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ABSTRACT

Educators consider student mobility one of the most important variables associated with achievement, but there is little agreement on how to measure mobility. The purpose of this study was to examine the relationship between academic achievement and a variety of possible definitions of mobility using archival school attendance records. A second purpose was to examine the relative value of using mobility as a predictor of achievement in the context of other demographic predictors of achievement. In addition, the stability of these relationships was assessed across several years of data. School-level archival data was obtained for all public elementary schools in Arizona, and the data from grades 3 through 8 were examined. Mobility figures were calculated using school-level counts of entrances and withdrawals for 1997 and 1998. Eleven mobility formulas were examined, and more than half of these were shown to have better correlations with achievement than the formula implied by the definition adopted by the Arizona Department of Education. Several predictors of academic achievement were examined, including free and reduced lunch percentages, numbers of students of limited English proficiency, absence rate, and mobility. Regression results indicate that mobility does not add any predictive power above and beyond other demographic variables considered. The implications of these results are discussed. (Contains 6 tables, 10 figures, and 25 references.) (SLD)

Running Head: PREDICTING ACADEMIC ACHIEVEMENT

Predicting Academic Achievement Using Archival Mobility Data

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ABSTRACT

Amongst the variables associated with achievement, mobility is considered to be one of the most important by educators. Despite its importance, there is little agreement about how to measure mobility. The purpose of this study was to examine the relationship between academic achievement and a variety of possible definitions of mobility using archival school attendance records. A second purpose of this study was to examine relative value of using mobility as a predictor of achievement in the context of other demographic predictors of achievement. Finally, we wanted to assess the stability of these relationships across several years of data. Regression results indicated that mobility does not add any predictive power above and beyond other demographic variables considered here. Implications of these results are discussed.

INTRODUCTION

In the United States, mobility appears to be a way of life for many families. According to a 1995 report from the US Bureau of the Census, approximately 20% of the population move each year (Mao, Whitsett, & Mellor, 1998), and families make many of these moves. In the state of Arizona, the average school mobility rate in 1998 was 20% and peaked at 55%. For years, educators have considered mobility an important factor in student achievement and adjustment, and it is widely believed that children who are more mobile experience a disadvantage in academic achievement when compared to their 'stable' peers (Mao, Whitsett, & Mellor, 1998; Vail, 1996). A major concern is that moving is disruptive and disorienting, both for the child and the classroom. The resources that teachers must devote to these new students detract from instructional time spent with students in the current classroom (Haywood, Thomas, & White, 1997; Williams, 1996), particularly since new students may require additional assessment time and instructional services on the material they have missed. This problem is exacerbated by differences in curricula and grading across district and school boundaries. Some schools have even taken strides to deter families from transferring by informing parents about the harmful effects of mobility and ensuring that parents are aware of transfer and open enrollment policies (Williams, 1996).

Despite this general consensus amongst educators, however, previous studies examining mobility as a predictor of achievement have produced contradictory evidence. Many studies suggest that mobility negatively impacts achievement (e.g., Mao, Whitsett, & Mellor, 1998; Williams, 1996; Nelson, Simoni, & Adelman, 1996; Audette, Algozzine, & Warden, 1993; Wood, Halfon, Scarlata, Newacheck, & Nessim, 1993; Schuler, 1990; Ingersoll, Scamman, & Eckerling, 1989; Felner, Primavera, & Cauce, 1981; Quisenberry, 1981; Benson, Haycraft, Steyaert, & Weigel, 1979). However, other studies draw different conclusions about the relationship between achievement and mobility. In one review (cited by Ingersoll, Scamman, & Eckerling, 1989), Barrett and Noble (1973) found a "surprising lack of compelling data relating mobility to children's performance," and according to Ingersoll, Scamman, and Eckerling "the situation has not improved markedly since that review" (1989, p. 143). Blane, Pilling, and Fogelman (1985) agree, they suggest that when mobility is considered, existing differences in achievement are small or marginal at best. They feel that by controlling for preexisting differences in achievement as well as differences in other key variables, these minimal differences can be explained. Still other studies suggest that other variables such as intelligence (e.g., Whalen & Fried, 1973), family structure (e.g., Tucker, Marx, & Long, 1998; Nelson, Simoni, & Adelman, 1996), maltreatment (Eckenrode, Rowe, Laird, & Brathwaite, 1995), and socio-economic status (Blane & Spicer, 1978) may interact with mobility, leading to differential achievement scores.

Reasons for contradictory findings

Several possible reasons exist for these contradictory findings. First, there is little agreement about how to measure mobility. No uniformly accepted definition of 'Mobility Rate' has been adopted amongst administrators and researchers in the United States. This ambiguity results in problems when researchers attempt to draw conclusions across studies. Most mobility rate definitions concern the interruption of the instructional process because of movement into or out of the classroom by students who change their attendance status due to changes of domicile or other reasons. However, some studies focus on a single recent move while others choose to use a certain number of moves as a cut off. One common definition of mobility seems to be a ratio based on the number of students entering and leaving school during a single school year versus the total number of students enrolled (e.g., Audette, Algozzine, & Warden, 1993; Alspaugh, 1991). However, mobility has been measured in numerous different ways. For example, Wood, Halfon, Scarlata, Newacheck, and Nessim (1993) defined mobility in terms of the total number of moves the child had completed in his or her lifetime. Schuller (1990), created a dichotomous mobility variable, coding individuals who "moved to different schools one time more than the number of years he/she was in school" (Schuller, 1990, p. 18) as mobile and coding all other students as stable. Mao, Whitsett, and Mellor (1998) examined mobility both in terms of percentages of students that moved once within a single school year and percentages of students that moved one time over a four year period. An implicit assumption behind mobility definitions is that they reflect the variability in school level achievement. This becomes problematic, however, when the mobility definitions differ so considerably. The lack of consistency in defining mobility limits researchers' ability to determine the effects of mobility as a predictor of academic achievement.

Another possible reason for the ambiguity is that educators often must rely upon archival data, such as school level counts, when conducting research and making policy decisions. Archival data, however, can be limited, since often it is not collected for the purpose of conducting research. Furthermore, the quality of the reporting in archival data varies greatly due to clerical error and financial and political biases (because of local district policies that direct the decisions about what data is important to gather). Therefore, at times the researcher must analyze records that are incomplete or struggle with sets of data that have key variables omitted.

