Does the Mode of Entry into Teaching Matter in Teacher Retention?
A Discrete-Time Survival Analysis Modeling of New York City Public School Teachers

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Submitted in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy
under the Executive Committee
of the Graduate School of Arts and Sciences

COLUMBIA UNIVERSITY

2014

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ABSTRACT

Does the Mode of Entry into Teaching Matter in Teacher Retention?

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This dissertation examines whether the mode of entry into K-12 public school teaching has any implications on teacher retention. Teacher retention is important because it is an important precursor to teacher quality, which has been shown to positively impact student performance. However, teacher turnover can seriously threaten teacher retention. Additionally, teacher turnover is associated with serious economic and non-economic costs. To this end, it may benefit schools and school districts to pay particular attention to hiring and retaining their teachers, especially the quality ones, for the long haul.

Current teacher labor markets literature is deficient in serious analytical frameworks for understanding longitudinal cohort retention comparisons of traditional and nontraditional teachers, as well as analysis of quit behaviors that focus on *when* a teacher is at the greatest risk of quitting. My research endeavors to bridge this gap. Using a large-scale administrative data set comprising cohorts of traditional and nontraditional teachers from the New York City Department of Education (NYCDOE), I used discrete-time survival analysis modeling, specifically, the Cox Proportional Hazards (PH) model, to analyze the quit and retention patterns of cohorts of teachers from traditional and nontraditional sources over a six-year period.

I found similar retention patterns between the two groups with notable peculiar patterns for the nontraditional group. The data suggests that entry routes into K-12 public school

teaching, the year of entry into teaching, individual age, sex, ethnicity, subject taught, and school level can be important predictors of retention.

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It is easy to say that an accomplishment as significant as completing one's doctorate, is a result of one's sheer perseverance, grit, and a steely resolve to succeed despite all odds. While that may be true, it is, in my humble view, grossly inadequate. Yes, this work represents the culmination of years of research and writing that was possible only through absolute determination on my part, I have, however, benefitted enormously from many individuals throughout the entire process.

First and foremost are two renowned experts in my field, Economics and Education, under whose tutelage I have been lucky enough to study: Professors Thomas Bailey and Henry (Hank) Levin. I am enormously grateful to my sponsor, Professor Bailey for his support, encouragement, and expertise. Right from the start, Professor Bailey adroitly steered me in the right direction when the idea of this dissertation was just that – an idea. From our numerous meetings and with his copious penetrating and profound questions at every stage, what was once a simple idea of trying to understand teacher retention became solidly grounded in my mind, germinated, and evolved into the work that culminated in this dissertation. Even after I had to take some time off, Tom welcomed me back with open arms and encouragement as I resumed my studies upon my return. I am truly grateful for having him as my sponsor.

Professor Levin, the chairperson of my dissertation committee, was extremely instrumental when I was trying to secure the data used in this dissertation from the New York City Department of Education. I will be eternally grateful for his assistance in this regard, not to mention his invaluable expert advice and suggestions during the early stages of the process which ultimately helped to tailor this work in the right path. I have also benefitted profoundly from the other members of my dissertation committee. Professor Erica Walker offered very

useful insights on survival analysis and was always available for discussions. Professor Aaron Pallas's expertise in New York City public schools was irreplaceable. Professor Randall Reback provided valuable suggestions on the intricacies of applied econometrics research methodology.

I am infinitely indebted to my dearest Karen and our brilliant son, Andrew, who both had to put up with my endless hours in the library everyday after leaving work, including most weekends and many holidays. I could not have done this without the two of you! Thank you so very much. Karen, thank you for being the unofficial editor, reader, and "critic-in-chief" on many occasions. Above all, thank you for being there.

Finally for everyone whose name I did not mention here but who has in some way, shape, or form, contributed to this work, directly or indirectly, I thank you.

DEDICATION

This dissertation is dedicated to my wonderful son, Andrew Oluseyi Ogundimu, who constantly reminded me to complete this work so that we could have the time to “go ride our bikes” on weekends; to the memory of my departed father, Samuel Oladeinde Ogundimu, who planted the seed of inquisitiveness and tenacity in me from a very early age; to my mother, Dr. Joyce Amiede Osunde, who significantly inspired me by acquiring a medical degree (MD) in the former Soviet Union, completing her entire medical education in Russian; and to the memory of my late grandmother, Grace Olubunmi Ogundimu, who practically raised me while my parents were abroad studying.

Chapter I

INTRODUCTION

For the past couple of decades, there has been a consensus of opinion in education research in the United States that there is a shortage of elementary and secondary school teachers (Ingersoll, 2003; Miller & Chait, 2008). Many believe that the prevailing low performance in K-12 education in the U.S. compared to other industrialized countries[1] is attributable, in part, to teacher shortage (Ingersoll, 2003). Persistent teacher shortage disrupts teaching and learning, especially for students with learning gaps (Jacob, 2007). Large urban schools districts like New York City, Chicago, Los Angeles, and Detroit are particularly vulnerable because historically they tend to have a greater percentage of low-income, underprepared students who need consistency in their learning. It should be noted that while rural and suburban districts have their share of low-income students, urban schools - particularly those in large cities - tend to have the lion's share of poor, underperforming students (NCES 96-184).

Researchers have theorized about the reasons for teacher shortage (Allen, 2005; Boe, et al., 2008; Guarino, et al., 2004, 2006; Ingersoll, 2003; Johnson, & Birkland, 2003; Johnson, et al., 2005). Some blame increased retirement of veteran teachers coupled with heightened student enrollment (Ingersoll, 2001; 2003). Others cite a lack of effective, strategic teacher recruitment and retention policies leading to low retention, and teacher attrition (Alliance for Excellent Education, 2005; Boe, et al., 2008;). The National Center for Education Statistics (NCES) of the U.S. Department of Education through its yearly School and Staffing Survey (SASS) and its corresponding Follow-up Survey has continued to gather and disseminate useful information on,

[1] In the 2009 PISA results, the United States ranked 17th in reading, 23rd in science, and 31st in mathematics consistently behind other industrialized nations like China, Korea, Singapore, Finland, Hong Kong, Japan, and Canada. Source: http://nces.ed.gov/surveys/pisa/

amongst others, teacher shortages, attrition, and retention, including yearly statistics on the movers, leavers, and stayers, in public and private schools.[2] Yet other studies have attempted to answer questions pertaining to teacher shortage and attrition as they relate to fields of study or disciplines, and individual characteristics (Johnson, et al., 2005).

The undeniable fact is that unimpeded, teacher attrition may lead to teacher shortage. The impact on instruction and school climate depends upon the rate at which teachers are quitting versus how quickly they are replaced which in turn depends on the hiring and retention policies of the school district. The best case scenario is to limit teacher attrition as much as possible. Some level of teacher attrition is inevitable and probably necessary to sustain instructional effectiveness (Ingersoll, 2001; Johnson, et al., 2005). Excessive and/or disproportionate attrition can have long-lasting, often negative effects on student achievement because schools are forced to replace permanent teachers with substitutes who may or may not be well-trained in the fields in which they are being temporarily hired to fill. Even well-trained, long-term substitutes need time to acclimate to the school environment. Furthermore, students' response to substitute teachers can vary dramatically from school to school. Arguably, private schools tend to have more consistently effective practice in this arena.

Generally speaking, teacher turnover can be costly for the school district (Alliance for Excellent Education, 2005). In 2005, it was estimated that nationwide, teacher turnover could cost up to $5 billion (Alliance for Excellent Education, 2005; See Appendix A, Tables 10a, and 10b). The costs associated with replacing teachers who leave can include that of advertising, selecting, training, developing, and placing new teachers in schools (Barnes et al., 2007). Financial costs are one aspect; unmeasured costs of disruption are another. These can range

[2] http://nces.ed.gov/

from administrative conundrum at the school level in the hiring and acclimatization of substitute teachers, to the adjustment of students to a newly hired teacher, to the effect on other teachers on having to constantly "cover" classes. The unmeasured disruption to the education process can be substantial depending upon how well school leaders can adjust to the disequilibria of teacher shortage/turnover, and when, during the school year, the turnover occurs. Clearly, turnover in the beginning or middle of the school year could be more destabilizing than at the end. In public schools, this can put a strain on taxpayers since funding for public K-12 schools is largely dependent upon property taxes. Therefore, constantly having to replace teachers can deplete school funds which can lead to districts seeking additional funding. Ultimately, taxes may have to be increased to offset the rising cost of replacement.

In any profession, it takes time to become an expert. The time it takes to hone one's skills into the highly proficient or distinguished category depends on the profession. It is estimated that it will take three-to-seven years to become an expert (effective) teacher (Alliance for Excellent Education, 2004; Berliner, 2000) - I would argue - due mainly to its complex nature. It is important to distinguish between a veteran and an expert teacher. In teaching (unlike probably in any other profession), and particularly in the public setting, it is quite possible to be a veteran, ineffective teacher if the veteran does not or cannot demonstrate improved student learning, especially over time. Improved student learning for this purpose is described as consistent high performance in state standardized tests which ultimately determines graduation rates. Equally conceivable is the notion that talented and hard-working novice teachers can develop into highly effective, master teachers – provided they remain in teaching long enough to acquire the skills necessary for this transformation. The question then is: Is this happening? This is one of the key questions that I will attempt to answer in this study. It is one

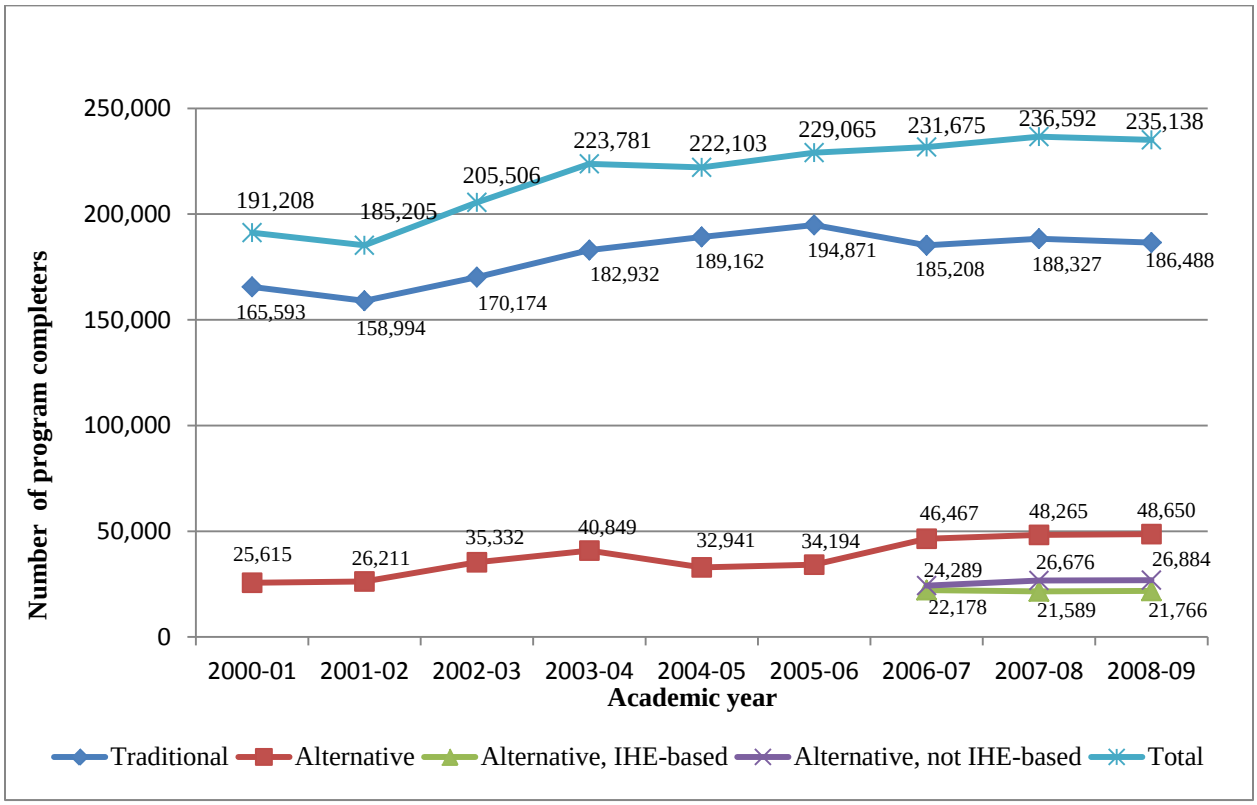
of the major concerns in teacher education research today. It is a central rationale for the establishment of the alternative certification routes to teaching and a leading reason in its expansion over the past two decades (See Figure 1).

These programs were created largely to stem the tide of teacher shortage and its potentially harmful effect on student learning. A typical alternative certification program allows qualified individuals (usually with bachelor's degrees) with little or no coursework in education theory, methods, or foundation, to apply for, and be certified to teach in subject areas in which these individuals have been deemed to be proficient. The definition of proficiency ranges from state to state. The common denominator is a minimum of either a bachelor's (or in rare cases, a master's) degree in the area that the individual has expressed interest in teaching; or having a determined number of credits in a subject area. Figure 1 below shows the growth of alternative teacher certification programs in the United States since the mid-eighties.

The New York City Teaching Fellows Program (NYCTFP or TFP) is an example of an alternative teacher certification program created to curb the teacher shortage problem in New York City (NYC). Since its inception in 2000, there have been discussions on whether or not it has fulfilled its promise of stemming the tide of teacher shortage and improving the quality of instruction. Questions have been raised about the retention of teachers in the program relative to other teachers. There is very little research to answer these questions. My dissertation is intended to shed some light on the retention questions of the TFP relative to other teachers in the NYC public school system. The results, I hope, will heighten our understanding of teacher shortage and teacher retention in general and teacher shortage/retention in a large urban area to be exact. It will clarify the distinguishing characteristics of the attrition/retention phenomena of teachers who were hired traditionally and those via non-traditional means.

Finally, it is my hope that long-lasting corrective measures to the teacher retention conundrum may be developed as a result of the findings from this study.

Figure 1: Trend in Total Number of Program Completers, by Traditional and Alternative Routes in the United States: AY 2000-01 through AY 2008-09



NOTE: The 50 states, the District of Columbia, Puerto Rico, American Samoa, Guam, the Northern Mariana Islands and the Virgin Islands submitted a state Title II report in 2010. Federated States of Micronesia did not submit a state Title II report in 2007 or 2010. Republic of the Marshall Islands did not submit a state Title II report in 2009 or 2010. Data presented in this report for previous years may not be consistent with data published in earlier reports because states are able to revise their data. The number of alternative completers in AY 2006–07 through AY 2008–09 is the sum of the alternative, IHE-based completers and alternative, not IHE-based completers. The Department used the 2010 reporting year to pilot the new reporting procedures and instruments. That year, the Department directed states and teacher preparation programs to report as completely as was reasonably possible, while they used the pilot year to build capacity and develop processes for collecting full and accurate data in 2011. Consequently, data elements that states reported in 2010 vary in comprehensiveness and limit the Department's ability to fully interpret the data.

SOURCE: U.S. Department of Education, Office of Postsecondary Education, Preparing and Credentialing the Nation's Teachers: The Secretary's Eighth Report on Teacher Quality; Based on Data Provided for 2008, 2009 and 2010, Washington, D.C., 2011.

U.S. Department of Education, Office of Postsecondary Education. (2011). Higher Education Act Title II Reporting System.

PURPOSE

The purpose of my dissertation is to critically examine and compare the retention of beginning teachers from the TFP in NYC (TFs) with the retention of teachers who entered teaching in New York City through the traditional route. For the purposes of this study, I will henceforth refer to this group as Non-Teaching Fellows or NTFs. As mentioned earlier, the NYCTFP is part of the alternative certification programs (ACP) of the New York City Department of Education (NYCDOE).[3] This analysis is necessary because the TFP is widely recognized as one of the (if not *the*) preeminent ACP in NYC, with millions of dollars invested to not only increase the supply of teachers in NYC but to also raise the quality of teaching. It is therefore worthy to investigate if the investment in this program has produced what it was meant to produce. In my view, stakeholders should be afforded the opportunity to ask questions such as: should the program continue to operate with its status quo or should it modify certain aspects of its operation? If so, what aspects and why? Is it necessary to highlight peculiar attributes of teaching in a large urban setting like NYC that many beginning teachers may not be familiar with? My objective is to provide answers to these questions based on my findings.

As mentioned earlier, the NYCTFP was established in 2000 in collaboration with The New Teacher Project (TNTP) partly to tackle the teacher shortage problem that NYC was experiencing in the late 1990s through the early 2000s, and partly to improve the quality of education in the New York City Public Schools (NYCPSS) by attracting nontraditional teachers – career changers, recent college graduates, and retirees – to teach in the NYCPSS. TNTP is a

3 Other lesser known ACP in NYC include the NYC Teaching Residency for School Turnaround (beginning August 2012), Teach for America (TFA), New Visions for Public Schools – Hunter College Urban Teacher Residency, I-START Urban Teacher Residency Program, Peace Corps Fellows Program, Math for America Fellowship Program, and Teaching Residents at Teachers College.

non-for-profit organization founded by teachers in 1997 to train new teachers and improve instructional policies and practices.

RATIONALE

The rationale for this study is multidimensional:

i. *To test proponents' conventional wisdom that TFs have a higher retention rate than NTFs.*

ii. *To assess the notion that the TF program involves a superior recruitment effort that has managed to find and retain educated individuals willing to teach in a large urban setting, many in high-poverty schools*.

iii. *To evaluating whether or not TFs stay long enough in teaching to have a positive impact on student achievement (as measured by sustained improved scores on standardized tests and graduation rates). I will rely on empirical research from other scholars to establish this relationship since the scope and sequence of this study exclude examining test scores and graduation rates.*

iv. To estimate when TFs (and NTFs) are at the greatest risk of quitting.

v. *To assess whether or not the TFP has successfully changed the dynamics of teacher recruitment in the NYC public school system.*

Given the demands of teaching, many believe that the NYCTF program has energized the teaching profession in NYC, particularly in high-need areas probably because many are career changers, and those who are not career changers, i.e., recent college graduates, enter teaching from nontraditional teaching routes having majored in disciplines other than education, thereby entering the profession with a different perspective.

By analyzing TFs' retention, and juxtaposing it with the retention of NTFs, I will be able to provide information that will either confirm or disprove the conventional wisdom stated above. If my analyses confirm the conventional wisdom, it may suggest that the program is successful in

hiring, training, and retaining non-traditional teachers many of whom might not have otherwise entered teaching. This may imply strengthening the program or maybe even scaling it nationally. It will entail a further examination of the recruitment strategy of NYCTF.

On the other hand, if my analyses reveal contradictory evidence to the accepted view of TF retention, I will have evidence to argue against the current notion that TF have higher retention rate than traditional teachers. One can then argue for ways to strengthen the retention of TFs or to augment or eliminate its existence if the evidence supports that..

Why is the study of NYCTF retention important?

In K-12, improved student performance is the ultimate goal of every school. Persistently low student performance invariably leads to increased dropout rates (Rumberger & Lim, 2008; Belfanz & Legters, 2004). The economic implications of high school dropouts, as well as potential individual and societal benefits have been well documented (Belfield & Levin, 2007). Teacher quality affects student performance and individual teachers can impact student achievement in measurable ways (Sanders & Rivers, 1996; Rockoff, 2004). An effective teacher is capable of making the biggest impact on student learning, but it takes time to develop into a successful teacher capable of imparting and sustaining such gains (Berliner, 2000). Low-performing students usually in high-need areas stand to gain the most from the most effective, high-quality teachers (Sanders and Rivers, 1996). The NYCTF program, like many of the alternative teacher certification programs in the United States today[4], is primarily made up of a combination mid-career (career-changing) individuals, and recent graduates (many from highly selective institutions). Although there is very little, if any, research on the *direct* impact of alternatively certified teachers on student achievement, the prevailing evidence suggests that they are more likely to enter teaching with more than adequate general academic skills, and specific content knowledge or coursework especially in the highly specialized areas like math and science (Boyd, et. al, 2003; Hanushek & Rivkin, 2008). Such attributes have been linked to some improved teacher quality (Goldhaber & Brewer, 2000), and student performance (Monk, 1994; Whitehurst, 2002). *Since TF have the potential to raise student performance, and improve student achievement, it may be worthwhile to examine ways to retain them in the teaching profession for the long haul*. This is one important reason to investigate their retention rate.

[4] For example, Teach For America (TFA), Troops to Teachers, The New Teacher Project (TNTP), Arizona Teaching Fellows, Baltimore City Teaching Residency, TEACH Charlotte, teach NOLA, Mississippi Teacher Corps (MTC), Educators of Change (FL), American Board for Certification of Teacher Excellence, Rhode Island. Additionally, Rhode Island, Philadelphia, Washington, DC, Chicago, Indianapolis, Milwaukee, Denver, Oakland, Nashville, Memphis, Georgia, and Forth Worth all have Teaching Fellows programs.

The only way to realize the potential gains of improved student performance from TF is if they stay long enough in teaching to gain the experience to impact such positive gains. If not, it may be necessary to reexamine its recruitment framework. If, on the other hand, the evidence shows that they do stay longer than other teachers, the question of the feasibility of replication then becomes apparent, as policy makers may want to replicate the hiring/recruitment policies that are instrumental in sustaining the high retention rate of TF.

