

AP EXAM SUBSIDIES IN NORTH CAROLINA

By Dayne Batten, Christopher Britt, Jennifer DeNeal, and Lauren Hales

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POLICY QUESTION: How do LEA subsidies for AP exam fees affect rates of participation and rates of success in AP courses and AP exams?

EXECUTIVE SUMMARY

This study examined the effect of LEA subsidies for AP exams on student participation and success in AP programs. We surveyed all 115 North Carolina LEAs to determine whether or not they paid for students to take AP exams, and found that 19 out of 65 responding LEAs offered full subsidies for AP exams, while another 12 offered partial subsidies. Using random effects models and data from NCDPI and CollegeBoard for the 2003-2004 school year through the 2010-2011 school year, we found evidence that full exam subsidies tend to increase participation in AP exams. We also found a more modest statistical relationship between subsidies and both increased course participation growth and decreased AP exam performance. Overall, though subsidies may decrease the percentage of students passing AP exams, our study found that they increase the total number of students participating and succeeding in AP courses.

INTRODUCTION

ADVANCED PLACEMENT

Advanced Placement (AP) curricula allow ambitious students to pursue college level coursework during their high school tenure. Traditional instructors teach a variety of AP courses in high schools across the country. Procedures and policies for AP courses vary among states and individual Local Education Agencies (LEAs). Students receive letter grades in AP courses, similar to regular academic or honors courses, but also have the opportunity to take AP exams, administered by the CollegeBoard.

CollegeBoard is a non-profit organization seeking to expand access to higher education for all students (College Board 2012a). A key component of its mission includes offering standardized tests to equalize the college application process, including the SAT and AP exams. CollegeBoard currently offers AP exams for 31 different subjects. Individual schools administer AP exams to their students towards the end of each school year, and students who pass their AP exams can often use the AP credit to opt out of introductory college classes.

CollegeBoard currently charges students \$87 per AP exam. However, to facilitate test taking by low-income students, CollegeBoard offers a \$26 exam fee reduction for qualifying students (College Board 2012b). In 2008, the United States Department of Education (USED) created the AP Test Fee Program to help states supplement AP exam fees for low-income students. USED leaves policies concerning AP funding for all other students to individual states and LEAs.

In 2011, over 540,000 U.S. public high school graduates scored a 3 or higher on at least one AP exam during their high school career (College Board 2012c). A score of 3 on AP exams is typically regarded as the minimum threshold of consideration for college credit. In 2011, North Carolina public high school students scored 3 or higher on approximately 48,000 AP exams (out of approximately 81,000 exams taken).



POLICY CONTEXT

In 2012, the North Carolina General Assembly introduced House Bill 965, which proposed fully funding AP exams for all students enrolled in AP courses (General Assembly 2012). The bill also offered monetary bonuses to teachers for each student in their class scoring a 3 or higher on an AP exam. Although the legislation had not passed at the time of this writing, it raises the issue of the impact of AP exam subsidies on AP participation and outcomes. This paper seeks to untangle those questions, using data from North Carolina LEAs.

METHODOLOGY

STUDY SCOPE

Our study examined trends in AP participation and outcomes over an eight year period beginning with the 2003-2004 school year and ending with the 2010-2011 school year. Since we expected larger LEAs to have more diverse AP course offerings, we chose to facilitate more accurate comparisons by limiting our study to five of the most common AP subjects:

- English Language and Composition (English III)
- Calculus AB
- Chemistry
- Biology
- U.S. History

We did not examine AP participation or outcomes for each of these subjects individually but, instead, aggregated data across the subjects to get an overall picture of AP trends in North Carolina.

COURSE DATA

We collected data on all students taking any of the selected AP courses from the North Carolina Department of Public Instruction (NCDPI) NC WISE database. For all students, we obtained records of the AP courses they took, which years they took the courses, their AP course grades, and their LEA. Using this information, we calculated the total number of AP courses taken as well as the percentage of students earning a B or higher in those courses for each LEA in each year of our study.

