Question: What were the strongest 8th-grade predictors of dropout among students who would have been members of the graduating Class of 2009?

The purpose of this report was to determine the strongest predictors of high school dropout and to provide information that could be used in the development of an early warning system to alert teachers, principals, and other administrators which 8th-grade students are most at risk of dropout.

Department of Program Evaluation (DPE) staff assembled a data set comprising all students who were first time 8th graders in the 2004–2005 school year (i.e., students who would have been members of the graduating Class of 2009 if they proceeded through high school at the recommended pace). The overall risk for dropout for this cohort was 8.4%.

The data set included the following student-level variables:

- an indicator for dropout anytime between 2005–2006 and 2008–2009;
- 8th-grade demographic characteristics (i.e., gender, ethnicity, and economic disadvantage);
- 8th-grade program characteristics (i.e., limited English proficiency and special education);
- 8th-grade student enrollment characteristics (i.e., total days enrolled, annual attendance rate, and an indicator if students attended more than one regular [non-disciplinary] campus during the school year [intra-district mobility]); and
- 8th-grade disciplinary characteristics (i.e., suspension and disciplinary campus enrollment).

DPE staff used logistic regression analyses to model students' overall likelihood of dropout and likelihood of early dropout for each variable independently and in various combinations to determine which 8th-grade variables best predicted overall risk of dropout and risk of early dropout. Appendix A lists regression estimates for each characteristic independent of the others; the body of the report summarizes the results of the analyses that included multiple risk characteristics.

Additional analyses were conducted for a subset of students who had reading and math Texas Assessment of Knowledge and Skills (TAKS) scores and who were enrolled in regular or pre-advanced placement (AP) sections of 8th-grade English/language arts (ELA), mathematics (math), or science. Students who were exempt from TAKS or who were enrolled in special education sections of ELA, math, or science were not included in this set of analyses.

Key Findings

- The following 8th-grade characteristics best predicted overall student dropout risk after controlling for the presence of other risk factors: (a) qualifying for free lunch, (b) an annual attendance rate of less than 90%, (c) intra-district mobility, (d) 1 or more suspensions during the year, (e) failing both the reading and math TAKS tests, (f) failing an English course in the second semester, (g) failing a math course in the first semester, and (h) failing a science course in the first semester (Figure 1).
- Of the above characteristics, the most powerful predictors of overall dropout risk were having an 8th-grade attendance rate of less than 90% and failing both the 8th-grade reading and math TAKS tests (Figure 2).
    - Students whose attendance rate was less than 90% were 2.3 times more likely to drop out than were students with attendance rates at or above 90%.

- Students who failed both reading and math TAKS tests were 2.8 times more likely to drop out than were students who passed both exams.

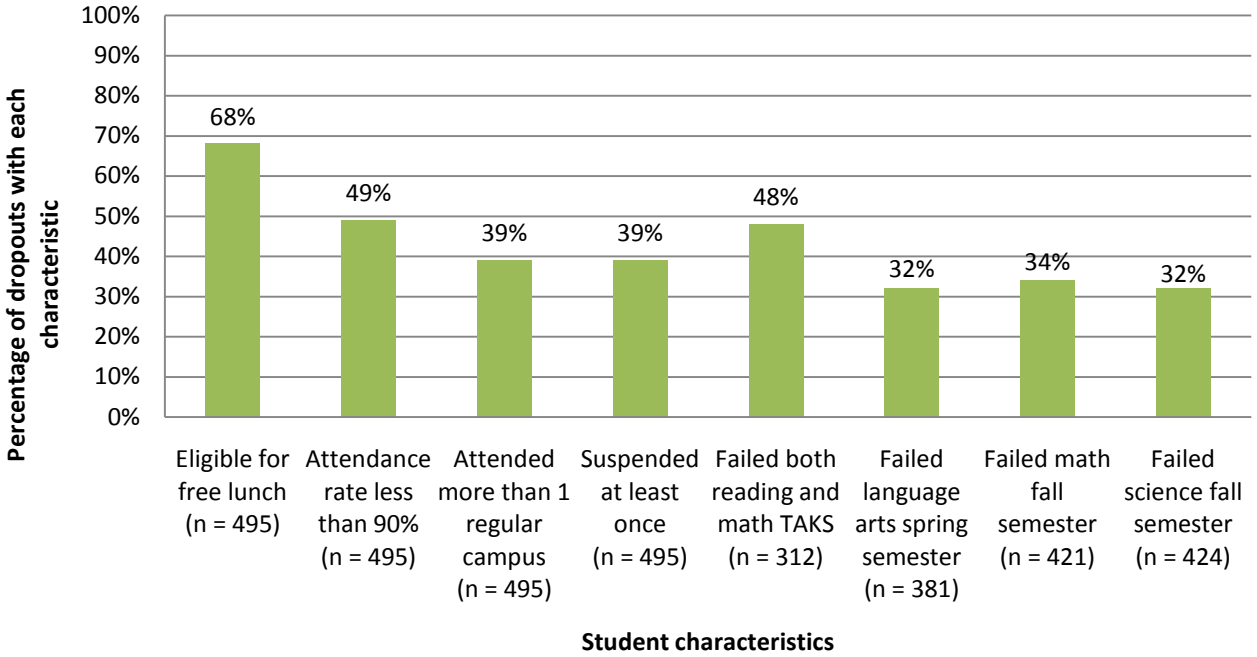
- The likelihood of early dropout (i.e., during the 2005–2006 academic year) was significantly higher for students in 8th grade who (a) were of Hispanic origin, (b) had attendance rates of less than 90%, (c) exhibited intra-district mobility, (d) were enrolled fewer than 170 days, or (e) failed a math course in the spring semester.
  - Students with 8th-grade attendance rates of less than 90% were 6.2 times more likely to drop out early than were students whose attendance was above 90%.

