

DOCUMENT RESUME

ED 364 533

SP 034 887

AUTHOR Kirby, Sheila Nataraj; Grissmer, David W.
 TITLE Teacher Attrition: Theory, Evidence, and Suggested Policy Options.
 INSTITUTION Rand Corp., Santa Monica, Calif.
 REPORT NO P-7827
 PUB DATE Jun 93
 NOTE 55p.; Paper presented at the Seminar of the World Bank/Harvard Institute for International Development on "Policies Affecting Learning Outcomes through Impacts on Teachers" (Cambridge, MA, June 28-July 2, 1993).
 AVAILABLE FROM RAND Distribution Services, 1700 Main St., P.O. Box 2138, Santa Monica, CA 90407-2138.
 PUB TYPE Information Analyses (070)
 EDRS PRICE MF01/PC03 Plus Postage.
 DESCRIPTORS Age Differences; Beginning Teacher Induction; Beginning Teachers; Educational Policy; Elementary School Teachers; Elementary Secondary Education; *Faculty Mobility; Influences; Longitudinal Studies; *Public Policy; Secondary School Teachers; Sex Differences; *Teacher Persistence; *Teacher Salaries; Theories; Trend Analysis
 IDENTIFIERS Indiana

ABSTRACT

This presentation examines teacher attrition and defines policies that could help reduce attrition. It first presents a theory of teacher attrition that explains what patterns to expect in teacher attrition and turnover and why some teacher attrition may be inevitable. It presents findings from a longitudinal study of Indiana teachers, concentrating on findings generalizable to some extent across countries. The study tracked approximately 50,000 full-time public school teachers from 1965-1987 and examined attrition by age, gender, and subject area; starting salaries by field; beginning teacher attrition; and median survival time for selected groups. The presentation's third topic is the role of teacher salary in determining attrition. When former teachers were asked whether a substantial increase in salary would have made a difference in their decision to leave teaching, the overwhelming majority said no, but when current mathematics and science teachers were asked about the most important factor that would help in teacher retention, over half mentioned higher salaries. Finally, an overview is offered of retention strategies aimed at keeping teachers in the teaching profession, focusing on the role of increased teacher salaries, performance-based compensation plans, and teacher induction programs for beginning teachers. (JDD)

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TEACHER ATTRITION: THEORY, EVIDENCE, AND SUGGESTED POLICY OPTIONS

Sheila Nataraj Kirby, David W. Grissmer

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Sheila Nataraj Kirby, David W. Grissmer

June 1993

Paper presented at the World Bank/Harvard Institute for International Development Seminar on "Policies Affecting Learning Outcomes Through Impacts on Teachers" held at Cambridge, Massachusetts on June 28-July 2, 1993.

**TEACHER ATTRITION:
THEORY, EVIDENCE, AND
SUGGESTED POLICY OPTIONS**

**Sheila Nataraj Kirby
David W. Grissmer**

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Teachers have come under increasing scrutiny over the past several years as part of the continuing national debate on the quality and appropriateness of American schooling. Issues that have been raised focus on the quality of the teaching force, the adequacy of teacher compensation, the potential for teacher shortages, and the patterns and magnitude of teacher attrition. Our original mandate was to give you an overview of the role of teacher compensation in teacher attrition and retention. However, on closer consideration, it seemed to us that teacher compensation is only part of the picture. In order to fully understand teacher attrition and to better define policies that could help reduce attrition, one needs to examine a number of other equally important factors that affect teacher attrition. As a result, this paper is somewhat more wide-ranging than the original title would suggest. We hope you will find the information presented here useful in managing the teaching force in your countries.

OUTLINE OF PRESENTATION

- Theory of Teacher Attrition
- Patterns of Teacher Attrition: Evidence from the Indiana Study
 - All Teachers
 - Beginning Teachers
- The Role of Teacher Salary in Teacher Attrition
 - Estimates from Multivariate Analyses
 - Evidence from Teacher Surveys
- Recruitment and Retention Strategies: Salary and Non-salary Initiatives

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There are several topics that we wish to address today. First, it is important to examine why teacher attrition occurs. To do this, we meld together several branches of literature in a theory of teacher attrition that helps explain what patterns one would expect in teacher attrition and turnover, and why some teacher attrition may be inevitable. Second, we present some findings from our longitudinal study of Indiana teachers. These findings mirror what several other researchers have found in several US states; we concentrate on findings that may be generalizable to some extent across countries. The third topic in this presentation is the role of teacher salary in determining attrition. Some of this is covered in your readings; however, you may not be familiar with data from teacher surveys and these might be of interest to you. Finally, we present a brief overview of some recruitment and retention strategies aimed at attracting teachers to and keeping teachers in the teaching profession. The main distinction we make here is between salary and non salary initiatives. We present evidence from Indiana on the importance of teacher induction programs in keeping beginning teachers in the profession. You may find this helpful when considering young teachers in your own countries.

IMPORTANCE OF MEASURING AND MONITORING TEACHER ATTRITION

- Attrition rates largely determine how many teachers need to be hired each year
- Difficult to predict accurately because attrition rates can be expected to vary over time
- Attrition rates provide good indicators of the relative adequacy of compensation levels and working conditions
- Definition of attrition--need to distinguish temporary from permanent attrition

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Accurate measures of teacher attrition are needed to serve several important planning and policy objectives.

First, attrition rates largely determine how many teachers need to be hired each year; they thus play a significant role in assessing future teacher shortages. We have shown elsewhere that over 70 percent of new teachers are hired to replace leaving teachers; only 30 percent are required to meet the needs of expanding enrollments, smaller class sizes, and new programs. Because of this, it is crucial to measure and predict attrition accurately.

Unfortunately, credible predictions are difficult to make because of the rapid changes that have occurred in teacher attrition rate over time and because of the multiple and changing factors that affect teacher attrition rates. Teacher attrition rates can be expected to vary over time with variations in age, experience, and demographic composition of the teaching force, employment opportunities in other related labor markets, the availability of other opportunities within the teaching profession itself, the teaching environment, and specific personnel policies including teacher salaries, class sizes, and the structure of the teacher retirement system.

Second, attrition rates when accurately measured and interpreted can provide good indicators of the relative adequacy of compensation levels and working conditions within the profession. Low salaries and poor working conditions are likely to lead to higher attrition and point to a need for corrective policies in these areas.

Third, differential patterns of attrition across subjects may point to the inadequacy of a uniform system of compensation such as the one characterizing the teacher labor market. Without pay differentials to compensate those with highly marketable skills, we risk having high turnover among those teachers with perhaps a significant deterioration in the quality of teaching in these areas.

There are several different ways to measure attrition and it is critical to match the appropriate measure with the policy or planning problem. If, for example, we are concerned about attrition at the national level, then we would not count those teachers

moving districts or states in our attrition measure. However, at a school or district level, each teacher who leaves, whether to another district or another school, will need to be replaced, so all losses should be counted. One of the important distinctions we have tried to make in our own work is the difference between temporary and permanent attrition. The traditional measure of attrition is the proportion of teachers who leave annually. We refer to this as annual attrition. However, our analyses and those of Richard Murnane and colleagues here at Harvard have shown that between one-fourth to one-third of those who leave in any given year return to teaching in subsequent years. We thus define a second measure, called permanent attrition, that adjusts the annual attrition measure downwards to take into account returns to the teaching force. In this measure, teachers who later return to teaching are not counted as losses in the year that they left.

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We now turn to the theory of teacher attrition.

THEORY OF TEACHER ATTRITION: HUMAN CAPITAL APPROACH

- Individuals make systematic assessments of benefits and costs of entering and staying in a profession
- Two types of human capital: generic and specific
- The greater the accumulation of specific human capital, the lower the probability of attrition; hence attrition and turnover are more likely early in the career

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The original commitment between a teacher and the school district regarding a teaching position is predicated on prevailing information and circumstances.¹ The key to understanding teacher attrition is to recognize that a change has occurred that causes a reversal of the original decision. What causes such a change?

First, let us examine this question from what might be called the human capital approach. The fundamental tenet of the human capital theory of occupational choice is that individuals make systematic assessments of the net monetary and nonmonetary benefits from different occupations and make systematic decisions throughout their career to enter, stay, or leave an occupation. The monetary benefits include the stream of likely income in that profession, promotion opportunities, value of benefits, etc. The nonmonetary benefits include working conditions, support of peers and superiors, compatibility of hours and schedules with family and leisure needs, availability of adequate materials, learning attitudes of students, parental support, etc. Presumably, rational individuals choose those occupations which maximize their net returns, properly discounted.

As an individual stays in a profession, he/she accumulates human capital that translates into wage premiums. There are two types of capital: generic, which could be transferred to other occupations fairly easily, and specific, that is relevant to that profession only. The greater the amount of specific capital, the less likely it is that the individual will consider leaving the profession. Examples of such capital are: home ownership, knowledge of contacts for summer employment, institutional or specialized knowledge, seniority/status in the system, and perhaps, most importantly, the vesting in the retirement system. This is one of the main reasons why moves are much more likely early in the career rather than mid-career because the greater amounts of specific capital

¹See D. W. Grissmer and S. N. Kirby, *Teacher Attrition: The Uphill Climb to Staff the Nation's Schools*, RAND, R-3512-CSTP, 1987, for further explication of this theory.

that one accumulates with age or experience tend to act as barriers to leaving the occupation.²

Although the theory of human capital provides one explanation for the wide variance between early- and mid-career attrition, there is an alternative, although not necessarily competing explanation.

²The previous discussion dealt with occupation-specific human capital that deters a change of profession. However, building occupation-specific capital in teaching may also ease transition into a set of jobs that can be broadly defined as within the education sector. A good example of this "stepping stone" theory of transition out of the classroom is the move into administration or counseling.