SCHOOL DATA

In order to understand the influence of various outside factors on AP participation and outcomes, we compiled information on various LEA-level variables, including racial breakdowns and per-pupil expenditures. We also gathered SAT participation rates (percentage of high school juniors and seniors taking the SAT) and SAT average scores as measures of the number of students interested in pursuing a college education, and their relative levels of academic performance. We compiled all of

this information from the NCDPI School Report Card database (Department of Public Instruction 2011a).

We assembled data on poverty rates in each LEA using the Census Small Area Income and Poverty Estimates (SAIPE) program (Census Bureau 2012). We used 2010 estimates as the best approximation of 2011 numbers as SAIPE had not yet published data for 2011. Though this likely introduced a small amount of error in our data, the rates for 2011 were likely very similar to those from 2010, and any variations would have fluctuated randomly, thus preserving the validity of our statistical results.

Finally, we collected high school final Average Daily Membership (ADM) for every LEA between 2004 and 2011. North Carolina tracks ADM monthly, and the final month of information corresponded most closely to the time of AP test administration. We acquired ADM estimates from the North Carolina Public Schools Statistical Profile (Department of Public Instruction 2011b).

AP EXAM DATA

We next obtained data from CollegeBoard on AP exam participation and scores in North Carolina schools. For each school, CollegeBoard reported the total number of exams taken in each subject, as well as a breakdown of exam scores for those subjects. Using these data, we isolated information on the five selected subjects and aggregated the information at the LEA level. Aggregation allowed us to examine the total number of students taking the selected AP exams for all LEAs, as well as a breakdown of exam scores by LEA. Finally, we calculated an exam “pass rate” for each LEA by calculating the percentage of students achieving a score of 3 or higher on AP exams in the selected subjects.

EXAM SUBSIDY DATA

Through an online survey, we asked all North Carolina LEAs whether they subsidized AP exam fees (beyond state and federal subsidies for low-income students), during what years their subsidies applied, and whether or not they covered the full cost of AP exams for all students.¹ Sixty-five LEAs responded to our survey for a response rate of 57 percent.

From the survey data, we created two variables for each LEA in each year. The first variable documented whether or not the LEA paid the full cost of all AP exams taken that year. The second variable documented whether or not the LEA had a partial subsidy policy for that year. Partial subsidies included paying for only a limited number of tests, paying a portion of the fee, or limiting the subsidy only to students who earned a certain course grade or exam score.

STATISTICAL ANALYSIS

In order to study the relationship between AP exam subsidies and AP enrollment, exam participation, and outcomes, we

¹ The full survey instrument is available in Appendix A.

created several variables to facilitate accurate comparison between LEAs. We calculated the total number of AP courses taken and the number of AP exams taken per every 1000 ADM. Using these data and the other information gathered, we used random effects models to examine the independent impact of AP subsidies. Using the random effects models allowed us to account for similarities between yearly data in a particular LEA, increasing the precision of our statistical results.

We gathered data from 65 LEAs over eight years, resulting in a theoretical sample size of 520 observations. However, several LEAs did not begin using NC WISE until after the first years considered in our study, meaning we were unable to gather data for those LEAs for all years. As a result, models involving NC WISE data were restricted to a sample of 425 data points.

RESULTS

SURVEY RESULTS

Since district policies change over time, the total number of districts with subsidies varied from year to year. Among survey respondents² in 2011, 19 school districts (29 percent) reported fully subsidizing AP exam fees for all students. An additional 12 districts (18 percent) reported a partial exam subsidy. Types of partial subsidies included:

- Paying only for the first AP exam
- Paying for AP exams after the third AP exam

- Paying for AP exams only for students who received a C or better in the AP course
- Reimbursing students if they scored a 3 or higher on the AP exam
- Paying a portion of the exam fee