There is another important reason for studying TF's retention rate vis-à-vis that of NTF. There is a preponderance of research evidence on the prevalence of teacher shortage (Hanushek, et. al, 2004; Ingersoll, 2001, 2002, 2003, 2004). Many studies have also examined and concluded that public schools, especially those with high-need populations, often lose their best teachers, some of whom may be alternatively certified, such as the TF (Hanushek & Rivkin, 2008). Needless to say, teacher shortage does not augur well for students, student performance, and schools in general. Poor, urban schools are mostly affected. Many school districts are forced to first grapple with recruiting, hiring, training, and developing teachers to fill the vacancies created by teacher shortage. The *real and social costs* of such actions can be considerable (Barnes, et. al, 2007). In an effort to stem the tide of teacher shortage, and increase the supply of teachers, many states developed alternative routes to teaching certification – an approach that aims to prepare qualified non-teachers to teach in K-12 classrooms through short but intensive teacher preparation courses with complementary internships at local school districts. In most cases, the alternative certification process involves a binding contractual agreement between the candidate and the school district providing the program that affords the selected participants the opportunity to enroll in paid master's degree programs in education at a local university – provided the candidate agrees in writing to remain in teaching at the district for

a specified number of years, usually 3 – 5 years. The NYCTF program is the largest of such programs nationwide. *One of the key questions that my research will shed some light on, is: Do TF stay long enough to make the needed impact in student performance and achievement?* The answer to this question will be extrapolated from the results of my research questions. These results will also be the basis for formulating meaningful recommendations to policy makers.

WORKING HYPOTHESES

Logically, my working hypotheses are directly linked to the rationale for my study. In broad terms, my rationale can be categorized into four distinct arguments/questions:

i. *The proponents' conventional wisdom argument*
ii. *The superior recruitment argument*
iii. *The tenure argument*
iv. *The greatest risk question*
v. *The teacher recruitment dynamics question*

I am hypothesizing that:

1. **TFs do not have a higher retention rate than NTFs**. Based on my experience as an educator, I do not believe that TF remain in teaching longer than NTF for a variety of reasons. Generally speaking, they are, on average, much younger than NTF; many from very selective colleges and universities. Even though they may seem to be amenable to the idea of teaching, especially in a big city like NYC, the complexities of teaching may be too exhausting for many, and can hasten their decision to exit. Secondly, again from my personal experience, it appears that many TF leave teaching after a couple of years to continue their graduate school education. For this group, teaching is seen as a stepping-stone to other ("bigger and better") life's pursuits.
2. **TFP has developed a recruitment program that finds, and retains (up to a point) educated individuals willing to teach in large, urban schools – many in high-poverty areas**. The premise of this hypothesis is that while the hiring system developed by TFP is, to a reasonable degree, highly effective, retention of TF seems to be problematic. It is therefore worth finding out what the data reveal.
3. **TFs do stay "long enough" to have "an impact"**. The question here is: how long is long enough? I hypothesize that while some TF do stay "long enough" to have *some* impact on a limited number of students' achievements, it may be difficult to say that such

impact is sustained over long periods of time because the evidence suggests that the percentage of TF who remain in teaching after five years[5] is closer to, if not less than, the national average of about 40% – 50%.

4. **TFs are at the greatest risk of quitting between the first five years of teaching.** This hypothesis is partly based on research literature on teacher turnover and partly on my own personal experience as a public school teacher and administrator.
5. **The TFP has changed the dynamics of teacher recruitment in the NYC public school system.**. Partly as a result of the recruitment efforts of the TFP, the overall supply of beginning teachers in NYC has increased substantially. I will discuss the long-term effects of temporarily halting the teacher shortage problem in NYC later in the study.

[5] The general consensus amongst researchers who have analyzed teachers and student achievement is that although it is possible to have an immediate impact on student learning as early as the first year of teaching, the evidence suggests that it takes about five years to fully hone one's teaching skills (Aaronson et al., 2007; Ballou et al., 2004; Rivkin et al., 2005; Rockoff, 2004; Rowan et al., 2002; Sanders et al., 1996).

Chapter II

LITERATURE REVIEW

In the 1970s, there was a surplus of teachers in the United States with widespread layoffs, and insufficient teaching positions (Ingersoll, 1997). However, the publication of "*A Nation at Risk*"[6] in 1981 surprisingly highlighted amongst other things, the paucity of teachers in particular areas such as mathematics, science, foreign languages, as well as specialties like teachers of gifted and talented and handicapped students. It was arguably, one of the most influential reports about the conditions of education in the U.S.. In the early 1980s, student enrollment and teacher retirement began to rise while there continued to be a decrease in the number of college graduates, particularly women, choosing to become teachers (Ingersoll, 1997). All this led to increased interest in teacher supply and demand which in turn motivated many educational reforms aimed at curbing the problem of teacher turnover, teacher shortage and low retention (Haggstrom et al., 1988; National Commission on Excellence in Education, 1983).

Although teacher turnover and teacher shortage have received considerable attention as described above, very few research studies have attempted to examine whether or not novice teachers quit prematurely before gaining the essential experience necessary to become effective at raising student performance. However, there is a significant body of work on overall teacher attrition, retention, supply and demand (Boyd et al., 2005; Brewer, 1996; Cochran-Smith, M. 2004; deCourcy Hinds, M. 2002; Hess et al., 2004; Ingersoll, 2001, 2003; Johnson et al., 2005; Johnson, & Birkland, 2003; Mintz, & Yun, 1999; Murnane, et al., 1991; Stinebrickner, 2001a, 2002; and Zarkin, 1985). Some studies have looked specifically at why high achieving teachers

[6] The National Commission on Excellence in Education was created by the then Secretary of Education, T.H. Bell on August 26, 1981 to "examine the quality of education in the United States and to make a report to the Nation and to him within 18 months of its first meeting." The Secretary's concern grew as a result of "widespread public perception" that something was seriously wrong with the educational system in the U.S.

do not stay in low-performing schools (Boyd, et al., 2005; Clotfelter, et al., 2004; Hanushek, & Rivkin, 2008; Lankford, Loeb, & Wykoff, 2002). Others have concentrated on the supply and demand of minority teachers in certain states (Kirby, Berends, & Naftel, 1999); how teaching conditions predict teacher turnover in certain states (Loeb, & Darling-Hammond, 2005); and the general characteristics of movers, stayers, and leavers (NCES, 1997b). One significant limitation is that many of these studies are dated.

Who Teaches And Why

It is difficult to discuss teacher retention without examining who elects to teach and why. Empirical research is still very sparse in this area. One relevant study was undertaken by Hanushek and Pace in 1995. Focusing on the quality of individuals who chose to teach and their decision to prepare for elementary and secondary teaching, Hanushek and Pace (1995) analyzed the 1980 – 1986 cohort of the High School and Beyond (HS&B)[7] datasets and found that: white females were much more likely to complete teacher preparation than males or members of racial or ethnic minority groups; higher ability students[8] were less likely than lower ability students to enter teaching; teacher supply was inhibited by the barriers that states set up, such as certification examinations. Teacher salaries did not seem to have any significant effect on student preparation for teacher training in this study.

Vegas et al., (2001) also tried to answer the question of who goes into teaching and why but with a different lens. Using the multiple paths to teaching from high school - graduation from high school, entry into college, graduation from college, and entry into teaching – as a

[7] HS&B is part of the three major studies (National Education Longitudinal Study of the High School Class of 1972 (NELS-72); HS&B; and The National Education Longitudinal Study of 1988 (NELS:88)) established by the National Center for Education Statistics (NCES). The HS&B Survey included two cohorts – the 1980 senior class and the 1980 sophomore class. Both cohorts were surveyed every two years through 1986; additionally the 1980 sophomore class was surveyed again in 1992. (Source: http://nces.ed.gov/surveys/hsb/)

[8] As measured by cognitive achievement tests

foundation, these researchers examined the roles of race, ethnicity, and academic skills in predicting the persistence of high school students along the multiple paths leading to entry into teaching. They also used the longitudinal HS&B (1992) data that interviewed participants in 1980, 1982, 1984, 1986, and 1992. They had four main research questions: (1) "Who graduates from high school?"; (2) "Who enters college?"; (3) "Who obtains a B.A.?"; and (4) "Who enters teaching?" For 1980, they had an initial sample of 11,816 high school sophomores. Sixty-two percent were white, 21 percent were Hispanic, 13 percent were African American, 3 percent were Asian American, 2 percent were of Native American descent. Between 1986 and 1992, a total of 434 individuals or 3.7 percent of the original sample, became teachers. Amongst African American sophomores of the original sampled cohort, 4.4 percent became teachers, for both White and Native American high school sophomores, 3.7 percent became teachers. Amongst Hispanic sophomores and Asian American sophomores, 3.3 percent and 2.9 percent respectively, became teachers upon college completion. The authors contend that there are significant differences in the percentages of sophomores of each racial and ethnic group who succeeded at each stage of the teaching process. These findings confirm that the notion of creating a racially and ethnically diverse teaching force must first address critical questions of minority students' high school completion and college enrollment, as well as college graduation. Influencing occupational decisions of minority college students, the authors contend, is not the answer.

As indicated earlier, there is a relatively small body of work on the questions of teacher retention in large urban school districts like NYC. Most of the studies on teacher mobility have focused on the factors that influence *overall* teacher retention/attrition – in public and private schools. While one can reasonably draw generalizations from these studies because of the relative universality of their findings, it is critical to keep in mind that, inner-city, socially

disadvantaged schools share certain peculiarities that may affect teacher mobility (Hanushek, 1986; Hanushek, et al., 2004; Jacob, 2007). Suffice it to say also that large urban school districts such as NYC, Chicago, Los Angeles, Detroit, etc., have peculiar dynamics (student demographics, family income, poverty level, etc.) that may indirectly contribute to teacher mobility.

More often than not, beginning teachers, regardless of what routes they pursued to get into K-12 teaching, are hired with limited awareness of its complexities (Darling-Hammond, 2000). Many demonstrate content knowledge but lack the pedagogic skills necessary to effectively deliver such content in the classroom. Education curriculum at the baccalaureate and graduate levels - while grounded in compelling theories - often lack practical applications. The end result is the production of theoretically skilled individuals with relatively little training in the practical aspects of effective teaching. This becomes particularly evident when new teachers start teaching. The problem is compounded in inner-city (urban), low-income, socially disadvantaged schools with high need, marginalized populations (Erskine-Cullen, & Sinclair, 1996). The general lack of in-depth, practical knowledge of the complexities of teaching in the inner-city K-12 environment may play a significant role in the attrition of teachers in these schools (Colbert, & Wolff, 1992).

As Fry (2009) pointed out, most new teachers have the potential to become very effective teachers; therefore increasing their retention is potentially beneficial. This is particularly important considering the potential positive impact of teacher quality on learning outcomes (Nye, et al., 2004; Ballou, et al., 2004; Sanders, et al., 1996). K-12 education needs teachers who are committed to excellence and equity and are not "content with simply performing their assigned jobs competently" (Borasi & Finnigan, p.1). Teachers who are change agents because

they are prepared to meet not only their students' needs but also committed to fulfilling societal expectations (Borasi & Finnigan, 2010). Motivated, beginning teachers are more likely to be the change agents K-12 education desperately needs (Lane, et al., 2003). Adequately supported, novice teachers are more likely to be predisposed to acquiring new skills and improving the quality of their teaching (Cochran-Smith, 1991). Teacher quality has been consistently linked to improved student learning outcomes (Jordan et al., 1997; Prince et al., 2007; Rockoff, 2004). Other benefits of retaining and supporting beginning teachers are found in the overall cost savings with regards to replacing departing teachers. Nationwide, the total annual cost of recruiting, selecting, and training new teachers to replace those who have left a particular school or school system or those who transferred to another school, has been estimated to be between $2.2 billion and $5.5 billion (Alliance for Excellent Education, 2005; Fry, 2009; Ingersoll, 2003).

The Impact of Working Conditions And Job Characteristics on Teacher Mobility

Historically in the United States, teaching was not perceived by the public to be a "real" profession until the 1950s (Lortie, 1975; Tyack, 1974). Prior to that it was "short-term, itinerant work taken by men on their way to a 'real' profession and by women before marrying or having children" (Johnson & Birkeland, 2003, p.583). Thanks in part to unionization and changing societal attitudes, today's teachers can now enjoy a profession with relatively decent pay and status, a work environment that is properly equipped with some of the latest teaching technology (SmartBoards, distance learning, the World Wide Web, etc.). Also, professional and career development opportunities with career advancement prospects, plus a professional status that is a far cry from what it was thirty, forty, or fifty years ago. Nevertheless, the complexities of teaching are still misunderstood by many in society. Most new teachers do not understand that teaching is fraught with many uncertainties coupled with the enormously challenging

responsibility of imparting knowledge to *every* student in their classroom; which is not an unreasonable expectation – until one realizes that many new teachers have limited knowledge of how to reach diverse learners. Inner-city, low-income, low-performing (socially disadvantaged) schools often bear the brunt of the confusion. Rosenholtz and Simpson (1990) reported in their study of 1,213 teachers from 78 elementary schools in Tennessee that beginning (as well as experienced) teachers' commitment to teaching is significantly impacted by certain internal organizational conditions, such as their sense of their performance efficacy, intrinsic rewards from teaching, task autonomy and discretion, opportunities for professional growth, school's management of students' behavior, and the extent to which new teachers are buffered against extraneous forces that may be counter-productive to school's goals

One preeminent study on teachers' supply, demand, and career choices involved 50,000 college graduates spanning the 1960s, 1970s, and 1980s (Murnane et al., 1991). Using national data and data from Michigan and North Carolina[9], and employing quantitative statistical methods, they found that salary differences, relative *working conditions*, as well as hiring procedures affect the supply of teachers. Essentially, teachers during the period of analysis paid very close attention to these variables in determining whether or not they would enter the teaching profession. They also found that teachers were most susceptible to leaving the profession during the first few years of teaching; that high school math and science teachers, young female teachers, and teachers with high scores on standardized tests, tended to spend the shortest amount of time in teaching.

[9] According to the authors, the national data came from the National Longitudinal Surveys of Labor Market Experience. The data from Michigan and North Carolina were selected to demonstrate the extent of similarities, if any, between two states in different parts of the country, with different economies, of the responsiveness of teachers to vagaries in teachers' salaries and to "opportunities outside of teaching." (p.5).

In 2000, Public Agenda[10] published a research report based on national telephone surveys of a random sample of 664 public school teachers (and 250 private school teachers)[11] with five years' of experience or less. Ninety-six percent of the respondents said that "teaching is work they love to do"; Eighty percent said "they would choose teaching again if starting over"; Seventy-five percent said " teaching is a life-long choice"; and sixty-eight percent said "they get a lot of satisfaction out of teaching"; only twelve percent of the respondents said "they fell into teaching by chance." According to these new teachers, teaching demands intense effort and energy; requires more talent and hard work than many other professions, and should be pursued by only those who have a love and dedication for the work – "a sense of calling."

On the question of whether new teachers in rural and suburban districts would take on teaching assignments in the cities with substantially higher salaries, twenty-nine percent said they would seriously consider it, and merely 8% said they would "very likely" consider this option. The point to keep in mind here is: if only 8% (self-reported) of this representative sample of new teachers is likely to consider teaching in urban areas even when the salaries are significantly higher, chances are the number will be considerably lower if or when they actually have to make the decision to move to teach in an urban school. A case in point, according to the report, a focus group of private school teachers in Westchester County (a suburb of New York City) self-reported that they would consider working in Westchester County's public schools mainly for the better salaries offered in these school districts but would not consider working in New York City Public Schools even for higher pay because of their perception of school

[10] Public Agenda was founded in 1975 by Daniel Yankelovich, a social scientist/author, and Cyrus Vance, former U.S. Secretary of State under President Jimmy Carter, "to help the nation's leaders better understand the public's point of view and to help average citizens better understand critical policy issues." (Source: http://www.publicagenda.org)

[11] My research focus is on public school teachers.

environments and working conditions that can potentially thwart their dedication and commitment to teaching and frustrate their sense of calling. To these new teachers, school environment and working conditions are important enough that they would turn down a higher paying teaching position in what they consider an unproductive school environment for a lower paying one where they were assured conducive working conditions.

In an effort to investigate whether or not the physical working conditions of schools affect teachers' satisfaction and ultimately their decision to remain or leave a school, Buckley, Schneider, and Shang (2005) surveyed K-12 public school teachers in Washington, D.C. and found that the quality of the physical space (i.e., building facility) can affect teachers' satisfaction and invariably retention. Buckley et al., also cite several studies that have linked the conditions of the school building to teacher morale, teachers' ability to teach, health and safety of teachers.[12]

Hanushek, Kain, and Rivkin (2004) used extensive longitudinal datasets from Texas to analyze teacher mobility with a focus on how salary and other determinants of job attractiveness affect quit or stay decisions of teachers. Their analysis reveals strong evidence that white teachers are more likely to leave a school as the enrollment of black and Hispanic students increases. On the other hand, black and Hispanic teachers are more likely to want to stay in a school as the enrollment of black and Hispanic students rises. They calculate the monetary cost required to offset the phenomenon described above. For instance, they note that "a school with 10 percent more black students would require about 10 percent higher salaries in order to neutralize the increased probability of leaving." (p.350). Submitting that their findings could be

[12] Buckley et al., (2005), cite numerous studies documenting how student and teacher performance can be affected by: poor indoor air quality; thermal comfort; classroom lighting; natural daylight; soundproofing and noise levels in classrooms and schools (pp. 1111-1113).

proxies for aspects of general working conditions in schools serving large minority populations, including disciplinary problems, administrative bureaucracies, poor leadership, low student completion/graduation rate, they suggest that directly improving these specific aspects of working conditions may positively impact teacher retention.

Similarly, Lankford, Loeb, and Wyckoff (2002) found substantial evidence suggesting that teachers in New York State (NYS) are sorted in such a way that socially disadvantaged inner-city schools with underprivileged students are more likely to receive the least qualified teachers. New York City tends to employ more under-qualified teachers than other urban areas in NYS. Also, large urban schools tend to experience higher teacher turnover rates. For instance, in the NYC area, 38% of the teachers were in the same school five years after they started, while 46% of the suburban teachers remained after five years (p.49). The NYC school system appears to have the highest turnover rate with 35% of the teachers leaving the system *within five years*, compared with the highest turnover in other areas of 29%. This confirms the conventional wisdom that novice teachers in New York State who start their teaching careers in NYC urban schools are more likely to quit public school teaching than teachers in any other parts of the State. Surprisingly, the lowest inter-district transfer rate is in NYC. Their findings also support the notion that *working conditions* play an important role in transfer and quit decisions of teachers, particularly the more qualified ones as they are more likely to leave poor working conditions for more conducive settings. Based on their findings, they contend that the inequitable distribution of highly qualified teachers in NYS is systematic and the current teacher salary structure does not appear to improve the inequitable distribution, but rather exacerbate it. Furthermore, they surmise that to effectively address the issue of low student performance in high need urban schools, education policies must attend to the problem of teacher labor market –

mobility and attrition – because these are the schools that need the most qualified, and effective teachers. However these teachers are unwilling to work in non-supportive environments.

Using the nationally representative datasets from the 1993-94 SASS/1994-95 TFS Ingersoll's (2001, 2002, 2003, 2004) analyses also reveal a number of critical findings. Chief amongst these findings is that the teaching profession loses between 40 to 50 percent of all new teachers within the first five years of entry into the profession. In Ingersoll's studies, personal and family issues were cited by 42 percent of the new teachers who left the profession; an estimated 39 percent of the newcomers left to pursue other interests; 29 percent named overall dissatisfaction as their main reason for quitting, while school human resource dynamics such as cutbacks, layoffs, termination, school reorganization, school closing accounted for approximately 19 percent of new teachers who left (Ingersoll and Smith, 2003). Amongst the 29 percent who left as a result of job dissatisfaction, low salaries was a major reason for their dissatisfaction, followed by *school working conditions* (students' behavioral issues , little or no administrative support, lack of teacher input). It is noteworthy to mention that, in this particular study, more than two-thirds of the attrition of new teachers was due to job dissatisfaction and interest in other jobs (See Appendix B, Figure 15). When asked to elaborate on "dissatisfaction" as a reason for quitting, the 29 percent leavers cited inadequate salary as the number one reason for their dissatisfaction (79%). This was followed by student discipline problems (35%), poor administrative support (26%), and poor student motivation (17%). Other reasons given for leaving include lack of faculty influence (6%), unmanageable class sizes (4%), lack of opportunity for advancement (1%), classroom intrusions (0.6%), and inadequate time (0.5%) (ibid) (See Appendix B, Figure 15).

For beginning teachers who enter the profession through alternative pathways – alternative certification – latest evidence suggests that compared to teachers who enter via traditional routes, these teachers are, on average, more likely to leave their positions from one year to the next (Grissom, J.A., 2008).[13] School characteristics *(urban, suburban, rural, and student readiness)* have been found to be a major factor in these decisions. Teachers with alternative certifications tend to be primarily placed in inner-city, socially disadvantaged schools (ibid.).

Teacher Quality, Student Learning, and Learning Outcomes

Teacher quality significantly affects student learning (Ballou, Sanders, & Wright, 2004; Hanushek, 2002; Jordan, Mendro, & Weerasinghe, 1997; Murnane, & Phillips, 1981; Rockoff, 2004). Sanders, and Rivers (1996) have shown that highly effective teachers have the propensity to be effective with all groups of students – initial attainment levels notwithstanding. In many cases, socially disadvantaged, inner-city schools are known to be disproportionately populated by low quality, ineffective teachers, which can further exacerbate the already complicated problem of teacher retention in these schools (Ballou, 1996; Boyd, Grossman, Lankford, Loeb, & Wykckoff, 2008; Hanushek, Kain, Rivkin, 2004; Hanushek, & Rivkin, 2008). This, coupled with other socio-economic considerations can create conditions for low graduation and high dropout rates.[14] The National Center for Education Statistics (NCES) estimated that "approximately four of every 100 students who were enrolled in high school in October 2004 left

[13] Grissom, J.A. (2008). But do they stay?: Addressing issues of teacher retention through alternative certification. In Grossman, P. & Loeb, S. (Eds.) (2008). *Alternative routes to teaching: Mapping the new landscape of teacher education*. Massachusetts: Harvard Education Press.