THEORY OF TEACHER ATTRITION: UNCERTAINTY/INCOMPLETE INFORMATION

- Process of finding/accepting/offering a job is conducted in an environment of uncertainty
- New information on alternatives can lead to reappraisal of job match
- Information on experience characteristics of a job can lead to attrition
- The greater the amount of experience characteristics, the greater the likelihood of attrition--hence beginning teachers more likely to be at risk

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A major limitation of human capital theory is its assumption that an individual has perfect information about salary, benefits, and the nonpecuniary aspects of the job. In reality, the process of finding and accepting a job is conducted in an environment of uncertainty. The worker and the employer both have incomplete knowledge of each other and of other employment alternatives. Early attrition can then be explained as resulting from new information regarding the costs and benefits of the current job versus alternate jobs. In one approach, one can portray the job as being characterized by two classes of attributes: inspection (or search) characteristics, which can be observed without actually experiencing the job and specific (or experience) characteristics, which being evident only after experience on the job. Examples of search characteristics are wage, type of neighborhood, type of school, benefits; while examples of experience characteristics are types of students, the workload, time taken for extracurricular activities, support from colleagues and principals, etc. The acceptance of any job is conditional; if the person finds the value of the experience characteristic below some critical level, he or she will quit. This is easily extended to the employer as well. The school district is only imperfectly informed about the teacher's attributes at the time of hiring. If the teacher's performance or character turn out to be unacceptable, the school will fire the teacher.

Our theory posits that the greater the amount of experience attributes in a given profession (i.e. the greater the number of attributes that cannot be fully known without actual experience), the more likely attrition will occur. Again, this model goes a long way in explaining why newly graduated teachers are more likely to leave teaching than teachers who survive the initial period.

THEORY OF TEACHER ATTRITION: LIFE-CYCLE FACTORS
<ul style="list-style-type: none">▪ Initial decision is based on existing family status/residence▪ Change in family status (marriage, childbirth) or residential location (spouse's job move) is likely to lead to reevaluation of initial decision▪ More likely to occur in early years of teaching--may lead to attrition from the district or from the profession
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Again, the initial decision to accept a specific job is conditioned on the existing family status and choice of residential location. However, a change in either of these will cause the individual to reevaluate his/her decision. The likelihood of changes in family status or residence tends to be fairly high for individuals in the early career stage.

**THEORY OF TEACHER ATTRITION:
INVOLUNTARY ATTRITION**

- District is subject to the same type of uncertainty and incomplete information as the teacher
- Teacher layoffs primarily a function of enrollments, fiscal environment, and union rules
- Mandatory retirement rules
- Illness and death

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Involuntary attrition or separations initiated by the employer can be caused by poor performance, reductions in force, death, or illness. When hiring teachers, the school is subject to the same sorts of uncertainty and incomplete information as the teachers. It is likely that school standards of performance may themselves be a function of perceived future shortages or difficulty of replacement. Another reason for attrition is reductions in force. Union rules may determine who gets laid off, while the fiscal environment will determine the magnitude of the RIF. Retirement rules, illness, and death are generally responsible for increasing the attrition rates of teachers in their late careers.

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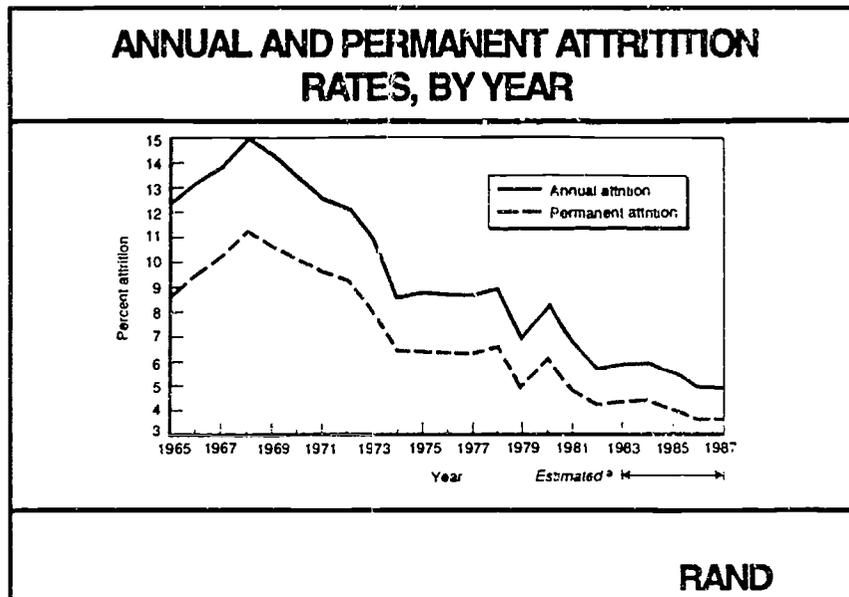
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Let us now turn to our findings from the study of Indiana teachers. Most of the focus will be on survival analyses of beginning teachers.

DATA	
<ul style="list-style-type: none"> ■ Data on fulltime teachers in Indiana public schools, 1965-1987 <ul style="list-style-type: none"> -Allow us to track attrition and returns over time -Demographic and economic factors; subject specialty ■ Survey of new teacher hires in 1988-89 <ul style="list-style-type: none"> -Beginning teachers: experience in the classroom, mentor program, future plans -Returning teachers: reason for break in service 	RAND

The database we constructed and which forms the basis of the analysis shown here consists of longitudinal records for all fulltime teachers in Indiana public schools from 1965-1987.³ These data allows us to track attrition and returns to the public school systems over time, as well as how these patterns differ by demographic, economic, and teaching-related variables. There are approximately 50,000 fulltime public school teachers in Indiana, although, of course, the number has varied considerably over time. In addition, we conducted a survey of about 1600 new hires in the 1988-89 school year. Of these, about 500 had participated in a new mentor program and they were asked about their experience with this program. Returning teachers were asked about their break in service. As we said earlier, apart from these data, we will present evidence from other teacher surveys as well, particularly surveys of science and mathematics teachers, the group regarding which there is considerable concern in this country.

³For further details on the database and the analysis that follows, see D. W. Grissmer and S. N. Kirby, *Patterns of Attrition among Indiana Teachers, 1965-1987*, RAND, R-4076-LE, 1992.

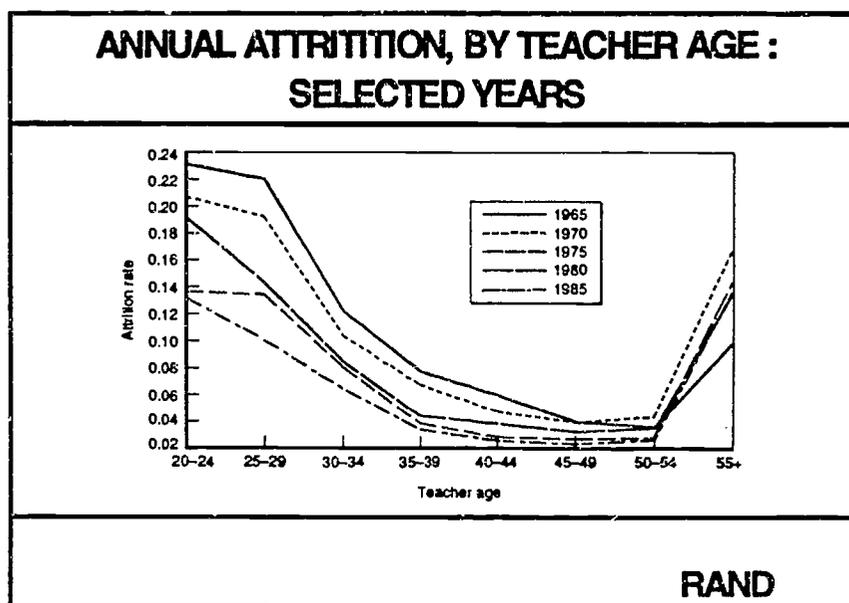


This slide compares the annual and permanent attrition rates over time for the entire teaching force. Among Indiana public school teachers, both rates have fallen markedly over time. Annual attrition stood at 12-13 percent in the mid-1960s, peaking at 15 percent in 1968. Attrition fell to 8-9 percent and held steady at this level during 1974-80, falling even further subsequently to around 6 percent. By 1987, attrition was at its lowest point in 23 years--5 percent. There are several reasons for this. First, the aging of the teacher force is associated with lower attrition. Second, women's role in the labor market has changed so that continuing to work after marriage and during child-rearing has become more acceptable and perhaps more of a necessity. Third, as economic conditions changed and demand declined, teachers have become unwilling to leave because of the possibility that they might not be able to return.