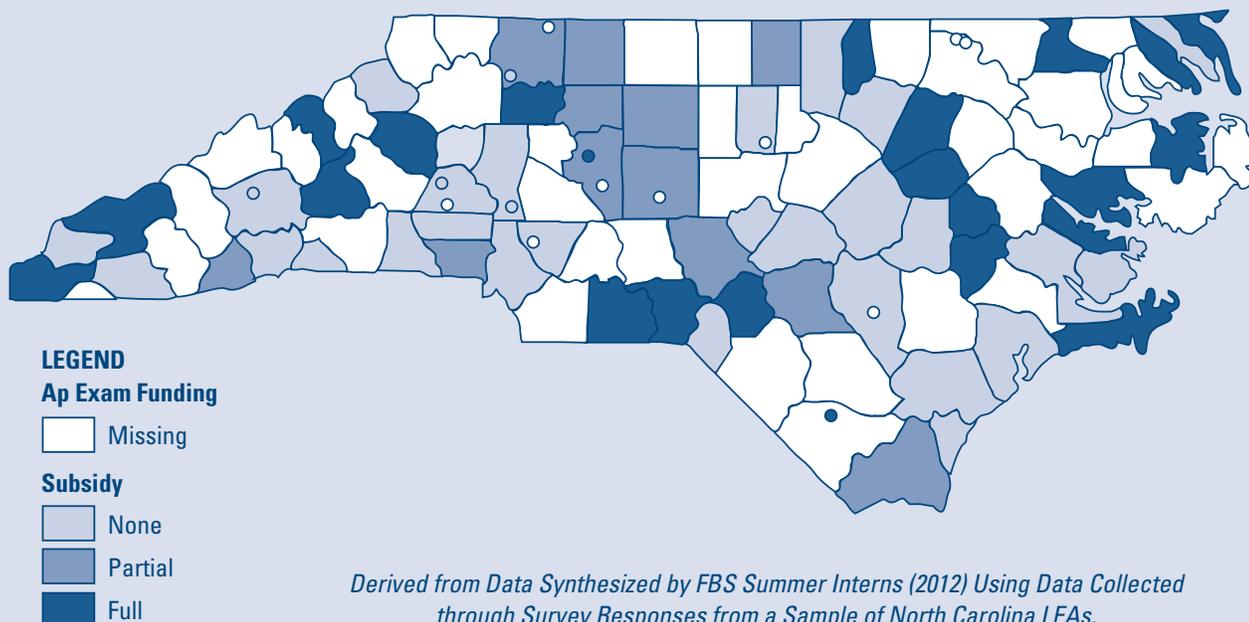
We categorized LEAs that responded to our survey as having a full, partial or no subsidy rather than attempt to statistically account for each of the individual LEA policies. The full distribution of 2011 subsidy policies for responding LEAs is shown in the map below.

Also noteworthy were several LEAs that reported certain policies which did not impact AP exam subsidies, but did set specific requirements for AP exam participation. Such policies included:

- Requiring students to enroll in an AP course to be eligible to take the exam
- Requiring students enrolled in an AP course to take the exam
- Giving only honors course credit to students enrolled in AP courses who did not take the exam (equivalent in terms of quality points to dropping a letter grade)

Furthermore, many LEAs changed their policies for AP exam subsidies over the eight years of our study. We report only the 2011 policies in this map, since they most adequately represent the current state of AP exam subsidies in North Carolina.

DISTRIBUTION OF NC SCHOOL DISTRICTS BY LEVEL OF AP EXAM SUBSIDY



² A full list of survey respondents and survey response data is available in Appendix B.

AP COURSE PARTICIPATION

We used our first model to examine the effects of AP exam subsidies on the number of AP courses taken per 1000 ADM. Our model, shown in the table below, indicated a statistically significant decrease in AP course participation in LEAs subsidizing AP exams. In fact, the model showed that LEAs fully subsidizing course exams tended, on average, to have 16 fewer AP courses taken for every 1000 ADM. Partial subsidies did not impact AP course participation rates.

REGRESSION RESULTS – COURSES PER 1000 ADM

Variable	Coefficient	P-Value
Full Subsidy	-16.3	.001
Partial Subsidy	4.1	.464
SAT Participation Rate	.575	.008
Per-pupil Expenditures (thousands)	7.4	.000
Year 2009	18.4	.000
Year 2010	18.5	.000
Year 2011	25.5	.000

We also found that increased AP course participation was associated with higher per-pupil expenditures and, unsurprisingly, with higher rates of SAT participation. Interestingly, AP course participation rates were considerably higher in the last three years of our study, indicating a statewide trend of increased AP course participation. We found no correlation between racial breakdowns and poverty levels with AP course participation.