Student Characteristics Associated With Dropout Between 2005–2006 and 2008–2009

For the analyses described below, DPE staff selected 19 student demographic, program, attendance, behavioral, and academic characteristics that have been associated with student dropout both in prior district research (Malerba, 2009) and in the broader education literature (Celio & Leveen, 2007; see Appendix Tables A1-A3 for the complete list).

DPE staff used logistic regression models to determine the likelihood of dropout among students enrolled as first-time 8th graders during the 2004–2005 school year (i.e., students who would have been members of graduating Class of 2009 if they proceeded through high school at the recommended pace; see Technical Note B-1). The tables in Appendix A list the likelihood of dropout associated with each risk factor, while holding all other characteristics constant. Eight of these variables were statistically significant predictors of overall dropout risk within this cohort (Figures 1 and 2; see Technical Note B-2 for more details).

Figure 1. Students who Dropped Out Between 2005–2006 and 2008–2009, by 8th-grade Characteristic

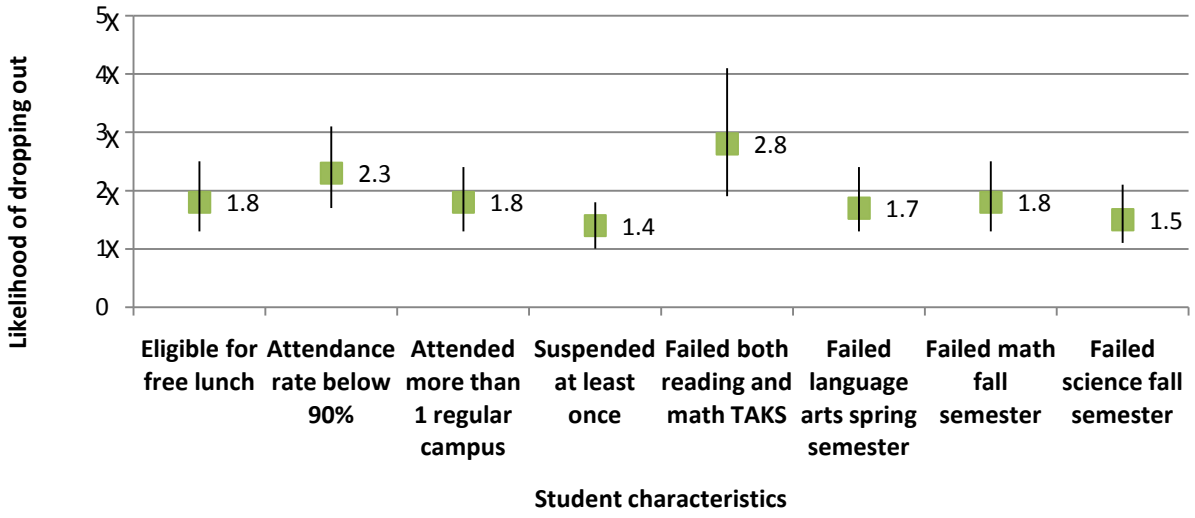


Source. AISD student records
Note. TAKS is the acronym for Texas Assessment of Knowledge and Skills.