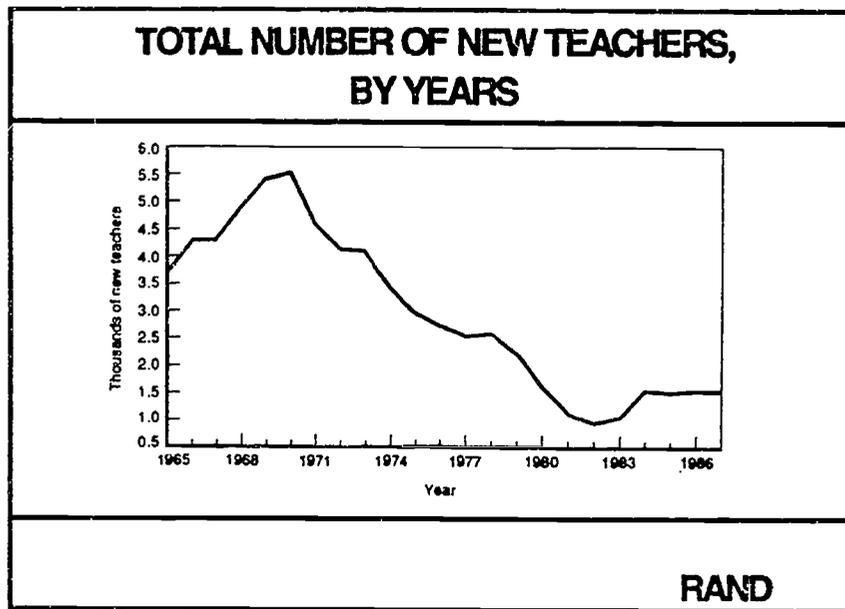
It is interesting to note that permanent attrition closely mimics annual attrition, suggesting that the proportion of teachers who leave teaching in any given year and later return does not vary a great deal.⁴ In fact, we find that this proportion is between 25 to 30 percent. As a result, permanent attrition is generally between 70-75 percent of annual attrition in any given year. By 1982, the last year for which we probably have credible data on permanent attrition⁵, permanent attrition stood at about 4.5 percent, compared to the annual attrition rate of 6.1 percent.

⁴We should make it clear that we are not suggesting that this proportion is exogenous; on the contrary, we expect it to be a function of incentives offered, teacher demand, and local economic conditions.

⁵We have shown elsewhere that most teachers return to teaching within five years of separation.



Our theory had suggested a U-shaped relationship between age and attrition, with the probability of attrition likely to be much higher during the early stages of the career, very low during mid-career, and high as the teacher approached retirement. This pattern holds true not only for a single cohort of teachers, but over time as well, although the overall curve moves down over time to reflect the decline in attrition we had just seen. This slide presents annual attrition rates by age of teachers for selected years. Attrition among young teachers, those aged 20-24 years, tends to be rather high--23 percent in 1965, 13 percent in 1985. The attrition rate falls with age, being the lowest for teachers aged 45-54 years. Then, not unexpectedly, attrition is higher for those aged 55 and over--the group that is approaching retirement. Permanent attrition rates follow the same general U-shaped pattern.



Let us now turn to our analysis of new teachers (defined as those with no prior teaching experience), in which we tracked incoming teacher cohorts and examined their experience over time. Before we present those results, however, it might be helpful to show you the size of these cohorts and how this has declined over time. It is clear from the above slide that this has varied considerably, with the largest number of new teachers being hired during 1967-71, when the number reached over 4,500. Since then, the size of the cohort has declined steadily and today has stabilized at around 1,500 new teachers per year.

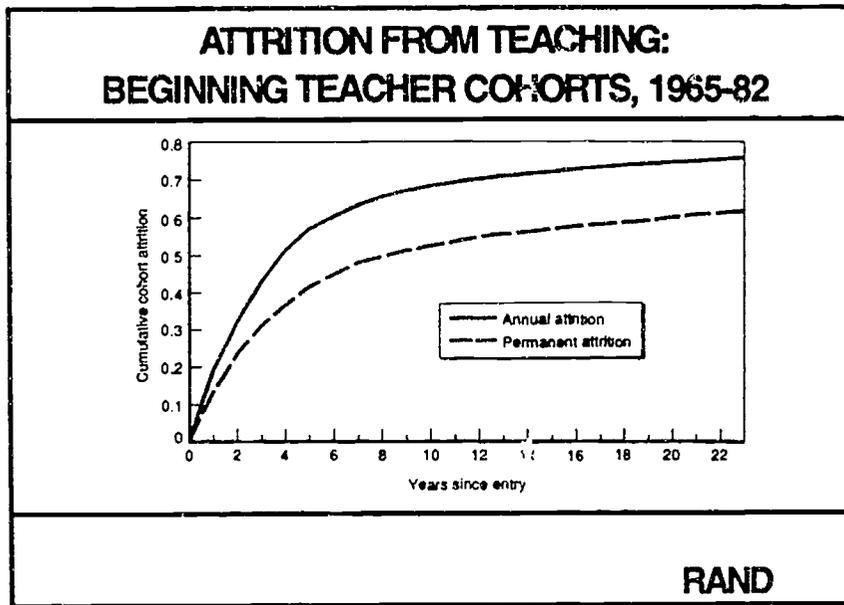
Although not shown here, we find that there is a surprising trend over time in terms of the age profile of new teachers. New teachers are tending to be somewhat older than was the case in the 60s and 70s. For example, three-quarters of new teachers then were younger than 25. By 1985, fewer than half (about 43 percent) were in this age range, with almost a third being between 25 and 29 years and the remaining 27 percent being 30 years or older. This suggests that new graduates are postponing teaching, perhaps to stay in school longer or to try other occupations or individuals are entering teacher education programs at older ages.

METHODS OF ANALYSIS

- Our data are right-censored, hence we use survival analysis techniques
- The Kaplan-Meier estimator is a descriptive technique that allows us to examine attrition patterns over time for different subgroups
- Multivariate analysis, (based on a Cox proportional hazards model), allows us to estimate the net effect of each variable.

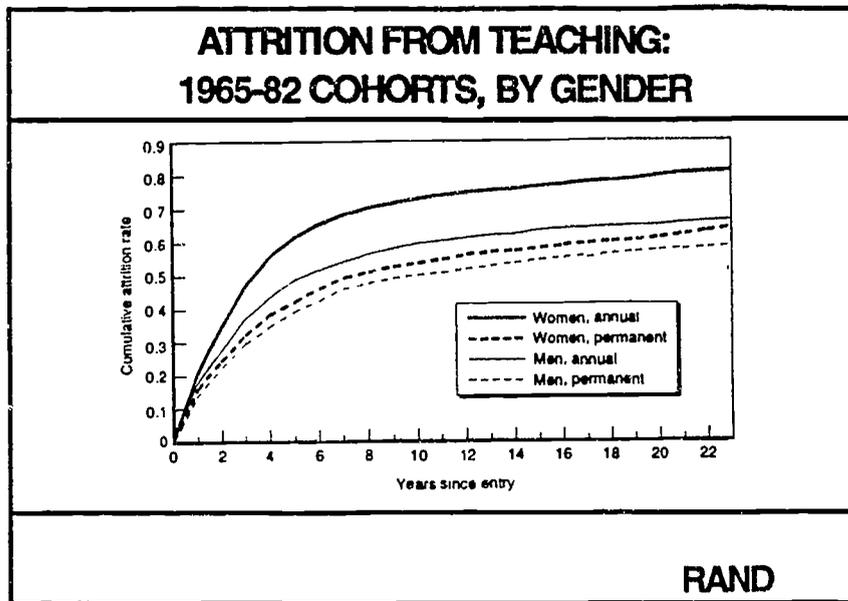
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A distinguishing feature of our data is that attrition may not have occurred at the time of analysis. We do not observe attrition for individuals who have not separated from teaching by 1988, although some of them may later leave teaching. These data are right-censored; we know only the amount of time that has elapsed between the time the individual entered teaching and the beginning of the academic year 1987-88 and that the individual had not left teaching by then. Survival analysis techniques allow us to handle censored data. We use two techniques to study when attrition occurs. The first, called the Kaplan-Meier estimator, is a descriptive technique that allows us to examine the distribution of attrition times for specific subgroups. This reveals the gross effect of that characteristic and everything else that varies with it. To estimate the net effect of each variable, we fit a Cox proportional hazards model. Similar to multiple regression analysis, this technique estimates the separate effects of several variables on the attrition rate.

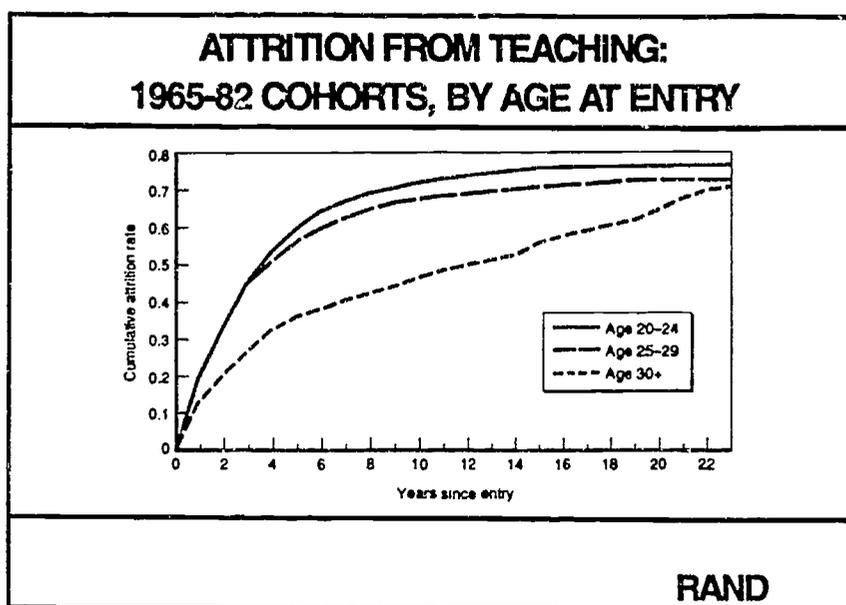


This slide shows the cumulative attrition function for the combined cohorts of new teachers from 1965-82. The horizontal axis shows the length of time in years since entering teaching. The vertical axis measures the cumulative proportion of teachers who will leave teaching by that time. The two curves correspond to the two definitions of attrition that we had discussed earlier. The first, called annual attrition, examines whether teachers are teaching continuously. The second, permanent attrition, examines the proportion of the cohort that leaves and does not return to teach later.