[14] See Tables 1 and 2 for a depiction of the "event" and "status" dropout rates. The event dropout rate measures the proportion of students who dropped out over a 1–year interval, while the status dropout rate reflects the percentage of individuals who are believed to be dropouts, regardless of when they dropped out. (Source: National Center for Education Statistics - NCES 2007-059 JUNE 2007).

school before October 2005 without completing a high school program" (NCES 2007-059, p. 3; Appendix A, Table A1). Additionally, the report also found that "between October 2004 and October 2005, Black and Hispanic high school students were more likely to drop out than were White and Asian/Pacific Islander students. The "event" dropout rates for Blacks and Hispanics were 7.3 percent and 5.0 percent, respectively, compared with rates of 2.8 percent for Whites and 1.6 percent for Asians/Pacific Islanders." (NCES 2007-059, p. 4; Appendix A, Table A1). Inner-city schools are predominantly attended by Black and Hispanic students.

Dropping out of school is usually associated with inadequate education with far reaching socio-economic ramifications for the individual, the community, and society at large. With characteristic lower incomes, lower tax contributions, poorer health, heavy dependence on publicly subsidized programs like Medicaid and Medicare, and higher incarceration rates, high school dropouts are more costly to the taxpayer than the educated members of society (Belfield, & Levin, (Eds.), (2007). Enrico Moretti (2007)[15] has estimated that the United States will save up to $1.4 billion per year from criminal related incidents in society if the high school completion rate goes up by a mere one percent amongst all men ages 20-60. Learning promotes high school completion rates, and we have evidence that quality teaching enhances learning; but the quality teachers – particularly the inexperienced ones – are prone to leaving the teaching profession in remarkable numbers, especially in socially disadvantaged, inner-city schools. Examining and understanding why these teachers leave the profession can contribute to our understanding of what needs to be done to retain them. Retaining them has the potential to

[15] In Belfield, C.R. & Levin, H.M. (Eds.). (2007). *The price we pay: Economic and social consequences of inadequate education.* Washington, DC: Brookings Institution Press.

translate into gains in student learning, higher high school completion rates, and ultimately greater savings to school districts and the society at large.

Inner-city schools have certain unique characteristics that can affect those who work inside them (Erskine-Cullen, & Sinclair, 1996; Colbert, & Wolff, 1992; Fuller, 1994). Teacher shortages, especially in urban schools, is not a new phenomenon (Hanushek, Kain, Rivkin, 2004; Ingersoll, 2001). Hiring and retaining effective teachers in inner-city schools have always been a challenge for school districts across the country (Hanushek, & Rivkin, 2008; Lankford, Loeb, & Wyckoff, 2002; Quartz, Thomas, Anderson, Masyn, Lyons, Olsen, 2008). This is partly because of the unique set of socio-economic circumstances that urban schools face. Numerous studies have confirmed the difficulties facing urban schools in retaining their "best" teachers, and whether or not they hire the "best" candidates (Murnane, & Phillips, 1981; Hanushek, & Rivkin, 2008; Shen, 1997; Lankford, Loeb, & Wyckoff, 2002), and especially in hard-to-fill disciplines such as special education, math, and science (Guarino, Santibanez, Daley, & Brewer, 2004; Guarino, Santibanez, Daley, & Brewer, 2006; Boyd, Lankford, Loeb, & Wyckoff, 2005; Borman, & Dowling, 2008). New teachers – those with less than five years of teaching experience - are particularly vulnerable to the enormous challenges of inner-city teaching (Guarino, Santibanez, Daley, & Brewer, 2006). A number of approaches have been employed by school districts to increase teacher retention with very few replicable outcomes, including merit-based pay, salary increase based on the decision to teach in hard-to-fill areas and low-performing schools; and tuition reimbursement for teachers in inner-city schools (Gritz, & Theobald, 1996). The results, in terms of the retention rates of new teachers in schools that have adopted these strategies have been, at best, mixed (Guarino, Santibanez, Daley, & Brewer, 2004;

Brown, & Schainker, 2008). Studies examining new teacher retention through a juxtaposition of modes of entry into teaching are very rare. My dissertation will contribute to filling this void.

Aggregate Teacher Supply, Demand, and Turnover.

There are 6.2 million teachers currently in the United States representing an estimated 4% of the total civilian workforce.[16] According to estimates from the National Commission on Teaching and America's Future (2003), and the National Education Association (2003), the current teaching workforce (of 6.2 million teachers) is the largest in history. Perhaps the most noticeable feature of the teacher labor market, apart from its size, is the constant movement of teachers from one school to the other or from one school district to the other. For instance, in the 1999-2000 school year, there were 534,861 teachers who moved into different teaching positions across the United States; compared to 546,200 who moved from, or left their former schools in 2000-2001. In the same school year (2000-2001), only 456,100 teachers replaced the exiting teachers (Luekens, Lyter, Fox, & Chandler, 2004; Ingersoll, 2004). This meant that 90,100 teaching positions were probably not filled with a qualified teacher at the beginning of the 2000-2001 school year.

Ingersoll (2002, 2004) estimates that relative to turnover in other occupations, annual teacher turnover is notably high. In 1998, the annual turnover rate of all non-teaching occupations was 11%. In 1988 –89, the annual turnover rate of teachers was 14.5%; in 1991 – 92, it went down slightly to 13.2%; only to be back up again in 1994 –95 to 14.3%. In 2000-01, the annual turnover rate of teacher was estimated at 15.7%. For beginning teachers, the data portrays a more somber picture. Ingersoll (2002) provides rough estimates of new teacher turnover using the available School And Staffing Survey (SASS) from 1987-88, 1990-91, 1993-

[16] (http://www.census.gov/Press-Release/www/releases/archives/facts_for_features_special_editions/001737.html

94 and the corresponding Teacher Follow-up Survey (TFS) data from 1988-89, 1991-92, 1994-95. He estimates that the cumulative percentage of teachers leaving the profession after their first-through their fifth year of teaching is 11%, 21%, 29%, 33%, and 39%. respectively (Ingersoll, 2002, p.23). This means that relatively speaking a third of all newly hired teachers will not stay in the profession beyond their third year. The question then is: ***Does the mode of entry into teaching matter for teacher retention?*** In other words, do teachers who are hired via alternative routes to teaching, such as the NYCTFP, have better retention rate when compared to those who were hired through traditional routes?

One of the misconceptions of low retention, teacher turnover and teacher shortage is the movement patterns of "movers" – teachers who transfer from one school to the other, or one school district to the other, sometimes referred to as "cross-school migration" (Ingersoll, 2004, p.6). Some observers neglect the contribution of such migration to the overall school staffing issue and the problem of teacher shortage. This is because by virtue of their movement pattern, i.e., transferring from one school to the other, and hence being absorbed by the "system", they are seen as not necessarily diminishing the aggregate teacher supply at any given time. While this perspective may be true at the macro level, it is important to understand that at the micro or school level, movers and leavers affect a particular school in essentially the same way, in the sense that their positions have to be filled.

On the other hand, increased student enrollment as a result of higher birthrates and immigration, certain government regulations like class size reduction, and low student-teacher ratio mandates in special education, have led to increased demand for teachers (Johnson, Berg, & Donaldson, 2005). Also, early retirement incentives have given rise to a surge in the number of teachers retiring. Additionally, according to relatively recent studies on teacher education

programs (National Commission on Teaching and America's Future (NCTAF), 2003), new graduates of teacher education programs are not entering the profession as quickly as before, due in part to licensing delays or additional required teacher training.[17] As a result of all this, some researchers have estimated that teacher supply has fallen below teacher demand (Consortium for Policy and Research in Education (CPRE), 2003; NCTAF, 1996;). But as I have pointed out, reduced supply can also be a function of turnover – attrition and mobility.

There is consistency in research with regards to predicting who leaves the teaching profession. With a U-shaped distribution, it is not difficult to see that teacher age and teacher experience are perhaps the most reliable predictors of turnover (Hanushek, et al., 2004; Ingersoll, 2001; Johnson, et al., 2005; Murnane, et al., 1988). There is a large body of work to support the fact that in most schools and school districts, the most likely movers and leavers are the least experienced and the most experienced teachers (Hanushek, et al., 2004; Murnane, Singer, Willett, Kemple, & Olsen, 1991). Male, general education teachers are more likely to remain in teaching than female; special education teachers are more likely to depart (Luekens, et al., 2004). Essentially, female teachers who are thirty years or older are more likely to remain in teaching than younger females or their male counterparts of any age (Johnson, et al., 2005; Murnane et al., 1991). In general, minority teachers are less likely to depart from teaching than their white counterparts (Murnane et al., 1991). However, there is a paucity of research on *why* the least experienced teachers are more likely to leave relative to experienced ones. More importantly, very few studies have examined these relationships in socially disadvantaged, inner-city schools. In this study, I hope to shed more light on the connections between these and other factors and

[17] Henke, R.R., Choy, S.P., Chen, X., Geis, S., & Alt, M.N., (1997). *America's teacher: Profile of a profession, 1993-1994*. Washington, D.C.: U.S. Department of Education, Office of Research and Improvement. As cited in Johnson, et al. (2005).

the retention of traditionally certified teachers (represented by NTFs) and alternatively certified teachers (represented by TFs). To be clear, I intend to examine the retention patterns of only teachers who came into teaching through the New York City Teaching Fellows program and juxtapose these patterns with those of traditionally trained teachers. As indicated, I will refer to the latter group as Non-Teaching Fellows (NTFs). This study will not include the retention patterns of teachers who entered teaching via Teach for America (TFA), or other programs.

The Cost of Teacher Turnover

Low teacher retention invariably translates into high teacher turnover. These two terms – teacher retention and teacher turnover - will therefore be used as complements, *since more of one means less of the other*. There is an extensive body of research showing that teacher quality is a highly reliable predictor of student achievement (Aaronson et al., 2007; Ballou et al., 2004; Bock et al., 1996; Jordan et al., 1997; Nye et al., (2004), Prince et al., 2007; Rivkin et al., 2005; Rockoff, 2004; Rowan et al., 2002; Sanders, 2000; and Sanders, & Rivers, 1996). Some of these studies also support the fact that ineffective teachers may actually disrupt student learning (Ballou et al., 2004; Rockoff, 2004; Rowan, et al., 2002; Sanders, & Rivers, 1996). Although a small degree of teacher turnover is necessary to weed out the weak, ineffective teachers, high turnover rates may be indicative of serious retention issues. *There is also the question of whether it is the effective or the ineffective teachers that leave*. The inability of a school or school district to retain its teachers can be associated with enormous cost - instructionally, financially, and systemically. As a matter of fact, it is not uncommon to see low performing schools constantly struggling to keep up with staff rebuilding as a result of persistent teacher turnover – particularly beginning teachers.

Recently, the NCTAF conducted a pilot study designed to quantify the actual cost of recruitment, hiring, and replacing teachers in five school districts in the United States: The Chicago Public Schools (Illinois), Milwaukee Public Schools (Wisconsin), Granville County Schools (North Carolina), and Jemez Valley Public Schools and Santa Rosa Public Schools (New Mexico)[18]. These districts represent the gamut of large, small, urban and rural school districts. Therefore, the findings may be generalized to a reasonable degree, or used as benchmarks for comparative analysis of similar districts. Essentially, eight cost categories associated with teacher turnover are reported. These are costs related to recruitment and advertising, special incentives, administrative processing, training for new hires, training for first-time teachers, training for all teachers, learning curve, and transfer. *Not to mention the unmeasured costs of disruption*. The researchers conclude that teacher turnover is associated with a multitude of sizeable costs, including but not limited to those outlined above. They range from "$4,366" per year in a small rural district like Jemez Valley, New Mexico to "$17,872" .per year in a large urban school district like the Chicago Public Schools where the total annual cost of teacher turnover is estimated to be over "$86 million" (Barnes et al., 2007, p.5). Low performing, high poverty schools were highly correlated with high teacher turnover rates, particularly in the Milwaukee and Chicago Public School systems; such schools are significantly undermined as a result of teacher turnover, because these schools have to expend scarce funds on reducing teacher turnover.

The cost ramifications of teacher turnover can disproportionately affect at-risk, inner-city students more so than any other student population (Barnes, Crowe, Schaefer, 2007). Although a

[18] This study was authored by Gary Barnes, Edward Crowe, and Benjamin Schaefer and it is titled "The Cost of Teacher Turnover in Five School Districts: A Pilot Study. It was released in June 2007 by the NCTAF. This study has led to the development of the NCTAF Teacher Turnover Cost Calculator available to schools and school districts to use to figure out the yearly cost of replacing teachers. This tool is available at: www.nctaf.org.

small degree of annual teacher turnover is essential for continued efficiency *(that is, relatively speaking, being able to produce improved student learning without necessarily hiring more teachers)*, high teacher turnover is invariably detrimental to student learning because of the high instructional, financial, and organizational costs that are customarily inflicted whenever a position needs to be filled as a result of teacher mobility (Johnson, Berg, & Donaldson, 2005). The instructional vacuum created by a teacher's exit must be filled immediately. Oftentimes, schools resort to filling these vacancies with novices. Novice teachers, are on average, fundamentally less effective than their experienced counterparts. This means that schools that have to resort to filling the void of teacher exits with novices will have to endure continual mediocre instruction at best. This can be diametrically counter-productive in high need, socially disadvantaged schools (Jacob, 2007; Murnane, & Phillips, 1981).

The financial cost of replacing a teacher exiting a school or district (a leaver) is considerable. Nationwide, the annual cost of teacher turnover has been estimated to be about $7.34 billion (NCTAF, 2007). According to the Texas Center for Educational Research (2000), it includes the cost of recruitment, selection, inducting, as well as those associated with professional development of the replacement teacher, separation expenses (e.g., closing out employee payroll, etc.). Significant variations exist in *both the method and results of calculation* of the financial costs associated with teacher turnover, but there seems to be consensus around the fact that turnover rates and rates of return on hiring, induction, and professional development expenditure are inversely proportional (Johnson, Berg, & Donaldson, 2005). The Alliance for Excellent Education (2005) estimated the financial cost of replacing public school teachers who leave the profession at $2.2 billion a year.[19] This amount goes up to $4.9 billion per year if the

[19] Alliance for Excellent Education (2005). *Teacher Attrition: A costly loss to the nation and to the states.*

cost includes movers - teachers who transfer from one school or district to another. The cost ranges from $8.5 million in North Dakota to more than half a billion dollars in large states like Texas.[20]

The onus of teacher turnover goes beyond monetary estimates; teacher turnover is a proven destabilizing force on the functioning of the school or district. In addition to not being able to provide quality instruction to the students, schools experiencing new teacher turnover also face faltering school norms and systems, and chaotic school environments (Johnson, Berg, & Donaldson, 2005). These problems are amplified in inner-city schools (ibid.). Other critical issues in schools with new teacher turnover include lack of cohesive instructional focus, absence of programmatic traction, and the perpetuation of the cycle of turnover (ibid.).

High Teacher Turnover and Non-Traditional Pathways to Teaching

As I mentioned previously, in an attempt to curb the teacher shortage problem, most states have introduced, amongst others, alternative certification. Mid-Career entrants[21] and others who enter teaching through alternative routes can be equally affected by lack of previous exposure to actual classroom pedagogy, especially in inner-city schools.[22] Moore and Johnson

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Issue Brief August 2005. "The Department of Labor conservatively estimates that attrition costs an employer 30 percent of the leaving employee's salary. Using national data from the National Center for Education Statistics, the Alliance for Excellent Education estimates that each teacher leaving a school costs the district $12,546. (Average teacher salary in 1999–2000 = $41,820 x .30 = $12,546.) In the 1999–2000 school year, approximately 173,439 public school teachers left the profession, not including retirees. Thus, the number of leaving teachers (173,439) multiplied by the average cost of attrition ($12,546) yields the total cost of attrition, $2.17 billion, rounded to $2.2 billion. A total of 394,140 changed or left public schools in school year 1999–2000 (394,140 x $12,546 = $4.9 billion). Figures are based on national averages and are slightly higher than the state-by-state calculation." (p. 6).

20 See Appendix 10, Table 6

[21] Mid-Career entrants into teaching are defined as teachers who entered teaching, as a second career, through any of the different alternative pathways to teaching.

[22] Moore & Johnson (2008) in Grossman, P. & Loeb, S. (Eds.) (2008). Alternative routes to teaching: Mapping the new landscape of teacher education. They analyzed thirteen fast-track alternative certification programs in Connecticut, Massachusetts, California, and Louisiana. Data collection was done in two stages through visitations, interviews, with administrators, and faculty, about program design and delivery. Classrooms were not observed and student performance data were not examined.

(2008) surmise that the school environment can be a catalyst to promoting or upsetting a new teacher's sense of efficacy and job satisfaction, which in turn can invariably influence the quit or stay decision.[23] Linda Darling-Hammond (2000), in a report published by the National Commission on Teaching & America's Future, found that in the Los Angeles Teacher Trainee Program, 80.3% (143 out of 178) of the 1984 cohort completed training in year one; 58.9% (105 out of 178) were teaching in year two; and 47% of those who entered teaching (30.3% of initial cohort) remained by year six. Similar patterns were recorded in the same program for the 1985 cohort: 80.6% (104 out of 129) completed training and entered teaching; 52% of those who entered remained by year five. The trend was not very different for another alternative teaching pathway – Teach for America – in Baltimore and in New York City (NYC) for the 1992 and 1990 cohorts respectively. In each case, out of the estimated 90% of completers who entered teaching, a mere 28% in Baltimore, and 30% in NYC were projected to complete year three of teaching. Darling-Hammond (2000) estimated that less than 29% of the 1991 entrants would remain in teaching at the beginning of their third year of entry.[24]

In recent years, other researchers (Hanushek & Rivkin, 2008; Ingersoll, 2001, 2003b; Lankford, Loeb, & Wykoff, 2002), focusing on more nationally representative samples, have found that there has been an apparent high demand for K-12 teachers *from teacher attrition*. Although contrary to conventional wisdom that the observed high demand is a consequence of increases in student enrollment and teacher retirement, Ingersoll (2001) reports that the increased demand was a direct result of schools and school districts trying to fill vacancies created by teacher attrition – either when teachers transfer from their present school ("movers") or leave the profession altogether ("leavers").

[23] Ibid.

24 Darling-Hammond (2000). Based on national data on attrition of emergency or nonstandard certificate holders for 1991 entrants.

Some researchers have concluded that "misdiagnosing" the teacher turnover problem has invariably led to what some observers believe to be a policy response that has not gotten to the crux of the teacher shortage matter (Ingersoll, 2001; 2003b; Ingersoll & Smith, 2003). Many of the policies focus on improving teacher supply. For instance, to attract prospective teaching candidates, some states provide financial incentives (e.g., signing bonuses, tuition reimbursement, student loan forgiveness, and housing assistance). Others are designed to encourage mid-career changers and *recent college graduates* to come into teaching (Teach for America, Teacher Opportunity Corp, etc.). Similarly, as I have mentioned, there are numerous alternative routes into teaching in practically every state now. These programs allow non-traditionally trained individuals to become teachers by exposing them to actual school contexts quickly, usually during the summer months preceding their initial teaching assignment. Others have even gone overseas to recruit prospective applicants for subjects in shortage areas (for instance, New York City). There is however, a paucity of research on the retention of these teachers. It is equally difficult to find empirical studies analyzing the retention of alternatively certified teachers vis-à-vis traditionally certified ones. Such comparisons can further illuminate our understanding of teacher retention and inform future teacher hiring policy.

Why Teacher Retention is Crucial in Large Urban School Districts Such As NYC

What students learn, how they learn it, whether or not they use it, and how they eventually use it depend, to large extent, on the teacher. There is a preponderance of research evidence documenting that *a quality teacher is the single most important factor that can eliminate the negative effects of learning barriers,* such as poverty, and cognitive delays (Alliance for Excellent Education, 2005; Aaronson, et al., 2007; Ballou et al., 2004; Hanushek, 2002). An effective teacher is capable of making the biggest impact on student learning, but it

takes time to develop into a successful teacher capable of effectuating and sustaining such gains (Berliner, 2000). As Haycock (1998) points out, a highly effective teacher is capable of producing student gains approximately *four times greater* than the least effective teacher. Having three effective teachers consecutively has been linked with student gains that are approximately three times higher than having three ineffective teachers consecutively (Haycock, 1998). Teacher effect on student achievement is "additive" and "cumulative" according to Sanders and Rivers (1996). Lower achieving students are the first to benefit as teacher effectiveness increases (Sanders and Rivers, 1996). A report by the Alliance for Excellent Education (2004) estimates that **new teachers need between three to seven years to become effective.** Historically, novice teachers are usually given the most challenging assignments in inner-city, socially disadvantaged schools, with at-risk students, many of whom have already fallen behind or in danger of falling behind (Alliance for Excellent Education, 2004; Boyd, et al., 2005; Hanushek, et al., 2004; NCTAF, 2007). According to Carey (2004), students in poor and minority schools are twice as likely to have an inexperienced teacher. These schools are constantly struggling to build and sustain the teaching quality gap (NCTAF, 2007) – not to mention the achievement gap. They are rarely in a position to provide proper support to retain these new teachers. Faced with these extreme challenges, underprepared to adequately deal with them, and grappling with lack of support from school and district officials, new teachers teaching marginalized students in inner-city, socially disadvantaged schools may opt to either transfer to other schools/school districts or leave the teacher profession as a whole. Evidence suggests that they are not adequately afforded the opportunity to stay long enough to gradually transition into highly effective teachers that these student desperately need (Alliance for Excellent Education, 2004).

