A Meta-Analysis of Dropout Prevention Outcomes and Strategies

Shanan L. Chappell, PhD • Old Dominion University
Patrick O'Connor, PhD • Kent State University
Cairen Withington, MA • Clemson University
Dolores A. Stegelin, PhD • Clemson University

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Please direct all correspondence regarding this meta-analysis to:

Dr. Shanan L. Chappell
Research Assistant Professor
The Center for Educational Partnerships
Darden College of Education
Old Dominion University
Norfolk, VA 23508
schappel@odu.edu
757-683-6957

For additional information regarding the NDPC/N and its work contact:

Dr. Sandy Addis
National Dropout Prevention Center/Network
Eugene T. Moore School of Education
Clemson University
209 Martin Street
Clemson, SC 29631
haddis@clemson.edu
864-656-2599

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A Technical Report by

Shanan L. Chappell, PhD
Patrick O'Connor, PhD
Cairen Withington, MA
Dolores A. Stegelin, PhD

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Foreword

A History of the Discovery of 15 Effective Strategies for Dropout Prevention
Jay Smink, PhD, Retired Executive Director, National Dropout Prevention Center/Network

Almost from the start of the public schools system in America, we have had students leaving school without high school diplomas. However, the dropout issue did not rise to the level of significance it has today until the early 1980's when social pressures along with business leaders leveraged their influence on educators to address the dropout issue in an attempt to find an acceptable workforce. The business and corporate world began to recognize how America's graduates were poorly prepared for the workplace compared to graduates from other nations. This realization sparked many different initiatives to target the world of school dropouts including two developmental approaches with implications to the solutions and strategies now used to address school dropouts.

One initiative was driven by a group of business leaders to form a national center focused on the dropout crisis. Concurrently, there was a similar initiative to form a national network of practitioners and researchers to address the dropout issue. Both initiatives were birthed almost simultaneously and eventually combined forces to form The National Dropout Prevention Center/Network (the Center), located at Clemson University in South Carolina. Begun in 1986, the Center was developed to serve as a clearinghouse on issues related to dropout prevention and to offer effective strategies designed to increase the graduation rate in America's schools.

From the beginning of the Center, one major mission was to develop a database of model dropout prevention programs. In addition, the initial database had numerous other components including professional development activities, active research projects, and a listing of organizations providing professional services related to the dropout issue. Separate lists of leading experts in the field of dropouts were also included and eventually the database was refined to focus mostly on model dropout prevention programs.

Throughout the refinement of the database it became clear that practitioners, business and community leaders, and legislators were focused on securing research and statistics related to the dropout issue. However, the dominant request from practitioners was to identify and implement dropout prevention programs that would "fix" the dropout crisis. These needs were clearly met by the database because it grew to include more than 500 model dropout prevention programs. These programs were self-reported from local education agencies, state education agencies, and national organizations that nominated their successful lighthouse programs to be included in the prestigious and user-friendly database.

The database provided an excellent pool of successful model programs to be promoted by the Center and then to be reviewed by local districts and schools searching for proven dropout prevention programs. However, as practitioners were gaining experiences in matching programs to meet their needs, they began to request additional information about the programs. This request for additional information about programs prompted the Center to initiate a more thorough and comprehensive analysis of the model programs.

In the early 1990s, I initiated a systematic review focused on all of the programs in the database. The intent of the research was to review each program to see the multiple design patterns in the programs such as objectives, instructional activities and tasks, staff training and engagement activities, management practices, and evaluation methods and findings. This analysis attempted to find common ground in the programs that could be used to guide potential users in their planning efforts to reduce the school dropout rates. The result of this thorough review of each program identified about 50-55 categories of descriptors that were most common in the database of programs. Some of the early findings confirmed the three structures used in the database, which were characterized as prevention, intervention, and recovery programs. Other structures that became obvious were community settings such as rural, suburban, and urban. Another main focus was the location of the high-risk students, which was either elementary, middle, or high school.

The Center began to promote these 50-55 categories of additional information and quickly found the information was useful but it was too broad and very difficult to use effectively at the school level or in community-based programs. Therefore, a more systematic and in-depth analysis was initiated to gain easier access to each of the programs and make a more accurate match between the needs of schools and communities and strategies used by successful programs. Completed in 2000, this second review of the model programs and their related categories provided a higher level of descriptive information and provided the first glimmer at a smaller number, approximately 25 categories, and a different structure for the commonalties found in the model programs.

Continued research of this information about models programs along with feedback from practitioners led directly to the 15 Effective Strategies for Dropout Prevention now promoted by the Center and used in many state agencies and school districts across America. However, there remained one last refinement of the 15 strategies and that was the final structure used to present the strategies to a wider audience of school and community leaders and to promote their use in a comprehensive dropout prevention plan at the school district level. These final 15 strategies are examined in this report, bringing the work on the NDPC to a more scientific level to further promote the effectiveness of the strategies in combating the national dropout crisis.

A Meta-Analysis of Dropout Prevention Outcomes and Strategies

The impact of dropping out of high school has implications on individuals as well as society overall. Research tells us that about one million students drop out every year, and nearly half of all African Americans, Hispanics, and Native Americans fail to graduate (Bridgeland, DiIulio, & Morison, 2006). These alarming statistics have far-reaching consequences for these individuals and the country's economic and civic health, as dropouts are more likely than high school graduates to be unemployed, in poor health, living in poverty, in prison, on public assistance, and to have children who also drop out of high school (Bridgeland et al., 2006). On average, a high school dropout earns $9,200 less per year than a high school graduate, and about $1 million less over a lifetime than a college graduate.

Over the past three decades, researchers and organizations have sought to identify those factors that put students at risk of dropping out of high school. The research indicates that dropout risk factors are many and are multifaceted (Hammond, Linton, Smink, & Drew, 2007; Smink & Schargel, 2004). As we become familiar with dropout risk factors and the impact of dropout on individuals and our society, it has also become clear that we need to determine the best solutions for each risk factor to reduce or eliminate the risks. The ultimate goal is to help schools create the most engaging environments to successfully prepare kids to graduate with clear pathways to rewarding postsecondary lives.