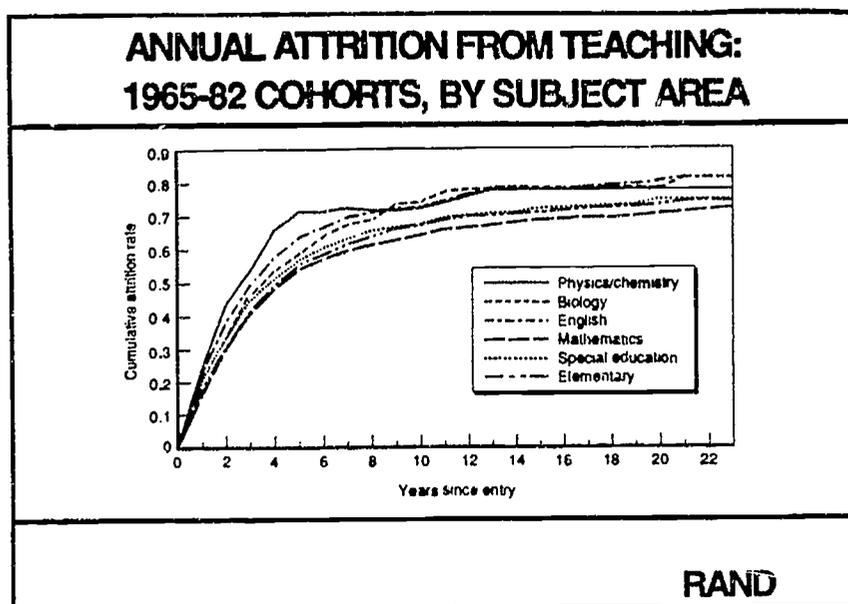
Looking first at annual attrition, we find that the largest proportion of teachers will leave one year after entering teaching, about 20 percent. Another 13 percent leave by the end of the second year. By the end of the fourth year, a little over half of the cohort will have left teaching. Only a third of the cohort will teach continuously for 10 years. Notice that permanent attrition rates are much lower. Allowing for breaks and subsequent returns, we find that half of the cohort will leave within 10 years of teaching.



Attrition differs markedly for different demographic groups. This slide shows the annual and permanent attrition rate functions for men and women teachers. Men clearly have much lower rates of attrition than women, generally 25 percent lower. Two years after entry, 28 percent of men drop out as compared to almost 35 percent of the women. By the fourth year, well over half of the women have left teaching at least once; the corresponding number for men is only 43 percent. However, the differences are much smaller when one examines permanent attrition--only 2-3 percentage points. This suggests that women tend to drop out more frequently than men but tend to return more frequently as well.



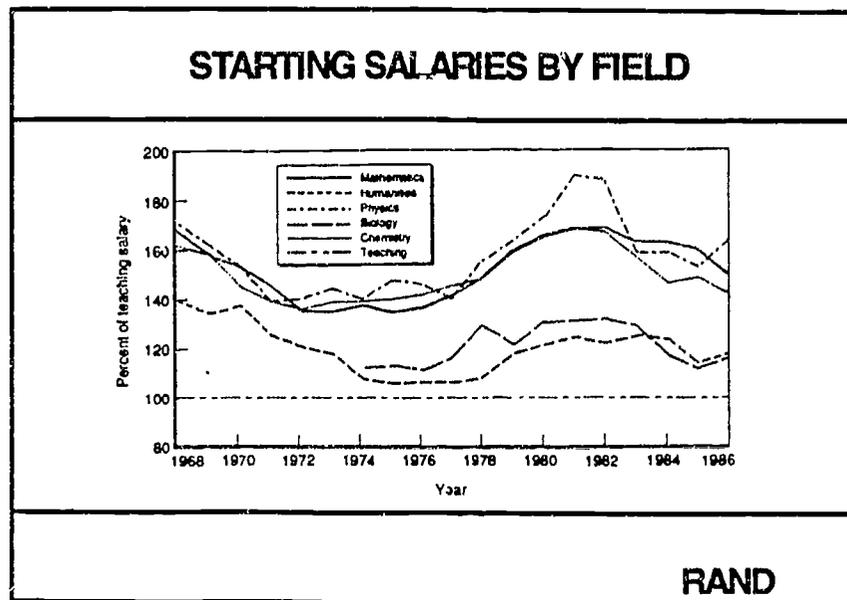
Older teachers tend to stay in teaching much longer than younger teachers. Those who enter at age 24 or younger appear to be at the greatest risk of leaving. At the end of two years, about a third of these teachers have separated from teaching as compared to only 20 percent of those over 30. The differences are even larger when we look at five, ten, or fifteen years after entry. Although not shown here, the return-adjusted rates show a very similar pattern, although of, course, the rates are much lower overall.



One of the most important questions regarding teacher attrition is whether there is a differential pattern of attrition by subject area and whether these differences have remained stable over time. Mathematics and science teachers are of particular concern. This slide shows the cumulative attrition rates over the first ten years for teachers categorized by their primary assignment area.

Our findings reinforce what others have found. The highest rates of attrition are among physics/chemistry, English, and biology teachers. By the end of the fifth year, 70 percent of the original cohort of physics/chemistry teachers have separated at least once. The comparable number for English and biology teachers is 60 percent. Mathematics teachers, contrary to popular opinion, have among the lowest rates of attrition, along with elementary teachers. Although not shown here, the differences in attrition are a little more marked when we examine permanent attrition rates. Science teachers again have the highest rates, suggesting that they not only leave more frequently but also are less likely to return than other types of teachers. Although mathematics teachers have relatively low rates of attrition, they do not tend to return to teaching after a break in service and their permanent attrition rates are higher than what we would expect from looking at the annual rates.

These results may be partly explained by the differential outside opportunities available to teachers in the different fields.



Murnane, Singer, and Willett (1988)⁶ point out that starting salaries in business and industry for graduates majoring in science (physics, chemistry, and biology) have been consistently higher than starting salaries for other graduates, as shown above, and this may help explain the higher annual and permanent attrition rates for science teachers. An additional explanation revolves around working conditions for teachers--science teachers, perhaps more than others, are likely to be hampered and frustrated by the lack of equipment, materials, and space, and so may be more prone to leave.

The results for mathematics teachers are puzzling. After all, starting salaries for mathematics graduates are almost as high as those for science graduates. A plausible explanation offered by Murnane, Singer, and Willett (1988) is that high-paying jobs in business and industry may be available only to those mathematics teachers teaching advanced courses and not to the majority of teachers teaching algebra, geometry, and remedial math.

⁶R. J. Murnane, J. D. Singer, and J. B. Willett, "The Career Paths of Teachers: Implications for Teacher Supply and Methodological Lessons for Research," *Educational Researcher*, August-September 1988, pp. 22-30.

MEDIAN SURVIVAL TIME IN YEARS FOR SELECTED GROUPS		
Selected Groups of Teachers	<u>Median Survival Time (Years)</u>	
	Annual Attrition	Permanent Attrition
Overall	3.9	8.2
Male	5.6	9.7
Female	3.5	7.6
Age 20-24	3.6	7.4
Age 25-29	3.9	6.9
Age 30+	11.9	15.9

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A useful way of summarizing the differences among the various groups seen in the previous slides is to examine the median lifetime of a typical teacher within the group. This statistic, which captures how rapidly the survivor function drops, represents the length of time that must pass before half of the teaching force in that group leaves teaching. Those who are at higher risk have shorter median lifetimes.

Overall, we find the predicted median lifetime of an average beginning teacher is 3.9 years; however, when one adjusts for returns, this rises to 8.2 years. Men, because of their lower attrition rate have higher median lifetimes. The difference is not as large for permanent attrition as for annual attrition. Given the sharp decline in women's attrition over time, we may find that even these differences may eventually disappear.

You can see the large differences in median lifetimes across teacher age categories; older teachers have median lifetimes that are almost two-three times larger than those of teachers 20-29 years. Older teachers may be more settled, and/or have made more reasoned decisions to enter teaching, perhaps having tried another career, or homemaking.

MEDIAN SURVIVAL TIME IN YEARS FOR SELECTED GROUPS		
Selected Group of Teachers	Median Survival Time (Years)	
	Annual Attrition	Permanent Attrition
Nondepartmentalized elementary	4.2	10.9
Special education	3.8	8.4
English	3.0	6.3
Mathematics	4.1	6.9
Physics/chemistry	2.6	3.8
Biology	3.5	4.5
Other science	3.5	6.5
Other departmentalized	3.9	6.9

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There are marked differences by subject area, with science teachers having much lower median lifetimes for both annual and permanent attrition. Elementary teachers tend to have the highest predicted median survival time for both annual and permanent attrition. These differences in survival times are important because they point to the need for tracking attrition by subject area and developing more flexible and targeted policies.

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We now present some findings on the role of teacher salaries in teacher attrition. We first present estimates from multivariate analyses and then show you some findings from teacher surveys, particularly surveys of mathematics and science teachers.

FINDINGS FROM NORTH CAROLINA

- Murnane, Singer and Willett
 - Secondary school teachers earning \$2,000 more than average stay in the classroom an extra two years. Salary becomes less important the longer the teacher stays in.
 - Salary effect is more modest for elementary teachers
- Murnane and Olsen
 - Teachers are sensitive to salaries—higher paid teachers, on average, stay 2-3 years longer
 - Effect is much smaller for later cohorts

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Murnane, Singer and Willett (1989)⁷ analyzed data from North Carolina on white teachers hired between 1976-78. Using hazards modeling, the authors examined the relationship between the risk of leaving teaching and teacher salary and opportunity cost, (defined to be the salary the teacher would obtain in the best alternative field); the analysis was done separately for secondary and elementary teachers. Their data indicate that the more a teacher earns, the more likely he or she is to stay in teaching. The median lifetime for a teacher earning average pay was 6.5 years, for a teacher earning \$2,000 less than average 4.5 years, and for a teacher earning \$2,000 more than average, 8.8 years. Over time, however, the importance of salary in the attrition decision tended to decline and by year eight, disappeared entirely. Among elementary school teachers, the differences in predicted median lifetimes tended to be much smaller, only about a year but did not decline over time.