As shown in Figure 2, the strongest 8th-grade predictors of dropout were having a daily attendance rate of less than 90% and failing both the reading and math TAKS tests; students with these characteristics were 2.3 times and 2.8 times, respectively, more likely to drop out than were similar students without these characteristics. Almost half of students from this cohort (48% to 49%) who dropped out between 2005–2006 and 2008–2009 had one of these two characteristics (Figure 1).

Although far more students from this cohort who dropped out qualified for free lunch (68%) than had an attendance rate of less than 90% or failed reading and math TAKS tests, the risk associated with this level of economic disadvantage was only 1.8 times higher than the risk for similar students who did not qualify for free lunch. This estimate likely was due to the high overall rates of economic disadvantage among district students.

Figure 2. Students' Likelihood of Dropout Between 2005–2006 and 2008–2009, by 8th-grade Characteristic

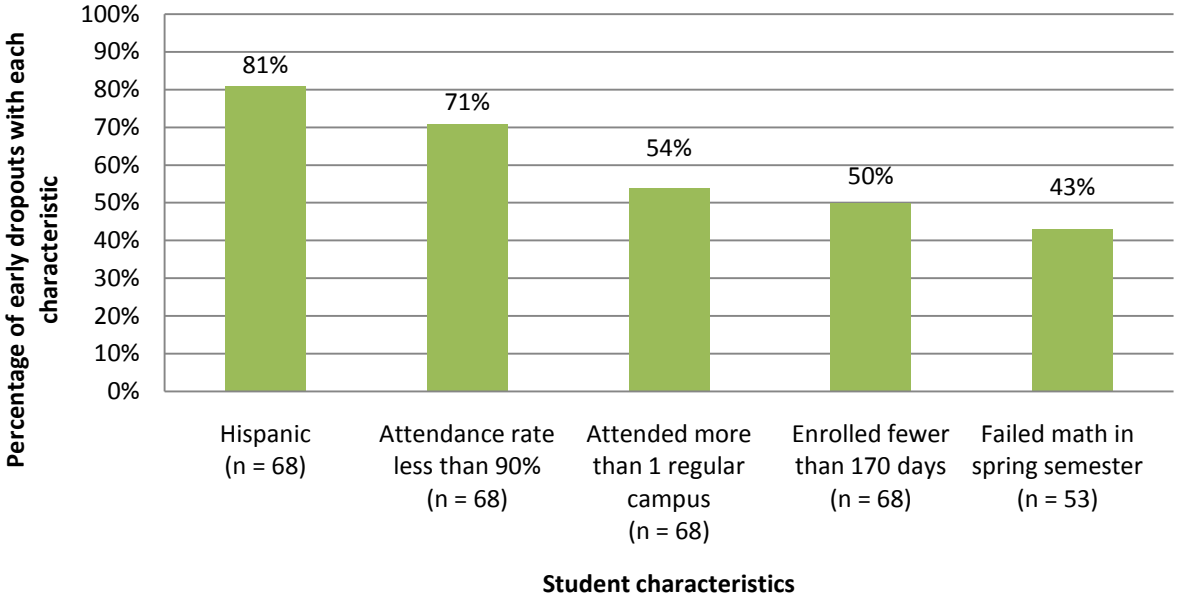


Source. AISD student records
Note. Likelihoods for students in each category were calculated in comparison with likelihoods for students not in the category; estimates statistically controlled for each of the other characteristics. The vertical axis shows the number of times more likely a student was to drop out, ranging from 1x (1 time) to 5x (five times) more likely. The line though each regression estimate indicates the width of the 95% confidence interval.
TAKS is the acronym for Texas Assessment of Knowledge and Skills.

Student Characteristics Associated with Early Dropout

As in the overall dropout risk analysis, DPE staff used logistic regression analyses to estimate the risk of early dropout (i.e., dropping out in 2005–2006) associated with each demographic, program, enrollment, behavioral, and academic characteristics, while holding all others constant. Figure 3 shows the percentages of early dropouts with each of the statistically significant risk characteristics.