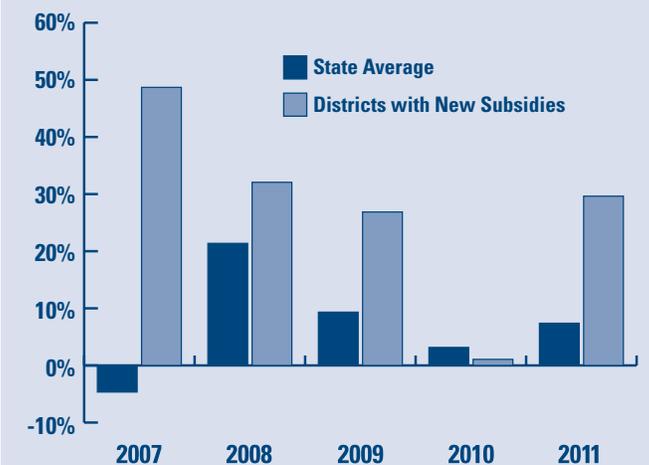
The negative relationship between subsidies and course participation contradicted our expectation that AP exam subsidies would increase the number of students participating in AP courses. We therefore hypothesized that, though AP exam subsidies are *correlated* with lower course participation, they may not be *causing* lower course participation. In fact, the causation might be reversed. LEAs with low AP participation may have introduced subsidies in order to increase their AP course enrollment.

To further explore these relationships, we examined trends in AP course participation for the LEAs that introduced subsidies during the years of our study. Of the responding LEAs, 13 had no subsidies at the beginning of the study period but had adopted full subsidies by the study period's end. Of those 13, we had course enrollment data for the year before the policy change for nine LEAs. Of the nine LEAs for which we had complete information, seven LEAs had AP course enrollments well below the state average in the year before they introduced their AP exam subsidy. These results suggest that LEAs with low AP course participation may be more likely to introduce subsidies for AP exams.

Next, we compared yearly growth in AP course participation in the 13 districts that adopted subsidies during the years of our study to

participation growth throughout the state. Our results, shown in the graph below, revealed that LEAs that introduced full subsidies during the years of our study had higher average enrollment growth in AP courses than the state average from the 2006-2007 to 2010-2011 school years.³ Overall, these results led us to believe that AP course participation was likely lower in LEAs that adopted AP subsidies because LEAs with low enrollment tended to be the ones that chose to subsidize exams. Moreover, the higher yearly course enrollment growth in districts with subsidies indicated that subsidies were helping increase course participation.

ENROLLMENT GROWTH VS. PREVIOUS YEAR



As an example of these trends, consider the experience of Richmond County Schools. In 2006, the year before it introduced full AP exam subsidies, Richmond County's students were taking 38 AP courses per 1000 ADM, which was 31 percent below the state average. By 2011, the fifth year of Richmond's AP exam subsidy, AP course enrollment had nearly doubled to 66 courses per 1000 ADM, which was only 14 percent lower than the state average for that year.

Unfortunately, though our analysis of these 13 LEAs revealed some interesting trends, our data set was not comprehensive enough to support generalized statewide conclusions. In addition to the narrative presented above, it is possible that other factors contribute to lower AP enrollment in LEAs with AP exam subsidies. Possible other factors could include:

1. LEAs subsidizing AP exams may do less to actively facilitate and encourage AP course enrollment. Encouraging more students to enroll in AP courses creates a larger pool of potential AP exam takers, resulting in a higher cost to the LEA.
2. Subsidies eliminate the cost of taking an AP exam and, consequently, make taking the exam a virtually risk-free proposition. Students may be less likely to take AP courses in preparation for the AP exam, as AP courses are more rigorous than a regular or honors course.

³ New subsidy averages reflect only growth in those districts that had introduced subsidies by that year (e.g., if an LEA introduced a full subsidy in 2010, it would only be factored into the average for 2010 and 2011). We did not examine enrollment growth before 2007 because the majority of the LEAs in question had not introduced subsidies before 2007, and those that did lacked sufficient course enrollment data from NC WISE.