Although numerous evaluations have been conducted on the impact of dropout prevention programs, there is little evidence that relates particular prevention strategies to dropout and graduation rates. In fact, there have been no rigorous syntheses of dropout prevention strategies to help identify the most successful features of these efforts and assist educators and policymakers categorize programs based on scientific evidence. We initiated this study to provide sound, empirical support of the most effective strategies for preventing dropout and improving graduation rates for all students.

Theoretical Framework

Since 1986, the National Dropout Prevention Center (NDPC) has focused on its mission to reduce the national dropout rate by meeting the needs of youth in at-risk situations. The Center has partnered with school districts and statewide departments of education, sponsored workshops and national conferences for researchers and practitioners, and collaborated with policymakers to help meet their respective goals. During this time, researchers at the NDPC identified 15 research-based strategies that have the most positive impact on the high school graduation rate. Though these strategies are independent of one another, in practice they work well together and frequently overlap. Further, the NDPC has gathered evidence that these strategies can be successful in all school levels from K-12 and in rural, suburban, or urban settings (Smink &

Schargel, 2004). However, while the literature identifies methods that may in part alleviate or eliminate the at-risk population, no synthesis of the literature has been conducted to establish which program strategies are most successful in reducing dropout rates and improving graduation rates.

Based on the body of research on dropout prevention, many schools, districts, and states are making appreciable gains in graduation rates. Over the most recent seven years, 42 states have, on average, increased their averaged freshman graduation rates by up to 2.4% per year. However, not all schools, nor all states, have shown such progress. In addition, funding for education is often the first on the chopping block in many areas of the nation (see *Trends in AFGR, Dropout, and Funding*, NDPC, 2013a). Cuts in funding and continued struggles to address the dropout issue mean that efficiency and effectiveness are perhaps even more crucial today than ever.

Purpose of the Study and Research Questions

The purpose of this study was to provide an overall estimated effect size of dropout prevention efforts on dropout and graduation rates and to provide estimated effect sizes of research-based strategies on these two outcome variables. However, our search of the literature rendered less than 30 evaluations that (a) included graduation rate as the dependent variable and (b) met our inclusion criteria. This small number of evaluations did not allow for examination of the strategies as predictors of graduation rates. However, we foresee that changing in the near future as states have begun to include graduation rate as a measure of student and school success, which should translate into more studies/evaluations that use graduation rate as the dependent variable.

Our final analyses focused on the following four research questions:

1. What are the mean effect size estimates of dropout prevention programs on dropout rates?
2. What are the mean effect size estimates of dropout prevention programs on 4-year graduation rates?
3. How do dropout rate effect sizes vary as a function of prevention strategies?
4. Which dropout prevention strategies are significant predictors of the overall dropout rate?

Method

We employed a meta-analysis research design (Borenstein, Hedges, Higgins, & Rothstein, 2009) to estimate a mean effect size of dropout prevention efforts on dropout and

graduation rates. The meta-analytic approach requires a number of steps from determining inclusion criteria, identifying variables and predictors to examine, conducting a search for appropriate studies, and coding studies according to the chosen predictors. Once all data were extracted and the studies were coded for predictors, we calculated overall estimates of effect size for the two dependent variables (separate analyses were conducted for each variable) and then for each strategy's impact on dropout rates. We also conducted a meta-regression to determine which dropout prevention strategies were statistically significant predictors of the dropout rate effect size. Institutional Review Board approval was not necessary because this study entailed a review of previously published research and the analyses included secondary data.

Selection Criteria

To be included in this meta-analysis, dropout prevention program evaluations[1] were required to meet the following criteria:

- Program evaluations must have been conducted using an experimental, quasi-experimental, or ex post facto design.
- Evaluations must include description of sample (size, demographic breakdown, sampling method, etc.).
- Evaluations must report an effect size or contain enough data to establish an effect size.
- Evaluations must measure dropout rate and/or graduation rate using a standardized measure or definition *and* using program participation as the independent variable.
- Evaluations must contain data describing program strategies and components.

Data Sources and Sample

All available dropout prevention program evaluations were examined for inclusion in this study. First, we reviewed the Model Programs Database established by the National Dropout Prevention Center. The NDPC established this database to identify programs according to the level of evidence of effectiveness. All those programs categorized as having a strong evidence of success were reviewed to gather evaluations conducted using experimental designs.

We also accessed the What Works Clearinghouse (WWC), a resource provided by the U.S. Department of Education's Institute of Education Sciences. The WWC presents some evidence of selected dropout prevention programs that have been submitted for inclusion in the WWC. Many of these did not meet WWC standards, but 19 dropout prevention program evaluations presented small or medium to large effect sizes (U.S. Department of Education, 2013).

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[1] The terms "study" and "evaluation" are used interchangeably in this report.

Additionally, other database searches were conducted seeking dropout prevention program evaluations. ERIC (Education Resources Information Center), a source for full-text articles and abstracts from educational journals; and PsycINFO, a database containing full-text and summarized scholarly articles, books, and dissertations; were accessed in this search. Reference sections and bibliographies from evaluations found through these search methods were also reviewed for additional studies, which were included in this analysis. Any evaluation that met the inclusion criteria was included.

We reviewed over 500 studies that evaluated dropout prevention efforts. Overall, we included 67 effect sizes[2] from 35 programs in the dropout rate analysis and 26 effect sizes from 16 programs in the graduation rate analysis that met our inclusion criteria. Sample sizes were $n = 42,291$ (23,535 treatment and 18,756 comparison) for the dropout rate analysis and $n = 310,257$ (43,111 treatment and 267,146 comparison) for the graduation rate analysis. Technical Appendix A lists the studies included in this report along with their corresponding numbers of dropout and/or graduation rate effect sizes.

Data extracted from each evaluation included sample sizes, means, and standard deviations for treatment and comparison groups, and effect sizes. We used the standardized mean difference value as effect size to allow for a standardized measure of impact across studies. Where standardized mean difference effect sizes were not reported, we gathered the reported outcome statistics and transformed them into standardized mean difference effect sizes using the Comprehensive Meta-Analysis software (Borenstein, Hedges, Higgins, & Rothstein, 2013). Program information was also gathered from the studies, including program name, program strategies (these were included as predictors in the analyses), and year the study was conducted.