Adding to the confusion is the concern that previous research studies were unrepresentative or otherwise methodologically unsophisticated (see citations in Barrett and Noble, 1973, and VanVliet, 1986; as cited in Tucker, Marx, & Long, 1998). Definition of the population being studied is critical in mobility research. As such, finding a common operational definition should be of paramount concern to educators and researchers. Lacey, Blane, and the Schools Council (1979) suggests that research must take into account other critical and related factors, such as the reasons behind the mobility and the socio-economic status of the individuals moving. Children may change schools for a number of different reasons, including divorce, eviction, or the job change of a parent. For example, Jurgens, Houlihan, and Schwartz (1996) examined the emotional well-being and academic achievement of students forced to move school districts when a tornado destroyed their high school. Marchant and Medway (1987) examined military families, a population known for being chronically mobile. Although these studies both involve mobile groups and are important contributions to the literature on mobility, the populations studied could be and most likely are very unique. Therefore, it would be difficult to synthesize the findings of these studies in an attempt to draw conclusions about mobility in general. Furthermore, when educators refer to the deleterious effects of mobility, they are most likely referring to the low SES family, moving their child from school to school. In fact, according to a 1994 federal General Accounting Office report (cited in Vail, 1996), children who are poor have a greater likelihood of being mobile, so "mobility walks hand-in-hand with poverty" (Vail, 1996, p.41).

Given a number of definitions with equal construct validity, school and state policy makers would benefit greatly from knowing if different definitions have differential merit when predicting achievement. Moreover, determining which definition most accurately and efficiently predicts achievement, could be extremely beneficial information to aid policy makers in making more informed decisions. Educators need to consider whether they want to use mobility as a sole predictor of achievement or whether mobility should be considered in the context of other variables that may predict academic achievement. One limitation of many past studies is that "they have not fully explored plausible interactions among several independent variables" (p. 113, Tucker, Marx, & Long, 1998). Perhaps a more important problem to solve for policy makers does not involve whether or not mobility alone negatively impacts achievement, but instead involves which variables in combination (mobility, SES, etc.) can make the most accurate predictions about achievement. According to Alspaugh (1991), mobility appears to correlate with several different variables, including achievement and the percentage of students eligible for free or reduced lunch (which is commonly used as an indicator of SES). Therefore, a more detailed examination of how well mobility, SES, and other important variables predict achievement could significantly contribute to the current literature, providing researchers and educators with a better model of academic performance to use when making decisions regarding student outcomes.

Our study

This study examines the relationship between academic achievement and a variety of possible definitions of mobility using archival school attendance records. Additionally, the relative value of using mobility as a predictor of achievement in the context of other demographic predictors of achievement, such as poverty (as measured by Free and Reduced Lunch percentages) and Absence rates is considered. Since a longitudinal assessment of the stability of these relationships is of great importance, we examine the relationships across two years of data. In Arizona, educators are also very concerned about students for whom English is a second language, often referred to as LEP (Limited English Proficiency). It is a common belief among educators that LEP status is associated with low academic achievement. As such, the predictive power of LEP is also examined in this study.

METHOD

Subjects

School level archival data was obtained from the Department of School Finance, the Department of School Nutrition, and the Bilingual Education Program in the Arizona Department of Education for the school years ending in 1997 and 1998. All public elementary schools in the state were included in the analysis, and data from grades 3-8 were examined. Data from students in grades K-2 were not included, since these students do not take the Stanford-9 in Arizona. Unfortunately, no statewide system for tracking students exists in the state of Arizona, so it was impossible to use student level data to calculate mobility figures for each school. Thus, mobility figures were calculated using school level counts of entrances and withdrawals. Additionally, schools that did not report LEP scores or Free and Reduced lunch percentages were not included in the analyses.

Variables for each school included several types of entrance and withdrawal codes (see Table 1), and these entrance and withdrawal counts were used to construct various definitions of mobility. The Department of School Finance data also included three other variables used in the regression analyses: LEP, Absence Rate, and Free and Reduced Lunch. To provide a measure of academic achievement, grade level Stanford-9 Achievement Test (SAT-9) averages in reading and mathematics were obtained for each school from the Department of Student Accountability in the Arizona Department of Education.

Procedure

The first goal of data analysis was to obtain a quantitative definition of mobility based on its relationship to academic achievement (as measured by performance on the SAT-9). Several definitions of mobility were created using the various combinations of entrance and withdrawal codes for each school. The first mobility definition was derived using the current Arizona Department of Education definition, which characterizes mobility as "the percent of students who transferred into the school from another school district after the start of the school year". This description suggests the formula E4 / (E1 + E2 + E3 + E4 + E5 + ET). However, this formula both misses students moving to Arizona from outside the state or country (E3's) as well as the large number of transitions that occur at the very beginning of the school year. There are also students who move frequently and can perhaps be accounted for in the withdrawal codes. Therefore, ten other possible definitions of mobility were systematically created using various combinations of entrance and withdrawal codes (See Table 2). All of the formulas listed in Table 2 were divided by the total number of Entrances (E1 + E2 + E3 + E4 + E5 + ET) to derive the mobility rates used in this study. The mobility formulas were examined to determine which singular formula produced the highest correlation with academic achievement. This formula was then used in all subsequent analyses.

Once the best quantitative definition of mobility was obtained, the next goal was to obtain the best combination of variables for predicting academic achievement. Specifically, we examined the predictive power of mobility, above and beyond other demographic variables. Several predictors of academic achievement were examined, including Free and Reduced Lunch percentages, LEP, Absence Rate, and Mobility. Data analysis was carried out using various quantitative exploratory data techniques (Behrens & Smith, 1996; Behrens, 1997). These techniques included a graphical examination of the multivariate data (using scatterplot matrices), an examination of correlation and partial correlation tables, and a series of multiple regressions predicting achievement. During this analysis, we took the additional step of considering the structural relationship of these variables (i.e. linear, logistic, logit, etc.) that most accurately predicted academic achievement, and transformed the data to meet the assumptions of regression analysis.

The same two-stage approach to data analysis was used on both the 1997 and 1998 Arizona data. In addition, the measures of mobility, Free and Reduced Lunch, LEP and Absence Rate were correlated between the two years to explore the stability of these measures across years. Although all grade levels were examined during data analysis, only the results from grades 3, 5 and 8 will be presented due to space considerations.

RESULTS

Mobility Formula Analysis

Eleven mobility formulas were examined to determine which quantitative formula best correlated with academic achievement as measured by the SAT-9. This analysis took place by examining the correlations of mobility with both math and reading average percentile ranks for 1997 and 1998 (See Tables 3 and 4). Examination of the correlations between the 11 mobility formulas and achievement measures showed that over half of the formulas produced better correlations with achievement than the formula implied by the definition adopted by the Arizona Department of Education.