Murnane and Olsen (1990)⁸ used a "waiting time" regression technique that allowed them to accommodate right-censoring (due to incomplete spells) and fixed effects to capture unobserved school district characteristics. Pay increases in the model had a statistically significant effect on attrition and a differential effect on those in the upper and lower quartiles of the National Teacher Examination, which was used as a proxy for ability. A \$1,000 increase in pay would increase median duration of the initial stay in teaching by about 2-3 years. However, the effect is much smaller for later cohorts and for higher ability teachers.

⁷R. J. Murnane, J. D. Singer, and J. B. Willett, "The Influences of Salaries and 'Opportunity Costs' on Teachers' Career Choices: Evidence from North Carolina," *Harvard Educational Review*, Vol. 59, No. 3, 1989, pp. 325-346.

⁸R. J. Murnane and R. J. Olsen, "The Effects of Salaries and Opportunity Costs on Length of Stay in Teaching: Evidence from North Carolina," *The Journal of Human Resources*, Vol. 25, No. 1, 1990, pp. 106-124.

FINDINGS FROM MICHIGAN
<ul style="list-style-type: none">▪ Murnane and Olsen<ul style="list-style-type: none">- Salary is statistically significant in all four models- A \$1,000 increase (constant dollars) is associated with an increase of more than four years in the median lifetime of a teacher- If differences in working conditions in districts are not controlled for by means of fixed effects, the salary coefficient is biased downward
RAND

Murnane and Olsen (1990)⁹ used the "waiting time" model to examine data from Michigan. Salary was statistically significant indicating that teachers who are paid more stay longer in teaching. The size of the coefficient implied that a \$1,000 increase in pay would increase the median length of time teachers remain in teaching by more than four years. However, in a second version of the model (the one without fixed effects), the salary effect was about a third smaller than in the first version. The authors suggest that this is due to the fact that some school districts pay high salaries to compensate for difficult working conditions and if this is not controlled for in the model, the impact of salary on duration is underestimated.

⁹R. J. Murnane and R. J. Olsen, "The Effects of Salaries and Opportunity Costs on Duration in Teaching: Evidence from Michigan," *The Review of Economics and Statistics*, 1989, pp. 347-352.

SOME FINDINGS FROM INDIANA

- A 10 percent increase in starting salary will reduce attrition by a little over 10 percent among men, 4 percent among women
- Teachers appear to be sensitive both to beginning salaries, as well as to growth in salaries
- Declining student-teacher ratios (a proxy for working conditions) also contribute to lower attrition levels

RAND

Using the Indiana data, we fit a Cox proportional hazards model that examined attrition during the first four years of teaching only. This is the period of highest attrition when we expect the greatest sensitivity to teacher salary and working conditions. This also allowed us to associate specific beginning salary, working conditions (proxied by student-teacher ratios) and salary growth with each cohort. We estimated models for men and women separately because their attrition patterns appear to be quite different.

We find that increases in starting salaries reduce the rate of attrition significantly. A \$1,000 increase in pay reduces the attrition rate by a little over 5 percent for men and a little over 2 percent for women. Given the average salary in our model, this translates into a pay elasticity of -1 for men and -0.4 for women. The salary growth of a cohort also appears to have a large effect on attrition, particularly that of women. These findings suggest that teachers are sensitive both to beginning salaries as well as to the early growth in earnings.

Student-teacher ratios have declined markedly from 1965 to 1985, due partly to statewide mandated lower class sizes in the early 1980s. Our results show that declines in class size will reduce attrition and suggest stronger effects for men than for women. This may partly be due to our inability with the current data to clearly distinguish trends in student/teacher ratios from similar trends in women's labor-force participation.

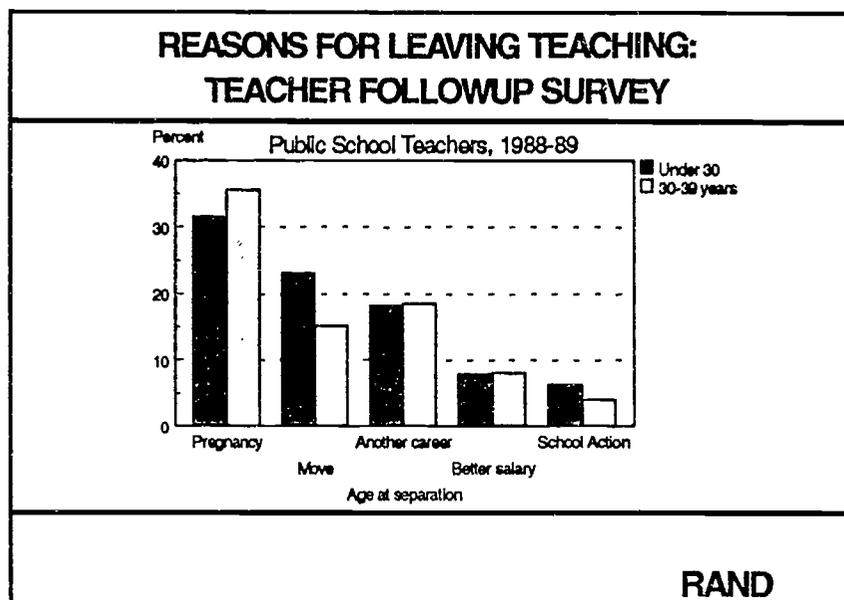
REASONS FOR BREAK IN TEACHING	
Main reason	Total (%)
School staffing action	4.4
Pregnancy/childrearing	47.2
Family emergency	0.8
Sabbatical/break from teaching	5.0
Try another career	13.1
Pursue further education	5.2
Geographic move for personal reasons	5.8
Spouse move	9.2
Retirement	0.4
Illness	0.8
Other	8.0

RAND

Let us now turn to some of the evidence that we have collected from teachers themselves regarding their reasons for leaving teaching and what they most like and dislike about teaching. We had mentioned earlier that as part of the Indiana study, we had surveyed new hires in 1988-89.¹⁰ Of the 1,660 teachers who responded to the survey, fewer than half (46 percent) were first-year teachers. A little more than a quarter were returning Indiana public school teachers, and 16 percent were migrating teachers from out-of-state public schools. The remaining 10 percent were transfers from private schools.

Experienced teachers who were not teaching the previous year were asked the primary reasons for the break in their teaching career. Such information could be useful to school systems in determining whether there are steps that could be taken to prevent teachers from leaving in the first place or whether the majority leave for reasons that cannot be affected by policy. This slide lists these responses. Regardless of type of teacher (returning Indiana teacher, migrating, or transferring teacher), pregnancy/child rearing was the most frequent response. Another 13 percent left to pursue another career; other reasons were to accompany a spouse or for other personal reasons. Men were more likely to say they had tried another career or left to pursue further education than women.

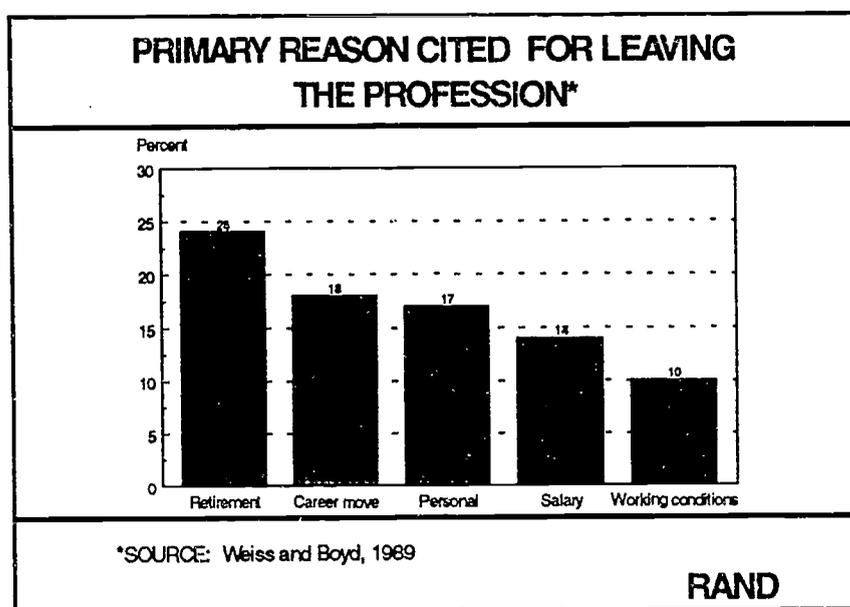
¹⁰For more details regarding the survey and analysis of other data from the survey, see S. N. Kirby, D. W. Grissmer, and L. Hudson, *New and Returning Teachers in Indiana: Sources of Supply*, RAND, R-4049-LE, 1991.



The Teacher Followup Survey was conducted by the National Center for Education Statistics in 1988-89, on a sample of teachers who responded to the Teacher Survey component of the 1987-88 Schools and Staffing Surveys (SASS). This slide is extracted from Bobbitt and Whitener (1992)¹¹ and shows reasons for teacher attrition by age of teacher. We have selected younger teachers because for those in older age groups, retirement is the most frequent reason. Among these teachers, pregnancy/child rearing was the main reason for leaving, change in residential location was second, and desire to pursue another career was third. Only about 8 percent mentioned "better salary" as the main reason for leaving, although some of the ones who mentioned another career doubtless changed for reasons of pay. Overall, only about 26 percent of attrition in this survey appeared to be for reasons (salary, another career) that might be amenable to changes in teacher compensation or education reform.