Model diagnostics. Diagnostic procedures indicated that six of the effect sizes for the dropout rate analyses violated assumptions of the model. These six effect sizes were removed from all subsequent dropout rate analyses. All of the graduation rate effect sizes fell within the acceptable diagnostic ranges and were retained in the appropriate analysis. The final analysis sample included 61 effect sizes from 30 programs, with $n = 38,155$ (21,255 treatment and 16,900 comparison) for the dropout rate analyses and 26 effect sizes from 16 programs, with $n = 310,257$ (43,111 treatment and 267,146 comparison) for the graduation rate analysis.

Analytic Approach

The meta-analytic approach allows us to either determine a fixed effect or calculate an overall mean effect. The fixed effect approach is used when all the included studies have very similar individual effect sizes. When that is not the case, the random effects model is appropriate

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[2] Some evaluations contained more than one effect size, so overall n's are reported in effect sizes rather than number of studies included.

(Borenstein et al., 2009). The random effects model allows us to calculate an overall mean effect across the varying effect sizes using a weighting procedure. We used the random effects model and applied the weighted linear combination approach to allow studies with larger sample sizes to carry more weight. Because studies with large sample sizes are considered to have higher statistical power, this provided a more accurate and representative overall mean effect size for each of our outcome variables and each of the strategies we examined as predictors of dropout rates (Hedges & Olkin, 1985).

Predictors/Strategy Variables

In our analysis, we included program strategies as predictor variables to examine if the dropout rate varied as a function of these program strategies and to determine if any of the strategies statistically significantly predicted the overall effect size for the dropout rate. First, we needed to establish effective strategies for dropout prevention and graduation rate improvement. To do this, we accessed the current *Effective Strategies for Dropout Prevention* Web page (2013b) on the National Dropout Prevention Center's Web site. The NDPC has identified 15 strategies that have been shown in the literature to have positive impacts on dropout rates. These strategies have been implemented successfully at all education levels and environments throughout the nation. The strategies are: Systemic Renewal, School-Community Collaboration, Safe Learning Environments, Family Engagement, Early Childhood Education, Early Literacy Development, Mentoring/Tutoring, Service-Learning, Alternative Schooling, After-School Opportunities, Professional Development, Active Learning, Educational Technology, Individualized Instruction, and Career and Technology Education (CTE; see Appendix B for strategy definitions and descriptions).

These overarching strategies were further partitioned into definable, tangible strategies to be used as predictors in the mixed effects models. To do this, we relied upon the 2007 report by Hammond et al. titled *Dropout Risk Factors and Exemplary Programs: A Technical Report*. The strategies we examined in our analysis are:

- Academic Support
- Afterschool
- Behavioral Interventions
- Career Development/Job Training
- Family Engagement
- Health and Wellness
- Life Skills Development

- Literacy Development
- Mentoring
- School/Classroom Environment
- Service-Learning
- Work-Based Learning

We also intended to include Adult Education, Credit Recovery, and Gang Prevention/Intervention as predictors of the dropout rate effect size in our analyses but these three strategies were not widely represented in the included evaluations and therefore we were unable to calculate effect sizes for each. See the attached Appendix for complete strategy definitions and example of services provided under each strategy.

Coding Procedures

Each of the four authors served as raters for the strategy coding procedures. The list of programs to be included in the final analyses was provided to each rater along with an electronic coding spreadsheet which included the programs to be coded and complete strategy definitions, descriptions, and services that applied to each strategy. Additionally, coders attended a training session that provided hands-on coding practice. We employed a dummy-coding approach, where a study received a code of "1" if it employed a given strategy and "0" if it did not. A total of 34 programs were coded by 2 independent coders each, with each coder rating 17 programs (not all 34 programs ended up in the final analyses as indicated in the *Diagnostics* section above). To determine interrater reliability, Pearson product moment correlations were conducted between the two coders for each program (Multon, 2010).[3] Correlations were calculated for each rating team (coders 1 and 2, coders 1 and 3, coders 1 and 4, coders 2 and 3, coders 2 and 4, and coders 3 and 4) and then averaged to determine an overall interrater reliability coefficient of .71, which exceeded the acceptable rate of .70 (Multon, 2010).

Results

Research Questions One and Two

Standardized mean difference effects and sample sizes for each included study were used to calculate weights to be used in the random effects model for the dropout rate analysis. Using Borenstein et al.'s (2009) estimation of effect sizes, the overall weighted mean effect on dropout rates was estimated at $d_+ = .15$ with an overall variance of $\sigma^2(d_+) = 0.001$. The standard error of the mean was .03. To test for statistical significance of the overall effect size, 95% confidence

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[3] The kappa statistic is often used to calculate interrater reliabilities but it was not appropriate here because (a) only two coders rated each program and (b) programs and coders were not fully crossed. In this case, the Pearson product moment correlation was an appropriate measure of interrater reliability (Multon, 2010).

intervals were calculated using the standard error of the mean and standard normal distribution values of +/- 1.96. The results indicated that the overall mean effect was statistically significant, with $\delta_L = 0.08$ to $\delta_U = 0.21$. Table 1 reports model statistics for the dropout and graduation rate analyses.

Similarly, standardized mean difference effects and sample sizes for each included study were used to calculated weights to be used in the random effects model for the graduation rate analysis. The overall weighted mean effect on dropout rates was estimated at $d_+ = .36$ with an overall variance of $\sigma^2(d_+) = 0.005$. The standard error of the mean was .07. To test for statistical significance of the overall effect size, 95% confidence intervals were calculated using the standard error of the mean and standard normal distribution values of +/- 1.96. The results indicated that the overall mean effect was statistically significant, with $\delta_L = 0.23$ to $\delta_U = 0.49$.