Continued study on AP subsidies could further explain these relationships. We recommend more attention to this area in future research.

AP COURSE GRADES

Next, we examined the relationship between AP exam subsidies and the number of students earning a B or higher in AP courses. We observed no relationship between subsidies and course grades.

REGRESSION RESULTS – PERCENT B OR BETTER (AP COURSES)

Variable	Coefficient	P-Value
Full Subsidy	-1.8	.284
Partial Subsidy	-.7	.720
Average SAT Score	-.04	.042
Percent Native American	-.5	.037
Percent African American	-.3	.000
Percent Hispanic	-.3	.028
Percent Poor	.6	.000

We did, however, note that the presence of a larger minority population slightly decreased overall grades in AP courses. Interestingly, LEAs with high average SAT scores tended to have *lower* grades for AP courses, while LEAs with *higher* levels of poverty tended to have higher AP course grades.

AP EXAM PARTICIPATION

We next looked at the impact of AP exam subsidies on AP exam participation. We found that LEAs offering a full subsidy for AP exams tended, on average, to have 9 additional exams taken per 1000 ADM. Partial subsidies did not impact AP exam participation rates.

REGRESSION RESULTS – EXAMS PER 1000 ADM

Variable	Coefficient	P-Value
Full Subsidy	9.0	.026
Partial Subsidy	1.7	.742
SAT Participation	.4	.017
Average SAT Score	.2	.000
Per-pupil Expenditures (thousands)	6.7	.000
ADM	.001	.037
Percent Poor	.6	.000

We also noticed that SAT participation rates, SAT scores, per-pupil expenditures, and ADM were all positively correlated with AP exam participation. Racial composition and poverty rates of districts did not impact exam participation.

AP EXAM SCORES

Finally, we examined the impact of AP exam subsidies on “pass rates”⁴ for AP exams. We found that fully subsidizing the AP exam fee resulted, on average, in a 3 percentage point decrease in the pass rate for AP exams. We are less confident in this result than the other effects observed in our study, since these results are only statistically significant at the 10 percent level. Again, we found that partial subsidies did not impact AP exam scores.

REGRESSION RESULTS – PERCENT 3 OR BETTER (AP EXAMS)

Variable	Coefficient	P-Value
Full Subsidy	-3.2	.097
Partial Subsidy	-2.3	.344
SAT Participation Rate	.3	.001
Average SAT Score	.02	.000
Year 2005	-6.4	.000
Year 2006	-4.4	.003
Percent Poor	.6	.000

We also noted that LEAs with higher SAT participation rates and SAT scores tended to perform better on AP exams. Finally, we found that AP exam “pass rates” tended, on average, to be slightly lower in 2004-2005 and 2005-2006.

DISCUSSION

PARTICIPATION

Increasing participation in AP exams is almost certainly the primary motive behind subsidies. In this regard, full subsidies succeed by increasing AP exam participation. On average, LEAs fully subsidizing AP exams had students taking an additional nine exams for every 1000 ADM every year. Given that the statewide average for AP exam participation during the course of our study was approximately 60 exams per 1000 ADM, nine additional exams represents a substantial increase in AP exam participation. Thus, full subsidies for AP exams are a powerful tool for increasing AP exam participation.

Using the same logic, it seems reasonable that LEAs hope to use AP exam subsidies to increase overall participation in AP courses as well. Though we observed that AP subsidies were correlated with decreased AP course participation, our evidence gave us reason to believe that this relationship resulted from LEAs with low AP participation choosing to introduce subsidies. Those LEAs that introduced subsidies experienced growth in AP course participation significantly higher than the state average. Thus, we conclude that AP exam subsidies represent a tool for increasing AP course participation in LEAs that traditionally have low AP course participation rates.

⁴ As noted earlier, we are using the term “pass rate” as a measure of the percentage of students achieving a score of three or higher on AP exams in the subjects under consideration.