We are now going to show you evidence relating to mathematics and science teachers.

¹¹S. A. Bobbitt and S. D. Whitener, *Why do Teachers leave Teaching? Reasons for Teacher Attrition from the Teacher Followup Survey*, paper presented to the American Educational Research Association, April 1992.



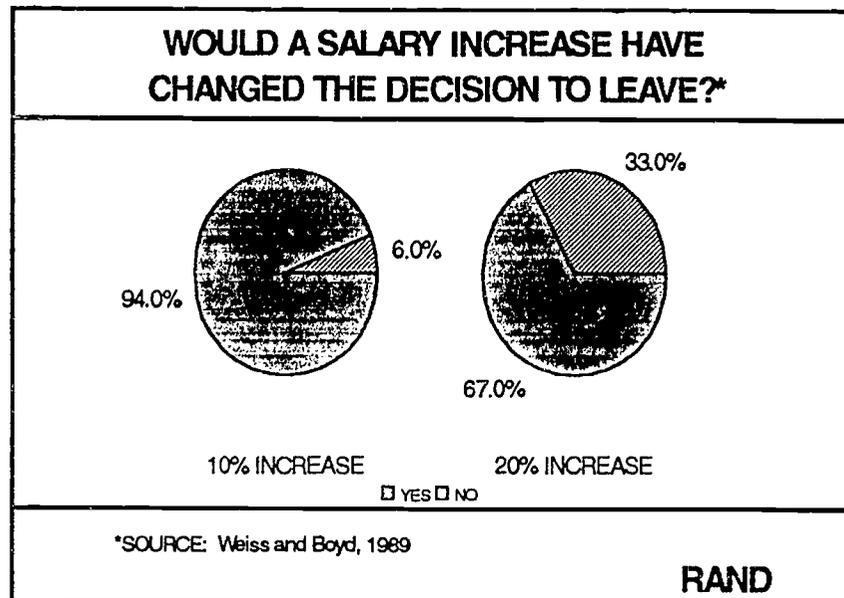
Because science and mathematics teachers appear to be of particular concern, at least in the U. S., the next few slides focus on data from a follow-up study of science and mathematics teachers conducted by Horizon Research, Inc. and Research Triangle Institute. The follow-up study examined a subsample of teachers who had participated in the 1985-86 National Survey of Science and Mathematics Education, and its major purpose was to investigate issues related to retention.

Weiss and Boyd (1989)¹² found that 75 percent of science and mathematics teachers were still teaching at the sample school, another 12 percent were teaching science and mathematics at other schools, and 13 percent had left the profession.

The data on the main reason for leaving the profession indicate that factors other than salary often play a major role in the decision. About one-quarter of the separating teachers had retired. Of the 18 percent who cited a career move, many mentioned the move to administrative or counseling/coaching positions, or going back to school as the main reason they were no longer teaching. Salary was mentioned by fewer than 15 percent as the primary reason and working conditions by another 10 percent of the leavers. Again, as Weiss and Boyd point out, the main reasons teachers leave teaching frequently have "less to do with conditions of teaching than with the demographics of the teaching population and the effect of family decisions."¹³

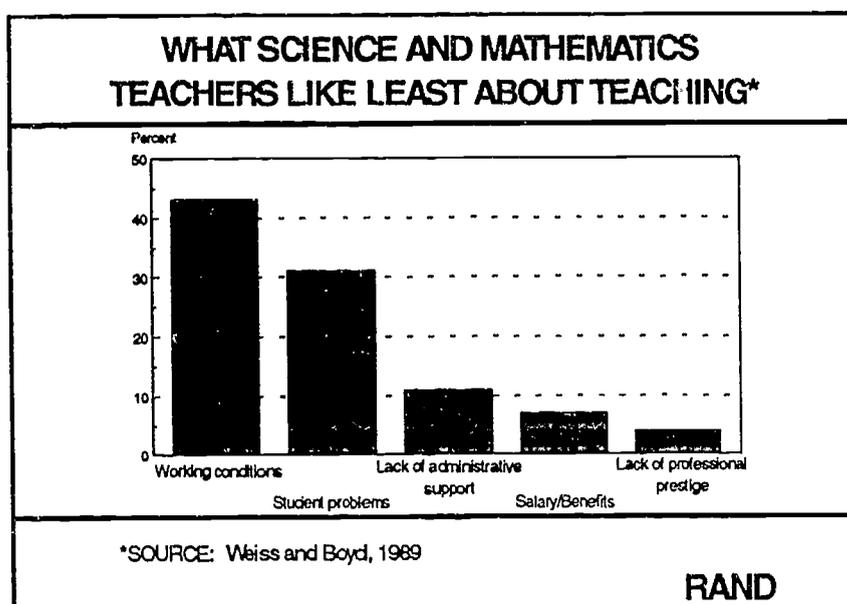
¹²I. R. Weiss and S. E. Boyd, *Where are They Now? A Follow-up Study of the 1985-86 Science and Mathematics Teaching Force*, Horizon Research, Inc., November 1990.

¹³Weiss and Boyd, *op. cit.*, p. 19.

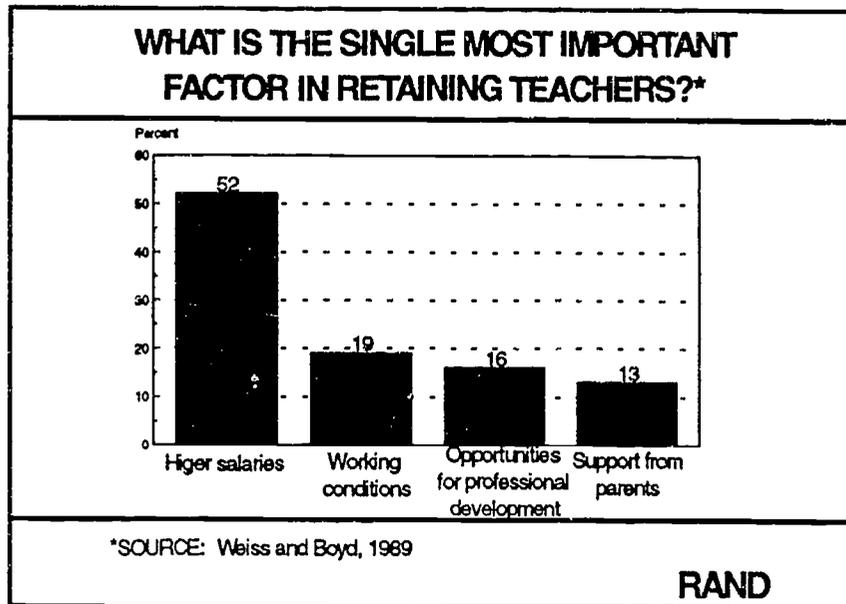


In an effort to discover how important salary is in the decision to leave, former teachers were asked whether a substantial increase in salary would have made a difference. The overwhelming majority of the leavers said no when asked about a 10 percent raise; 2 out of 3 said even a 20 percent raise would not have made a difference in their decision.

At first glance, this seems to run counter to what we had seen earlier--all our research from the multivariate analyses showed that salary is fairly important in teacher retention and would significantly raise the median lifetime of teachers. We need to remember that here we are talking about all teachers rather than new teachers. For new teachers, particularly in certain subjects, increased salaries or salaries that are more competitive with outside opportunities would make a difference between entering and not entering teaching and between staying through the first few vulnerable years.



It might be helpful to examine some of the factors most disliked by science and mathematics teachers about the teaching profession. Two out of five teachers mentioned some aspect of working conditions, generally excessive paperwork, nonteaching responsibilities, large class sizes, and heavy workload. Another big factor was student problems. One of the teachers in the Weiss and Boyd (1990) described this as "the general I-hate-you attitude" of the students. Salary/benefits appeared to be quite far down on the list with fewer than 10 percent citing this as the major drawback to teaching. Men were more likely to mention salary while women were more likely to focus on working conditions.



A little surprisingly, given the previous evidence, when asked about the single most important factor that would help in teacher retention, over half of the teachers mentioned higher salaries. Working conditions, opportunities for professional development, and parental support were other major factors, but not to the same extent as salary. Clearly, the role of compensation is seen by teachers as important even if surveys of current or former teachers may seem to indicate otherwise, primarily because many of them are experienced teachers for whom generally salary plays a secondary role in the decision to stay in teaching.

OUTLINE OF PRESENTATION	
<ul style="list-style-type: none">▪ Theory of Teacher Attrition▪ Patterns of Teacher Attrition: Evidence from the Indiana Study<ul style="list-style-type: none">- All Teachers- Beginning Teachers▪ The Role of Teacher Salary in Teacher Attrition<ul style="list-style-type: none">- Estimates from Multivariate Analyses- Evidence from Teacher Surveys▪ Recruitment and Retention Strategies: Salary and Non-salary Initiatives	
	RAND

Let us examine some recruitment and retention strategies that might be helpful for you to consider when managing your own teaching force.

OVERVIEW OF RECRUITMENT AND RETENTION STRATEGIES
<ul style="list-style-type: none"> ▪ Increased inducements to enter and to remain in teaching <ul style="list-style-type: none"> - Increased teacher salaries - Performance-based compensation plans - Teacher induction programs ▪ Lowering the costs or other barriers to teaching <ul style="list-style-type: none"> - Scholarships, student loans - Retraining teachers in shortage areas - Alternative certification/"nontraditional route" programs
RAND

Two general types of policy initiatives are typically developed to increase the supply of teachers. One set of policies attempts to increase teacher supply by increasing the inducements to enter and remain in teaching. These policies range from increased teacher salaries, teacher induction programs, and performance-based compensation plans, such as merit pay and career ladder plans. These policies affect both teacher recruitment and retention. The second set of policies also attempts to increase teacher supply, but by lowering the costs or other barriers to teaching. These include student loans and scholarship programs, funds and programs for retraining teachers for certification in shortage areas, and alternative certification and "nontraditional route" programs.¹⁴ This latter set of policies is aimed at recruitment of teachers. Today, we will focus on the former set of policies.