Table 1
Overall weighted mean effect sizes by outcome.

| Outcome | # of Studies Included | Effect Size (*d*) | *SE* | 95% Confidence Interval | | Test of Heterogeneity | | |
				Lower	Upper	*Q*	*df*	*p*
Dropout rate	61	.15*	.03	.08	.21	397.56	60	<.001
Graduation rate	26	.36*	.07	.23	.49	454.54	25	<.001

*Indicates statistical significance at the .001 level

Sensitivity Analysis

To determine if the results of the two main analyses would change if one study was removed, we conducted sensitivity analyses using the Comprehensive Meta-Analysis software. For the dropout rate effect sizes, the overall values with one study removed ranged from .136 to .157 (overall effect size was .149) and were all statistically significant ($p < .001$). This indicated that the results from the overall dropout rate analysis would not be different if any of the 61 included effect sizes were removed. Results from the graduation rate sensitivity analysis revealed effect sizes of .313 to .391 (overall effect size was .36) and were all statistically significant at the .001 alpha level. Again, this indicated that the results of the overall graduation rate effect size would not differ if any of the 26 effect sizes were removed from the analysis.

Publication Bias

We used Rosenthal's *Fail Safe N* (Rosenthal, 1979; Begg & Mazumdar, 1994) approach to examine publication bias for the dropout rate and graduation rate analyses. Assuming a nil effect, we would need 1,677 studies for the dropout rate analysis to bring the significance level above the .05 alpha level. For the graduation rate analysis, we would need 1,223 studies to bring the overall effect to a level of nonsignificance.

Research Question Three

We also conducted group analyses to determine how the dropout rate varied as a function of prevention strategies employed by the programs evaluated in the included studies. We used Borenstein et al.'s (2009) mixed effects model to estimate overall effects of programs that employed each of the 12 strategies identified above. In these analyses, we were only measuring the effect of each strategy individually on the dropout rate. Research question four addresses the impact of all of the strategies together as determined by the meta-regression procedure.

Four strategies revealed larger effect sizes than the overall effect of .15: Behavioral Intervention, Career Development/Job Training, Family Engagement, and Literacy Development. This means that programs that employ these strategies have larger dropout rate effect sizes than those who do not employ the strategy. Four others have effect sizes that are about the same as the overall effect: Academic Support, Health and Wellness, Life Skills Development, and Mentoring. However, the effect size for those studies that did not include these strategies is equivalent or larger than those that did. Four strategies had smaller effect sizes for those that included the strategy: Afterschool, School/Classroom Environment, Service-Learning, and Work-Based Learning. However, effect size by subgroup were only statistically significantly different for four of the strategies: Career Development/Job Training and Family Engagement, where the programs that employed these strategies had statistically significantly higher effect sizes than those who did not, and School and Class Environment and Service-Learning, where the programs that employed these strategies had statistically significantly smaller effect sizes than those who did not.

These findings should be taken into context with the fact that each strategy was analyzed independently of the others. In other words, these results do not taken into account any confounding effects of other variables on the effect size outcomes. Table 2 reports the model statistics by subgroup for each strategy, including effect sizes and between-group statistics for each strategy.

Table 2

Overall weighted mean dropout rate effect sizes by strategy.

Strategy	# of Studies Employing Strategy	Effect Size (*d*)	Test of Heterogeneity		
			Q	*df*	*p*
Academic Support					
No	2	.43	0.88	1	.35
Yes	59	.14			
Afterschool					
No	40	.18	2.24	1	.14
Yes	21	.09			
Behavioral Interventions					
No	28	.12	0.94	1	.33
Yes	33	.18			
Career Development/Job Training					
No	48	.12	6.25	1	.01
Yes	13	.35			
Family Engagement					
No	29	.06	8.13	1	< .01
Yes	32	.21			
Health and Wellness					
No	39	.16	0.09	1	.76
Yes	22	.14			
Life Skills Development					
No	35	.15	0.01	1	.95
Yes	26	.15			
Literacy Development					
No	53	.15	0.39	1	.53
Yes	8	.18			
Mentoring					
No	36	.16	0.10	1	.76
Yes	25	.14			
School/Classroom Environment					
No	24	.29	4.25	1	.03
Yes	37	.11			
Service-Learning					
No	54	.18	11.44	1	< .01
Yes	7	-.15			
Work-Based Learning					
No	53	.17	3.01	1	.08
Yes	8	-.01			

Research Question Four

Finally, we conducted a meta-regression to determine if any of the strategy variables (covariates) were able to statistically significantly predict the overall dropout rate effect size. First, a model was converged that included all 12 predictor variables to determine the variance (R^2) accounted for by the set. The application output includes several scenarios to assist in determining the most appropriate model for the given task, including correlation and increment matrices. The correlation matrix identifies correlations among covariates; strong correlations indicate that two or more covariates are highly confounded and should not be analyzed independent of one another. The increments matrix reports results from an automated series of analyses that incrementally introduce each of the covariates into the model, collating the changes in the variance accounted for at each iteration, or increment. This allows the researcher to easily identify any covariates that have a nil or negative impact on R^2. An examination of these two matrices can provide the researcher with knowledge regarding any covariates that may be able to be removed to develop the most appropriate model for explaining the variance of an effect.

Examination of the correlation matrix in our analysis revealed no strong correlations (correlations were all < +/- .50) between any of the 12 covariates, indicating that covariates were not highly confounded and that covariates could be removed from the model if desired. Additionally, an examination of the increments matrix indicated that the Afterschool and Life Skills Development covariates negatively influenced R^2. These two covariates were removed from the model and the meta-regression was conducted with just 10 covariates: Academic Support, Behavioral Intervention, Career Development/Job Training, Family Engagement, Health and Wellness, Literacy Development, Mentoring, School/Classroom Environment, Service-Learning, and Work-Based Learning.

The results of the test of the model revealed a Q value of 101.59 with $df = 10$ and $p <$ .001, indicating that at least one of the covariates is likely related to the overall dropout rate effect size. However, the goodness of fit test indicated that the model is still incomplete ($Q =$ 103.42, $df = 50$, $p < .001$), suggesting that there are other (unknown) covariates that could help explain the variance in the dropout rate effect. The total variance in true effects (between-study T^2) was .042 and the variance not explained by the model (null model T^2) was .01, with an R^2 value of .76. This means that though the model explains 76% of the between-study variance in effects, only 3.2% of the overall variance is explained by the model.