In general, the addition of elements (E's and W's) to the mobility formula provided a better correlation between achievement and mobility, with the exception of the addition of E3, which reduced the relationship. A greater relationship between mobility and achievement was found when E4 and E5 were combined with different combinations of withdrawal codes, as can be seen in mobility formulas 4 through 9. These formulas consistently produced correlations in the moderate to high range in both subjects across all grade levels in 1997 and 1998. Closer examination of the individual formulas revealed that a strong relationship was established by adding the three codes E4, W1 and W4 and dividing by the total number of entrances (Mobility 10). This provided the most parsimonious definition that was as highly related to achievement as other more complex computations. Therefore, this mobility formula was used in the remainder of the analyses.

Descriptive Statistics

Descriptive statistics, consisting of measures of central tendency and variability, were computed. Specifically, descriptive statistics were computed for each variable included in the regression analyses and these statistics are reported in Table 5 for both 1997 and 1998. All of the values reported in Table 5 were in the expected range and mobility rates averaged around 20% in the state of Arizona when using the mobility formula from phase one of the data analysis. Poverty rates were very high, with about 54% of students qualifying for Free or Reduced lunch over the two years.

Since stability of demographic measures continues to be of interest to state policy makers and educators, a brief examination of the demographic variables was completed. It appears from this examination that the independent variables used in this analysis were quite stable. (See Table 5). To verify this, the Pearson Product Moment correlation between the 1997 and 1998 values of each of these variables was computed, and this analysis can be seen in Table 6. Results indicated that both Poverty and LEP Rates were extremely stable measures, with correlations of .95 and above. Absence Rate and Mobility were also very stable, with correlations in the .73 range.

Following an examination of the stability of the independent variables, each of the variables used in the regression analysis was examined to determine whether it met the normality assumption of regression analysis. Evaluation of normality consisted of graphical examination of the distribution of each independent and dependent variable. The histograms for each 1997 variable can be seen in Figure 1. As seen Figure 1, all of the achievement variables had a roughly normal distribution and thus met the normality assumption of regression analysis. However, three of the four independent variables were positively skewed and did not appear to meet the normality assumption. In addition, the distribution of poverty also violated the assumption of normality. To address these violations of the normality assumption, each of the four variables was transformed using a logit transformation. This transformation produced a bell-shaped normal distribution for all variables except mobility (See Figure 2). However, for mobility, any attempted transformation produced an extremely negatively skewed distribution, so the original mobility estimates were used in further analyses. The same process of checking normality was conducted for the 1998 data. This analysis produced very similar distributions and requiried the exact same transformations as the 1997 data. Thus, only the 1997 data are shown in Figures 1 and 2.

Scatterplots of the relationship between the original demographic variables and academic achievement are shown in Figure 3. Figure 4 shows the scatterplots of the relationship between the transformed variables and academic achievement. Comparison of these scatterplots graphically illustrates the benefit of using transformed variables to predict achievement. The scatterplots show that the transformed variables have a clear linear relationship with the achievement outcome variables. Therefore, it is better to use the transformed variables when attempting to predict academic achievement.

The relationship among the independent variables is also important to consider when building a regression model. A brief analysis of the Pearson Product Moment Correlations among the independent variables was conducted. The correlations among these variables in 1997 and 1998 can be seen in Table 7. The correlations among these variables all fell in the moderate to high range. In particular, the correlation between the logit of poverty and the logit of LEP status was very high, indicating that these two variables were highly related to each other. This high correlation informed further analysis and special attention was paid to the specific contributions of these variables in the model.

The final step of data analysis involved several univariate regression analyses. Mobility, the logit of poverty, the logit of LEP and the logit of absence rate were used to predict academic achievement in reading and math at each grade level for 1997 and 1998. In addition, each regression model was also examined with mobility removed from the set of predictor variables. In each analysis, mobility did not significantly contribute to the regression model, while the other three demographic variables were significant. The trend of results was the same across all grade levels and both subjects. In general, the regression model accounted for more variance in reading score than in math scores. Additionally, the model accounted for more variance in 1997 than it did in 1998. Tables 8 and 9 include the regression results with and without mobility for 1997 and 1998 3rd grade math and reading, respectively.

One way to evaluate how well a model fits the data is to check the amount of variance in the outcome that is accounted for by the predictor variables. The R^2 and the adjusted R^2 statistics in Table 10 provide estimates of the variance in achievement scores accounted for by mobility, the logit of poverty, the logit of LEP and the logit of absence rate. The adjusted R^2 statistic provides an estimate of R^2 that accounts for measurement error in the predictor variables. The estimates in Table 10 show that mobility did not account for any variability in achievement scores above and beyond the other demographic variables in the model. Thus, the best model to predict academic achievement does not include mobility.

Finally, the scatterplots of the residuals were examined to see how well each regression equation fits the data. These scatterplots show how far the actual values deviate from the values predicted by the regression equation. Therefore, it is optimal for these values to be as close to zero as possible. For the current analysis, the residual plots had the expected shapes and did not reveal any problems with our model. Examination of the residual scatterplots also provides a way to identify outlying data that may not be best explained by the model, but this analysis did not reveal any schools that were extreme outliers.

DISCUSSION

The purpose of this study was threefold. First an attempt was made to find a quantitative definition of mobility that was highly related to academic achievement. Second, we wished to determine what, if any, predictive power this definition of mobility had in the context of other demographic variables. Our final goal was to study the stability of these demographic measures over time.

Several definitions of mobility were examined to determine how strongly they were related to academic achievement. One of the mobility formulas examined was derived using the definition of mobility specified by the Arizona Department of Education. This definition did not include students who move into and out of Arizona schools from other states or countries, and this oversight could be the reason that this formula did not correlate very highly with academic achievement. Other formulas that included the students moving from outside of Arizona generally had a stronger relationship with academic achievement. Perhaps inclusion of these students in mobility definitions should be a consideration for future policy decisions regarding mobility.

Inclusion of school level withdrawal counts also provided formulas that were highly related to academic achievement. Specifically, inclusion of students who move from one school to another, students who leave for a home-schooling situation (W1), and students who leave after 10 days of unexcused absences (W4) greatly increased the relationship between academic achievement and mobility. This suggests that it is just as important to consider the impact of students leaving the classroom as it is to consider the impact of a student joining a classroom. In addition, the inclusion of W4 students indicates that educators may want to place more emphasis on tracking those students who just seem to "disappear" from school. Educators, researchers, and policy makers should begin to consider developing an operational definition of mobility that accounts for these students. The addition of W2 and W3 counts did nothing to change the relationship between mobility and academic achievement, as can be seen by comparing formula 6 and formula 7. This makes some logical sense, as W2 counts consist of students who leave school due to chronic illness. These students can not be counted as part of the mobile student population that educators often specify as "at-risk".