From personal experience as an inner-city teacher and school administrator for the past two decades, I know that for reasons yet to be fully understood, more students in low performing schools tend to demonstrate apathy toward learning. This may take many forms: non-completion of classroom and homework assignments, cutting class, absenteeism, lack of focus, and a general educational malaise that is difficult to comprehend by even minority teachers. This can be exacerbated by lack of parental involvement. While it is clear from research that teachers can be *the* catalyst for student achievement gains, many students in socially disadvantaged, inner-city schools often need additional support, patience and understanding that beginning teachers may initially lack, because these skills take time to develop. Unfortunately these environments also attract certain individuals into teaching who assume that these marginalized students cannot be helped. Therefore, such teachers find inner-city working conditions, school and student characteristics extremely challenging. For these teachers, the end result in most instances is to quit teaching or transfer to the suburbs. Individuals who remain in teaching in inner-city, socially disadvantaged schools without acquiring the requisite pedagogical, social, and psychological skill sets necessary to be successful in these schools often become disenfranchised, unhappy, and disgruntled; oftentimes becoming roadblocks to change.

The New York City Teaching Fellows Program and Teacher Retention

The NYCTF program started in 2000 as an alternative teacher certification program to attract recent college graduates, mid-career professionals, and retirees, to teach in NYC[25]. Through short, intensive induction programs, the program aims to prepare individuals from diverse educational and professional backgrounds, who are not trained teachers to become classroom teachers. The primary objective of the program is to improve the quality of teaching

[25] https://www.nycteachingfellows.org/purpose/impact.asp

and raise student achievement in the NYC public schools. NYC public schools (with the exception of a few) have long suffered the stigma of poor teaching/poor teachers and the attendant poor student performance/achievement. NYC schools, New York State, and to a large extent, the United States in general, have been experiencing declining high school graduation rate since the 1970s[26]. For instance, in NYC, only 52.7% of the students who entered 9th grade in 2000 graduated after 5 years; 12.2% were still enrolled; 7.4% transferred to G.E.D. programs; and 25.6% had dropped out (See Table 6).

For decades, the graduation rates in NYC public schools (and other large cities such as Detroit, Chicago and Los Angeles) have persistently fallen below 70% (Heckman & LaFontaine, 2010; Swanson, 2010). Since teacher quality has been empirically shown to substantially influence student achievement (Darling-Hammond, 1999; Sanders & Rivers, 1996; Sanders, 2000), poor teacher quality, low teacher retention, and lack of qualified applicants for teaching positions were often blamed for poor student performance, particularly in large urban schools where it is more likely to observe these conditions (National Commission on Teaching and America's Future, 1996).

[26] SOURCES: EPE Research Center, 2010; U.S. Department of Education

Table 1: New York State Graduation Rates – June 2005

Only a small majority of students in New York City and the Big 4 Cities had graduated after 5 years, but over 93 percent of students in Low Need Districts did.

The Percentage of Students in the 2000 Cohort by Outcomes as of June 30, 2005 after 5 years

Needs/ Resource Category	Cohort Enroll-ment	Regents or Local Diploma	IEP Diploma	Still enrolled	Trans-fer to GED	Dropped Out
New York City	74,114	52.7%	2.1%	12.2%	7.4%	25.6%
Large City	8,569	54.7%	3.4%	4.4%	14.4%	23.0%
Urban/Suburban	16,161	68.5%	3.0%	4.5%	7.4%	16.7%
Rural High Need	14,656	76.5%	3.8%	1.3%	4.9%	13.4%
Average	68,295	83.9%	1.9%	1.8%	4.2%	8.2%
Low Need	28,237	93.4%	0.9%	0.9%	1.5%	3.2%
Charter Schools	127	46.5%	0.0%	40.9%	0.8%	11.8%
Total Public	210,159	71.3%	2.1%	5.7%	5.7%	15.3%

Source: New York State Department of Education

In the mid-to-late-1990s, particular attention was paid to teacher certification as a key component of teacher quality. In New York State, 1998 marked the watershed year when the New York State Board of Regents passed a regulation that effectively abolished temporary licensees for uncertified teachers starting September 1, 2003 (Goertz, et al., 2011). Costigan (2004) citing Ballou & Podgusky (2000), contends that a significant rationale for alternative certification programs such as the NYCTFP is the belief that ***individuals with strong academic backgrounds*** in various subject areas like mathematics, English, history, physics, chemistry, biology, business administration, accounting, etc., ***or people who have successfully embarked on a career path, are capable of becoming effective teachers*** who can positively affect the lives of youngsters caught in the web of poverty and its endless cycles of poor schooling.

In 2000, before the enactment of No Child Left Behind Act (NCLB) in 2002[27], New York City public schools, under the leadership of school Chancellor Harold Levy was already facing enormous challenges in projected teacher shortage, anticipated loss of teachers to the tune

[27] NCLB, also known as The No Child Left Behind Act of 2001, was promulgated "to close the achievement gap with accountability, flexibility, and choice, so that no child is left behind." (Public Law 107-110, 107th Congress – January 8, 2002)

of 25,000 over several years, and the threat of law suit from New York State Board of Regents because of the unusually high numbers of unlicensed teachers in NYC public schools' classrooms (Pabon, 2011). In concert with Pabon (2011), Boyd, et al., (2012) describe teacher hiring and retention prior to 2000 as "bleak" (p.4). In these years, the pool of applicants into the City school system was unimpressive with most newly hired teachers coming from less competitive undergraduate institutions and having SAT math and verbal scores in or around the 30th percentile of all SAT takers (Boyd, et al., 2012).

Without question, the NYCTFP clearly began as an initiative to attempt to ease the looming teacher shortage in NYC schools (Pabon, 2011), as well as a response to regulatory changes at the State level to tighten teacher certification.[28] Observers projected three sources of the anticipated teacher shortage: resignation, teacher flight to suburban districts, and retirement (Swartz, 2003). The program was a collaborative effort between the NYCDOE and a national non-profit agency, The New Teacher Project (TNTP) – a program started by teachers to end "the injustice of educational inequality."[29] As I mentioned earlier, from inception, its purpose was to attract, retain, train, and staff non-traditional applicants into hard-to-staff schools, many of which were also Schools Under Registration Review (a.k.a. SURR schools) (Stein, 2002).

Today, the Fellows program has developed into a stable source for recruiting up to about 30 percent of beginning teachers into the NYC school system (Boyd, et al., 2012). It is a selective program, hiring an estimated ***14 percent*** of its inaugural pool of applicants in its first year (Sipe & D'Angelo, 2006). Typically, Fellows do not have prior teaching experience or

28 According to Boyd, et al., (2012), the New York State Board of Regents, the regulatory body of the New York State Department of Education, passed laws in 1998 that "ended the use of temporary licensed teachers by 2003." (p.5).

29 http://tntp.org/about-tntp

coursework in education but they must be "high-quality" applicants[30] (www.nycteachingfellows.org). As a matter of principle, the program encourages diverse individuals *from non-education backgrounds* to apply. Hence, it is not uncommon to find the pool of applicants to consist of lawyers, doctors, nurses, accountants, recent graduates, chief executives, police officers, secretaries, artists, journalists, and retirees (Sipe & D'Angelo, 2006).

Upon acceptance to the program and before they can be assigned to teach a class, Fellows must complete two hundred hours of pre-service training, pass the Liberal Arts and Science Test (LAST) as well as the requisite Content Specialty Test (CST) for their discipline or license area.[31] The LAST is designed to measure knowledge and skills in: (1) Scientific, Mathematical, and Technological Processes; (2) Historical and Social Scientific Awareness; (3) Artistic Expression and the Humanities; (4) Communication and Research Skills; (5) Written Analysis and Expression. The CST on the other hand assesses content-specific knowledge and skills. For instance, the Mathematics CST evaluates applicant's core knowledge in: (1) Mathematical Reasoning and Communication; (2) Algebra; (3) Trigonometry and Calculus; (4) Measurement and Geometry; (5) Data Analysis, Probability, Statistics, and Discrete Mathematics; and (6) Algebra: Constructed Response Assignment.

Successful completion of these requirements entitles the Fellow to a "Transitional B" teaching certificate, which is good for three years. NYCTFP supports qualified TFs ready to take on teaching assignments through connections to teacher recruitment fairs and school-based

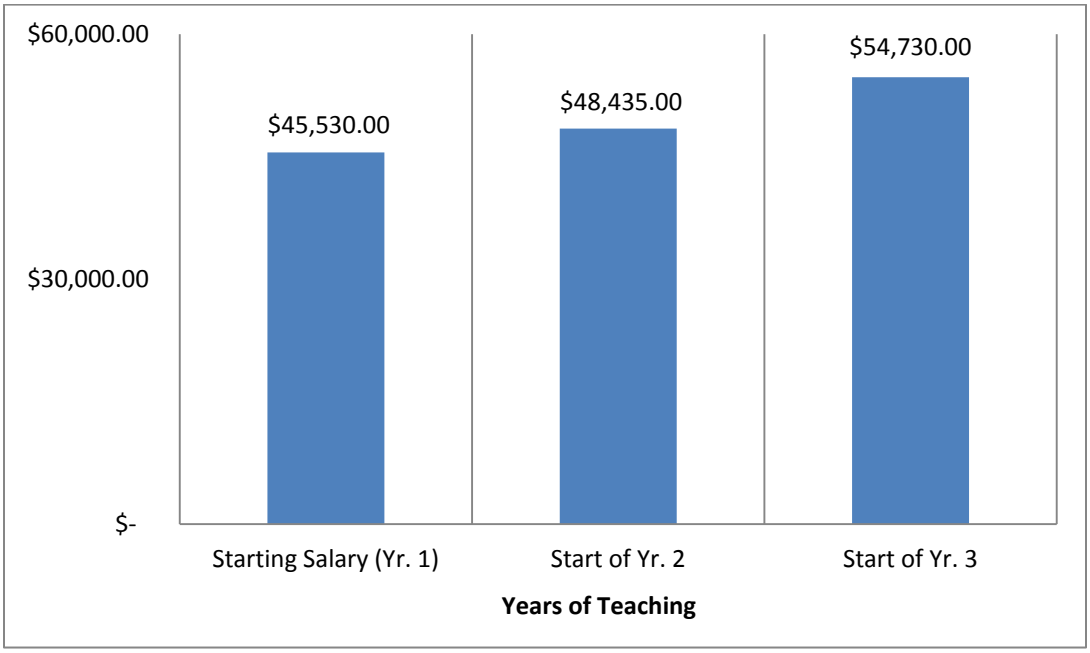
[30] High quality applicants are described as "strong candidates committed to having a positive effect on student achievement, who display excellence in their previous endeavors, and who are dedicated to reaching and influencing students—especially those in under-resourced areas—on a daily basis." (NYCTF.org).

[31] According to the NYS Teacher Certification Examination Guide (available at http://www.nystce.nesinc.com/PDFs/NY_fld001_prepguide.pdf), the LAST and the CST are criterion referenced, objective based tests that are designed to measure a candidate's knowledge and skills in relation to an established standard rather than in relation to the performance of other candidates. The main purpose of these tests "is to help identify for certification those candidates who have demonstrated the appropriate level of knowledge and skills that are important for performing the responsibilities of a teacher in NYS public schools." (www.nystce.nesinc.com; p.2).

interview events, as well as online tools and resources (NYCTF.org). Ultimately licensed TFs will find suitable teaching positions. Once a TF is hired as a classroom teacher, s/he must enroll in a master's degree teacher education program at one of the partner universities to fulfill the rest of the certification requirements as those in traditional routes to certification. Understandably, partnering universities also accommodate Fellows by scheduling their classes in the evenings and during the summer months thereby allowing most Fellows to complete their degrees in two-to-three years. During the duration of the training, TFs continue to earn the equivalent of a starting teacher salary in NYC.[32] Additionally, the tuition for the master's degree is substantially subsidized by the Fellowship, excluding books and materials. The fractional portion of the tuition for which Fellows are responsible, are deducted directly from their paycheck over time, making it seemingly more seamless compared to writing monthly checks. Newly hired TFs are immediately eligible for all the benefits afforded all NYC teachers, including but not limited to a pension plan and a myriad of choices of health insurance (nycteachingfellows.org). Clearly, the cost to the individual of becoming a NYC teacher via the NYCTFP is considerably less than going through a traditional teacher certification program (Boyd, et al., 2012). Arguably, part of the attractiveness of the TFs program is that newly hired Fellows receive full salary as beginning teachers and the heavily subsidized training costs.

[32] The current starting salary for teachers with a bachelor's degree has increased by 37.1% from $33,186 in 2000 to $45,530 in 2008 (Boyd, et al., 2012). This is part of the reason why the TFs program has successfully attracted many career changers.

Figure 2: NYCTF: Salary Increases in the First Three Years of Teaching



Adapted from: https://www.nycteachingfellows.org/program/salary_benefits.asp

It is estimated that the DOE spends between $20,000 and $30,000 to train one TF.[33] Some observers argue that this may be justified by the highly selective nature of the program since majority of those recruited score highly on the S.A.T. and the teacher certification examinations (Boyd, et al., 2012, 2006).

The rationale for the creation of the TFP is undoubtedly laudable, one question that comes to my mind as I become more cognizant of the development is: Are the TF prepared for the complexities of teaching in general, and the intricacies of teaching in hard-to-staff schools in NYC in particular? As a matter of fact, this question can be broadly extended to alternatively certified teachers in general: Compared to traditionally certified teachers, are alternatively

[33] This estimate is based on a presentation by Eileen Donoghue, Andrew Brantlinger, and Shana Henry, researchers from MetroMath: The Center for Mathematics in America's Cities. The presentation was titled: "Kelly and the Context of Her Mathematics Cohort in the NYC Teaching Fellows Program." It is available at: http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CDIQFjAA&url=http%3A%2F%2Fwww.teach-now.org%2FDonoghue_09.ppt&ei=aIYhUe2iAcW60QGk_YGoAw&usg=AFQjCNHho2DcUJ-zMs9Frri2P0zXCmThIw&bvm=bv.42553238

certified teachers prepared for the complex nature of teaching in general and/or more specifically, the exclusive intricacies of urban school teaching.

Before delving into what we have learned from the literature about how non-traditional, novice teachers perceive their preparation, it is helpful to examine the typical educational path of NTFs. This will provide us with a better basis for comparing the two types of teacher "preparations." Most NTFs undergo teacher preparation within the curriculum and teaching programs of the school of education at traditional universities or colleges. Focus areas can include Childhood Education (sometimes called Elementary Education), Adolescent or Secondary Education, Early Childhood Education, Literacy, Bilingual Education, Teaching English to Speakers of Other Languages (TESOL – K-12 and Adult), as well as Administration and Supervision[34]. Typically, students (NTFs) in these programs also receive academic content area instructions in the departments that house the content areas such as mathematics, science English language, foreign languages, music, and social studies. To get the initial teaching certification, beginning teachers must possess a minimum of a bachelor's degree, and pass the requisite licensing examinations: Prior to Spring 2014: Liberal Arts and Science Test (LAST) and Assessment of Teaching Skills – Written (ATS-W), as well as the Content Specialty Test (CST). After Spring 2014, all prospective teachers must pass the new Teacher Performance Assessment (edTPA), Educating All Students Test (EAS), Academic Literacy Test (ALST), and the Content Specialty Test (CST).

A major distinguishing characteristic of some traditional teacher preparation programs (e.g., CUNY's Hunter, or Queens Colleges) that prepare NTFs is the design format of the fieldwork and student teaching component where students must take coursework with field

[34] This example is from Hunter College School of Education of the City University of New York (CUNY) and represents the typical major areas of study in most traditional schools of education.

experience requirements. Field experience entails the student being in the classroom usually one day a week, all day for three semesters, on average. Depending on the school, the focus can change each semester from say, developing classroom observation skills, understanding instructional delivery and classroom management, to working with individual students, small group instruction, and ultimately whole class teaching. Upon successful completion of the field internship, students will then embark upon student teaching where they will engage in full teaching (all day Mondays through Fridays). At this juncture, many first-rate teacher education programs will continue to provide the students with external support in the form of instructors, cooperating teachers, and supervisors. This is perhaps the most important single reason why traditionally certified teachers such as the NTFs often perceive their preparation as superior to that of TFs. The relatively lengthy exposure to the realities and complexities of teaching through field internships and student teaching is seen as an added advantage that is absent in the somewhat ad hoc pedagogical preparation of TFs.

Kee (2012) discusses this issue in her examination of how well-prepared teachers from different teacher preparation programs felt in their first year of teaching. Using data from 2003-2004 Schools and Staffing Survey, Kee found that alternatively certified teachers felt somewhat less prepared than traditionally trained teachers; and that the more education coursework and the longer the field experience, the more well-prepared a first-year teacher felt (Kee, 2012). The notion of alternative teachers' feelings of inadequacy is buttressed by Blazer (2012), citing Davis et al., (2006); Laczko-Kerr & Berliner (2002) when she examined several studies confirming "lower levels of self-confidence and feelings of efficacy" (p. 5) of alternatively certified teachers.

In a study of 38 first-year TF, Costigan (2004) found through verbal and written narratives from these participants, that there was a struggle to develop their understanding of themselves as teachers and their assessment of teaching. These participants ultimately had to adjust their initial perceptions and ideals of teaching as a result of their daily experiences and complex realities of teaching in the (urban) classroom (Hammerness, 2003).

The complex realities of teaching was further brought to light in a panel discussion on obstacles to entering the teaching profession (Brookings Papers on Education Policy, 2004) in which the participants discussed some of the more severe obstacles to recruiting new teachers into the profession, particularly for inner-city schools, like New York City. Michelle Rhee, representing the TNTP (a partner organization of the NYCTFP), and Vicki Bernstein of the NYCTFP, spoke extensively but precisely about three main barriers to entry into teaching by TF. Teaching is not perceived as a first-choice profession, particularly by women who have other choices. Second, State obstacles make it difficult to get licensed. Finally, "candidates encounter an impenetrable bureaucracy" (p.269).

Interestingly, for those who made it through and were eventually hired, researchers continue to be interested in the adjustments, if any, that TFs have had to make to bridge their perception of teaching reality with the realities of everyday teaching. Malow-Iroff et al., (2004) explored TF in a public graduate elementary education program using a survey instrument to glean their previous working experience, reasons for joining the TF program, Fellows' perception of: the curriculum, socio-economic status, support from school administrators, Fellows' pupil control ideology, beliefs about teaching efficacy and retention. The researchers report positive findings including TF's inclination to be genuinely concerned about their

students' academic, psycho-social well-being, as well as competence in their personal teaching efficacy (Malow-Iroff et al., 2004).

Cicchelli and Cho (2007) studied TFs' multicultural attitudes in the context of a teacher education program at Fordham University, a large private university in NYC. They administered the Teacher Multicultural Attitude Survey to 61 intern/TFs enrolled in a 39-credit teacher education program that had adopted multicultural curricula, and urban field experiences. Using a single-group, pre-post design, the researchers observed White intern/TFs' multicultural attitudes increased at a significance level but no significant change in the pre-and post-attitudes scores of culturally diverse intern/TFs. This suggests that culturally diverse intern/TFs were already predisposed to certain cultural sensitivities by virtue of their ethnicities.

Schonfeld and Feinman (2012), studied the daily diaries of 252 beginning teachers, 176 of whom were NYCTF over a two-week period to compare the frequencies with which alternatively certified teachers (mostly NYCTF) experienced job-related difficulties compared to traditionally trained teachers. Employing the "event proneness" model (p.219) which can be used to explain some of the differences in work experiences of two distinct groups of workers, (for instance, the experiences of alternatively certified teachers and traditionally certified ones), the researchers found results that were consistent with the theoretical event proneness model, i.e., the frequency of exposure to an experience on the job can be linked to the extensiveness of the workers' training (in this case, teacher training). The theoretical expectation was that because TF received a less extensive training, they were more likely to encounter more classroom management issues (including student disrupting lessons, not paying attention, refusing to work, and confronting the teacher). According to Schonfeld and Feinman (2012), this was confirmed by this study. The proportions of problematic interactions with colleagues and students' parents

were the same for both groups of teachers. Fellows also reported experiencing more threats from students. Students physically hurting other students were unexceptional for both groups. Equally common for both groups were students with legitimate learning difficulty and those with serious emotional issues which often cause them to be upset. Fellows also reported "highly adversarial relationships with administrators" (p.237), which did not augur well for the novice teachers to seek help. Yet others complained about what appeared to be highly invasive, top-down model of supervision by some administrators. For instance, an insistence on utilizing a mode of reading instruction called the "workshop model" which requires students to work in small groups throughout the day, even though there was little or no evidence of rigorous evaluation of its effectiveness. Fellows reported being extremely stressed over the possibility, and repercussions of, getting caught using a different instructional model. The end result of all this is that teacher morale suffered. And when teacher (or any employee) morale is questionable, job satisfaction is almost always questionable. Dissatisfied employees are prone to quitting the job where they are dissatisfied (Mak, & Sockel, 2001; Myers-Giacometti, 2005). Teaching is no exception.