Though the model is not complete in terms of explaining the variance within the overall dropout rate effect size, the model did identify eight of the 10 variables as being statistically significant predictors of the dropout rate effect. Further, effect sizes for each of the 10 covariates can be calculated from the coefficient values. These effect sizes differ from the effects reported above in that they are the effect sizes for each strategy *holding all other covariates constant.*

This allows us to calculate an effect size that accounts for any confounding effects of other covariates. The model revealed effect sizes for the 10 covariates ranging from .11 to .81, all of which are statistically significant predictors of the overall dropout effect except Career Development/Job Training and Mentoring. Table 3 reports the complete model statistics by covariate for the dropout rate meta-regression and Table 4 reports the effect sizes derived from the meta-regression for the 10 included covariates in order of effect size.

Table 3
Meta-regression model statistics for dropout rate analysis.

Covariate	Coefficient	SE	95 % Confidence Interval		p
			Lower	Upper	
Intercept	0.43	0.10	0.23	0.63	0.00
Academic Support	-0.32	0.12	-0.55	-0.09	0.01
Behavioral Intervention	0.04	0.06	-0.09	0.16	0.56
Career Development/Job Training	0.39	0.07	0.24	0.53	0.00
Family Engagement	0.25	0.05	0.15	0.34	0.00
Health and Wellness	-0.25	0.06	-0.37	-0.13	0.00
Literacy Development	-0.01	0.07	-0.14	0.12	0.91
Mentoring	0.20	0.06	0.09	0.31	0.00
School/Classroom Environment	-0.18	0.06	-0.29	-0.06	0.00
Service-Learning	-0.22	0.09	-0.39	-0.06	0.01
Work-Based Learning	-0.17	0.08	-0.34	-0.01	0.04

Table 4

Strategy effect sizes from meta-regression model.

Strategy	Effect size	p
Career Development/Job Training	0.81	0.56
Family Engagement	0.67	0.00
Mentoring	0.63	0.91
Behavioral Intervention	0.46	0.01
Literacy Development	0.42	0.00
Work-Based Learning	0.26	0.01
School/Classroom Environment	0.25	0.00
Service-Learning	0.21	0.00
Health and Wellness	0.18	0.00
Academic Support	0.11	0.00

Discussion and Implications

Improving dropout rates and graduation rates are actually comprehensive K-12 issues, although much of the prevention work occurs at the high school level. To appropriately interpret the effect sizes estimated here, we need to view them in light of other high school reform efforts. Research indicates that mean effects for high school reform efforts are estimated at about .24 (Hill, Bloom, Black, & Lipsey, 2007). However, these are effect sizes that represent school-wide populations, not just the at-risk or very at-risk populations that are included in most of the studies we have included here. In that context, we interpret our overall effect sizes of .15 for dropout rate as promising and .36 for graduation rate as excellent. These effects provide us with an indication that dropout efforts are resulting in positive impacts on students, which is especially important considering the cost of dropouts on society and individually.

This is good news for a couple of reasons. First, many of these programs are implemented using taxpayer dollars; others are funded through private sources. Second, substantial resources other than finances go into these programs, including time and research. There is obviously still substantial work to be done in the dropout prevention field, but our results indicate that we are making progress in the area. Hopefully, the positive results will allow us to more smoothly build or extend relationships with schools and program developers as we now have empirical evidence to identify those strategies that are impactful on dropout rates. Programs that employ these strategies have larger effects than those who do not, particularly those programs that include Family Engagement, Behavioral Intervention, and Literacy

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Development strategies. Other strategies, however, such as Work-Based Learning, School/Classroom Environment, Service-Learning, and Health and Wellness are also significant predictors of positive dropout prevention outcomes, as is Academic Support.

Costs involved with implementing prevention programs are often quite large, and can inhibit broad scale implementation of programs. Not surprisingly, some strategies are more costly to implement than others, some are more appropriate to specific populations and settings than others, and some are more easily modified to fit within existing programs and processes than others. Those needing to make decisions about program implementation usually know these types of constraints but until now have not been aware of the varying strengths of strategies.

Ultimately, we foresee our findings as being influential in policy and practice as it will allow us to help schools "personalize" programs that have the best chances of promoting students beyond high school onto meaningful college or career pathways.

Implications for Practitioners

For those who work directly in schools and community-based organizations as well as key stakeholders who support their efforts, the findings here provide compelling empirical data which points to family engagement, behavioral intervention, and literacy development as the most significant evidence-based solutions to address the dropout problem in America. Given that programming for school and community-based projects can be quite costly and many districts, especially those serving students in at-risk situations, are woefully underfunded, these findings enable youth leaders and advocates to narrow the focus of resources. Financial, human, and material resources can be redirected toward strategies that ultimately improve efficiency and effectiveness and therefore should result in better and more meaningful student outcomes.

School boards, school and district administrators, teachers, and community service organizations should reflect on the findings here and review current policies, practices, and programs for alignment. Should there be dissonance between current practices and those aligned with the results, programming modification should be considered. The following are suggestions for specific areas to target:

Implications for school boards and district administrators. While policy development related to the findings of the meta-regression is highly recommended, school boards and district administrators should conduct a self-assessment to determine all programming both central to and tangential to dropout prevention efforts. Where feasible, ineffective policies, practices, and programs should be reformed to conform to the findings emergent in the meta-analysis. Broad scale implementation of effective programming should be pursued versus continuation of multiple programs deemed ineffective.

Because *Family Engagement* emerged as the most significant factor and families have an indelible impact on both the performance and the behavior of their children, districts should examine current practices related to family engagement. Central to this examination is the common understanding of the term *family*. As many youth in at-risk situations may see their biological/nuclear family as an impediment to success, districts must recognize that the term *family* is relative to each student. Caring influential adults who offer real-time guidance to youth in at-risk situations could very well be regarded as extended family. Nonetheless, once *family* is defined for individual students, districts can deliberately include them in their programming through regular and meaningful two-way communication.