When educators discuss the impact of mobility on student performance, they often focus on the loss of instructional time usually experienced by teachers when students move into the classroom. The formula used in this study focuses just as much on the numbers of students who leave the classroom as it does on students entering the classroom. Perhaps educators should also be focusing on how students' leaving the classroom effects instructional time and the classroom environment. It appears from this study that any disruption of the learning environment has a negative effect on the academic achievement of students.

Regression results reported here clearly indicated that mobility does not significantly contribute to the prediction of academic achievement when other demographic variables are included in the model. Given what we know about the inconsistencies in definitions of mobility, there is no reason that mobility should be used to predict academic achievement when poverty, LEP and absence rate are known. In addition, educators should begin to consider why mobility doesn't add any information beyond what we learn from these other demographic variables.

It is apparent that high mobility rates are associated with a culture of poverty and high absence rates, which in turn negatively impact academic achievement. Thus, educators and researchers should be focusing on finding ways to help students who fall into these categories. For instance, it is clear from the results obtained here that decreasing absence rates would have a positive impact on academic achievement. Instituting programs to increase attendance rates could be a first step in improving education for a large group of students and schools.

This study also provided useful information about the stability of demographic variables often associated with academic achievement. Educators and policy makers can use this knowledge to guide decisions at the school and district level. In fact, this knowledge could guide the development of a model that could be used to identify 'at-risk' schools who are performing better than expected. These schools can then be systematically studied to see what they are doing to improve the achievement of their students.

The results obtained in this study, while important, should be interpreted with caution. First, the sample was limited to school level averages rather than student level data. Thus, we cannot use the results of this study to figure out how any particular student will do, rather the focus of this study was on how well schools perform on average. Second, this study relied upon archival data collected by various school districts and agencies. Therefore, the accuracy of the data may be questionable. Third, the regression analyses were performed using transformed variables. This manipulation of the data requires that we use caution when drawing conclusions from our results. Finally, this study was exploratory in nature and further confirmation of these findings in another study is needed.

Much more research in the field of mobility needs to be conducted. Educators and researchers need to find a generally accepted operational definition of mobility, particularly for research purposes. Once this definition is specified, further research about the specific effects of mobility can and should be explored. Specifically, researchers should investigate the processes by which mobility, poverty, absence rate and LEP status interact to affect academic achievement.

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Table 1. Arizona Public School Entrance and Withdrawal Codes

	Description of E Counts		Description of W Counts
E1	Entering Arizona public school for the first time this year, last school attended was this school.	W1	The number of students withdrawn to continue studies in another school or to be taught at home.
E2	Entering Arizona public school for the first time this year, last school attended was another school in this district.	W2	The number of students withdrawn due to chronic illness.
E3	Entering Arizona public school for the first time this year, last school attended was outside this district.	W3	The number of students who are expelled or on long-term suspension
E4	Entering this school and was previously enrolled this year in another Arizona public school outside the district.	W4	The number of students withdrawn for 10 consecutive days of unexcused absence, or status unknown.
E5	Entering this school and was previously enrolled this year in another Arizona public school within the district.	W5/ W6	The number of students that leave due to dropout or change of age, respectively.
ET/ ER	Transferring from another grade or another register within a grade respectively, all within the same school.	W7/ W8	The number of students that leave due to graduation or death, respectively.

Table 2. Mobility formulas used in Stage 1 data analysis.

	Codes divided by Total Entrances	Description of Formula
1.	E4	Students moving between AZ. School districts.
2.	E4 + E5	Students moving between and within AZ. School districts.
3.	E3 + E4 + E5	Students moving entering school for the first time this year and students moving between and within AZ. School districts.
4.	E4 + E5 + ET	Students moving between and within AZ school districts and students moving between classrooms within a school.
5.	E4 + E5 + W2 + W3 + W4	Students moving between and within AZ school districts and students who withdrawal due to transferring, illness or expulsion.
6.	E4 + E5 + W1 + W2 + W3 + W4	Students moving between and within AZ school districts and students who withdrawal due to transferring, illness, expulsion, or absence.
7.	E4 + E5 + W1 + W4	Students moving between and within AZ school districts and students who withdrawal due to transferring or absence.
8.	E1 + E2 + E4 + E5 + W1 to W4	Students entering school for the first time this year, who attended this school last and students entering school for the first time and went to school in this district last and students moving between and within AZ school districts and students who withdrawal due to transferring, illness, expulsion, or absence.
9.	E4 + E5 + ET + W1 to W4	Students moving between and within AZ school districts and students moving between classrooms within a school and students who withdrawal due to transferring, illness, expulsion, or absence.
10.	E4 + W1 + W4	Students moving between AZ school districts and students who withdrawal due to transferring or absence.
11.	E4 + W4	Students moving between AZ school districts and students who withdrawal due to absence.

Table 3. Pearson Product Moment Correlations of Mobility Formulas with average Math SAT-9 Percentile Rank in 1997 and 1998.

Mobility Formula	1997 Math Percentile Ranks					
	3rd Grade	4th Grade	5th Grade	6th Grade	7th Grade	8th Grade
Mobility 1	-0.31	-0.32	-0.31	-0.29	-0.14	-0.21
Mobility 2	-0.37	-0.39	-0.39	-0.32	-0.20	-0.26
Mobility 3	-0.12	-0.10	-0.15	-0.08	-0.12	-0.18
Mobility 4	-0.38	-0.39	-0.40	-0.33	-0.21	-0.28
Mobility 5	-0.41	-0.43	-0.43	-0.39	-0.30	-0.34
Mobility 6	-0.47	-0.48	-0.49	-0.45	-0.31	-0.34
Mobility 7	-0.47	-0.48	-0.49	-0.44	-0.31	-0.34
Mobility 8	0.41	0.39	0.40	0.41	0.44	0.44
Mobility 9	-0.48	-0.49	-0.50	-0.45	-0.37	-0.41
Mobility 10	**-0.47**	**-0.48**	**-0.49**	**-0.46**	**-0.35**	**-0.40**
Mobility 11	-0.35	-0.37	-0.38	-0.38	-0.26	-0.32
Mobility Formula	1998 Math Percentile Ranks					
	3rd Grade	4th Grade	5th Grade	6th Grade	7th Grade	8th Grade
Mobility 1	-0.26	-0.30	-0.31	-0.28	-0.20	-0.18
Mobility 2	-0.32	-0.35	-0.39	-0.24	-0.23	-0.30
Mobility 3	-0.11	-0.13	-0.13	-0.03	-0.14	-0.19
Mobility 4	-0.32	-0.36	-0.38	-0.25	-0.24	-0.30
Mobility 5	-0.38	-0.40	-0.44	-0.32	-0.33	-0.39
Mobility 6	-0.45	-0.47	-0.52	-0.37	-0.36	-0.41
Mobility 7	-0.45	-0.47	-0.51	-0.37	-0.36	-0.41
Mobility 8	-0.39	-0.36	-0.41	-0.36	-0.26	-0.27
Mobility 9	-0.45	-0.47	-0.51	-0.38	-0.37	-0.41
Mobility 10	**-0.43**	**-0.46**	**-0.50**	**-0.43**	**-0.38**	**-0.38**
Mobility 11	-0.32	-0.35	-0.37	-0.38	-0.33	-0.32