The intersection of support, mentoring, and Fellows' retention was examined by O'Connor, Malow, and Bisland (2011) through the analysis of survey instruments administered to 68 NYCTF graduate students in an MAT (Master of Art in Teaching) degree in Elementary Education from a public college in NYC. At the forefront of their findings was an expressed need by Fellows for congruence between college coursework and classroom management issues that classroom teachers encounter on a fairly regular basis. This is consistent with Wayman, et al., (2003) who found that teachers in alternative certification programs were more concerned

with work-related issues than those enrolled in traditional certification programs (Wayman, et al., 2003).

Boyd, et al., (2008) focusing their analysis on 16 institutions that prepare the majority of elementary teachers for NYC public schools, found an overwhelming lack of "structural variation" (p.336) in courses taught as well as overall program designs in the teacher preparation programs that they examined. Their findings revealed that none of the institutions they examined had any radically different teacher education program arrangements. This, they contend, contradicts the prevailing notion that teacher preparation programs are similar (Ibid, citing Shulman, 2005). They theorized that "institutional isomorphism" (p. 337) can explain the homogeneity found in these programs. Since their research was primarily focused on elementary teacher education programs in NYC, the offered the caveat that generalizing their findings would be difficult because the uniformity found in these programs could be a response to the highly regulated contextual framework of teacher preparation in New York State. This type of framework may not be available in other states, therefore, local adaptations must be properly considered when we examine teacher education.

A number of studies concentrate on NYCTF and mathematics education (Boyd et al., 2010; Evans, 2009, 2012; Smith et al., 2009; and Vatuk & Meagher, 2009) . Boyd et al., (2010) found that the math immersion teachers had stronger academic qualifications than their traditionally certified counterparts. But despite the strong qualifications, they produced somewhat smaller gains in mathematics achievement for middle school mathematics students compared to the gains of students of traditionally certified teachers. Evans (2009, 2012) also examined the mathematics immersion program that was used to prepared TFs who were prospective mathematics teachers. He found improvements in problem-solving abilities of the

TF in one mathematics immersion program. TFs attributed this increase to their teaching of problem-solving to their middle and high school students. Operating under the assumption that TFs' attitudes toward mathematics and the teaching of mathematics matter, Evans (2009) focused particularly on understanding TFs' attitudes during the semester. He found a positive correlation between TFs' attitudes toward mathematics and an increase in mathematics content knowledge. It is difficult to generalize Evans' (2009) study because of methodological issues of selectivity and sampling. The sample was made up of 42 TFs who were enrolled in mathematics methods course in one of the teacher preparation programs in a partner school.

Smith et al., (2009) also analyzed TFs' pre-service training, their experiences and perspectives during pre-service training using in-depth surveys of 269 first-year mathematics TFs at 4 partnering universities. In congruence with Boyd, et al., (2008) – lack of structural variation – Smith et al., (2009) concluded that there were similar content in the pre-service training of the 4 partnering institutions. However, significant variations existed in the amount of time spent on different curricula issues such as general education matters (e.g., classroom management), mathematics content, multicultural education, fieldwork experiences and mathematics specific teaching methods. Significant variation was also reported in fieldwork experiences. According to the researchers, within-program variations exceeded between-program variations. For example, some TF spent more than 75 hours at their summer school site while others reported spending less than 35 hours. Ironically, in the follow-up study on those who remained in teaching after one year, fieldwork experience was the most cited strength of their pre-service training. Many of the Fellows reported that the summer pre-service was "too short", "too accelerated", or "too theoretical" (p.1328). Although the majority of the 'surviving' math TF felt that they were "prepared" as a result of the summer pre-service training, they did

not feel “well-prepared” to teach their assigned (math) courses. In terms of classroom management, especially the handling of disciplinary issues and teaching with varied instructional methods, there was an even split between those who thought they were “prepared” and those who felt “poorly prepared” (p.1328). More importantly, most of the Fellows did not feel prepared to teach mathematics to students whose native language is not English (English Language Learners or ELL students as they are known in the NYC public school system), as well as those with learning disabilities.

In the same vein, Vatuk and Meagher (2009) using Shulman’s (1986) theoretical framework of pedagogical content knowledge (PCK) as a guide, sought to explore Fellows’ “Mathematical Knowledge for Teaching” (MKT). Shulman (1986) defines PCK as

> “the particular form of content knowledge that embodies the aspects of content most germane to its teachability (including) the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations – in a word, the ways of representing and formulating the subject that make it comprehensible to others. Since there are no single most powerful forms of representation, the teacher must have at hand a veritable armamentarium of alternative forms of representation, some of which derive from research whereas others originate in the wisdom of practice ” (p.9).

Through observational work in the form of interviews, fieldnotes, video and audio tapes, data on 8 TFs were collected and analyzed throughout one school year. The authors concluded that TFs needed additional mathematics support; the current training did not completely address TFs’ MKT needs; mentoring of Fellows was more focused on classroom management issues and student motivation.

These findings are consistent with the findings of Blazer, 2012, Davis et al., 2006, Kee (2012), and Laczko-Kerr and Berliner 2002. The underlying idea in all of these studies is that there is a preponderance of evidence that alternatively certified teachers’ (such as NYCTF) generally tend to feel less prepared than traditionally trained teachers.

To my knowledge, very few studies at this point (2013) have seriously examined the retention of NYCTF. Malow-Iroff, O'Connor, and Bisland (2004; 2007) used Pearson product-moment correlations and stepwise regression analysis to analyze the results of surveys administered to TFs in a graduate elementary education program. They found that about 29 percent of the TF surveyed planned to leave their teaching positions at the end of their contractual obligations. Their correlational analyses showed a strong relationship between TFs' long-term goal to stay teaching in their current schools and their perceptions of: (i) the schools' socioeconomic status; (ii) support received from fellow teachers and the principals within the schools; (iii) TFs' beliefs about the efficacy of their teaching practices; and (iv) TFs' beliefs about pupil control in a classroom setting

Arthur Costigan (2005) was one of the first researchers to study the TF program. He and his co-researchers studied 38 TFs assigned to teach literacy programs in one of the low performing schools in a poor area. In order to get a more intense look at the thinking of novice teachers, Costigan decided to focus on 3 of these new TF. Costigan and his colleagues based their research on the theoretical framework that sees teaching as "an autobiographical process that is best understood through the narratives new teachers create as they struggle with a job that is a complex intermingling of personal autobiography and an emerging understanding of the teaching craft" (p.127). At the end of their three-year study, they found that: (i) The Fellows perceived a lack of academic investment on the part of many of their students which contradicted Fellows' academic expectations; (ii) There was perceived lack of congruence between meaningful teaching practice and standardized curricula. This divergence further impaired the relationship identified in (i), above; (iii) Fellows thought that lack of autonomy compromised the vision for professional growth; (iv) Fellows developed a sense of personal relationship with their

students which sometimes influence their decisions to remain in teaching and induced a sense of guilt when they quit. A noteworthy part of Costigan's observations in this particular study was that the method of personal, relational and observational considerations "currently have no place in the supply-and market-driven philosophy of alternative programs…" (p.139). The frustrations felt by TFs who wanted to remain in teaching is constantly being juxtaposed by their passion for teaching and the relationship they have built with their students.

Other studies have concentrated on the support system given to TF. Mary Foote and her co-researchers (2011) assessed the induction policies and practices for novice alternatively certified mathematics teachers from the TFP. They surveyed an entire cohort of 167 TFs and followed up with in-depth interviews and written reflections from 12 case studies. The researchers found inconsistent policy-practice continuum. In other words, while the policy might seem sufficient, the practice did not mirror the dictates of policy. They also found that Fellows reported that the informal relational support structures built within their local schools were more helpful in their first years of teaching mathematics. One policy implication of this research is to carefully examine/re-examine the induction of TFs.

To the extent that teacher quality, as measured by a teacher's impact on students' performance on standardized test, is often linked to high school graduation rate. The NYCTFP has proven to be a successful recruitment endeavor that has managed to recruit highly credentialed individuals many from very selective universities (Boyd, et al., 2008, 2010, 2012). Raising teacher quality (as defined above) may improve student performance on standardized tests (Rockoff, 2004). But student learning should not be limited to student performance on standardized tests and teacher quality involves more than just a teacher's impact on outcomes of test scores. Improving teacher quality is greatly impacted by teacher shortage (Rockoff, 2004).

Increasingly, as I have mentioned above, many states have resorted to alternative means of certifying teachers to ameliorate the teacher shortage dilemma.

Clearly, one can say that the above has shed a great deal of light on the NYCTFP as a model of alternative teacher certification programs, its policies and practices, its participants, their perceptions of the teaching profession and their place in it, their sense of efficacy, the support structures available to these beginning teachers and to an extent the interplay of all these factors on the stay or quit decisions TFs. While it does not appear to be a shortage of research on aspects of alternative teacher certification in general, it is safe to say that there is a dearth of empirical studies on the retention of NYCTF. While there have been a few studies that investigated NYCTFP specifically (Costigan, 2004, 2005; Malow-Iroff, 2004, 2007; Boyd, et al., 2005, 2006, 2008, 2009, 2010, and 2012), even fewer (Boyd, 2010, 2012) have closely examined NYCTF retention. My hope is to use my dissertation to further contribute to the understanding of teacher retention as it relates to one of the nation's largest alternative teacher certification program – the NYCTF. I will do this by carefully analyzing cohorts on TFs and NTFs and presenting the results and suggesting implications for policy and further research.

Chapter III

METHODOLOGY

Overview of Proposed Study

In this study, I use both general descriptive statistics and survival analysis, more specifically, the Cox proportional hazards (PH) model to analyze and compare the retention rates of NYC teachers who were hired via the NYCTFP and NTF. I elect to use these methods because instead of asking whether or not teachers quit (which we know they do), I want to be able to answer the more illuminating question of **when are TFs and NTFs at the greatest risk of quitting?** Knowing when teachers are **at the greatest risk of quitting** not only answers the questions of whether or not they quit, it also tells us **by how much** (Willett & Singer, 1991)**.** For the sake of specificity and clarity, I will concentrate on distinctive cohorts of TFs and NTFs from 2003, 2004, 2005, 2006, 2007, and 2008. To eliminate ambiguity, I will factor in predictor variables that have been shown in empirical research to influence quit decision: **sex, ethnicity, age, subject taught (or subject/license area), and school type.** I will also create interaction variables to ascertain any interactive variable effect. I will provide descriptive statistics on the different cohorts to illustrate what each cohort looks like with respect to my variables of interest – discussed hitherto. The descriptive statistics will set the stage for running the discrete-time survival analysis models using the combined cohort numbers. This will provide a more robust estimate of the parameters, and lend itself to a more meaningful interpretation. Each model, including its corresponding graphical representation, will be carefully analyzed and interpreted. I will use the terms "survival probability" and "retention rate" interchangeably.

This study is necessary because there is a dearth of empirical research on this subject, as I have explained previously. Without a doubt, teachers are the critical ingredient in the

educational landscape. Research has consistently shown that good teaching can positively impact student achievement in substantial ways (see my teacher quality section in my literature review). One good teacher can reverse up to three years of instructional deficit in the right direction. Unfortunately, the contrary is also true: one bad teacher can cause potentially irreversible educational "damage". These results have been particularly pronounced with low-functioning students, especially those in inner-city schools. Large urban schools tend to have a disproportionate percentage of lower-functioning students who can benefit greatly from a consistent presence of an effective teacher.

As mentioned in my introduction, empirical studies have also demonstrated that it takes **three-to-seven years** to master the art and science of good teaching (Alliance for Excellent Education, 2004). Teacher shortage threatens the hiring, training, and retaining of all teachers – especially the effective and talented ones. Alternative certification programs have the potential to bridge the teacher shortage gap. But these programs will only be meaningful if the teachers hired through them stay in teaching long enough to make the right impact. If teachers quit within the first three-to-five years of teaching, they may miss the opportunity to become better at teaching. Students, schools, families and ultimately society will continue to bear the brunt of inadequate teaching force. This will manifest in persistently low graduation rates, which are sometimes geographically, demographically, and often economically differentiated. Large urban schools will persistently be on top of the list of poor performance.

It is therefore helpful to know: (a) if teachers are staying long enough (more than five years) to take full advantage of the opportunity to master the profession; (b) if there is a difference in retention rates of teachers in the fast-track to teaching routes (e.g. TF) and those in the traditional routes; (c) if there is a difference in retention rates between cohort groups from the

different tracks to teaching; (d) if retention is influenced significantly by sex, age, experience, subject taught, and school level. This is what my proposed research will do using data sets from the NYCTFP and the NTF.

The results of this research will inform current debate on teacher retention especially as it relates generally to the alternative certification entry mode into teaching and specifically as it pertains to the NYCTFP of the New York City Department of Education. Undoubtedly, this research study invariably answers many questions on teacher retention in the NYC school system and raises other important questions.

Data

The data sets that I used were provided by the NYCDOE. I combined twelve separate administrative files into one major file which then became my main data source. Data were available on TFs and NTFs as follows:

- Cohort of 2003 – 27,014 observations – 2,222 (TFs); 24,792 (NTFs)
- Cohort of 2004 – 20, 110 observations – 1,888 (TFs); 18,222 (NTFs)
- Cohort of 2005 – 11,263 observations – 2,005 (TFs); 9,258 (NTFs)
- Cohort of 2006 – 10,041 observations – 1,866 (TFs); 8175 (NTFs)
- Cohort of 2007 – 10,012 observations – 1,854 (TFs); 8,159 (NTFs)
- Cohort of 2008 – 7,720 observations – 1,518 (TFs); 6,202 (NTFs)

The variables supplied in the data were:

- Cohort Year: The year in which a TF or a NTF entered the program
- First Teaching Year
- School: Where TF/NTF began his/her teaching career

- Employment Status: The TF's/NTF's status as of date of data collection
- Location Code: The school in which TF/NTF worked as of date of data collection
- File (or EIS) Number: A unique identifying number that all DOE employees have
- Subject License Area: The subject that the TF/NTF was licensed to teach
- Assignment Code: Identifying the subject that each TF/NTF was actually teaching
- Employment Status Date: As of data collection, this is the date of any event in employment – terminations, quits, leave of absence, etc.

As a result, it was possible to do several comparative analyses of TFs and NTFs

Research Questions (RQ)

RQ 1: **Do TFs have a higher retention rate than NTF?** I will analyze and compare retention rates for TFs and NTFs using the product-limit survival estimates of survival analysis.

RQ 2: **Compared to NTF, when are TF at the greatest risk of quitting?** I will use the Cox PH model (survival analysis) to answer this question. I will run several models from the available cohort data and compare the hazard ratios of TF and NTF for each cohort. The analyses will show when TF are more likely to quit (i.e., at the greatest risk of quitting). Based on my findings, I will conclude with a summative policy implication based on my findings.

RQ 3: **To what extent do sex, ethnicity, subject taught, school type, and whether or not an individual is a TF affect quit/stay decision?** My mode of analysis will be as described in RQ 1, and 2 above.

RQ 4: **Do TF stay long enough to have a positive impact on student outcomes?** The answer to this question will come from the results of the analyses in RQs 1, 2, and 3, above. I will rely on available research confirming what "long enough" mean for teacher effectiveness. I will also discuss the concept of teacher effectiveness as defined in current research literature.

<u>RQ 5</u>: To what extent has the NYCTF program changed the dynamics of teacher recruitment in NYC public schools? Here, as in RQ 3, the answer will come primarily from the results in RQ 1 and RQ 2, but will be specific to the teacher labor market in NYC.

Method of Data Analysis

This research study addresses teacher retention by simultaneously examining the retention of teachers whose mode of entry into teaching was alternative certification and juxtaposing that with the retention of teachers whose mode of entry was more traditional. Survival analysis, a statistical analytic method used to investigate time-to-event or event history, prescribed by notable researchers such as Richard Murnane, John Willett, and Judith Singer of Harvard University, was utilized (Murnane, et al., 1988). This method of analysis is preferred because of its robustness and predictability (Willett & Singer, 1993). Not only does it allow one to describe temporary patterns of time-to-event, it permits comparisons of these patterns amongst groups (e.g., cohorts of TF and NTF), and also allows one to develop statistical models of the risks of occurrence over time (Kleinbaum & Klein, 2005; Willett & Singer, 1991). The Cox PH model is also preferred because it uses more information, such as **survival times**, and **censoring**, that other models like logistic regression overlooks. Censoring refers to what happens when individuals have not yet experienced the event in question (quitting) as of the time that data collection ended. Those individuals – i.e., the ones who have not quit at the end of data collection (2010) are said to be **censored**, and are factored into the analysis in the Cox PH model.

Its general form is given as[35]:

$$h(t, \mathbf{X}) = h_0(t)\, e^{\sum_{i=1}^{p} \beta_i X_i}$$

[35] Kleinbaum & Klein (2005)

where,

$h(t, \mathbf{X})$ = hazard at time *t* for a TF exhibiting a set of predictor variables represented by **X**

X = a vector of explanatory variables modeled to predict a TF's hazard

$h_0(t)$ = Baseline hazard function; it is the hazard for the particular TFs when all explanatory variable values are equal to zero (This model can be linearized by dividing both sides of the equation by $h_0(t)$ and then taking the natural logarithm of both sides)[36] When there are no predictor variables in the model, the Cox model condenses to the baseline hazard. Hence, before including any independent or predictor variables, such as sex, ethnicity, or age, $h_0(t)$ is considered the "baseline" form of the hazard function. It is an **unspecified** function; hence the Cox PH model is often referred to as a **semiparametric** model. (Kleinbaum & Klein, 2005).

$e^{\sum_{i=1}^{p} \beta_i X_i}$ = the exponential expression "*e*" raised to the linear sum of $\beta_i X_i$; where the sum is over the "*p*" predictor variables[37]

$\beta_i \ldots \beta_p$ = are the coefficients of the predictor variables described below.

$X_i \ldots X_p$ = are predictor variables: TFs(Women), school type (early childhood, elementary, junior high, high, K-12, secondary), subject taught/license area, ethnicity, and age.

The Cox PH Model Assumptions

- The baseline function is a function of *t*; it does not involve the predictor variables
- The predictor variables are **time-independent.** This means that their values do not change over time (e.g., sex, ethnicity, etc.). For the purposes of this research study, I will consider the predictor variable AGE, a time-independent variable, even though

[36] http://www.statsoft.com/textbook/survival-failure-time-analysis/#rcox

[37] Kleinbaum & Klein (2005), p.94.

its value changes over time. The justifications for this are: (a) its effect on decisions to quit or remain in teaching depends primarily on its value at only when individuals decide to make that decision; (b) age changes very little over time.

- The hazard ratio is constant over time. Another way of saying this is that individuals are proportionally exposed to the hazard (in this case the hazard of quitting teaching). The **constant of proportionality is time-independent**. In other words, every subject is equally exposed to the hazard, and this exposure does not depend on time.

How Estimates Are Obtained for the Parameters of the Cox Model[38]

In the general form of the Cox PH model, above, the Bs (sometimes called "betas") represent the parameters. The estimates of these parameters are known as maximum likelihood (ML) estimates. ML estimates are symbolized as "$\widehat{\boldsymbol{\beta}}_i$". Theoretically, the ML estimates of the Cox PH model parameters are the result of maximizing a likelihood function, ***L***, which is the joint probability of obtaining the data being truly observed on the subjects in the research as a function of the unknown parameters (the Bs) in the model.

In reality, the likelihood function, ***L***, estimates probabilities for subjects who fail (i.e., quit teaching). It does not calculate probabilities for individuals who are censored (i.e., still teaching as of the end of data collection). It is therefore referred to as "partial" likelihood. It can be expressed as:

$$L = L_1 * L_2 * L_3 *\ldots* L_k = \prod_{J=1}^{K} L_j$$

Where,

L_j = portion of L for the jth failure time given the risk set $R(t_{(j)})$.

[38] Adapted from Kleinbaum & Klein (2005)

The above indicates that the partial likelihood is essentially the product of many likelihoods – one for each of *k* failure times. L_j indicates the likelihood of failing at the *jth* failure time, given that the subject has survived up to this time. The group of individuals at risk at *jth* failure time is called the "**risk set"** denoted by $\boldsymbol{R(t_{(j)})}$. Typically as failure time increases, the risk set reduces in size.

It is worthy of note to mention here that even though the partial likelihood centers around individuals who fail (i.e., teachers who quit); survival time information before censorship is used for censored individuals. This means that a teacher who is censored after the *j*th quit time period is part of the risk set that will be used to compute L_j, despite the fact that this teacher is censored later.

The Hazard Ratio

The hazard ratio (HR) is the hazard for one person divided by the hazard for a different person. The predictor values for each individual distinguish them. As I have pointed out earlier, the predictor values are the Xs.

$\widehat{HR} = \frac{h(t,\boldsymbol{X}*)}{h(t,\boldsymbol{X})} \Rightarrow$ The hazard ratio can be written as the estimate of $h(t,\mathbf{X}^*)$ divided by $h(t,\mathbf{X})$.

where,

$\mathbf{X}^* = (\mathbf{X}^*_1, \mathbf{X}^*_2, \ldots, \mathbf{X}^*_p) \Rightarrow$ The set of predictors for one subject (teacher).

and,

$\mathbf{X} = (\mathbf{X}_1, \mathbf{X}_2, \ldots, \mathbf{X}_p) \Rightarrow$ The set of predictors for one subject (teacher).