Implications for schools and community-based organizations. Practitioners working directly with students in at-risk situations who are on the verge of leaving school before graduation should understand the findings and the triad nature of the most significant factors: Family Engagement, Behavioral Intervention and Literacy Development. As *Family Engagement* is understood to be the practices that engage and inform parents and families of the performance and behavior of their child(ren)/family member, strategies that include the family in behavioral intervention and/or literacy development will undoubtedly have a positive compounded effect.

Family Engagement coupled with *Behavioral Intervention* may offer the most useful and scalable model. Whereas some families may see literacy development as academic (school's role), behavior is different. Families see behavior as a home issue and will more readily address this (in collaboration with school officials) as they feel more empowered and capable to intervene. Thus, families should be considered full partners in decision making that impacts their children, especially regarding behavior modification.

In short, our findings are particularly beneficial to district, school and community-based programs. From this body of work, practitioners are well-positioned to adopt new relevant activities that reduce the likelihood that students will leave school before graduation.

Implications for Policymakers

Our findings would be incomplete without the inclusion of thoughtful, tangible recommendations for policy decisions related to dropout prevention. This section aligns each of the strategies with a set of school policy options.

Academic Support *(Policies that provide academic support for students at risk of dropping out)*

- Implement an early warning system to identify students. The early warning system will include specified early warning indicators on attendance, suspensions, course failure in English or math, and low scores on statewide English and math assessments. Schools can

also identify additional early warning indicators. When a child exhibits two or more early warning indicators, the school-based team will meet to determine appropriate interventions for the student. Require that schools provide parents with at least 10 days' written notice of this meeting and provide the parent the opportunity to participate.

- Include information and data on the school's early warning system in its annual school improvement plan, including data on indicators used, students identified with two or more indicators, students by grade level who exhibit each indicator, and intervention strategies the school is using to improve identified students' academic performance. Schools should also describe in school improvement plans the strategies being used to implement the instructional practices for middle grades emphasized by the district's professional development system.

- Establish requirements that dropout recovery programs must meet, including offering appropriate supports for students, including tutoring, career counseling, and college counseling. Schools should strongly consider that each eligible student in a dropout recovery program have an individual graduation plan developed by the student's assigned academic coach.

- Establish a special student recovery program that offers specified services, including services designed to enable students to obtain high school equivalency certificates.

- Ensure that students who are suspended from school for 10 or fewer consecutive days, whether in or out of school, shall have an opportunity to make academic progress during the period of their suspension, to make up assignments and earn credits missed. Schools should develop a schoolwide education service plan for all students who are expelled or suspended from school for more than 10 consecutive school days, whether in or out of school.

Behavior Intervention *(Policies that identify and address behaviors that predictably lead to dropping out of school)*

- Establish a treatment center for K-12 students. Define treatment as a planned, individualized program of educational, medical, psychological, or rehabilitative procedures, experiences, and activities. The purpose of treatment is to relieve or minimize mental, emotional, physical, or other symptoms; or social, educational or vocational disabilities resulting from or related to a mental or emotional disturbance, physical disability, or alcohol or drug problem. Treatment may also be designed to reduce delinquency and rehabilitate delinquent youth.

- Develop attendance policies with the intent to change behavior, not to punish. Reconsider the use of zero-tolerance policies such as suspensions for truancy and instead consider less severe consequences such as community service or in-school detentions.

Career Development and Job Training *(Policies that support career and job training as essential component of school and demonstrate the relevance of education)*

- Schools should place top priority on career development and job-training teaching and learning strategies and programs to engage students in authentic experiences that utilize project-based learning, community-based learning, and other forms of active learning where a community need is identified and met.

- School should provide formal professional development for teachers to understand the principles of quality career development and job training teaching and learning and programs, develop the skills necessary to integrate this pedagogy in their classes, and recognize the critical role the community plays to engage youth in activities that lead to career competencies.

Family Engagement. *Policies that engage and inform parents and families of the performance and behavior of their child(ren)/family member.*

- Schools should assist parents in gaining knowledge and skills to engage with fellow parents, faculty, staff, and community partners in support of high-quality education for each student.

- Schools should build faculty, staff, and administrator capacity to effectively engage parents in support of their child(ren) through formal professional development and establishing corresponding benchmarks to evaluate impacts on parents and students.

- School administrators should notify a student's parent or guardian of the charges and the reason for the suspension or expulsion in English and in the primary language of the home. The student will also receive written notification, and have the opportunity to meet with school leadership to discuss the infraction. If a student has been suspended or expelled for more than 10 school days for a single infraction or for more than 10 school days cumulatively for multiple infractions, the parent or guardian will receive written notice of the right to appeal and the process for appealing. The principal or his or her designee shall hold a hearing with the student and his or her parent or guardian within 3 school days of the student's request for an appeal. At the hearing, the student shall have the right to present oral and written testimony, cross-examine witnesses, and shall have the right to counsel.

- Policies should provide that no student who has not graduated from high school can be considered to have permanently left public school unless an administrator of the school which such student last attended has sent notice within a period of 5 days from the student's tenth consecutive absence to the student and his or her parent or guardian. The district must offer at least two dates and times for an exit interview between the principal or designee and the student and his parent or guardian to occur prior to the student permanently leaving school. The purpose for the exit interview is to discuss the reasons for the student permanently leaving school and consider alternative education or other placements. The school should be required to publish a model protocol for conducting exit interviews with students and maintain a list of research and information relative to the consequences of dropping out, the benefits of earning a high school diploma, and a list of alternative education resources and programs available to the student.

Health and Wellness *(Policies that support health and wellness in each student to be adequately prepared for school and to fully develop*

- Recognize the importance of student health and wellness and establish a nutrition promotion and education program, physical activity, and other school-based activities that promote student wellness.

- Include nutrition guidelines for all foods available on the school campus to promote student health and reduce obesity.

- Create a school health and wellness committee composed of students, parents, faculty, staff, administrators, school health professionals, and community health organizations to ensure appropriate health and wellness programs are available to each student.

- Inform and update the public about the content, implementation, and impacts of the school's health and wellness policy.

- Periodically measure the extent to which the school is in compliance with the health and wellness policy, the extent to which it compares to model local school wellness policies, and the progress made in attaining the goals of the school's health and wellness policy, and make this assessment available to the public.