Figure 3. Students who Dropped Out in 2005–2006, by 8th-grade Characteristic



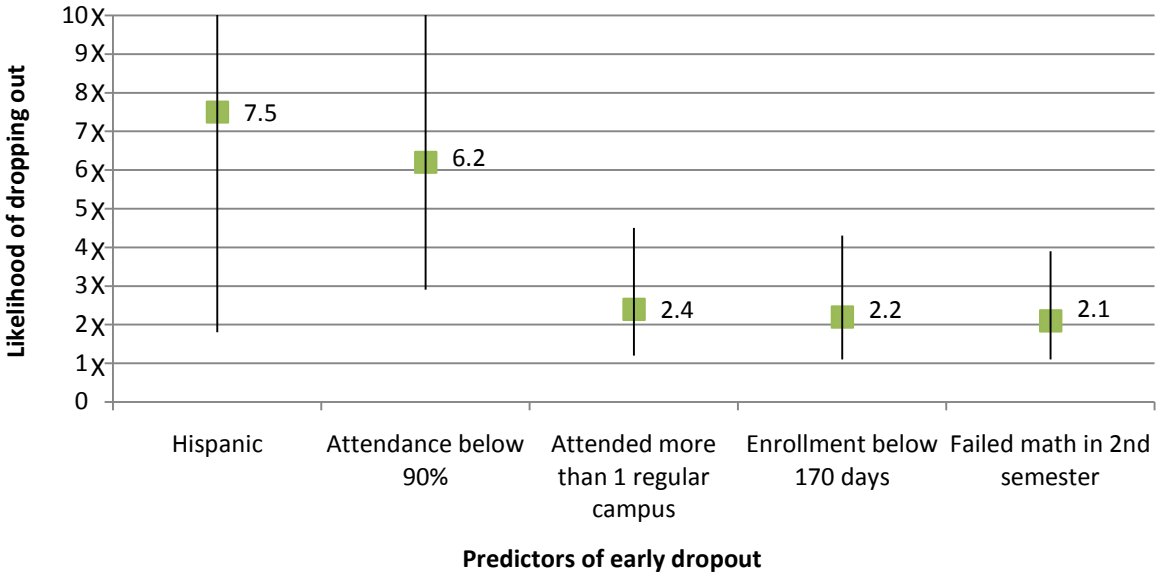
Source. AISD student records

As shown in Figure 4, the strongest 8th-grade predictors of dropout were being of Hispanic origin and having an attendance rate of less than 90%; students with these characteristics were 7.5 times and 6.2 times, respectively, more likely to drop out than were similar students without these traits. More than 70% of early dropouts had one or both of these two characteristics (Figure 3).

In these analyses, African-American ethnicity was not a statistically significant predictor of early dropout. It appears that within the cohort of first-time 8th graders from the 2004-2005 school year, Hispanic students were at greater risk of early dropout than African-American students even after accounting for attendance and enrollment patterns, and academic performance.

It also is important to note that although limited English proficiency (LEP) independently predicted overall and early dropout (Appendix Table A1), when included in a logistic regression model with the characteristic of Hispanic origin, only Hispanic origin remained statistically significant (see technical note B-3 in Appendix). This outcome likely was due to the high correlation between LEP status and Hispanic origin in AISD, and should be interpreted with caution; previous analyses showed a higher dropout risk for high school students who were LEP than for students who were proficient in English (Malerba, 2009). These analyses also should be replicated with a cohort of high school students to determine if the associations between LEP status, ethnicity, and dropout differ for students who enter the district as high schoolers.

Figure 4. Students' Likelihood of Early Dropout in 2005–2006, by 8th-grade Characteristic



Source. AISD student records

Note. Likelihoods for students in each category were calculated in comparison with likelihoods for students not in the category; estimates statistically controlled for each of the other characteristics. The vertical axis shows the number of times more likely a student was to drop out, ranging from 1x (1 time) to 10x (ten times) more likely. The line though each regression estimate indicates the width of the 95% confidence interval.

The only significant academic performance predictor of early dropout was failing math in the second semester. Enrollment of fewer than 170 days also was a significant predictor of dropout, even after controlling for daily attendance and intra-district mobility. This finding implies that students who enter late or leave early in the year are more likely to drop out than students who are enrolled in AISD for the entire 8th-grade school year, which is consistent with findings from Celio and Leveen (2007). They found that students who enrolled late or transferred out early from the Portland School District were more likely to drop out of school before graduation than students who were consistently enrolled in the district. They also reported that students entering the district during their 9th-grade year or later were more likely to drop out than were students who were in Portland School District in 8th grade. DPE staff recommends further analyses on the Class of 2009 cohort to understand how movement into AISD in later grades affects the likelihood of students dropping out.