Table 4. Pearson Product Moment Correlations of Mobility Formulas with average Reading SAT-9 Percentile Rank in 1997 and 1998.

Mobility Formula	1997 Reading Percentile Ranks					
	3rd Grade	4th Grade	5th Grade	6th Grade	7th Grade	8th Grade
Mobility 1	-0.34	-0.33	-0.33	-0.30	-0.18	-0.21
Mobility 2	-0.40	-0.39	-0.40	-0.34	-0.20	-0.24
Mobility 3	-0.15	-0.11	-0.15	-0.10	-0.13	-0.15
Mobility 4	-0.41	-0.40	-0.41	-0.35	-0.22	-0.25
Mobility 5	-0.44	-0.42	-0.45	-0.41	-0.32	-0.34
Mobility 6	-0.50	-0.49	-0.50	-0.45	-0.28	-0.36
Mobility 7	-0.50	-0.49	-0.50	-0.44	-0.27	-0.35
Mobility 8	0.42	0.39	0.40	0.44	0.43	0.43
Mobility 9	-0.52	-0.49	-0.52	-0.49	-0.38	-0.41
Mobility 10	**-0.51**	**-0.49**	**-0.51**	**-0.49**	**-0.38**	**-0.40**
Mobility 11	-0.40	-0.38	-0.40	-0.39	-0.31	-0.33
Mobility Formula	1998 Reading Percentile Ranks					
	3rd Grade	4th Grade	5th Grade	6th Grade	7th Grade	8th Grade
Mobility 1	-0.32	-0.32	-0.32	-0.29	-0.23	-0.20
Mobility 2	-0.37	-0.38	-0.39	-0.32	-0.29	-0.28
Mobility 3	-0.13	-0.12	-0.09	-0.05	-0.18	-0.17
Mobility 4	-0.37	-0.38	-0.39	-0.33	-0.29	-0.29
Mobility 5	-0.44	-0.42	-0.45	-0.40	-0.37	-0.37
Mobility 6	-0.49	-0.47	-0.50	-0.44	-0.39	-0.40
Mobility 7	-0.48	-0.47	-0.50	-0.44	-0.39	-0.39
Mobility 8	-0.40	-0.37	-0.43	-0.40	-0.26	-0.28
Mobility 9	-0.48	-0.48	-0.50	-0.44	-0.39	-0.40
Mobility 10	**-0.47**	**-0.46**	**-0.48**	**-0.46**	**-0.40**	**-0.39**
Mobility 11	-0.39	-0.37	-0.39	-0.40	-0.34	-0.32

Table 5. 1997 and 1998 Descriptive Statistics for Variables used in Regression Analysis

Variable Name	N	Mean	Standard Deviation
		1997	
Mobility (formula 10)	890	19.95 %	9.87 %
Poverty (FRL)	867	53.39 %	29.02 %
LEP Rate	840	17.14 %	20.33 %
Absence Rate	934	7.00 %	2.47 %
3rd Grade Math PR	691	40.60 %	18.46 %
5th Grade Math PR	694	45.60 %	19.49 %
8th Grade Math PR	324	45.55 %	16.37 %
3rd Grade Reading PR	691	43.41 %	17.44 %
5th Grade Reading PR	694	48.47 %	18.14 %
8th Grade Reading PR	324	49.42 %	15.86 %
		1998	
Mobility (formula 10)	943	19.90 %	9.24 %
Poverty (FRL)	843	54.44 %	29.34 %
LEP Rate	866	18.57 %	21.27 %
Absence Rate	959	6.10 %	1.76 %
3rd Grade Math PR	714	44.42 %	18.77 %
5th Grade Math PR	705	49.06 %	19.53 %
8th Grade Math PR	328	47.54 %	16.22 %
3rd Grade Reading PR	715	48.87 %	17.50 %
5th Grade Reading PR	704	49.27 %	18.30 %
8th Grade Reading PR	327	49.40 %	15.84 %

Table 6. Pearson Product Moment Correlations of Demographic Independent Variables between 1997 and 1998

		1997			
		Mobility (10)	Poverty	LEP	Absence Rate
	Mobility (10)	.72	*	*	*
1998	Poverty	*	.96	*	*
	LEP	*	*	.95	*
	Absence Rate	*	*	*	.73