Literacy Development *(Policies that support literacy development for students to be successful in school and in life)*

- Conduct a reading intervention pilot program to focus on the use of data coaches to improve reading and literacy, to determine the effectiveness of intense data-focused

professional development, and provide expert support in literacy and early reading instruction.

Mentoring *(Policies that support school-based mentoring activities and programs that effectively engage students as mentors and mentees building their academic and social-emotional knowledge and skills)*

- Ensure that faculty, staff, and administrators understand the rationale for mentoring programs and the positive impacts expected from both the mentor and mentee.

- Provide professional development for each mentor to ensure they understand their responsibilities and how to effectively engage with mentees.

- Mentees should be supported with a mentor and program staff to ensure they are effectively engaged and progressing in academic knowledge and socio-emotional skill development.

- Mentors should meet with their mentees at scheduled times and also meet with the program supervisor periodically to reflect on experiences for continual improvement.

School/Classroom Environment *(Policies that identify, measure and improve the school and classroom environment most conducive to positive student development)*

- Establish a systematic and frequent assessment of the school's climate focusing on safety, trusting relationships, teaching and learning, and physical environment. Use the corresponding data to document the impact on student engagement and reduction of dropouts.

Service-Learning *(Policies that support high-quality service-learning that combine classroom instruction with community service)*

- Provide professional development for teachers, staff, and administrators to understand the characteristics of high-quality service-learning and the necessary administrative support for this pedagogy.

- Create a school-based Service-Learning Advisory Committee that includes students, teachers, administrators, parents, and community partners to integrate and sustain high-quality service-learning.

Work-Based Learning *(Policies that support high-quality work-based learning that engage students in career orientation)*

- Provide a work-based learning program to expand and enhance student's learning with actual job site experiences and facilitate the transition from school to work.

- Ensure students who are engaged in the work-based learning program sign a Work-Based Learning Agreement between the student, parent, school, and the employer.

Conclusions

We hope our findings here will provide a mechanism by which decision makers can weigh the effectiveness and feasibility of particular strategies so they choose the strategies that will give them the most bang-for-the-buck for their education environments. As we finalize this study and extend our research efforts in this area, we believe we are on the verge of having evidence that can be directly applied to practical, real-time decisions made by local school officials. But we also should be able to extend our findings to legislators, policymakers, and program developers at state and national levels to help develop evidence-based solutions to the dropout problem.

Ultimately, it seems appropriate to conclude that our findings should help us achieve our goal of increasing efficiency and effectiveness of dropout prevention programs so we can impact real change. Conducting this meta-analysis of dropout prevention strategies has provided further insight into what we already knew. Previous research identified dropout risk factors, which has helped educators establish methods that may help alleviate or eliminate these risk factors. Unfortunately, many prevention programs require substantial resources (time, personnel, financing), but current economic conditions often prohibit the implementation of such programs on a broad scale. However, by identifying those program strategies that have the strongest probability of positively impacting student outcomes, we can assist schools in selecting those strategies that address their particular school's issues. We plan to extend our research to include additional evaluations and additional predictors to help explain the overall variance in the dropout rate, and to clearly discuss the context in which these strategies are successful.

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APPENDIX

Table A1

Effective Strategies for Dropout Prevention

Strategy	Description
Systemic Renewal	A continuing process of evaluating goals and objectives related to school policies, practices, and organizational structures as they impact a diverse group of learners.
School-Community Collaboration	When all groups in a community provide collective support to the school, a strong infrastructure sustains a caring supportive environment where youth can thrive and achieve.
Safe Learning Environments	A comprehensive violence prevention plan, including conflict resolution, must deal with potential violence as well as crisis management. A safe learning environment provides daily experiences, at all grade levels, that enhance positive social attitudes and effective interpersonal skills in all students.
Family Engagement	Research consistently finds that family engagement has a direct, positive effect on children's achievement and is the most accurate predictor of a student's success in school.
Early Childhood Education	Birth-to-five interventions demonstrate that providing a child additional enrichment can enhance brain development. The most effective way to reduce the number of children who will ultimately drop out is to provide the best possible classroom instruction from the beginning of their school experience through the primary grades.
Early Literacy Development	Early interventions to help low-achieving students improve their reading and writing skills establish the necessary foundation for effective learning in all other subjects.
Mentoring/Tutoring	Mentoring is a one-to-one caring, supportive relationship between a mentor and a mentee that is based on trust. Tutoring, also a one-to-one activity, focuses on academics and is an effective practice when addressing specific needs such as reading, writing, or math competencies.
Service-Learning	Service-learning connects meaningful community service experiences with academic learning. This teaching/learning method promotes personal and social growth, career development, and civic responsibility and can be a powerful vehicle for effective school reform at all grade levels.

Table A.1 *(Continued)*

Strategy	Description
Alternative Schooling	Alternative schooling provides potential dropouts a variety of options that can lead to graduation, with programs paying special attention to the student's individual social needs and academic requirements for a high school diploma.
After-School Opportunities	Many schools provide after-school and summer enhancement programs that eliminate information loss and inspire interest in a variety of areas. Such experiences are especially important for students at risk of school failure because these programs fill the afternoon "gap time" with constructive and engaging activities.
Professional Development	Teachers who work with youth at high risk of academic failure need to feel supported and have an avenue by which they can continue to develop skills, techniques, and learn about innovative strategies.
Active Learning	Active learning embraces teaching and learning strategies that engage and involve students in the learning process. Students find new and creative ways to solve problems, achieve success, and become lifelong learners when educators show them that there are different ways to learn.
Educational Technology	Technology offers some of the best opportunities for delivering instruction to engage students in authentic learning, addressing multiple intelligences, and adapting to students' learning styles.
Individualized Instruction	Each student has unique interests and past learning experiences. An individualized instructional program for each student allows for flexibility in teaching methods and motivational strategies to consider these individual differences.
Career and Technology Education (CTE)	A quality CTE program and a related guidance program are essential for all students. School-to-work programs recognize that youth need specific skills to prepare them to measure up to the larger demands of today's workplace.

Table A2

Service/Strategy Categories.