To express the HR in terms of the regression coefficients, we substitute the Cox PH model into the numerator and denominator of the HR. Simplifying, the HR becomes the exponential expression presented here:

$$\widehat{HR} = \frac{h(t,\boldsymbol{X}*)}{h(t,\boldsymbol{X})} = \frac{ho(t)e^{\sum_{i=0}^{p}\hat{\beta}iXi^*}}{ho(t)e^{\sum_{i=0}^{p}\hat{\beta}iXi}} = e^{\sum_{i=0}^{p}\hat{\beta}i(Xi^* - Xi)}$$

The hazard ratio is calculated by exponentiating the sum of each $\hat{\beta}i$ multiplied by the difference between X^*_i and X_i.

$$\widehat{HR} = e^{\sum_{i=0}^{p}\hat{\beta}i(Xi^* - Xi)} \quad \text{or} \quad \widehat{HR} = \exp\left[\sum_{i=0}^{p}\beta i(Xi^* - Xi)\right]$$

As a general rule, if X*i* is a coded 0,1, then the hazard ratio is equal to the effects of the exposure (quitting) adjusted for other Xs – as long as there are no interaction terms. This can be expressed as:

$$\widehat{HR} = e^{\hat{\beta}i} \quad \text{(provided there are no interaction terms)}$$

When there are interaction terms, and the exposure variables are coded 0,1, the hazard ratio is expressed as:

$$\widehat{HR} = \exp\left[\hat{\beta} + \sum \delta iWi\right]$$

where,

$\hat{\beta}$ = coefficient of E

δi = coefficient of E x W*i*

"$\widehat{HR}$ does not contain coefficients of non-product terms."[39]

Model Interpretation

The Cox PH model produces hazard ratio (HR) which estimates the instantaneous hazards ratio of, in this case, quitting teaching, for independent variables (TFs who taught math,

[39] Kleinbaum & Klein (2005), p.103

English, etc. as well as those who worked in elementary, middle, or high schools, etc.). HR measures the strength of the effect of the phenomenon one is studying (quitting). If the HR is less than one, it means that the group that is exposed to the hazard, has a fraction of hazard of the unexposed group. An HR of 1 implies that there is practically no effect since 1 is the null value for the exposure-outcome relationship. An HR that is greater than one (e.g., 2) means that the exposed group has that many times the hazard of the unexposed group (Kleinbaum & Klein, 2005) In general, the lower the hazard ratio, the less likely it is to experience the hazard – quitting – and vice versa.

Estimation of the Survival Curves Using the Cox PH Model

It is possible to fit survival data with no model. The survival curve thus generated is called the Kaplan-Meier curve (KM). It is plotted as step functions. Under the Cox PH model, survival curves can adjust for the predictor variables. These curves known as adjusted survival curves, are also generated as step functions (Figures 3 and 4) .

Figure 3: An Example of a Survival Curve for Cohort 2005: Product-Limit Survival Curves for TFs and NTFs

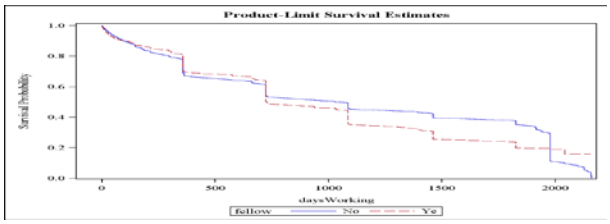
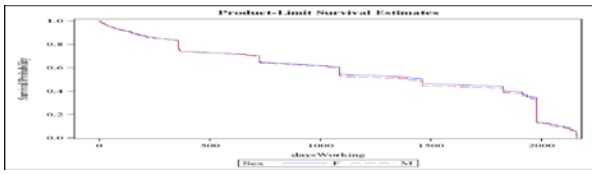


Figure 4: An Example of a Survival Curve for Cohort 2005: Product-Limit Survival Curves for Men and Women



Contribution to Current Knowledge on Teacher Turnover

I will contribute meaningfully to current research efforts on teacher turnover, particularly for beginning teachers by analyzing the propensity of beginning teachers from the NYCTF to quit or remain in teaching, and by synthesizing the event history analysis of their quit behavior. My focus on beginning teachers is influenced by my experience as an educator in the NYC school system who has witnessed the tendencies of novice teachers to be receptive to needed institutional change that has been shown to raise student achievement. New teachers are generally dynamic, and less risk averse to educational innovations. They are more likely to be technologically savvy which can be highly correlated with improved student performance. They are more likely to work long hours, relate well with students, and try innovative approaches to educate children. These types of traits have been shown to work exceptionally well in urban, inner-city environments because of educational deficiencies with which many students enter school (Chenoweth, 2007). With proven in-depth content knowledge, TF bring strong academic backgrounds to the table. Additionally, many have work experience, hence can provide the link between pedagogy and real life. Theoretically, these traits should make TF potentially effective classroom teachers. The reality though, can be categorically different from theory. Teaching can be a complex endeavor. TF and other novice teachers are prone to the harsh realities of teaching – particularly in urban settings. Oftentimes, these teachers may not necessarily have the type of experiences that they originally anticipated and this may further lead to decisions that affect their retention. My study is intended to contribute to this debate by illuminating the realities of the retention of new teachers in NYC, and by offering policy implications and recommendations for the future.

It is a challenge to hire and retain highly effective teachers in inner-city, particularly in high poverty schools. Through experience, I know that TFs and generally speaking beginning teachers can be potentially dedicated and committed to educating students in high-need areas. It is therefore imperative to understand their mobility patterns in such setting, where they are most likely to make positive impacts in the lives of young people. Understanding these patterns has long-lasting policy implications in the sense that such understanding can become the catalyst for effective teacher retention policies that can effectively address the needs (if any) of this segment of the teaching force. If successful, such policies have the potential of becoming widespread because most states have now adopted the staffing of schools with alternatively certified teachers like the TFs.

It is equally important to understand that many TFs are young and may have aspirations for further studies and probably other career choices. Is the TFP offering them enough opportunity that they will decide to make teaching a career goal? Or is this just a temporary stop-gap on their way to "bigger and better" things or other professional/career goals? Is the teaching profession in general (especially in urban schools) contributing to this type of attitude (if it exists)? My research will contribute to the understanding of many of these questions and that is part of the reason why it is crucial.

Data Analysis and Rationale

I began my analyses with descriptive statistics of the independent variables in the models for each cohort using the FREQ procedure in the SAS software. This provides a starting point upon which more sophisticated analyses will be built (Trochim, 2005). For example, Table 2 (below) illustrates, as the title implies, the distribution of the TFs and NTFs from the cohort of 2005. This is done for all the cohorts being analyzed for this study. I give a brief explanation of

the descriptive statistics. My other starting point is the censored and uncensored values for the members of the group of interest. These numbers are useful because they give us a glimpse of those who have not yet experienced the event at hand – quitting teaching – as of data collection. The LIFETEST procedure in SAS is employed to generate these values. (see tables 5 – 8 for select censored values on cohort 2005) and the PHREG procedure is used to produce other valuable information such as the "model fit statistics" which use select statistical criterion (-2 Log L, AIC, and SBC) to fit the model with and without covariates. This procedure also produces the test of global null hypothesis which simply tests the overall model for significance.

It is worth reiterating that the parameter estimate (beta) for each explanatory variable is called the maximum likelihood (ML) estimate. It estimates the partial likelihood of a teacher quitting given that he or she has remained in teaching up to that point.

The seminal works of John Willett and Judith Singer of Harvard University on survival analysis, student dropout, and teacher retention were particularly influential in my decision to select this methodology and the explanatory variables for this study (Willett & Singer, 1991; 1993; Singer & Willett, 1988; 1991; 1993; and 2003). The outcome variable in survival analysis is "time to an event" (Kleinbaum & Klein, p.32) including censored data, i.e., those who have not yet experienced the event. The outcome variable in linear regression is usually a continuous variable which may not capture the essence of comparing retention patterns among teachers who entered the profession via different entry modes as in TFs and NTFs. A comparable method for analyzing teacher retention is logistic regression. But its outcome variable is a dichotomous variable, which in this case, is whether teachers quit or not without factoring in teachers who have not yet experienced quitting up to the point of consideration (censored data). In linear regression effect is typically measured by the regression coefficient β. The effect measure in

logistic regression is an odds ratio expressed as an exponent of one or more coefficients in the model ((Kleinbaum & Klein, 2005). As mentioned previously, hazard ratio (HR) is the measured of effect in survival analysis. Similar to logistic regression, it is expressed as an exponent of one or more regression coefficients in the model, i.e., e^{β}.

To sum up, for the combined cohort of TFs and NTFs from 2003 – 2008, I ran several survival analyses models starting with the most basic single variable model with TFs and then building up to model 9 with multiple variables, including interactions. Dummy codes 0,1, were used to separate TFs from NTFs, as well as in the other dichotomous variables such as "Sex", "YearStart" (or "Year"), "Ethnicity", "SubjectTaught" (or "Subject"), and "SchoolType". Essentially, for each iteration of the combined model, I estimated the following model adding the variables of interest as I proceeded:

$$h(t, \mathbf{X}) = h_0(t)\, e^{\sum_{i=1}^{p} \beta_i X_i}$$

This allowed me to build the models as follows:

Model 1: $h(t, \mathbf{X}) = h_0(t)e^{\beta(Fellows)}$

Model 2: $h(t, \mathbf{X}) = h_0(t)e^{\beta(Fellows) + \beta(Year)}$

Model 3: $h(t, \mathbf{X}) = h_0(t)e^{\beta(Fellows) + + \beta(Year) + \beta(Sex)}$

Model 4: $h(t, \mathbf{X}) = h_0(t)e^{\beta(Fellows) + \beta(Year)\ \beta(Sex) + \beta(Ethnicity)}$

Model 5: $h(t, \mathbf{X}) = h_0(t)e^{\beta(Fellows) + \beta(Year) + \beta(Sex) + \beta(Ethnicity) + \beta(Age)}$

Model 6: $h(t, \mathbf{X}) = h_0(t)e^{\beta(Fellows) + \beta(Year) + \beta(Sex) + \beta(Ethnicity) + \beta(Age) + \beta(Subject\ Area)}$

Model 7: $h(t, \mathbf{X}) = h_0(t)e^{\beta(Fellows) + \beta(Year) + \beta(Sex) + \beta(Ethnicity) + \beta(Age) + \beta(Subject\ Area) + \beta(School\ Type)}$

Model 8: $h(t, \mathbf{X}) = h_0(t)e^{\beta(Fellows) + \beta(Year) + \beta(Sex) + \beta(Ethnicity) + \beta(Age) \beta(Subject\ Area) + \beta(School\ Type) + \beta(Age*Fellow)}$

Model 9: $h(t, \mathbf{X}) = h_0(t)e^{\beta(Fellows) + \beta(Year) + \beta(Sex) + \beta(Ethnicity) + \beta(Age) + \beta(Subject\ Area) + \beta(School\ Type) + \beta(Age*Fellow) + \beta(Ethnicity*Fellow)}$

Additionally, for cohorts of 2003, 2004, 2005, 2006, 2007, and 2008, I followed the above iteration thereby capturing six separate analyses with distinguishing features.

Models

Since the fundamental reason for my research is to determine whether or not the mode of entry into teaching impacts teachers' decision to remain or quit teaching in a large urban school district like NYC, my methodology inherently has to include different modes of entry into teaching. In all my analyses, model 1 is intended to answer the basic question of whether there is a significant relationship between being a TF and quit decision. Another way of looking at this is to say that does being a TF involves being disproportionately exposed to the 'hazard' of quitting teaching in NYC? Although seemingly simple, model 1 for each of the cohort years to be analyzed forms the crucial basic foundation upon which my other analyses are built. This model is consistent with the literature (Costigan, 2004; Schonfeld & Feinman, 2012). For the purposes of this analysis, TF are coded 1 and NTF are coded 0. This is the pattern that I used for dummy variables throughout my analyses.

In model 2, my intention is to see if there will be a significant difference in quit patterns if the year that the teacher started teaching would make a statistically significant difference in retention rates. I used dummy variable (1,0) for the variable year. Since there were six starting years to examine(2003, 2004, 2005, 2006, 2007, and 2008), 2008 became the comparison year as

it was the closest starting year to the end of data collection. I introduced gender as a variable in model 4 to see of sex makes a difference in the decision to quit or if there is a significantly different HR for male and female TFs and NTFs. The gender variable (sex) is important because it is exogenous to the teaching establishment and cannot be readily changed by the individual. The gender variable is also a dummy variable coded 1, 0 for female and male respectively. Model 4 builds on 1, 2, and 3 with the inclusion of ethnicity – another exogenous explanatory variable. From the research literature, we see that cultural sensitivity has been examined as a confounding factor in retention and effectiveness of TFs (Cicchelli & Cho 2007). Ethnicity can therefore be perceived as a potential predictor of teachers' multicultural attitudes, and ultimately retention (Cicchelli & Cho 2007). This study is examining labor market decisions of TFs and NTFs in a large urban school setting – NYC. Clearly, multiculturalism should be considered as NYC is a global melting pot of cultures. NYC schools are very diverse; the consideration of teacher ethnic backgrounds as they relate to retention should not be far-fetched. I posit that, knowledge of, or willingness to understand students' cultures can help in developing meaningful student-teacher relationship. Meaningful student-teacher relationship can bridge the instructor-student gap, or become the catalyst that opens the door to learning, fostering positive student attitude which is crucial in the learning process. The NYCDOE supplied ethnicity data on Asian, Black, Hispanic, and White TFs and NTFs. Ethnicity variables are dummy variables with 1, 0, coding design; 1 representing the ethnic group. *The comparison group is white because it is the largest group.* In model 5, I introduced the variable "Age", which represents the age of TFs or NTFs (at the time of employment). Following Ingersoll's comprehensive examination of teacher retention (Ingersoll, 2001; 2002; and 2003) in which age was found to be a significant predictor of retention, I wanted to see if age played a part in TFs' and NTFs' retention in NYC public

schools. To get a clearer picture of the age distribution, one approach I took was to divide age into categories, namely, under 25, 30, 40, 50, 60, 70, and over 70. For certain descriptive statistics, and to limit the production of unnecessary outputs, I grouped age according to specified range, such as 20 – 29; 30 – 39; 40 – 49; 50 – 59; 60 – 69; and over 70. I consider the variable AgeThen another exogenous variable because it is not determined by the NYC public school system in which TFs and NTFs work.

In model 6, I introduced the endogenous variable "Subject" which is essentially the subject or license area of TFs and NTFs. I consider this variable important because it can be seen as a proxy to the undergraduate discipline of the teachers in many cases. There are, of course, exceptions. For instance, To curb the problem of shortage of math teachers, the TFs program provides an intensive crash course program for prospective mathematics teachers who did not major in mathematics, but have up to about 18 - 24 credits in mathematics, non-mathematics majors can opt to teach mathematics provided they agree to take additional undergraduate mathematics credits in one of the participating colleges within the period of eligibility for provisional license – usually 2 - 3 years. The data supplied by the DOE for subject area had the following licenses: Common Branches (CB), English as a Second Language (ESL), Foreign Language (FL), Mathematics (Math), Other (this includes vocational licenses such as Business Education, Automotive, Building Trades, etc.), Science (Biology/Living Environment, Earth Science, Physics, and Chemistry), and Social Studies (History). My objective here is to estimate the effect, if any, of working under a particular license area, on teacher retention. This variable will also allow me to answer questions like: "Are science and math teachers more likely to quit than other teachers?"

In model 7, I introduced the predictor variable "School Type." Essentially, this tells us the school or grade level where TFs and NTFs taught during data collection. There are 7 different school types/levels in this data sets: (1) Early Childhood; (2) Elementary School; (3) High School; (4) Junior High/Intermediate/Middle School; (5) K-12 Schools; (6) K-8 Schools; and (7) Secondary Schools

As a seasoned educator, I am aware that certain anecdotal perceptions hold true among K-12 teachers with regards to whether or not school level impacts job satisfaction, morale, and retention. Generally, most educators tend to remain at one level or school type in their careers. Moving from one school type to the other tends not to happen frequently. The general consensus in the urban, public K-12 circles is that junior high school teachers tend to burn out quicker than other teachers because of the energy level that is required for sustained engagements of adolescents of that age group. However, there is little or no empirical research on this.

For each cohort, models 7, 8, 9, and 10 contain interaction terms "Age*Fellow", "Ethnicity*Fellow", and "Subject*Fellow" respectively. Although this is somewhat of a challenge, the rationale here is to isolate and estimate the effects of TFs' and NTFs' age at start, ethnicity, and subject taught on the hazard of quitting. These analyses produced extensive, voluminous results because of the layers of data involved. As a result I will only include parts of the analyses that are statistically significant and relevant to the larger teacher retention picture.

Chapter IV

FINDINGS

Overview of Sample and Descriptive Statistics for TFs and NTFs in All Cohorts (2003 – 2008)

In general, there were consistently more female teachers in each cohort for both the TFs and the NTFs with the ratio of approximately 2:1 for TFs and at least 3:1 for NTFs. As expected, the mean age of TFs in each cohort was noticeably less (younger) than that of NTFs (see chart below).

Mean Age of Teaching Fellows and Non-Teaching Fellows by Cohort[40]

Cohort	Mean Age TFs	Standard Deviation (Mean Age – TFs)	Mean Age NTFs	Standard Deviation (Mean Age - NTFs)
2003	33.5	9.8	44.1	12.2
2004	32.9	8.8	47.5	12.9
2005	31.8	8.7	39.2	12.8
2006	30.9	8.1	37.5	12.5
2007	30.8	8.3	36.5	12.5
2008	29.7	7.9	35.3	12.7

It is clear that the TFs in these cohort years tended to be younger than the NTFs. Arguably, this might have played a part in their retention behavior as well. We see from the literature that young teachers tend to have low retention early in their teaching careers, and this ultimately improves with increasing responsibilities of family, raising children, purchasing a house, etc. (Ingersoll, 2001, 2002, 2003). The evidence in this study appears to corroborate Ingersoll's (2001, 2002, 2003) general findings albeit in a different, more confined context. Throughout the years under study, an overwhelming majority of the teachers were white (See Table 21 in the

[40] Data collection error might have contributed to upward bias of the mean age values.

Appendix). Blacks and Hispanics were neck-and-neck but there seemed to be slightly more black teachers hired during these years than Hispanic teachers by a margin of about two-to-six percentage points. Approximately 6% of the new teachers hired during this time period identified themselves as Asians (See Table 21).

Table 20 (in the Appendix) shows that TFs were mainly hired to work in high schools, junior high schools, secondary schools (grades 6 – 12), and K-12 schools. On average, the proportions of TFs hired to teach in elementary and early childhood schools were significantly less than those hired to teach in the other types of schools listed hitherto. In 2005, 50% of the teachers hired were hired to teach mathematics. From 2005 to 2008, more than 40% of the teachers hired to teach mathematics were TFs. During the same time period, at least 38% of the teachers hired to teach special education students were TFs, and at least 35% of those hired to teach English As a Second Language were TFs. Between 2006 and 2008, at least 37% of those hired to teach science were TFs. A significant proportion of English and foreign language teachers (from 20% to 34%) were TFs during the time period under study (See Table 19 in the Appendix). All this suggests that the NYC school system has gradually begun to rely somewhat heavily on recruiting from the TFs program, particularly for the shortage areas of mathematics, special education, and science.

Although the numbers for cohorts 2003 and 2004 seem unusually large implying the possibility of inflated cohort numbers unwittingly supplied by the NYCDOE, it is safe to say that this did not seem to be a substantive problem in the analyses and subsequent results. This is because analyses of independent cohorts of 2005, 2006, 2007, and 2008 which seem to have more acceptable numbers, yielded relatively similar (but comparative) results as those of 2003, and 2004. To be sure, I also conducted the analysis without cohorts 2003 and 2004 and got

similar results. One minor difference is that the TFs' survival probability curve is noticeably closer to that of the NTFs' implying that retention rates for both groups are very similar but the TFs still have statistically significant HRs (1.132) relative to NTFs. This means that on average, TFs in the cohort years 2005 – 2008 were still more likely to quit when compared to NTFs from the same cohort years. This result is consistent with the results of the analyses containing cohorts 2003 and 2004.

A more comprehensive discussion of the sample and descriptive statistics by cohort is provided below.

Cohort 2003: Sample and Descriptive Statistics

Based on available data from the NYCDOE, the cohort of 2003 comprised of 2,222 TFs and 24,792 NTFs for a combined total of 27,014. However, data on gender were available for 19,400 individuals - considered adequate for generalizations.[41] Out of this, females made up 73.05%; males were approximately 27%. This is not surprising because historically women have been in the majority in K-12 teaching (Lortie, 1975; Tyack, 1974). Females were also in the majority in the TFs with 66.19% compared to males at almost 34% (See Table 2a, below).

Table 2a: Cohort 2003 – Gender Distribution

Table of Sex by Teaching Fellows			
Sex	**Teaching Fellows**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
Female	12738 65.66 89.89 73.91	1433 7.39 10.11 66.19	14171 73.05
Male	4497 23.18 86.00 26.09	732 3.77 14.00 33.81	5229 26.95
Total	17235 88.84	2165 11.16	19400 100.00

[41] Missing data was a recurrent issue in this data set. Fortunately because of the large sample, and operating under the assumption that data were missing completely at random, I elected the listwise deletion (a.k.a. complete case analysis) approach which simply entails the omission of missing data from the analyses and using only those observations for which one has values. The main disadvantage is decrease in sample size. But the substantial advantages include unbiased parameter estimates, (Howell, D.C., 2008).