Figure 1. Histograms for all Independent and Dependent Variables

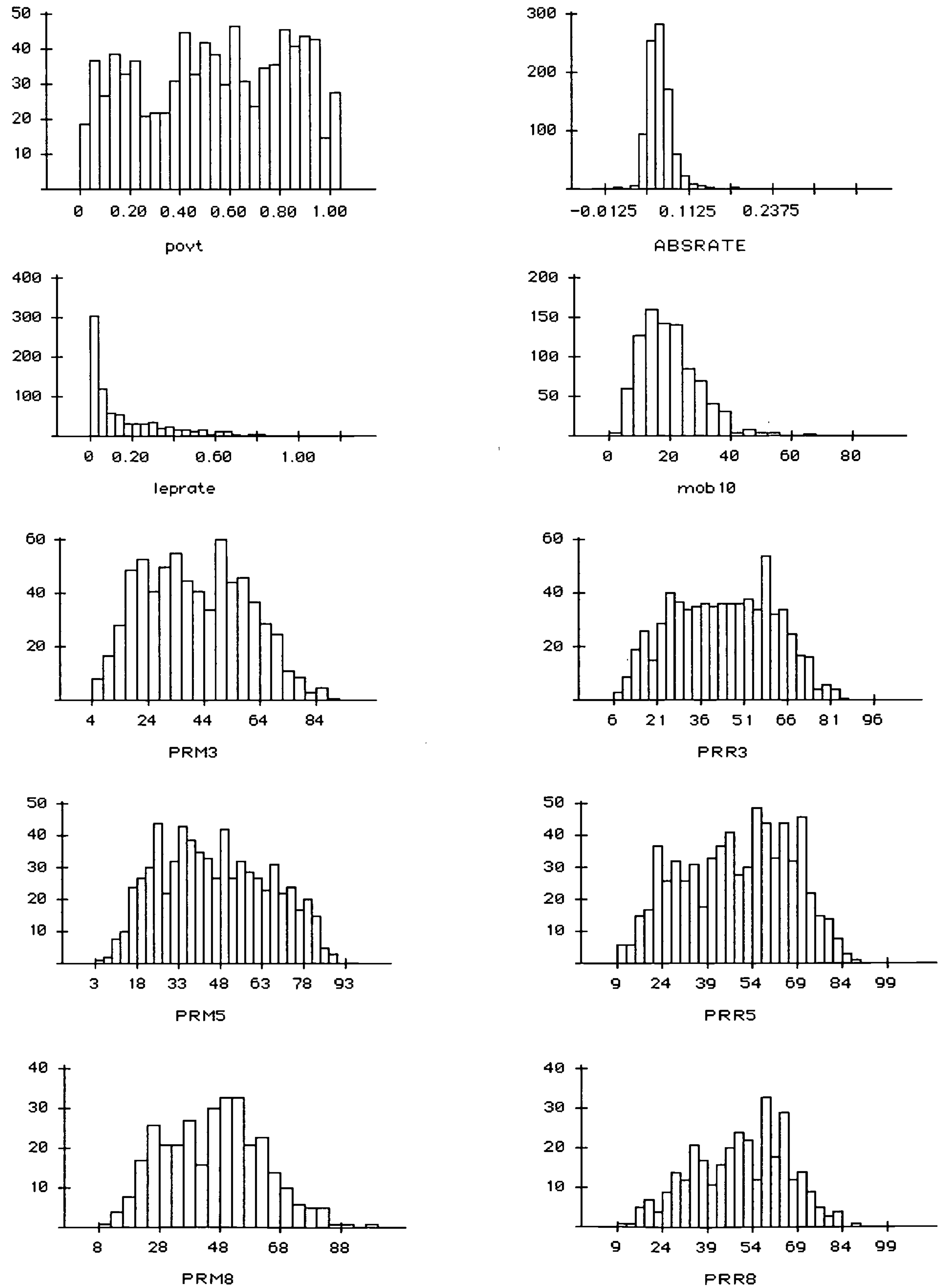

Figure 2. Histograms of Distributions Produced by Logit Transformations of Original Variables

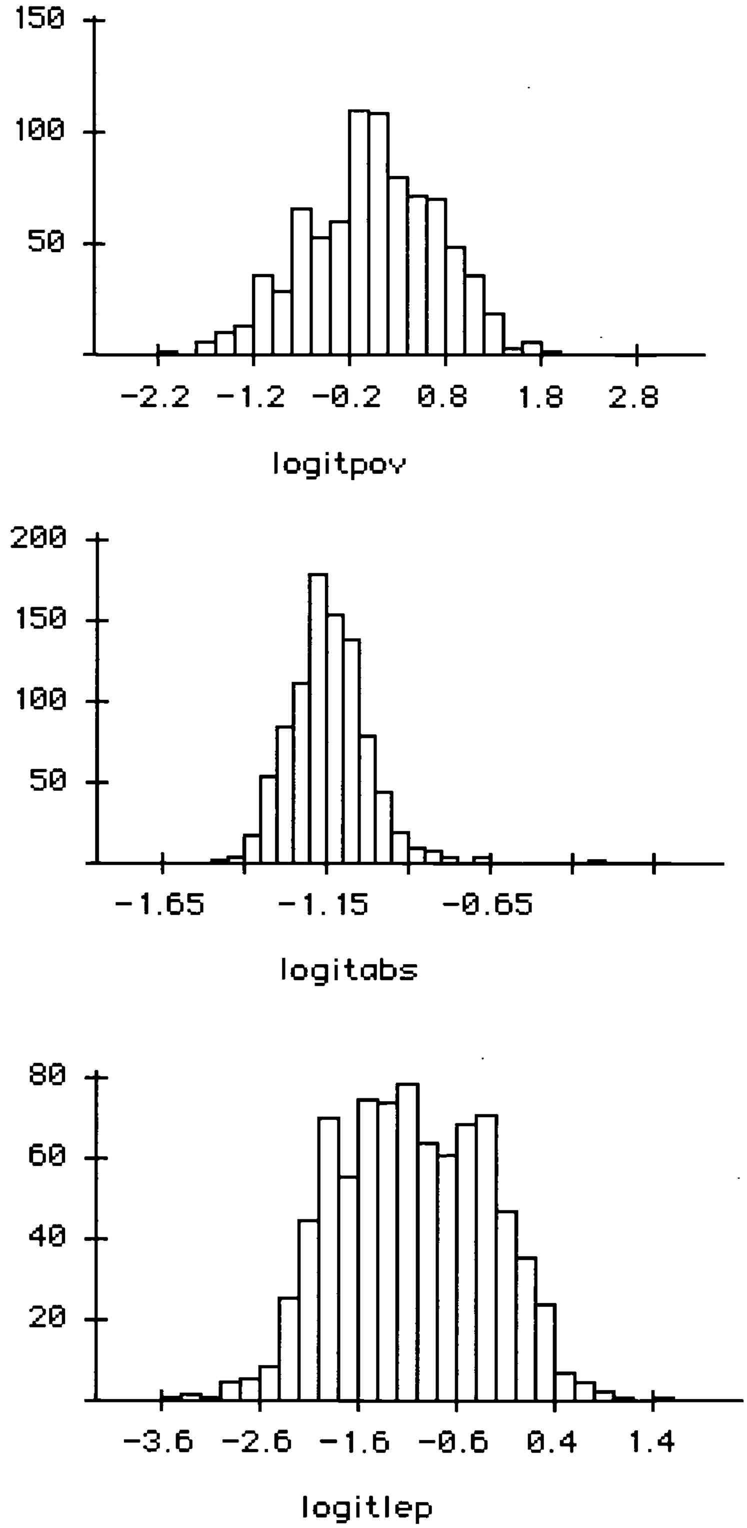

Figure 3. Scatterplots of Original Demographic Variables and 3rd Grade Math Achievement in 1997