PASS RATES

We found that the number of students getting a 3 or higher on AP exams tended to be about three percentage points lower in LEAs that fully subsidize AP exams. This relationship is most likely explained by students who choose to take the subsidized exam without taking the AP course.

Additionally, it is important to note the difference between the *number* of students passing AP exams and AP exam pass *rates*. Though the percent of students passing AP exams tends to be slightly lower in LEAs with subsidies, the aggregate number of students passing exams is actually higher in these LEAs. Thus, AP exam subsidies increase the total number of students potentially able to receive college course credit through AP, despite the slight decrease in the rate of students passing AP exams.

The decrease in pass rate could be mitigated by an LEA level policy requiring students to enroll in an AP course in order to receive a subsidy for the corresponding AP exam. Such a policy would ensure that the LEA does not fund exams for students that have not completed the preparatory AP coursework. We believe this policy is a better alternative to setting a course grade or AP exam score threshold for receiving an exam subsidy because it encourages all students to participate and benefit from the rigor of the AP course and exam without placing the financial burden of an AP exam on the student.

CONCLUSION

Ultimately, we find that AP exam subsidies are an effective tool for increasing student participation in AP courses and

exams. Though subsidies decrease overall exam pass rates, they increase the total number of students potentially qualifying for college credit through AP exams. We believe that policies tying exam subsidies to course participation could mitigate the decrease in pass rates in LEAs with subsidies. Overall, subsidies for AP exams show promise as a way of increasing the number of students participating and succeeding in the AP process.

POLICY RECOMMENDATIONS

Our findings have several implications for LEA and statewide policies surrounding AP exams:

- 1. LEAs seeking to increase AP exam participation should consider introducing full exam subsidies.** Our results showed significantly higher rates of AP exam participation in LEAs with full subsidies and we therefore believe they are an effective tool for boosting AP programs.
- 2. LEAs should provide exam subsidies only to students enrolled in the corresponding AP course.** This policy will give all students equal opportunity to take AP exams, while ensuring that LEAs do not cover exam fees for students that have not completed the preparatory coursework.
- 3. LEAs should encourage AP participation, regardless of subsidy cost.** One potential explanation for low rates of AP course enrollment in some districts with subsidies is that districts with subsidies do less to encourage AP participation since it will have a larger impact on their budgets. Though we have no evidence that this is happening, we believe it is a hazard LEAs should be careful to avoid.

APPENDIX A – SURVEY INSTRUMENT

LIST OF SURVEY QUESTIONS SENT TO ALL LEAS REGARDING AP SUBSIDIES

1. What is the name of your LEA?
 2. What is your LEA's code?
 3. Has your LEA subsidized AP exam fees at any time during the last 10 years, outside of state or federal subsidies for low-income students?
 - Yes
 - No
- Questions 4 – 11 displayed only for respondents answering “yes” to question 3.
4. Please check all subjects in the following list covered by your LEA's AP exam subsidy.
 - English I
 - Calculus AB
 - Biology
 - Chemistry
 - US History

5. Did your LEA cover the FULL AP exam fee for all students?
 - Yes, we covered the full fee
 - No, we covered only part of the fee
6. If your LEA did not cover the full fee, how much of the fee did you pay?
7. Were all students able to receive funding?
 - Yes, all students could receive funding
 - No, only certain students were eligible
8. If only certain students were eligible to receive funding, please explain your policy below
9. Did your program pay exam fees in advance, or reimburse students after taking the test?
 - We paid in advance
 - We reimbursed students
 - We reimbursed students only if they scored high enough on the exam

10. Please check all years during which your LEA paid for AP tests

- 2002-2003
- 2003-2004
- 2004-2005
- 2005-2006
- 2006-2007
- 2007-2008
- 2008-2009
- 2009-2010
- 2010-2011
- 2011-2012