Obviously, given the limited amount of time we have today, we cannot examine the full gamut of strategies or policy initiatives. The paper by Darling-Hammond and Berry (1988)¹⁵ provides an excellent overview of teacher policy and some of what follows is taken from there. We will touch briefly on each of the three sub-topics and then show you some data from districts that have been experimenting with differential pay.

During the 1980s, teacher compensation policies changed markedly, reflecting concerns over shortages and the quality of teachers. Teacher salaries have increased substantially. In some cases, state legislatures and state boards have taken the unusual step of mandating beginning teacher salaries, and statewide salary schedules. However, higher teacher pay needs to be combined with effective management of the teaching force in order for major improvements to occur. In addition, while raising teacher pay

¹⁴For more details on alternative certification and nontraditional route programs, see S.N. Kirby, L. Darling-Hammond, and L. Hudson, "Nontraditional Recruits to Mathematics and Science Teaching," *Educational Evaluation and Policy Analysis*, Vol. 11, No. 3, Fall 1989, pp. 301-323.

¹⁵L. Darling-Hammond and B. Berry, *The Evolution of Teacher Policy*, RAND, JRE-01, 1988.

across the board is important to increase the attractiveness of teaching as a profession, it is an expensive way of dealing with shortages in certain specialties.

Let us now turn to some of the more innovative ways adopted by certain districts in dealing with shortages.

DIFFERENTIAL PAY BASED ON SHORTAGES
<ul style="list-style-type: none"> ▪ Increase salaries of all teachers within a specialty (simple but expensive) ▪ Raise pay of incoming teachers only <ul style="list-style-type: none"> - Higher initial pay step - One-time bonus - Higher pay to selected new hires
RAND

From an economic perspective, a single salary schedule for all types of teachers will inevitably cause either persistent shortages or lowered quality of teachers in those specialty areas where the wages of alternate job opportunities significantly exceed those of teaching such as science and mathematics, or where the working conditions are extremely poor or unusual, such as special education teachers. As far back as 1962, Kershaw and McKean (1962)¹⁶ pointed out the inefficiencies of the uniform salary schedule for teachers and its role in causing shortages among certain types of teachers. In more recent times, Levin (1986)¹⁷ provide more detailed critiques of the uniform pay schedule. The most obvious and cost-effective solution to teacher shortages: differential pay scales for different types of teachers or those working under particularly difficult conditions, has met with tremendous resistance from the teachers' unions for a number of reasons, mostly having to do with equity. Some believe that teaching is inherently a process requiring teamwork and common effort among all teachers with no one contribution being more important than others. Higher wages for equal work strikes some as being inequitable. In addition, differential pay based on specialty also brings back memories of the time prior to the 1960s when separate salary schedules existed by gender, race, and level taught. Much effort was required to remove discrimination from salary schedules and the proposal to establish differential pay--particularly in the male-dominated areas of science and mathematics--raises some of these same fears. We should point out, however, that wage differentiation by specialty is the norm in most of our society, and associated questions of equity are solved in these situations. Occupational wage differentiation based on labor market conditions exists across the private and government sector of our economy for professional personnel. For example,

¹⁶J. A. Kershaw and R. N. McKean, *Teacher Shortages and Salary Schedules*, McGraw-Hill, New York, 1962.

¹⁷H. M. Levin, "Solving the Shortage of Mathematics and Science Teachers," *Educational Evaluation and Policy Analysis*, Vol. 7, No. 4, 1985, pp. 371-382.

even in the military, long term bonus increments are given for different military occupations. These increments recognize the differential opportunities individuals have in the labor market outside the military.

The simplest form of differential pay--although clearly the most expensive--is to raise the salary of all teachers within a specialty. A second is to raise the pay of incoming teachers only and this can be done in several ways. The most common form is to offer a higher initial pay step, although a one-time bonus is also used. A more restrictive variant is to offer higher pay only to certain new hires. Thus a "matching offer" program would first designate shortage specialties, but then allow discretion as to which new recruits received higher offers.

In recent years, faced with persistent shortages in some teaching areas or in some schools, a small number of school districts have implemented various forms of differential pay in order to attract teachers into these specialties or schools. The next few slides show you some details of their plans.

HOUSTON'S "SECOND MILE PLAN"

- End-of-year stipends to teachers in critical shortage areas
 - \$750 – special education teachers
 - 1500 – bilingual education, mathematics, science
- \$200-\$700 for professional development
- \$2000 stipends for teaching in "high priority" schools
- Improved retention and turnover and decreased teacher vacancies

RAND

Houston's "Second Mile Plan" is an example of a local district incentive program. From 1982-83 to 1986-87, the Houston Independent School District implemented several pay incentive programs designed to increase teacher attendance and retention in critical shortage areas and schools. End-of-the year stipends were awarded to teachers who taught severely handicapped students (\$750), regular special education (\$525), bilingual education, mathematics, or science (\$1500 each). To qualify, a teacher had to pass the district's teacher assessment and meet attendance requirements, which meant missing no more than five days of school. For not taking these five "allowed" days, the teacher was given a bonus of \$100 per day for each of the five days. Teachers were also given \$200-700 for professional development and \$2000 stipends were given for teaching in a school designated as high priority. The program was eliminated in 1987 because of the decline of Houston's oil-based economy. An early evaluation of the program showed that after two years, there were improvements in teacher attendance and teacher turnover, and decreased teacher turnover.

BOSTON'S "MATCHING SALARY PROGRAM"

- Allows new teachers to be given offers higher than mandated beginning salaries if needed to match existing salary offers
- Critical shortage areas, or minority teachers
- Increment often exceeded \$5000 annually
- One-half of mathematics and science teachers hired under this program

RAND

Boston had a "matching" salary program whereby in designated teaching areas, new teachers may be placed higher on the pay scale than their experience would dictate. However, this is only done if needed to match existing salary offers from other school districts or private industry. Areas designated as eligible for this program were bilingual education, special education, mathematics, and all sciences. The program also covered minority teachers. Approximately one-half of the mathematics and science teachers were being hired under this program with enhanced pay, which often exceeded \$5,000 annually. we are not aware of any evaluation of the program.

DADE COUNTY'S INITIATIVES
<ul style="list-style-type: none"> ▪ \$1,000 first year bonus for new teachers in shortage areas—English, mathematics, all sciences ▪ Bonus does not affect future salary ▪ Additional pay for high priority schools—teachers given increasing increments starting at \$500 per year for first four years; \$2,000 for subsequent years ▪ Scholarships for students majoring in education and preparing to teach in shortage specialties ▪ Persistent shortages are no longer a major problem
RAND

Dade County, Florida has several initiatives aimed at attracting teachers to shortage areas. A \$1,000 bonus is offered to new teachers in the areas of English, mathematics, science, exceptional education, and certain vocational education areas. The payment is for the first year only and future salary is not affected. In addition, Dade County provides increasing annual increments for teaching in high priority schools, as shown in the slide. After the fourth year, the increment is kept permanently at \$2,000. Scholarships of \$4,000 are provided for students in their junior and senior year in college if they prepare for teaching in state shortage areas. Although no formal evaluation has been done, anecdotal evidence suggests that persistent shortages are no longer a major problem.

Quite apart from pay increases, both general and targeted, the states have become increasingly active in developing and piloting programs that compensate teachers based on performance standards, similar to the norm in most other occupations, where worker compensation is based in whole or in part on the adequacy of the workers' performance. Let us briefly look at merit pay plans and career ladder plans, both of which are described in some detail in Darling-Hammond and Berry (1988).

MERIT PAY PLANS
<ul style="list-style-type: none"> ▪ Based on sound economics—salary schedules linked to job performance will lead to better performance ▪ Requires that performance criteria on which salary increments are based must be validly operationalized; specific behaviors that constitute "good" teaching difficult to delineate ▪ Most merit pay plans characterized by: Flawed or unreliable evaluation instruments; Administrative problems; Staff dissension; Inadequate funding; Failure to meet goals
RAND

Darling-Hammond and Berry (1988) describe merit pay programs as being designed to financially reward outstanding teachers for doing their job well. The merit pay is usually in the form of a bonus and awarded on a yearly basis depending on performance evaluations for that year. Murnane and Cohen (1986)¹⁸ point out the history of merit pay "suggests that while interest in paying teachers according to merit endures, attempts to use merit pay do not." This observation reflects the fundamental dilemma of pay-for-performance plans: They are based on an enduring, sound economic philosophy—salary schedules linked to job performance will lead to better performance—that is in direct conflict with the historically egalitarian nature of the teaching profession.

Murnane and Cohen (1986) note that for merit pay programs to work, the performance criteria on which salary increments are based must be validly operationalized. That is, discrete, objectively observable actions that are related to productivity must be used as the basis of evaluating worker performance, so that workers must be able to answer the following two questions: (1) Why does worker X get merit pay while I do not? and (2) What can I do to get merit pay?