Conclusions and Future Directions

These analyses showed which of the dropout risk characteristics were most powerful even when they occurred together with other at-risk indicators. The results showed that although the overall risk of dropout among AISD 8th graders was only 8.4%, a meaningful early warning system could be put in place in middle schools to indicate the students who are most at risk of early dropout and of dropping out of school at any point in their high school career. Most students who drop out give evidence of their academic struggles and disengagement from school well in advance of their final day of enrollment.

Given the trends across the analyses predicting overall dropout risk and the risk of early dropout, DPE staff recommendations for the most important 8th-grade characteristics to include in an early warning system are as follows:

- Failing both the reading and math TAKS tests
- Core course failure, especially in math
- Poor attendance, especially if less than 90%
- Switching campuses during the year (i.e., intra-district mobility)
- Enrollment of 170 or fewer days
- School suspension

It also may be valuable to include demographic characteristics such as student eligibility for free lunch and African American or Hispanic ethnicity; however it should be done with the understanding that unmeasured family (e.g., parent education level) or community characteristics (e.g., neighborhoods with high concentrations of poverty) may underlie the higher levels of risk among African American and Hispanic students in comparison to other (i.e., Asian, Native American and White) students.

Follow up analyses will address possible disproportionate effects of individual schools on students' risk of early dropout. If particular schools have both high dropout rates and high percentages of African American and Hispanic students, then the contribution of ethnicity might be eliminated as a significant predictor of early dropout.

Future analyses also should examine the associations among these risk characteristics across each of the high school grade levels. These analyses suggest that different student characteristics are significant predictors of dropout at different points in a students' academic career. Understanding the most important risk characteristics as students progress through school is essential for targeting the right interventions at the right time to ensure student success.

References

Celio, M. A., & Leveen, L. (2007). *New research shows which academic indicators are the best predictors of high school graduation—and what interventions can help more kids graduate.* Portland, OR: Connected by 25.

Malerba, C. (2009). *E-Team report: High school at risk 2008–2009* (Publication No. 08.36I). Austin, TX: Austin Independent School District.

Appendix A. Dropout Risk Characteristics

The tables in this appendix show the 8th-grade student characteristics associated overall dropout risk and with the risk of early dropout. Table A1 lists the risk ratios for demographic and program characteristics; Table A2 lists the risk ratios associated with enrollment and disciplinary predictors; and Table A3 lists the risk ratios associated with various indicators of academic achievement.

Table A1. Eighth-grade Demographic and Program Characteristics Associated With Dropout

	Number	Percentage	Overall dropout risk	Early dropout risk
Gender				
Male	2991	51%	1.29**	1.23
Female «	2898	49%		
Ethnicity				
African American	823	14%	3.66**	7.97
Hispanic	3119	53%	3.87**	11.63**
Other (Asian, Native American and White) «	1947	33%		
Economic disadvantage				
Free lunch	2598	44%	3.20**	2.26*
Reduced-priced lunch	515	9%	1.62	.77
Not eligible «	2776	47%		
Special education				
Special education	872	15%	1.93**	2.09*
Not identified as special education «	5017	85%		
Limited English proficiency				
Identified limited English proficient	849	14%	1.71**	2.16*
Not identified limited English proficient «	5040	86%		
Total	**5889**	**100%**		

Source. AISD student records

Note. The odds ratios did not control for any other risk factors. Despite a very high point estimate, there were insufficient numbers of African American students to result in statistically significantly higher risk of dropout than the comparison group (i.e., Asian, Native American and White).

« indicates comparison group

*$p < .05$, ** $p < .001$

See Technical Note B-4 for more information about the associations between dropout, gender and the academic achievement predictors.

See Technical Note B-5 for information about the associations between dropout, ethnicity and the academic achievement predictors.

See Technical Note B-6 for information about the associations between dropout, special education status, attendance, and intra-district mobility predictors.