11. Please use this space to explain any other aspects of your policy not covered by the above questions



APPENDIX B – SURVEY RESPONSES

RESPONDING DISTRICTS, WITH SUBSIDY POLICIES FOR 2004-2011⁵

District	2004	2005	2006	2007	2008	2009	2010	2011
Anson	None	None	None	None	None	Full	Full	Full
Asheville City	None							
Beaufort	None	None	None	None	Full	Full	Full	Full
Brunswick	Part							
Buncombe	None							
Cabarrus	None							
Caldwell	None	None	Full	Full	Full	Full	Full	Full
Camden	None	None	None	Part	Part	Part	Part	None
Carteret		None	Full	Full	Full	Full	Full	Full
Catawba	None							
Charlotte-Mecklenburg			Full	Full	Full	Full	None	None
Cherokee	Full							
Cleveland	None							
Craven	None							
Cumberland	None	Part						
Currituck		None	Full	Full	Full	Full	Full	Full
Davidson	Part							
Elkin City	None							
Forsyth	None	None	Part	Part	Part	Part	Part	Part
Franklin	None							
Gaston	None	None	None	None	None	Part	Part	Part
Graham	None							
Granville	None							
Greene			Full	Full	Full	Full	Full	Full
Guilford	Full	Full	Full	Full	Full	Full	Part	Part
Harnett	None							
Henderson	Full	Full	Full	Full	Full	Full	None	None
Hertford	None	None	None	None	None	Full	Full	Full
Hickory City	None							
Hoke	None	None	None	None	None	None	Full	Full
Iredell-Statesville	None	None	None	None	None	Part	Part	None
Johnston	None							
Lee	None							

District	2004	2005	2006	2007	2008	2009	2010	2011
Lenoir	Full							
Lexington City			Full	Full	Full	Full	Full	Full
Lincoln	None							
Macon	None							
McDowell			Full	Full	Full	Full	Full	Full
Mitchell			Full	Full	Full	Full	Full	Full
Moore		None	None	None	None	Part	Part	Part
Mooreville City	None							
Nash-Rocky Mount	Full							
New Hanover	None							
Onslow	None							
Orange	None							
Pamlico	None							
Pasquotank			Full	Full	Full	Full	Full	Full
Pender	None							
Person	Part							
Polk	None	Part	Part	Part	Part	None	None	None
Randolph			Part	Part	Part	Part	Part	Part
Richmond			None	Full	Full	Full	Full	Full
Sampson	None							
Scotland	None							
Stokes	Part							
Surry	Part							
Swain	Full							
Transylvania	Part							
Tyrrell	None	Full						
Vance	None	None	Full	Full	Full	Full	Full	Full
Watauga	None							
Wayne	None							
Whiteville City	None	None	None	Full	Full	Full	Full	Full
Wilson	None	None	Full	Full	Full	Full	Full	Full
Yadkin	None	None	None	None	None	Full	Full	Full

⁵ Some surveyed districts have new staff members unfamiliar with older AP policies, limiting our data for 2004-05.

PARTIAL SUBSIDY / EXCEPTIONAL POLICIES BY DISTRICT

District	Policy
Brunswick	Reimbursed students only if they score a 3 or higher on the exam.
Camden	Paid for the first test.
Cumberland	Paid for any test after the third. Required students to take the exam if taking the course.
Davidson	Paid \$30 of the fee.
Gaston	Reimbursed students if meeting a score threshold.
Guilford	Paid 75 percent of the fee in 2010 and 2011.
Iredell-Statesville	Reimbursed students if meeting a score threshold.
Moore	Paid 50 percent of the fee.
Person	Paid for students with a 'C' or higher in the class to take the exam.
Polk	Reimbursed part of the fee.
Randolph	Paid 50 percent of the fee.
Surrey	Paid for the first test.
Transylvania	Reimbursed students if meeting a score threshold.
Winston Salem/Forsyth	Paid for any test after the third. Gave only honors credit to students not taking the exam.



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The Financial and Business Services Area is in its sixth year of the Research Intern Program. The Program is designed to help build a quality research program within NCDPI to supplement and supply data for discussions related to procedural, process, and policy changes. This year's program included students from Duke University's Master of Public Policy program, The University of North Carolina at Chapel Hill's Master of Public Administration program, and North Carolina State University's Master of Public Administration program. The intern program is managed by Eric Moore (919-807-3731) and Kayla Siler (919-807-3824) | intern_research@dpi.nc.gov.

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