Service/Strategy Category	Description/Definition	Mapping to 15 Effective Strategies (described below)
Academic Support	Help with remediation, support learning, other than tutoring, such as computer labs; academic skills enhancement programs that use instructional methods designed to increase student engagement in the learning process and hence increase their academic performance and bonding to the school (e.g., cooperative learning techniques and "experiential learning" strategies); includes homework assistance and tutoring.	• Mentoring/Tutoring • Active Learning • Individualized Instruction • Professional Development
Adult Education	Educate adults through a variety of means, such as continuing education courses or online courses; adult secondary education, including GED preparation; English-as-a-Second-Language programs; adult basic education, literacy; work skills or work-based education; lifelong learning/opportunities for adult growth and development.	• Alternative Schooling
Afterschool	Rewarding, challenging, and age-appropriate activities in a safe, structured, and positive environment after regular school hours. They may reduce delinquency by way of a socializing effect through which youth learn positive virtues such as discipline or simply reduce the opportunity for youth to engage in delinquency. This category also includes: **Structured Extracurricular Activities** Recreation, sports, creative, performing arts, academic, or social activities usually in afterschool programs; community service opportunities.	• After-School Opportunities

Table A2 *(Continued)*

Service/Strategy Category	Description/Definition	Mapping to 15 Effective Strategies (described below)
Behavioral Interventions	Individualized interventions designed to decrease a specific behavior, by shaping and reinforcing a desired alternative replacement behavior, while tracking changes over time; designed to improve the individual's overall quality of life (i.e., student development). This category also includes: **Conflict Resolution/Anger Management** Encourage nonviolent dispute resolution through a wide range of processes; teach decision-making skills to better manage conflict; learn to identify interests, express own views, and seek mutually acceptable solutions to disputes. Common forms of conflict resolution include: negotiation, mediation, arbitration, community conferencing, and peer mediation. **Court Advocacy/Probation/Transition** Individuals who serve as advocates for youth with social services, the juvenile justice, or school system to make sure they receive appropriate services; provision of resources and support during transition and reintegration after being released; probation services, monitoring, and support through intensive supervision programs or school-based probation. **Substance Abuse Prevention** Reduce the use or abuse of illegal drugs, alcohol, or steroids by educating youth about the effects of drugs/alcohol/steroids. **Truancy Prevention** Promotes regular school attendance through one or more strategies including an increase in parental involvement, the participation of law enforcement, the use of mentors, court alternatives, or other related strategies.	• Safe Learning Environments

Table A2 *(Continued)*

Service/Strategy Category	Description/Definition	Mapping to 15 Effective Strategies (described below)
Career Development/Job Training	Provision of social, personal, and vocational skills and employment opportunities to help youth achieve economic success, avoid involvement in criminal activity, and subsequently increase social and educational functioning.	• Career & Technology Education
Credit Recovery	An alternative to repeating a course for students who have failed required courses for graduation. Services may be offered online or face-to-face using traditional or technology-based instruction.	• Individualized Instruction
Family Engagement	Encompasses a broad range of events from picnics and field trips to activities that involve families in their children's education. This category also includes: **Family Strengthening** Educating parents on specific parenting skills, management skills, and communication skills; providing education on various topics such as abuse and sexuality; training on ways to assist child academically. **Family Therapy** Focuses on improving maladaptive patterns of family interaction and communication. **Teen Parent Support** Parenting skills training; financial management; other types of training and/or services to assist teen parents in staying in school and developing family life; includes pre-post natal care; and provision of child care for children of teen parents while they attend programs, schools, etc.	• Family Engagement
Gang Prevention/ Intervention	Prevent youth from joining gangs; intercede with existing gang members during crisis conflict situations.	• Safe Learning Environment • School-Community Collaboration

Table A2 *(Continued)*

Service/Strategy Category	Description/Definition	Mapping to 15 Effective Strategies (described below)

*Health and Wellness	Health issues are known to affect a student's risk of dropout and should be addressed to reduce the impact on school experience. These issues may include obesity, mental and physical health as well as the following:
	
	This category also includes:
	
	Mental Health Services
	    Substance abuse treatment such as 12-step programs such as Alcoholics Anonymous or Narcotics Anonymous; counseling related to substance use; counseling related to suicide prevention; counseling related to other mental health syndromes or issues.
	Pregnancy Prevention
	    Aims to reduce the incidence of teen pregnancy through education and provision of comprehensive information.	

*Life Skills Development	Communication skills; the ability to cope effectively with relationships; problem solving/decision making; critical thinking; assertiveness; peer selection; low-risk choice making; self-improvement; stress reduction; consumer awareness; peer resistance; recognize and appropriately respond to risky or potentially harmful situations; appreciation for diversity; social influences on behavior; overviews of conflict resolution skills and social skills; leadership skills/training; and health education.	
Literacy Development	Early interventions to help low-achieving students improve their reading and writing skills establish the necessary foundation for effective learning in all other subjects.	• Literacy Development
Mentoring	Relationship over a prolonged period of time between two or more people where an older, caring, more experienced individual provides help to the younger person as he or she goes through life.	• Mentoring/Tutoring

Table A2 *(Continued)*

Service/Strategy Category	Description/Definition	Mapping to 15 Effective Strategies (described below)
School/Classroom Environment	Reducing or eliminating problem behaviors by changing the overall context in which they occur; interventions to change the decision-making processes or authority structures; redefining norms for behavior and signaling appropriate behavior through the use of rules; reorganizing classes or grades to create smaller units, continuing interaction, or different mixes of students, or to provide greater flexibility in instruction; and the use of rewards and punishments and the reduction of down time.	• Safe Learning Environments
Service-Learning	Community service with integration of service experience into classroom curricula.	• Service-Learning
Work-based Learning	Consists of a variety of learning experiences designed to narrow the gap between theory and practice. Experiences include apprenticeships, career fairs, field studies, mentoring, guest speakers, job shadowing and student internships. WBL can be a component of Career-Technical Education programming or offered to all students usually at the secondary level.	• Active Learning

*Not currently listed as an effective strategy by the NDPC but identified as program characteristic in one or more programs included in the study.

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