With regards to ethnicity, white teachers were in the overwhelming majority for both the TFs and NTFs. White teachers constituted 60.13% of the overall cohort population and about 65% of the TFs group (See Table 2b, below).

Table 2b: Cohort 2003 – Ethnicity Distribution

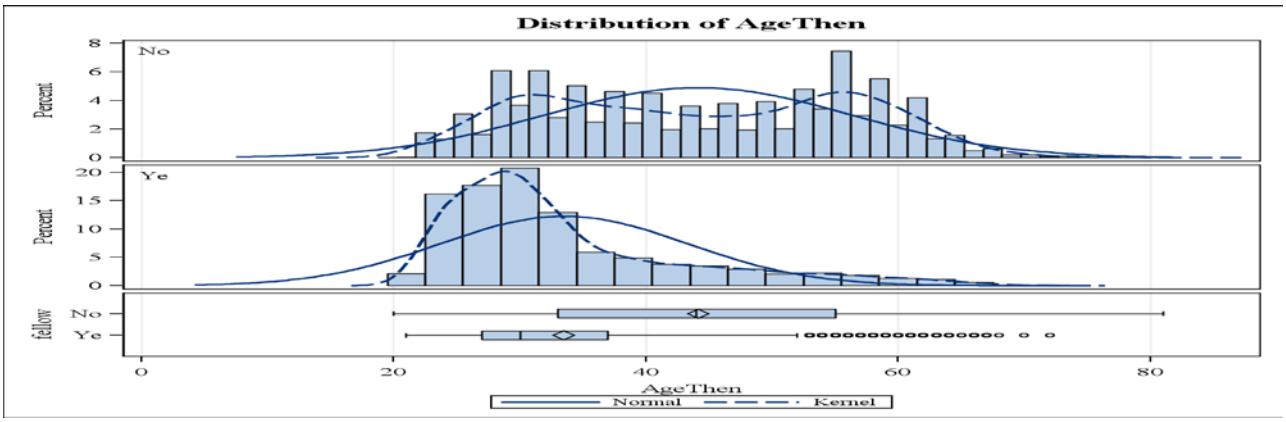
Table of Ethnicity by Teaching Fellows			
Ethnicity	**Fellows**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
ASIAN	852 4.40 84.27 4.95	159 0.82 15.73 7.34	1011 5.22
BLACK	3727 19.24 91.35 21.66	353 1.82 8.65 16.30	4080 21.06
HISPAN	2404 12.41 91.30 13.97	229 1.18 8.70 10.57	2633 13.59
WHITE	10223 52.77 87.77 59.42	1425 7.36 12.23 65.79	11648 60.13
Total	17206 88.82	2166 11.18	19372 100.00

The age-at-start distribution of teachers in this cohort depicts one with an interesting mix of younger and older teachers (See Table 2c and Figure 5). Majority of the TFs in this cohort were in the 20-29 or the 30-39 age groups. On the other hand, most of the NTFs were in the 50-59, and the 30-39 age groups. Figure 5 illustrates a clearly bimodal distribution. Also noteworthy is the fact that more than 10% of this cohort were in the 60+ age group.

Table 2c: Cohort 2003 – Age Distribution

Table of AgeThen by Teaching Fellows			
AgeThenCat	**Fellows**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
20-29	2383 12.27 71.22 13.80	963 4.96 28.78 44.46	3346 17.22
30-39	4678 24.08 86.10 27.10	755 3.89 13.90 34.86	5433 27.96
40-49	3417 17.59 93.23 19.79	248 1.28 6.77 11.45	3665 18.86
50-59	4852 24.97 97.16 28.11	142 0.73 2.84 6.56	4994 25.71
60 up	1932 9.94 97.09 11.19	58 0.30 2.91 2.68	1990 10.24
Total	17262 88.85	2166 11.15	19428 100.00

Figure 5: Cohort 2003 – T-Test Age Distribution



The top half of Figure 5 represents the age distribution of NTFs while the bottom half represents the TFs. Most of the NTFs were clustered around the 30 – 60 age group while the TFs were mainly clustered around the 25 – 30 age group. This makes intuitive sense since the NYCTFP was originally established to attract recent graduates and young professionals looking to change careers to become NYC teachers. The mean age for TFs in this cohort was 33.5, and NTFs was 44.1.; this is consistent with available literature on teaching force (Ingersoll and Merill, 2010). But that of the NTFs is not entirely consistent because of the sizeable number of older teachers in the distribution. I will explore this further in the discussion section.

More than half of the teachers hired in 2003 were hired to teach in non-academic areas but these were predominantly NTFs (See Table 2d). This might have been because of the proliferation of the career and technical education areas around this time. In 2003, TFs were hired to mainly for positions in common branches, special education, and mathematics. As we would later see, common branches ceased to be an area for which many TFs were hired. I will posit that this was probably due in part to the increased stability of teachers in that area as well as lower birth rates at the turn of the 21st Century which meant lower enrollment in the elementary grades. Although 18% of the newly hired TFs in this cohort were hired to teach mathematics, only about 5% were placed in science positions (See Table 2d). Obviously there was no real emphasis on STEM (Science, Technology, Engineering, and Mathematics) around this time. The evidence suggests that this trend changed for later cohorts.

Table 2d: Cohort 2003 – Subject Area Distribution

Table of Subject **by Fellows**			
Subject	**Fellow**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
Common Branches	3901 15.15 88.90 16.36	487 1.89 11.10 25.47	4388 17.04
ESL	355 1.38 87.22 1.49	52 0.20 12.78 2.72	407 1.58
English	1193 4.63 84.01 5.00	227 0.88 15.99 11.87	1420 5.51
Foreign Language	283 1.10 94.02 1.19	18 0.07 5.98 0.94	301 1.17
Mathematics	989 3.84 73.97 4.15	348 1.35 26.03 18.20	1337 5.19
Other	13845 53.76 98.78 58.08	171 0.66 1.22 8.94	14016 54.43
Science	756 2.94 89.47 3.17	89 0.35 10.53 4.65	845 3.28
Social Studies	755 2.93 89.35 3.17	90 0.35 10.65 4.71	845 3.28
Special Education	1762 6.84 80.38 7.39	430 1.67 19.62 22.49	2192 8.51
Total	23839 92.58	1912 7.42	25751 100.00

In terms of placement into schools, close to 40% of all new hires in 2003 were placed in elementary schools followed by high school (25.36%), and junior high school (20.07%) (See Table 2e).

Table 2e: Cohort 2003 – School Type Distribution

Table of School Type by Fellows			
School Type	**Fellows**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
Early Childhood	135 0.61 93.75 0.67	9 0.04 6.25 0.46	144 0.66
Elementary	7895 35.96 92.74 39.44	618 2.81 7.26 31.87	8513 38.77
High school	5101 23.23 91.60 25.48	468 2.13 8.40 24.14	5569 25.36
Junior High-Intermediate-Middle	3942 17.95 89.47 19.69	464 2.11 10.53 23.93	4406 20.07
K-12 all grades	569 2.59 86.34 2.84	90 0.41 13.66 4.64	659 3.00
K-8	1833 8.35 89.28 9.16	220 1.00 10.72 11.35	2053 9.35
Secondary School	544 2.48 88.60 2.72	70 0.32 11.40 3.61	614 2.80
Total	20019 91.17	1939 8.83	21958 100.00

Cohort 2004: Sample and Descriptive Statistics

There was a total of 20,110 teachers in the 2004 cohort comprising of 1,888 TFs and 18,222 NTFs for whom data were available. Out of this, females made up 12,795 females and males made up 5,495. There were random missing data issues, and these were treated as *complete case analysis or listwise deletion*, i.e., they were completely omitted from the analysis. Females were in the majority with approximately 70% of the population. NTFs female teachers constituted 92.25% of the female population in the cohort. The ratio is similar for male teachers as well – NTFs male teachers made up almost 92% of the male cohort population (see Table 3a, below).

Table 3a: Cohort 2004 – Gender Distribution

Table of Sex by Fellows			
Sex	**Fellows**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
Fe	11804 64.54 92.25 70.10	991 5.42 7.75 68.34	12795 69.96
M	5036 27.53 91.65 29.90	459 2.51 8.35 31.66	5495 30.04
Total	16840 92.07	1450 7.93	18290 100.00

As in the cohort of 2003, white teachers in the cohort of 2004 were also in the majority with 67.36% of the population; Although the components of the other ethnic groups as a percentage of the total population were less than 20%, Asian teachers were represented less than 7% of the total cohort population (see Table 3b)

Table 3b: Cohort 2004 – Ethnicity Distribution

Table of Ethnicity by Fellows			
Ethnicity	**Fellows**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
ASIAN	998 5.25 89.91 5.78	112 0.59 10.09 6.42	1110 5.84
BLACK	2706 14.24 89.54 15.67	316 1.66 10.46 18.12	3022 15.90
HISPAN	1858 9.77 89.67 10.76	214 1.13 10.33 12.27	2072 10.90
WHITE	11703 61.57 91.39 67.78	1102 5.80 8.61 63.19	12805 67.36
Total	17265 90.83	1744 9.17	19009 100.00

The ethnicity distribution that is described above for the entire cohort is mirrored both in the TFs' and NTFs' representations. Similar proportions of the different ethnic groups were represented very closely to how they were in the main population (see Table 3b, above).

The age distributions of the 2004 cohort for TFs and NTFs were almost opposites. While majority of TFs were between the ages of 20–39, virtually the exact opposite was true for NTFs. In the NTFs group, 33.53% of the teachers were in the 50-59 age group, and approximately 19% were in the 60+ group (see Table 3c and Figure 7). With this type of juxtaposing distribution, I wanted to know what subjects the NTFs taught. It turns out that an estimated 39% of them were hired to teach in "other" subject areas (see Table 3d). These are the non-academic or vocational areas often referred to as career and technical education. On the other hand, in the TFs group,

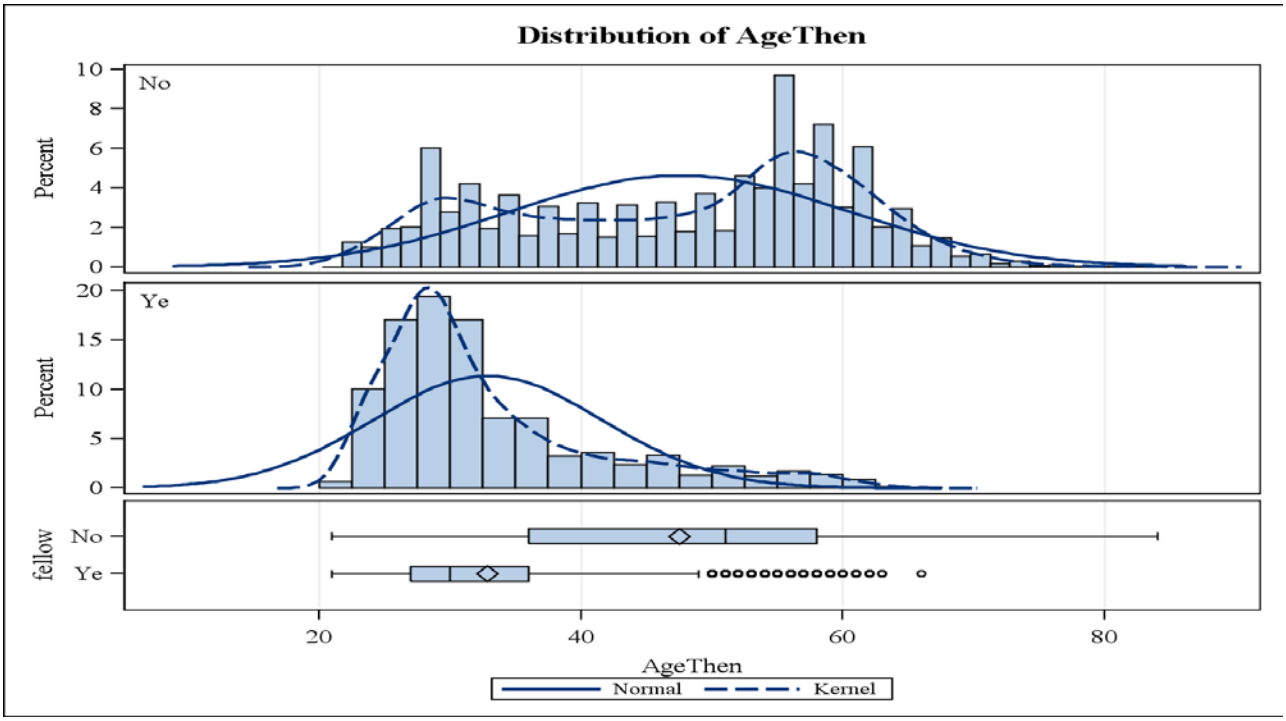
close to 30% were hired to teach in one of the then designated hard-to-fill area of special education; compared to 11% NTFs in the same area. Another hard-to-staff area in 2004 was mathematics where about 19% of TFs were hired to teach.

Table 3c: Cohort 2004 – Age Distribution

Table of AgeThenCat by Fellow			
agethencat	Fellow		
Frequency Percent Row Pct Col Pct	NO	YES	Total
20-29	2147 11.21 72.12 12.34	830 4.33 27.88 47.24	2977 15.54
30-39	3303 17.25 84.52 18.99	605 3.16 15.48 34.43	3908 20.41
40-49	2844 14.85 93.80 16.35	188 0.98 6.20 10.70	3032 15.83
50-59	5832 30.45 98.05 33.53	116 0.61 1.95 6.60	5948 31.06
60 up	3269 17.07 99.45 18.79	18 0.09 0.55 1.02	3287 17.16
Total	17395 90.83	1757 9.17	19152 100.00

For NTFs in this cohort, the mean age was 47.5 compared with 32.8 for TFs. Incidentally, the minimum age for both groups was 21 but the maximum age for NTFs was 84 and 66 for TFs. There is clearly a disparity along the age line in this cohort.

Figure 6: Cohort 2004 – T-Test Age Distribution



As mentioned earlier, even though less than 10% of those hired in 2004 were hired to mathematics, 18.78% of the TFs in this cohort were hired to teach mathematics. Twenty-eight percent of TFs hired were hired to teach special education. This reflects high demand in these areas relative to other areas during this time.

Table 3d: Cohort 2004 – Subject Area Distribution

Table of Subject by Fellows			
Subject	**Fellows**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
Common Branches	3466 18.51 94.57 20.24	199 1.06 5.43 12.41	3665 19.57
ESL	394 2.10 87.75 2.30	55 0.29 12.25 3.43	449 2.40
English	1260 6.73 82.73 7.36	263 1.40 17.27 16.41	1523 8.13
Foreign Language	396 2.11 94.74 2.31	22 0.12 5.26 1.37	418 2.23
Mathematics	1163 6.21 79.44 6.79	301 1.61 20.56 18.78	1464 7.82
Other	6656 35.54 97.17 38.87	194 1.04 2.83 12.10	6850 36.58
Science	881 4.70 90.27 5.14	95 0.51 9.73 5.93	976 5.21
Social Studies	1034 5.52 97.73 6.04	24 0.13 2.27 1.50	1058 5.65
Special Education	1875 10.01 80.65 10.95	450 2.40 19.35 28.07	2325 12.41
Total	17125 91.44	1603 8.56	18728 100.00

The bulk of this cohort came from high school (42.18%) and elementary school (29.30%). Early childhood had the lowest portion of the distribution with 0.36%. Other than junior high school with 13.26% of the cohort distribution, the rest of the distribution had less than 10% each of this population (See Table 3e).

Table 3e: Cohort 2004 - School Type Distribution

Table of School Type by fellow			
School Type	**fellow**		
Frequency **Percent** **Row Pct** **Col Pct**	**No**	**Ye**	**Total**
Early Childhood	48 0.28 76.19 0.31	15 0.09 23.81 0.88	63 0.36
Elementary	4683 26.98 92.09 29.92	402 2.32 7.91 23.62	5085 29.30
High school	6769 39.00 92.47 43.24	551 3.17 7.53 32.37	7320 42.18
Junior High-Intermediate-Middle	1924 11.09 83.62 12.29	377 2.17 16.38 22.15	2301 13.26
K-12 all grades	561 3.23 84.74 3.58	101 0.58 15.26 5.93	662 3.81
K-8	1171 6.75 88.91 7.48	146 0.84 11.09 8.58	1317 7.59
Secondary School	497 2.86 81.88 3.18	110 0.63 18.12 6.46	607 3.50
Total	15653 90.19	1702 9.81	17355 100.00

Cohort 2005: Sample and Descriptive Statistics

Data supplied by the NYCDOE for the cohort of 2005 comprised of 2,005 TFs, 9,258 NTFs for a total of 11,263. Of this, data on gender were available for 8,952 (See table 4a, below). TFs made up 16.76%, while NTFs were 83.24% of this cohort. There was a disproportionate representation of females (77.90%) versus males (22.10%). Female TFs were 11.33% compared with 66.58% of females for NTFs.

Table 4a: Cohort 2005: Gender Distribution

Sex	TF		
Frequency Percent Row Pct Col Pct	NO	YES	Total
F	5960 66.58 85.46 79.98	1014 11.33 14.54 67.60	6974 77.90
M	1492 16.67 75.43 20.02	486 5.43 24.57 32.40	1978 22.10
Total	7452 83.24	1500 16.76	8952 100.00

There were substantially more white teachers overall than any other group (67.12%; see Table 4b). White TFs represented 11.68% of the total population of this cohort compared to 1.21% for Asians, 2.88% blacks, and 2.27% Hispanics. Comparatively, white NTFs were 55.44% of this cohort, while Asians represented 5.17%, blacks were 11.83%, and Hispanics were 9.51%.

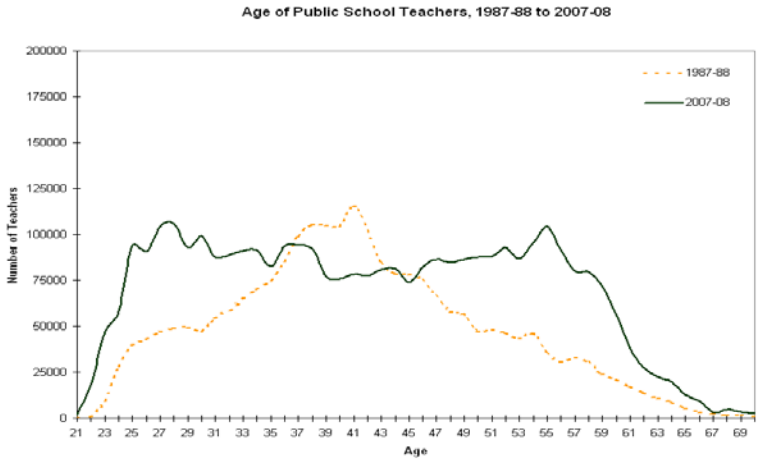
Table 4b: Cohort 2005: Ethnicity Distribution

Ethnicity	Teaching Fellows		
Frequency Percent Row Pct Col Pct	NO	YES	Total
ASIAN	554 5.17 80.99 6.31	130 1.21 19.01 6.73	684 6.38
BLACK	1268 11.83 80.41 14.44	309 2.88 19.59 15.99	1577 14.72
HISPAN	1019 9.51 80.74 11.60	243 2.27 19.26 12.57	1262 11.78
WHITE	5940 55.44 82.60 67.65	1251 11.68 17.40 64.72	7191 67.12
Total	8781 81.96	1933 18.04	10714 100.00

In general, there were relatively more younger teachers (TFs and NTFs) than older teachers in the cohort of 2005. Teachers under the age of 40 represented more than 60% of the teachers' population for this cohort (See Table 4c). This is contrary to what Ingersoll and Merrill (2010) found in their exploratory research of the teaching force in the United States where they reported an aging teaching force with the modal age moving from 41 years old in 1987-88 to 55 years of age in 2007-08 (see figure 5). They also found that nationally the number of teachers 50 years or older has drastically increased from about 525,000 in 1987-88 to 1.3 million in 2007-08. According to their data[42], teacher retirements have also increased from 35,000 in 1988 to 85,000 in 2008; and the average age of retirement for teacher is 59.

[42] The researchers used the large-scale School and Staffing Survey (SASS) conducted by the National Center for Education Statistics (NCES). They used the six cycles of the survey from 1987-88, 1990-91, 1993-94, 1999-2000, 2003-04, and 2007-08.