Table A2. Eighth-grade Enrollment and Disciplinary Characteristics Associated With Dropout

	Number	Percentage	Overall dropout risk	Early dropout risk
Days enrolled				
Enrolled < 170 days	970	16%	2.19**	5.22**
Enrolled ≥ 170 days «	4919	84%		
Attendance rate				
Attendance < .90	1128	19%	4.91**	10.54**
Attendance ≥ .90 «	4761	81%		
Intra-district mobility				
Attended more than 1 regular campus	912	15%	4.14**	6.75**
Attended 1 regular campus «	4977	85%		
Disciplinary actions				
1 or more suspensions	1949	33%	3.53**	2.59**
No suspensions «	3940	67%		
Disciplinary campus attendance				
Attended disciplinary campus	258	4%	3.62**	4.86**
Did not attend disciplinary campus «	5631	96%		
Total	**5889**	**100%**		

Source. AISD student records

Note. The odds ratios did not control for any other risk factors.

« indicates comparison group

*$p < .05$, ** $p < .001$

See Technical Note B-7 for information about the associations between dropout, intra-district mobility, and the number of days enrolled.

See Technical Note B-8 for information more details about the definition of 'attended disciplinary campus.'

Table A3. Eighth-grade Academic Achievement Characteristics Associated With Dropout

	Number	Percentage	Odds ratio for dropping out
Texas Assessment of Knowledge and Skills (TAKS) reading performance			
Met minimum standard «	3531	76%	
Did not meet minimum standard	1136	24%	3.86*
TAKS math performance			
Met minimum standard «	2524	54%	
Did not meet minimum standard	2130	46%	5.57*
English/Language Arts (ELA) grades			
Failed 1st semester ELA course	628	13%	1.66*
Passed 1st semester ELA course «	439	87%	
Failed 2nd semester ELA course	516	10%	3.42**
Passed 2nd semester ELA course «	4419	90%	
Math grades			
Failed 1st semester math course	669	13%	2.15**
Passed 1st semester math course «	4476	87%	
Failed 2nd semester math course	540	11%	2.56**
Passed 2nd semester math course «	4588	89%	
Science grades			
Failed pass 1st semester science course	598	11%	2.14**
Passed 1st semester science course «	4673	89%	
Failed pass 2nd semester science course	479	9%	2.98**
Passed 2nd semester science course «	4759	91%	

Source. AISD student records

Note. The odds ratios did not control for any other risk factors. The number of dropouts who had TAKS scores was 324, who had grades in all core subjects was 380, and who had both TAKS scores and grades was 291.

« indicates comparison group

*$p < .05$, ** $p < .001$

Appendix B. Technical Notes

B-1 The 2004–2005 8th-grade cohort comprised students who were not repeating 8th grade from the previous year (i.e., first-time 8th graders).

B-2 DPE staff used logistic regression analyses to establish the strength of each indicator as a good predictor of high school dropout. Logistic regression is used for predicting the probability of the occurrence of an event. A logistic model determines whether the difference in event occurrence, provided a specific condition is significant, and provides an odds ratio estimate of the occurrence of the event, given the condition. A predictor in probability modeling is an indicator that influences the likelihood of a particular outcome. Of the 19 indicators examined, only eight significantly influenced the likelihood of an 8th-grade student dropping out at any time between 2005 and 2009.

B-3 The logistic model determined that the condition of limited English proficiency (LEP) was not a significant predictor of student dropout. The greater odds associated with LEP students dropping out of school was explained by the greater number of Hispanic students dropping out of school; 13% of LEP Hispanic students dropped out at any time between 2004 and 2009; 11% of non-LEP Hispanic students dropped out during that same time interval. In general, 8th-grade LEP Hispanic students have nearly the same odds of dropping out of school as do non-LEP Hispanic students.

B-4 While males were more likely than were females to drop out of school (see Table A-1). TAKS performance and failing semester grades in ELA, math, and science contributed to the difference in probabilities.

B-5 Failing to meet minimum standards on 8th-grade reading, math, or both TAKS tests explained the greater likelihood of African American and Hispanic students to drop out of school compared with students of other ethnicities.

B-6 Although students receiving special education services were nearly twice more likely to drop out of school than were students not requiring special education services, lower daily attendance and greater inter-district mobility explained the difference in dropout rates. The full model presented in Figure 1 does not include students receiving special education services. By removing these students, the effect of inter-district mobility and attendance rates of less than 90% on the full model were more conservative, and the predictive validity of the model was not significantly affected.

B-7 Intra-district mobility contributed to the elimination of students' enrollment for fewer than 170 days as a good determinant of high school dropout rate. In general, students who moved to a different AISD school in the year were more likely to be enrolled for fewer than 170 days than students who were not mobile within the district.

B-8 PEIMS 425 records disciplinary action code "07" was used to indicate enrollment in a disciplinary campus.