Such questions are easily answered for some professions but not for others such as teaching, where specific behaviors that constitute "good" teaching cannot be delineated. As many researchers have pointed out, teaching cannot be characterized in terms of a universally applicable set of teaching behaviors and practices. As a result, teachers often view the evaluation procedures in merit pay plans as invalid and this compromises the plan and its implementation. This, in turn, engenders hostility and resentment, and leads to lowered morale. Most merit-pay plans have tended to be short-lived and some of the many reasons for their failure are shown in the above slide. The plans that have survived have tended to evolve into other forms of pay incentive plans

¹⁸R. J. Murnane and D. K. Cohen, "Merit Pay and the Evaluation Problem: Why Most Merit Plans Fail and a Few Survive," *Harvard Educational Review*, Vol. 56, No. 1, 1986, pp. 1-17.

such as career ladder plans (extra pay for extra work), or general bonus programs in which the original intent is quite lost.

CAREER LADDER PLANS
<ul style="list-style-type: none"> ▪ Designed to reward teachers for more responsibilities and for professional development ▪ Seem to focus less on teacher evaluations and more on roles/responsibilities which are more easily measured ▪ Concerns: tendency of evaluation to stifle creativity; perceived unfairness of the evaluation system and criteria; lack of teacher input into the development and implementation of program; lack of evidence on effects of plans on retention or effectiveness
RAND

Unlike merit pay, career ladders are designed to reward teachers for not only outstanding teaching, but also for taking on more job responsibilities and participating in professional development. Thus, career ladders are designed to encourage teacher retention by increasing both the monetary and nonmonetary rewards of a teaching career. In so doing, these plans address both the inadequate pay issues and the lack of career development/advancement available in teaching. The development of career ladders is a reform espoused by many recent reports examining ways to improve teaching and teacher education.

In many career ladder plans, teaching is divided into three to five career levels; in others, usually called master or mentor teacher plans, there are only two levels--regular teachers and master teachers, who are accorded more pay in exchange for (typically) supervising, assisting, and evaluating first-year teachers. Many merit pay plans have been replaced by career ladder plans. These latter are more acceptable in general because they focus less on teacher evaluation and more on teacher roles and responsibilities, which are more easily delineated. However, evaluation is part of the career ladder plan, and it is usually the least acceptable part of the plan to teachers, and the part that is most difficult to implement. Many states have been proceeding cautiously and as Darling-Hammond and Berry (1988) note: "The survival of career ladder programs will depend, in large part, on the ingenuity and perseverance of these test sites in developing credible and practical solutions to the issues of evaluation."

There has been no formal evaluation of any such programs regarding their effect on teacher retention, effectiveness, student achievement.

We now turn briefly to teacher induction programs and Indiana's experience in this area.

INDIANA'S BEGINNING TEACHER INTERNSHIP PROGRAM

- Implemented in 1988-89 as part of a larger educational reform package
- Requires all new teachers to serve a one-year internship under a mentor teacher
- Program is designed to provide support to new teachers, and to increase their likelihood of staying in teaching
- Evaluated by the principal to assess teaching competency

RAND

The Indiana Beginning Teacher Internship Program was established as part of a larger educational reform package passed by the state legislature in 1987.¹⁹ The 1988-89 school year, the year of our survey, was the first year the internship program was implemented. The program requires that all new teachers serve a one-year internship if they received their state teaching certificate after March 31, 1988, unless they have at least two years of teaching experience in an accredited out-of-state school. During the internship, both the novice and mentor teachers work as regular teachers with full classroom responsibilities. The mentor teacher receives a \$600 stipend. The school principal also evaluates the beginning teacher using a state-developed instrument that assesses minimal teaching competency. The internship program goals focus on the following three areas: (1) providing a psychological and social support structure for beginning teachers; (2) providing the knowledge and assistance beginning teachers need to become effective teachers; and (3) increasing the likelihood that the beginning teacher will remain in teaching.

As part of the survey of new hires referred to earlier, data were collected on program implementation and how beginning teachers rated their mentors and different aspects of the program.

¹⁹For more detail, see L. Hudson, D. W. Grissmer, and S. N. Kirby, *New and Returning Teachers in Indiana: The Role of the Beginning Teacher Internship Program*, RAND, R-4048-LE, 1991.

USEFULNESS OF MENTOR'S ADVICE			
Area of Assistance	Mentor Rating		
	Extremely Useful	Moderately Useful	Not Useful
Dealing with classroom management	47	40	13
Dealing with instructional problems	48	39	13
Adjusting to the school en- vironment	60	31	10

RAND

One of the questions asked of beginning teachers was how useful they found the assistance they received from their mentor teacher. As the slide above shows, mentors' assistance was viewed as quite helpful, especially in easing their adjustment to the school environment. Almost half of the beginning teachers found their mentors' advice for dealing with classroom management and instructional problems to be "extremely" useful, and 60 percent found their mentors' assistance in adjusting to the school to be extremely useful. Moreover, 87-90 percent of beginning teachers found their mentors' assistance to be at least moderately useful--an overwhelming consensus. Among those who did not find mentor assistance useful, experienced teachers were overrepresented. Overall, these data suggest that the mentors' advisory role was very successful.

OVERALL FINDINGS
<ul style="list-style-type: none"> ▪ 65 percent of teachers rated the program as "good" or "excellent" ▪ 54 percent of program participants were "very satisfied" with their first-year teaching compared with 44 percent of nonparticipants ▪ 84 percent of program participants stated they would definitely teach next year compared with 74 percent of nonparticipants
RAND

Overall, 65 percent of teachers rated the program as "good" or "excellent"; another 25 percent rated it as "fair." Only 10 percent rated the program as "poor." Specific aspects of the program, however, rated much higher than the overall rating would suggest.

Participants were more satisfied with their first-year experience than nonparticipating beginning teachers and this effect was statistically significant. An estimated 54 percent of typical new teachers participating in the program stated that they were *very* satisfied with their first-year experience, compared with 44 percent of nonparticipants. This may reflect a more effective job performance and may lead to improved retention rates.

Although we could not assess job performance or actual retention, our data show that the program appears successful at influencing new teachers' plans to stay in teaching the following year. Participants were much more likely to state that they would *definitely* teach next year, compared to nonparticipants. A logistic regression analysis that controlled for teacher characteristics shows that a typical teacher who was a participant had an estimated 84 percent probability of definitely teaching next year, as opposed to 74 percent for nonparticipants.

Teacher induction programs appear to provide an improved learning environment for new teachers and show promise of reducing their attrition rates. They are also fairly inexpensive and cost-effective.

CONCLUSIONS: I
<ul style="list-style-type: none"> ▪ Important to measure and monitor attrition rates because they serve several important planning and policy objectives ▪ Important to define attrition carefully and to distinguish annual from permanent attrition ▪ Attrition rates are likely to be higher for: <ul style="list-style-type: none"> - young, inexperienced teachers - teachers in specialties with high opportunity costs - teachers in poor or unusually stressful working conditions ▪ Disaggregation by different characteristics important for accurate predictions of shortages
RAND

There are several conclusions that we would like to leave you with today. First and foremost, it is extremely important to track attrition over time. This serves, as we showed earlier, several planning and policy objectives. Not only do attrition rates largely determine how many teachers need to be hired each year, but they also provide important indicators of the relative adequacy of compensation levels and working conditions within the profession. Low salaries and poor working conditions are likely to lead to higher attrition and point to a need for corrective policies in these areas.

We have also shown the need to distinguish temporary attrition from attrition out of the profession. We have seen that about a quarter of all teachers who leave do so temporarily and return within five years. Such temporary attrition is frequently for reasons that do not lend themselves to corrective actions--pregnancy/child rearing, pursuing further education, family moves. One needs to examine the rates and patterns of permanent attrition in order to see what reforms might be needed.

The data we have presented has shown that there are some groups that are particularly vulnerable to attrition, as predicted by our theory of attrition. Young, inexperienced teachers, experiencing the demands of teaching without a clear prior knowledge of such demands, and subject to changes in family status and residential location, will tend to have higher attrition rates than any other age-group, except perhaps those at retirement age. Those with higher opportunity costs in terms of higher wages in their next best alternate occupations, are also likely to leave at higher rates and much less likely to return to teaching. Teachers who are working in particularly stressful subject areas, or locales are also likely to be at risk.

CONCLUSIONS: II

- Compensation policy initiatives can increase quality and retention of teachers
 - increasing salaries to be more competitive with other occupations
 - implementing differential pay plans for shortage areas
 - developing performance-based compensation plans that link salary with performance
- Nonsalary initiatives are equally important: teacher induction programs; professionalization of teaching; increasing parental involvement; assistance with emotional/social problems of children

RAND

The role of compensation is very important in attracting and keeping quality teachers. We have examined several policy initiatives, ranging from across-the-board increases in teacher pay to be more competitive with other occupations, to implementing some form of differential pay that would be targeted toward critical shortage areas or schools. The move to link salary with performance is based on sound economic theory, even if the implementation of such performance-based pay plans has been hampered by constrained budgets, poor conceptualization, and failure to gain acceptance by teachers. The idea behind such plans is nonetheless noteworthy and pilot programs to carefully test various options need to be developed and monitored.

The role of nonsalary initiatives is equally important, particularly in a profession such as teaching which is subject to great variability in working conditions, peer and administrator support, degree of parental involvement, and level of student problems, both emotional, and psychological. In addition, teachers frequently mention the lack of respect for teaching as a profession--something that combined with lower salaries engenders resentment and low morale and may deter higher ability students from entering teaching. Teacher induction programs, efforts to professionalize teaching, support networks that would help with student problems, efforts to involve parents in the schools--all these might help attract and retain a quality workforce.

An excellent critique of recent reform efforts in education is contained in Murnane et. al. (1991).²⁰

²⁰R. J. Murnane, J. D. Singer, J. B. Willett, J. J. Kemple, and R. J. Olsen, *Who Will Teach? Policies That Matter*, Harvard University Press, 1991.

