduced lunch (81%) are most notable.

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HGLM based Analysis

Tables 13 and 14 show the results based on three-level HGLM analysis for predicting student's status of graduation and dropout respectively using appropriate predictors at grade 7 in the model.

Table 13. *Standardized Estimates, Standard Error, Odds ratios, and Confidence Intervals for Fixed and Interaction Effects Predicting Graduation Status*

Predictor	Estimate	Standard Error	Odds Ratios	Lower limit limit	Upper
Total achievement (1)	0.12*****	0.003	1.13	1.12	1.13
Percent days absent (2)	-0.05*****	0.01	0.95	0.93	0.97
Total ISS & OSS percent (3)	-0.03*****	0.004	0.97	0.96	0.98
School poverty (4)	-0.06*	0.017	1.06	1.03	1.10
(1) * (4)	0.02***	0.003	1.02	1.01	1.03
(2) * (4)	0.001	0.008	1.00	0.99	1.02
(3) * (4)	0.02*****	0.003	0.98	0.97	0.99

Levels of significance: *.05, **.01, ***.001, ****.0001.

Table 14. *Standardized Estimates, Standard Error, Odds ratios, and Confidence Intervals for Fixed and Interaction Effects Predicting Dropout Status*

Predictor	Estimate	Standard Error	Odds Ratios	Confidence Interval Lower limit	Upper
Total achievement (1)	-0.02*****	0.00	0.98	0.97	0.99
Percent days absent (2)	0.05*****	0.01	1.05	1.03	1.07
Total ISS & OSS percent (3)	0.01**	0.00	1.01	1.00	1.02
School poverty (4)	0.01	0.02	1.01	0.98	1.04
(1) * (4)	0.00	0.00	1.00	0.99	1.00
(2) * (4)	0.00	0.01	1.00	0.99	1.02
(3) * (4)	-0.01	0.00	0.99	0.98	1.00

Levels of significance: **.01, ****.0001.

Four of the seven predictors, i.e., total achievement, and interaction of school poverty with total achievement, percent days absent, and total ISS and OSS percent, had positive effects on the odds of high school graduation. However, three of the predictors (i.e., percent days absent, total ISS / OSS percent, and school poverty) had negative effects on

the odds of high school graduation. Six of the predictors significantly predicted high school graduation at .05, .01, .001, or .0001 levels.

The odds ratios provide the basis for interpreting effect due to the predictors in the model. For example, the odds ratio of 1.13 for total achievement can be interpreted as “when total achievement is increase by one unit, the odds of high school graduation is increased by a factor of 1.13, controlling for other predictors”. On the other hand, the odds ratio of 0.95 for percent days absent can be interpreted as “when percent days absent is increased by one unit, the odds of high school graduation is decreased by a factor of 0.95, controlling for other predictors.” The small³ confidence intervals for total achievement, total ISS and OSS percent, and the interaction effects of school poverty with these predictors indicate that these predictors in the model predicted the odds of graduation status very precisely.

Five of the seven predictors (i.e., percent days absent, total ISS /OSS percent, school poverty, interaction of total achievement, and percent days absent with school poverty) had positive effects on the odds of high school dropout. However, two of the predictors (i.e., total achievement and the interaction between school poverty and total ISS/OSS percent) had negative effects on the odds of high school dropout. Three of the predictors in the model significantly predicted the odds of high school dropout either at .01, or at .0001 levels.

The odds ratio of -0.02 for total achievement can be interpreted as “when total achievement is increase by one unit, the odds of high school dropout is decreased by a factor of 0.02, controlling for other predictors.” On other hand, the odds ratio of 0.05 for percent days absent can be interpreted as “when percent days absent is increased by one unit, the odds of high school dropout is increased by a factor of 0.05, controlling for other predictors.” The small confidence intervals for total achievement, total ISS and OSS percent, and the interaction effects of school poverty with these predictors indicate that these predictors in the model predicted the odds of dropout status very precisely.

Discussion and Conclusions

Some of the interesting findings were based on the descriptive analysis. While predicting four-year cohort in SDPBC (SY2006 graduation/dropout using seventh-grade for SY2001 data), FCAT achievement levels are found to be associated with the probability of graduation or dropout. For example, Level 1 students have a high chance (12%) of dropping out compared to dropping out for all students (7%). Similarly, Level 1 students have a lower chance of graduating (48%) than all students (74%). However, Level 4 and 5 students have a low chance of dropping out and a high chance of graduating. Logistic regression using additional variables has little capability of predicting dropout (R-square of 5%), but some capability of predicting graduation (R-square of 22%). Table 12 shows that an analysis of the composition of those students with a high probability of graduating

³ A small interval is determined to be a maximum of size of 0.02 (i.e., difference between UL and LL).

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vs. a low probability of graduating indicated definite differences, particularly for variables related to ESE, free/reduced lunch, Black, and White.

Logistic regression (LR) analysis used a single-level model, and HGLM analysis used a two-level model to predict the probability of graduation and dropout of high school students. In both LR and HGLM, graduation was better predicted than dropout. LR used the student level free and reduced lunch variable in the model to predict the probability of graduation and dropout. HGLM used school poverty as a school level predictor and interaction between school poverty and student level predictors in addition to those student level predictors (used in LR analysis) to predict these outcomes.

Total achievement, percent days absent and percent days ISS and OSS significantly predicted the odds of graduation in both LR and HGLM analyses. In addition, the effects of student's free and reduced lunch status and school poverty were significant predictors of graduation in the LR and HGLM analysis, respectively. Percent days absent, total achievement, and Hispanic significantly predicted the odds of dropout in both LR analysis. In HGLM analyses, the total achievement, percent days absent, total ISS and OSS significantly predicted the probability of dropout.

Implications

The SDPBC will benefit from the findings mentioned above. For example, the LR model has provided the evidence of potential student level predictors and HGLM has provided the evidence of potential student and school level predictors for predicting graduation and dropout. Note that HGLM provided the basis to measure the effect of school poverty and cross-level interaction effects in order to predict the graduation and dropout status.

School districts could potentially benefit from this research because this study not only identifies the important predictors influencing graduation and dropout but also helps in identifying the students at-risk of graduation and dropping out. As a result, districts may be able to provide interventions for those students at-risk of non-graduation or dropping out using the potential predictors, which, in turn, would help to promote graduation rates and abate dropout rates.

Limitations

This study was both benefited and limited in the manner in which the State of Florida computes its four-year graduation cohort. On the positive side, the tracking of individual students over the four years is superior to other methods that only approximate a graduation rate.

However, the State calculation is only a "four-year" graduation rate. Approximately 23% of the students in the cohort fall into the "not graduated" category, which is neither four-year graduates nor dropouts. Presumably, these students either graduate or drop out in subsequent years. Therefore, the identity of "graduation rate" is somewhat confusing, since the students who graduate in the fifth year are not counted as graduates.⁴ One must

⁴ A preliminary investigation indicated that the percent of students who graduated in the fifth year was small.

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understand that the graduates in this study are only those who graduate in four years after their initial ninth grade enrollment.

Similarly, “dropout” refer to only those students who have withdrawal codes indicating that they dropped out of the educational system during the four years. It is likely that some additional students actually drop out but are not coded as dropouts because the schools believe that they may have transferred to another district, etc. Further, it is likely that many of the 23% of “not graduated” students actually dropout in the 5th or later year. Therefore, the dropout rate of approximately 8% is probably low.

Another limitation of this study is the complexity in preparing, understanding, designing, modeling, and analyzing the data. Further complexity was involved in interpreting and presenting the results of the HGLM analysis to school system and educational audiences.

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