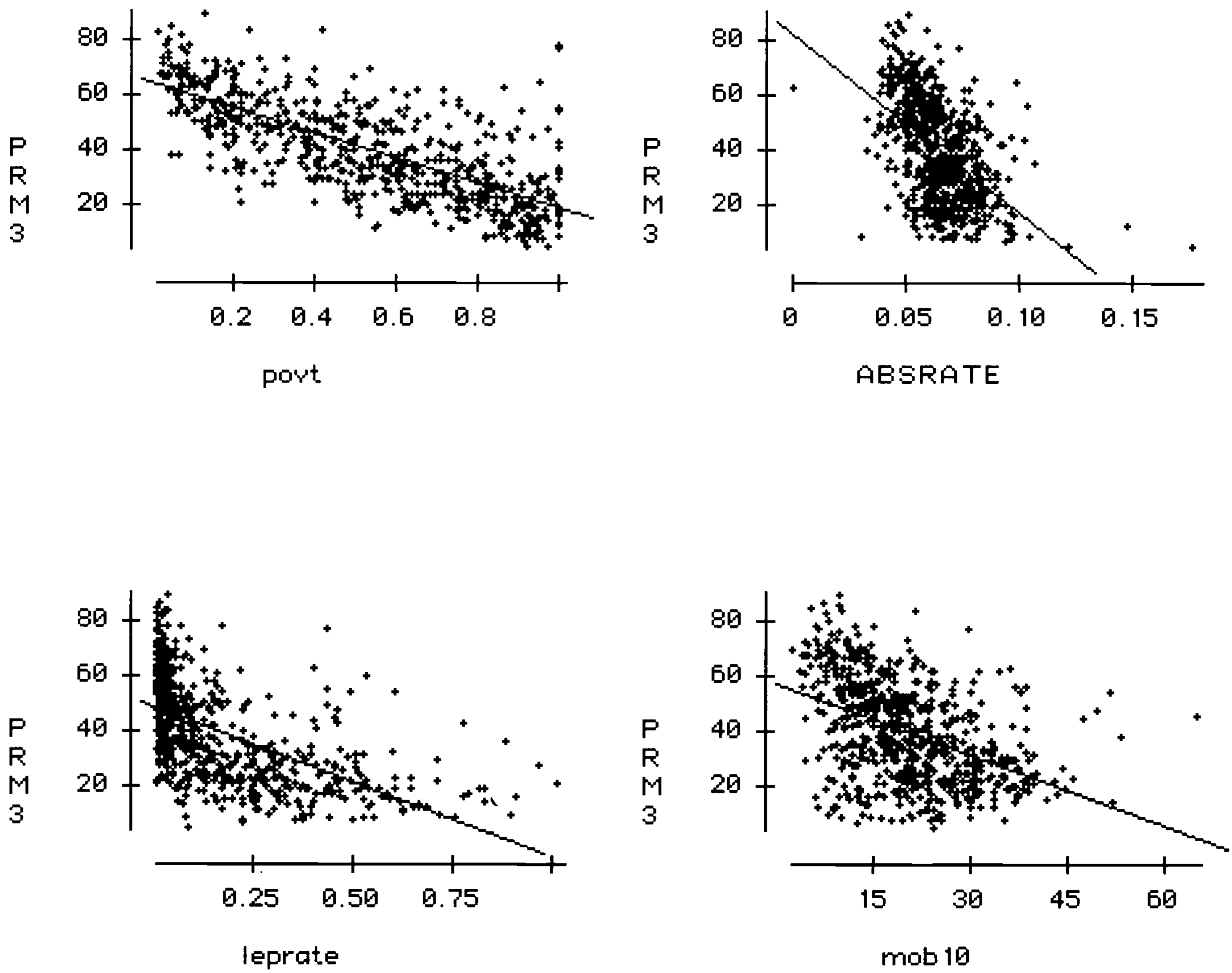

Figure 4. Scatterplots of Transformed Demographic Variables and 3rd Grade Math Achievement in 1997

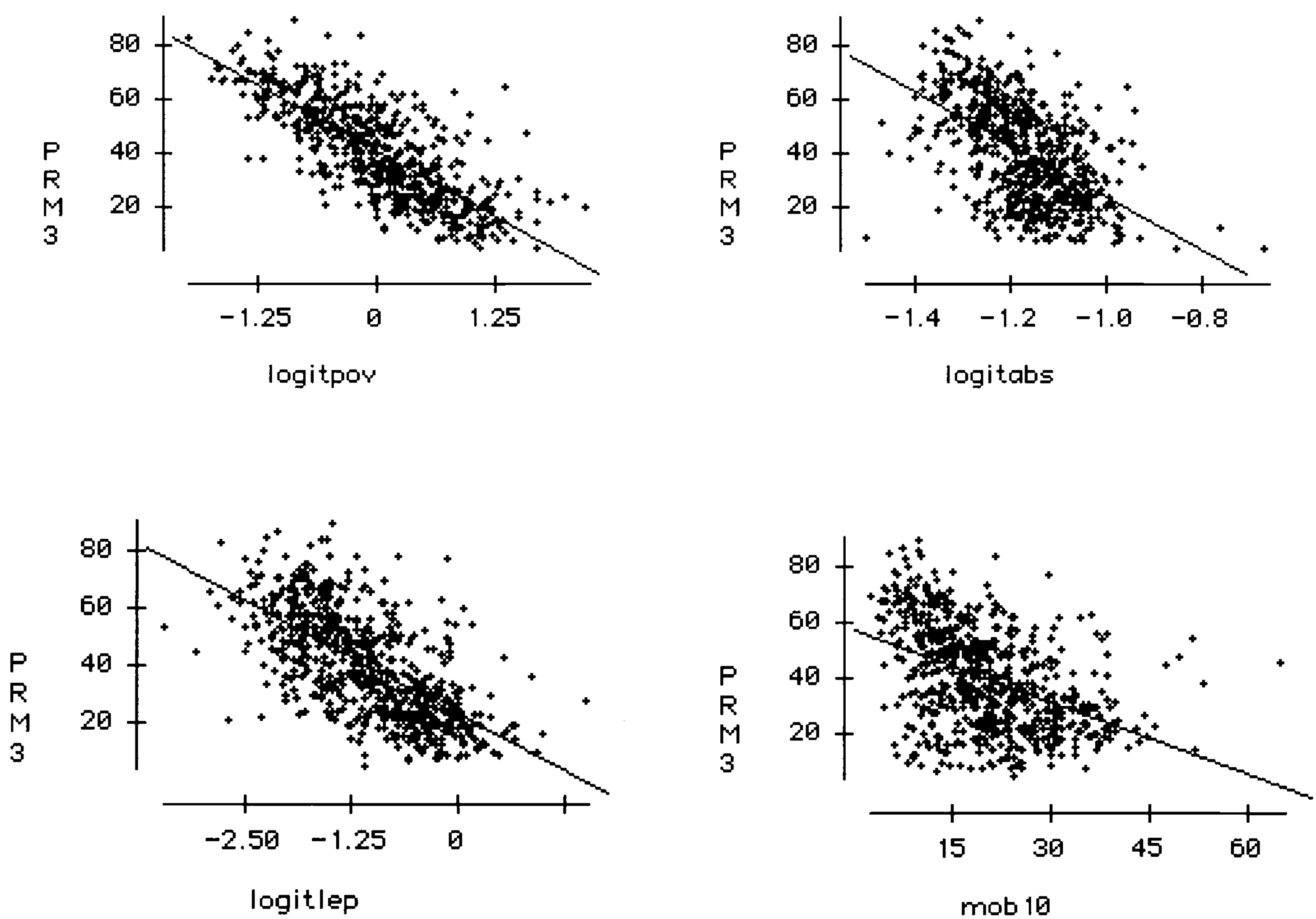

Table 7. 1997 and 1998 Pearson Product Moment Correlations among Independent Variables

Variable	Logit Poverty	Logit Abs. Rate	Logit LEP	Mobility
		1997		
Logit Poverty	1.00	*	*	*
Logit Abs. Rate	0.50	1.00	*	*
Logit LEP	0.75	0.34	1.00	*
Mobility	0.56	0.33	0.42	1.00
		1998		
Logit Poverty	1.00	*	*	*
Logit Abs. Rate	0.48	1.00	*	*
Logit LEP	0.77	0.33	1.00	*
Mobility	0.56	0.35	0.36	1.00

Figure 8. 1997 3rd Grade Reading and Math Achievement as Predicted with and without Mobility

Reading

With Mobility					Without Mobility				
Source	df	Mean Square	F-Ratio	R^2	Source	df	Mean Square	F-Ratio	R^2
Regression	4	32349	425	74.6%	Regression	3	44242	582	74.7%
Residual	578	76			Residual	591	76		
Variable	Coefficient		t-ratio	Prob.	Variable	Coefficient		t-ratio	Prob.
Constant	19.40		3.17	.0016	Constant	19.04		3.23	.0013
Logit Pov.	-14.82		-14.9	<.001	Logit Pov.	-15.05		-16.5	<.001
Logit Abs.	-16.27		-3.28	.0011	Logit Abs.	-16.41		-3.34	<.001
Logit LEP	-5.04		-6.63	<.001	Logit LEP	-5.00		-6.63	<.001
Mobility	-0.01		-0.25	.806					

Math

With Mobility					Without Mobility				
Source	df	Mean Square	F-Ratio	R^2	Source	df	Mean Square	F-Ratio	R^2
Regression	4	30486	248	63.2%	Regression	3	41800	342	63.4%
Residual	578	123			Residual	591	122		
Variable	Coefficient		t-ratio	Prob.	Variable	Coefficient		t-ratio	Prob.
Constant	9.03		1.16	.25	Constant	7.72		1.03	.30
Logit Pov.	-13.93		-11.00	<.001	Logit Pov.	-14.25		-12.3	<.001
Logit Abs.	-23.35		-3.71	<.001	Logit Abs.	-23.94		-3.84	<.001
Logit LEP	-4.42		-4.57	<.001	Logit LEP	-4.42		-4.61	<.001
Mobility	-0.03		-0.48	.63					

Figure 9. 1998 3rd Grade Reading and Math Achievement as Predicted with and without Mobility

Reading									
With Mobility					Without Mobility				
Source	df	Mean Square	F-Ratio	R^2	Source	df	Mean Square	F-Ratio	R^2
Regression	4	28228	293	66.5%	Regression	3	37637	392	66.5%
Residual	591	96			Residual	592	96		
Variable	Coefficient		t-ratio	Prob.	Variable	Coefficient		t-ratio	Prob.
Constant	6.93		.99	.32	Constant	19.04		3.23	.0013
Logit Pov.	-27.69		-5.2	<.001	Logit Pov.	-15.05		-16.5	<.001
Logit Abs.	-4.84		-5.55	<.001	Logit Abs.	-16.41		-3.34	<.001
Logit LEP	-12.24		-11.1	<.001	Logit LEP	-5.00		-6.63	<.001
Mobility	.01		.12	.90					

Math									
With Mobility					Without Mobility				
Source	Df	Mean Square	F-Ratio	R^2	Source	df	Mean Square	F-Ratio	R^2
Regression	4	26961	181	55.1%	Regression	3	35921	241	55.0%
Residual	590	149			Residual	591	149		
Variable	Coefficient		t-ratio	Prob.	Variable	Coefficient		t-ratio	Prob.
Constant	-3.92		-.45	.65	Constant	7.72		1.03	.30
Logit Pov.	-37.18		-5.6	<.001	Logit Pov.	-14.25		-12.3	<.001
Logit Abs.	-3.09		-2.84	.005	Logit Abs.	-23.94		-3.84	<.001
Logit LEP	-12.77		-9.3	<.001	Logit LEP	-4.42		-4.61	<.001
Mobility	.05		.75	.45					

Figure 10. R squared and adjusted R squared for each regression analysis

	1997				1998			
	With Mobility		Without Mobility		With Mobility		Without Mobility	
	R^2	Adj. R^2	R^2	Adj. R^2	R^2	Adj. R^2	R^2	Adj. R^2
3rd Grade Reading	74.6%	74.4%	74.7%	74.6%	66.5%	66.3%	66.5%	66.3%
3rd Grade Math	63.2%	62.9%	63.4%	63.3%	55.1%	54.8%	55.0%	54.8%
5th Grade Reading	78.1%	78.0%	77.9%	77.7%	73.1%	73.0%	73.1%	73.0%
5th Grade Math	69.1%	68.8%	68.8%	68.6%	66.4%	66.1%	66.3%	66.1%
8th Grade Reading	74.9%	74.5%	73.8%	73.4%	71.1%	70.6%	70.8%	70.4%
8th Grade math	66.8%	66.3%	66.6%	66.2%	60.4%	59.8%	60.4%	59.9%

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