Figure 7: Age of Public School Teachers: 1987-88 to 2007-08



Source: Ingersoll & Merill (2010)

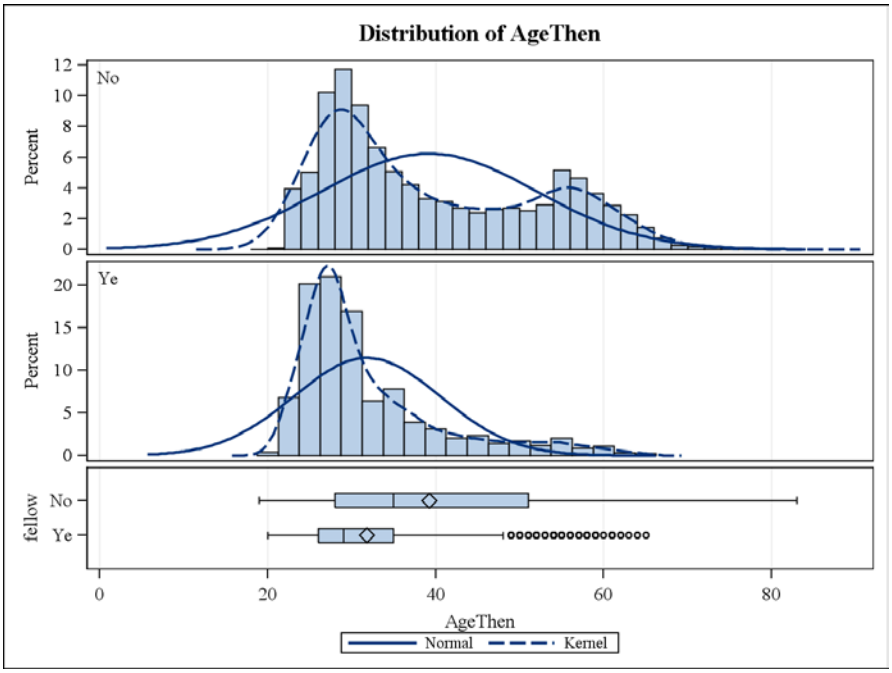
My analysis of the age distribution of the cohort of 2005 does not seem to support the trends in teacher supply as described by Ingersoll and Merill (2010) (see table 4). Clearly, there were more teachers (TFs and NTFs) under the age of forty than any other age group in this cohort. This implies that more young people were attracted and hired at this time by the NYCDOE. The implication for teacher retention will be discussed later. Missing data, though negligible, is still an issue.

Table 4c: Cohort 2005: Age Distribution

Table of Age by Fellow			
Age	**Fellow**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
20-29	2753 25.43 71.56 31.01	1094 10.10 28.44 56.13	3847 35.53
30-39	2538 23.44 81.95 28.59	559 5.16 18.05 28.68	3097 28.60
40-49	1199 11.07 88.29 13.51	159 1.47 11.71 8.16	1358 12.54
50-59	1674 15.46 93.57 18.86	115 1.06 6.43 5.90	1789 16.52
60 up	714 6.59 97.01 8.04	22 0.20 2.99 1.13	736 6.80
Total	8878 82.00	1949 18.00	10827 100.00

The majority of the TFs and NTFs in the cohort of 2005 were concentrated in elementary (39.06%), high school (20.11%), and middle or junior high school (20.05%) (See Table 4d). There were relatively many more TFs and NTFs with Common Branch license than any academic license (26.78%). Individuals holding special education licenses constituted 14.69% of the cohort population (See Table 4d).

Figure 8: Cohort 2005 - T-Test Age Distribution



The above distribution also compares the age distribution of TFs and NTFs. Not surprisingly, it shows that the TFs are much younger, on average. One surprise is the surge in NTFs around the 50-65 age group. This is somewhat consistent with the findings of Ingersoll and Merill (2010) referenced earlier. The mean age for TFs in this cohort was about 31.8 years, while for NTFs, it was around 39.2 years of age.

Table 4d: Cohort 2005: Subject Area Distribution

Subject	Fellow		
Frequency Percent Row Pct Col Pct	NO	YES	Total
Common Branches	2590 25.66 95.82 31.34	113 1.12 4.18 6.19	2703 26.78
ESL	189 1.87 62.38 2.29	114 1.13 37.62 6.24	303 3.00
English	590 5.85 66.74 7.14	294 2.91 33.26 16.09	884 8.76
Foreign Language	123 1.22 80.39 1.49	30 0.30 19.61 1.64	153 1.52
Math	429 4.25 49.54 5.19	437 4.33 50.46 23.92	866 8.58
Other (Vocational & Non-Academic Subjects)	2738 27.13 95.80 33.13	120 1.19 4.20 6.57	2858 28.32
Science	356 3.53 75.74 4.31	114 1.13 24.26 6.24	470 4.66
Social Studies	356 3.53 95.70 4.31	16 0.16 4.30 0.88	372 3.69
Special Education	894 8.86 60.28 10.82	589 5.84 39.72 32.24	1483 14.69
Total	8265 81.90	1827 18.10	10092 100.00

From Table 4d, above, we can see that the largest proportion of license holders in the 2005 cohort were holders of the common branch (subjects) license.[43] Of the academic areas, this was where most of the license holders in this cohort fell. It is noteworthy to point out that amongst teachers in this cohort, 50.46% of TFs had mathematics license, 39.72% had special education, and 37.62% had ESL licenses. Followed by English (33.26%), and science (24.26%). Close to 24% and more than 30% of the beginning TFs in this cohort were mathematics teachers and special education teachers respectively. This points to the probably shortage of teachers in these areas at this time. Most of the TFs in this cohort taught at the high school level (34.47%), and junior high school (22.96%) (see Table 4e). Elementary school had 19.82% of the TFs who entered teaching in 2005 suggesting that the bulk of the vacancies were at these levels as of 2005. TFs represented 17.87% of the teachers hired in 2005, but out of this, 30.64% of high school teachers, and 20.47% of junior high school teachers were TFs. Relatively small percentage of teachers, 0.28% and 19.82% of TFs hired for positions in early childhood, elementary schools respectively.

[43] According to the New York State Department of Education (NYSED), the Regulations of the Commissioner of Education, Subpart 80-1 General Requirements for Teachers' Certificates, "Common branch subjects means any or all of the subjects usually included in the daily program of an elementary school classroom such as arithmetic, civics, visual arts, elementary science, English language, geography, history, hygiene, physical activities, practical arts, reading, music, writing, and such other similar subjects."

Table 4e: Cohort 2005: School Type Distribution

School Type	Fellow		
Frequency Percent Row Pct Col Pct	NO	YES	Total
Early Childhood	48 0.47 90.57 0.58	5 0.05 9.43 0.28	53 0.52
Elementary	3608 35.51 90.93 43.24	360 3.54 9.07 19.82	3968 39.06
High school	1417 13.95 69.36 16.98	626 6.16 30.64 34.47	2043 20.11
Junior High-Intermediate-Middle	1620 15.94 79.53 19.42	417 4.10 20.47 22.96	2037 20.05
K-12 all grades	278 2.74 74.13 3.33	97 0.95 25.87 5.34	375 3.69
K-8	1007 9.91 86.36 12.07	159 1.56 13.64 8.76	1166 11.48
Secondary School	366 3.60 70.66 4.39	152 1.50 29.34 8.37	518 5.10
Total	8344 82.13	1816 17.87	10160 100.00

Cohort 2006: Sample and Descriptive Statistics

There were 10,041 observations used in the cohort of 2006, out of which 1,866 were TFs, and 8,175 were NTFs. Close to 80% (77.76%) were female while the male population was slightly over 20% (22.24) (See Table 5a). This is extremely consistent with the literature that women have continued to make up a significant portion of the teaching force historically and otherwise (Lortie, 1975; Tyack, 1974).

Table 5a: Cohort 2006 - Gender Distribution

Table of Sex by Fellow			
Sex	**Fellow**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
F	5718 65.01 83.60 79.67	1122 12.76 16.40 69.30	6840 77.76
M	1459 16.59 74.59 20.33	497 5.65 25.41 30.70	1956 22.24
Total	7177 81.59	1619 18.41	8796 100.00

Teaching Fellows were 18.41% of beginning teachers in this cohort but they represented, 45.86% of mathematics, 43.66% of special education, 41.69% of ESL, and more than ⅓ (36.79%) of science teachers in this cohort (See Table 5d).

The ethnic representation of this group was very similar to that of 2005. White teachers were in the majority for both TFs and NTFs – 61.02% (TFs); 67.40% (NTFs) – (See Table 5b).

Table 5b: Cohort 2006 – Ethnicity Distribution

Ethnicity	Teaching Fellow		
Frequency Percent Row Pct Col Pct	NO	YES	Total
ASIAN	440 4.63 75.99 5.69	139 1.46 24.01 7.80	579 6.09
BLACK	1108 11.65 77.21 14.34	327 3.44 22.79 18.34	1435 15.09
HISPAN	972 10.22 80.93 12.58	229 2.41 19.07 12.84	1201 12.63
WHITE	5209 54.76 82.72 67.40	1088 11.44 17.28 61.02	6297 66.20
Total	7729 81.26	1783 18.74	9512 100.00

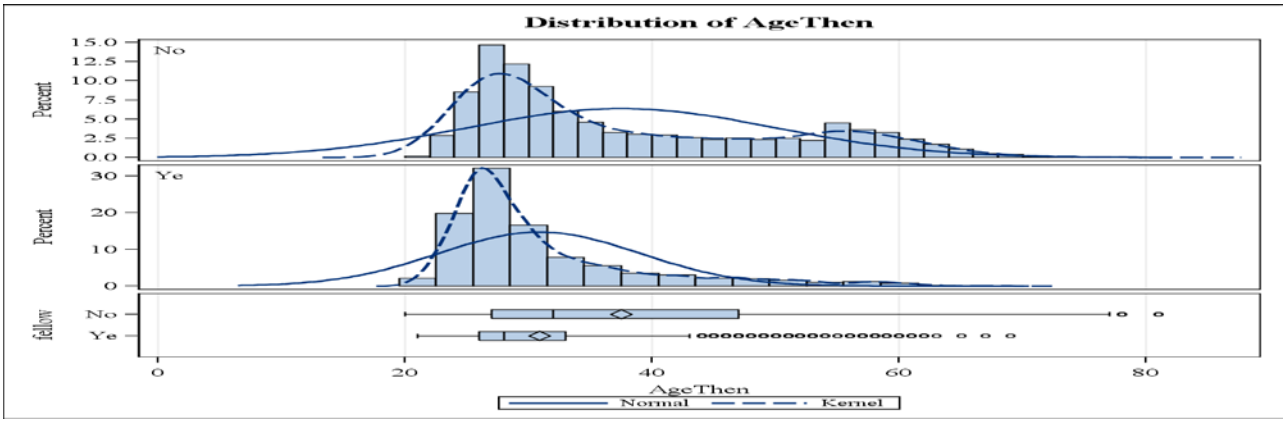
With the exception of whites, and Hispanics, there were relatively more black, and Asian TFs than NTFs in this cohort possibly because the NYCTF program was in its 6th year of operation and its marketing strategies were successfully reaching these minority groups more than the others.

For TFs, there were more in the 20-29 age group (26.92%) than any other age group in this cohort (See Table 5c). By the same token, it is interesting to see a similar pattern as in the cohort of 2005 for NTFs with regards to a higher percentage of older teachers. For instance, 96.96% of teachers who were 60 years and older in this cohort were NTFs (See Table 5c).

Table 5c: Cohort of 2006 – Age Distribution

Table of Age by Fellows			
Age	**Fellows**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
20-29	3000 31.26 73.08 38.45	1105 11.51 26.92 61.53	4105 42.77
30-39	2045 21.31 81.87 26.21	453 4.72 18.13 25.22	2498 26.03
40-49	994 10.36 87.12 12.74	147 1.53 12.88 8.18	1141 11.89
50-59	1253 13.05 94.35 16.06	75 0.78 5.65 4.18	1328 13.84
60 up	510 5.31 96.96 6.54	16 0.17 3.04 0.89	526 5.48
Total	7802 81.29	1796 18.71	9598 100.00

Figure 9: Cohort 2006 – T-Test Age Distribution



The top half of Figure 11 represents the age distribution of NTFs while the bottom half represents the TFs. Most of the NTFs were clustered around the 30 – 60 age group while the TFs were mainly clustered around the 25 – 40 age group. This makes intuitive sense since the

NYCTFP was originally established to attract recent graduates and young professionals looking to change careers to become NYC teachers. The mean age for this cohort was 37.5, slightly lower than 39.2 for the cohort of 2005. As with the cohort of 2005, the age distribution of TFs in the 2006 cohort is consistent with available literature on teaching force (Ingersoll and Merill, 2010). But that of the NTFs is not entirely consistent because of the sizeable number of older teachers in the distribution. I will explore this further in the discussion section.

More than forty-five percent (45.86%) of the mathematics teachers hired in 2006 were TFs. Other subject areas with a noticeably high percentage of incoming TFs in this cohort were special education (43.66%), ESL (41.69%), and science (36.79%). A significant number of TFs were not hired to teach common branch subject areas (elementary school license), English, and social studies (See Table 5d). This is a noticeable trend for both cohorts 2005 and 2006. The effect of this trend on teacher retention will be explored further in the discussion section of this study.

Slightly more than one-third of the TFs in this cohort taught at the high school level (30.13%), followed by junior high school (24.33%), and elementary school (22.39%). Significantly more TFs in this cohort than NTFs began teaching at the high school and the junior high school level relative to NTFs (See Table 5e). This may be because there was more demand for TFs than NTFs in these types of schools at this particular time.

Table 5d: Cohort of 2006 – Subject Area Distribution

Subject	Fellows		
Frequency Percent Row Pct Col Pct	NO	YES	Total
Common branches	2052 22.92 93.61 28.64	140 1.56 6.39 7.83	2192 24.48
ESL	200 2.23 58.31 2.79	143 1.60 41.69 8.00	343 3.83
English	530 5.92 74.02 7.40	186 2.08 25.98 10.40	716 8.00
Foreign lang.	84 0.94 68.29 1.17	39 0.44 31.71 2.18	123 1.37
Math	386 4.31 54.14 5.39	327 3.65 45.86 18.29	713 7.96
Other	2451 27.38 94.96 34.21	130 1.45 5.04 7.27	2581 28.83
Science	280 3.13 63.21 3.91	163 1.82 36.79 9.12	443 4.95
SocStudies	356 3.98 94.68 4.97	20 0.22 5.32 1.12	376 4.20
Special Ed.	826 9.23 56.34 11.53	640 7.15 43.66 35.79	1466 16.37
Total	7165 80.03	1788 19.97	8953 100.00

Table 5e: Cohort 2006 – School Type Distribution

Table of School Type by Fellow			
School Type	**Fellows**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
Early Childhood	52 0.56 78.79 0.69	14 0.15 21.21 0.82	66 0.71
Elementary	3195 34.55 89.32 42.36	382 4.13 10.68 22.39	3577 38.68
High school	1320 14.27 71.97 17.50	514 5.56 28.03 30.13	1834 19.83
Junior High-Intermediate-Middle	1385 14.98 76.94 18.36	415 4.49 23.06 24.33	1800 19.46
K-12 all grades	244 2.64 75.78 3.24	78 0.84 24.22 4.57	322 3.48
K-8	957 10.35 85.14 12.69	167 1.81 14.86 9.79	1124 12.15
Secondary School	389 4.21 74.10 5.16	136 1.47 25.90 7.97	525 5.68
Total	7542 81.55	1706 18.45	9248 100.00

Cohort 2007: Sample and Descriptive Statistics

There were 8,159 NTFs and 1,854 TFs – a total of 10,012 teachers - used to begin the analysis for this cohort. Data on gender was available for 9,631 individuals depicted in Table 6a, below.

Table 6a: Cohort 2007 – Gender Distribution

Table of Sex by Fellow			
Sex	**Fellow**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
Female	6184 64.21 83.47 78.98	1225 12.72 16.53 68.02	7409 76.93
Male	1646 17.09 74.08 21.02	576 5.98 25.92 31.98	2222 23.07
Total	7830 81.30	1801 18.70	9631 100.00

Consistent with the literature and past cohorts, the overwhelming majority of this cohort was female for both TFs and NTFs – 68.02% and 78.98% respectively. Not surprisingly, more than ¾ of this population was female (76.93%).

Available data on the ethnic composition of this cohort reveals, yet again, that close to 65% of these teachers were white with blacks (15.56%), Hispanics (13.79%), and Asians (6.16%) trailing behind. Teaching Fellows constituted only about 18% of the population. This, again, is not a surprise because we have seen similar distribution in previous cohorts. One surprise is that the percentage of white TFs in the cohort dropped below 60% for the first time within the time period under review for this study, i.e., 2005 – 2008 (See Table 6b).

Table 6b: Cohort 2007 – Ethnicity Distribution

Table of Ethnicity by Fellow			
Ethnicity	**Fellow**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
ASIAN	450 4.72 76.53 5.80	138 1.45 23.47 7.74	588 6.16
BLACK	1154 12.09 77.71 14.87	331 3.47 22.29 18.56	1485 15.56
HISPAN	1035 10.85 78.65 13.34	281 2.94 21.35 15.76	1316 13.79
WHITE	5121 53.66 83.21 65.99	1033 10.82 16.79 57.94	6154 64.49
Total	7760 81.32	1783 18.68	9543 100.00

Also, there were slightly more Hispanic TFs than Hispanic NTFs (15.76% versus 13.34%) in this cohort relative to the cohort of 2006.

As for the age distribution of this cohort, the vast majority fell in the 20 – 29 age group (46.85%), followed by the 30 – 39 age group (24.74%). Similar representations were found in the 40 – 49, and the 50 – 59 age groups where both groups had about 11% each of the entire cohort. Less than 6% of this cohort was in the 60 and older age group. A noteworthy exception here is that the 20 – 29 age group represented more than 60% of the TFs population (See Table 6c).

Table 6c: Cohort 2007 – Age Distribution

Table of Age by Fellow			
Age Cat	**Fellow**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
20-29	3396 35.23 75.20 43.33	1120 11.62 24.80 62.19	4516 46.85
30-39	1944 20.17 81.51 24.80	441 4.58 18.49 24.49	2385 24.74
40-49	932 9.67 86.46 11.89	146 1.51 13.54 8.11	1078 11.18
50-59	1043 10.82 93.54 13.31	72 0.75 6.46 4.00	1115 11.57
60 up	523 5.43 95.96 6.67	22 0.23 4.04 1.22	545 5.65
Total	7838 81.32	1801 18.68	9639 100.00

Figure 10: Cohort 2007 – T-Test Age Distribution

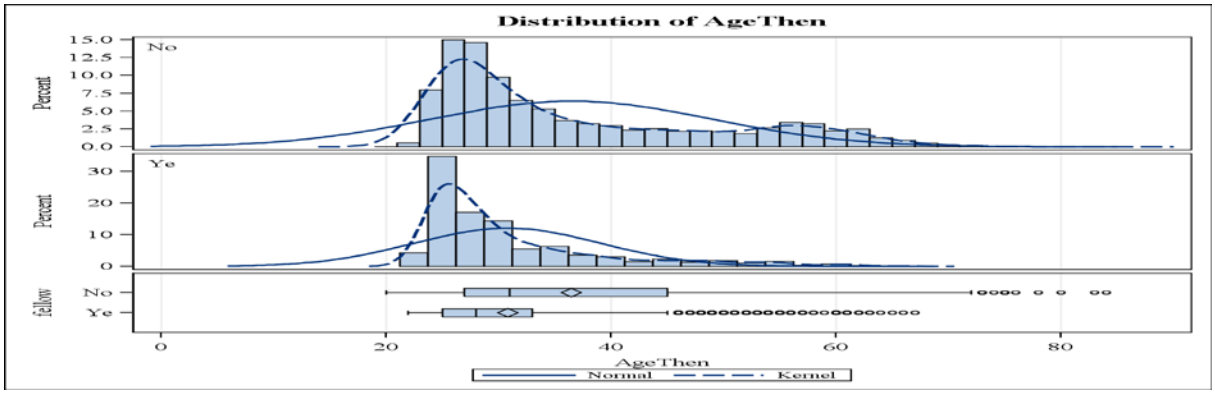


Table 6d: Cohort 2007 – Subject Area Distribution

Table of Subject by Fellow			
Subject	**Fellow**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
Common Branches	2228 23.32 95.58 28.94	103 1.08 4.42 5.56	2331 24.40
ESL	227 2.38 61.68 2.95	141 1.48 38.32 7.61	368 3.85
English	525 5.50 73.12 6.82	193 2.02 26.88 10.41	718 7.52
Foreign Language	129 1.35 67.19 1.68	63 0.66 32.81 3.40	192 2.01
Math	393 4.11 55.20 5.10	319 3.34 44.80 17.21	712 7.45
Other	2502 26.19 95.46 32.49	119 1.25 4.54 6.42	2621 27.43
Science	267 2.79 53.51 3.47	232 2.43 46.49 12.51	499 5.22
Social Studies	452 4.73 99.78 5.87	1 0.01 0.22 0.05	453 4.74
Special Education	977 10.23 58.86 12.69	683 7.15 41.14 36.84	1660 17.37
Total	7700 80.59	1854 19.41	9554 100.00

The mean age for NTFs in the cohort of 2007 was 36.5 while that of TFs was 30.8. Compared to TFs, there were more older teachers in the NTFs group as depicted in Figure 15, above. Many of the individuals in the 60+ age group were from the NTFs cluster (See Figure 15 and Table 6c).

Science (46.49%), mathematics (44.80%), special education (41.14%), and ESL (38.32%) were the subject areas in which most of the TFs from this cohort were absorbed (See Table 6d, above). There were noticeably stark contrasts between TFs and NTFs in common branches (95.58% NTFs compared with 4.42% TFs), and social studies (99.78% NTFs compared with 0.22% TFs). One possible explanation for this could be that the emphasis on recruiting TFs for these areas was not as strong as that of mathematics, science, special education, and ESL during this time.

As for the school types or levels, most of TFs hired in 2007 were hired to teach at the high school level – 34.93% (See Table 6e). Junior high school and elementary school followed at 25.24% and 17.72% respectively. These schools comprised the bulk of the distribution of TFs relative to NTFs. For instance, 95.24% of those hired to teach early childhood education in 2007 were NTFs. Similarly, 91.04% of those hired to teach in elementary schools were NTFs. Clearly, this shows that the emphasis at this time, on where the needs were for newly hired TFs, was not in early childhood and elementary schools. Even though elementary schools had the highest total percentage of new hires relative to the other levels, less than 20% of newly hired TFs in 2007, were hired for elementary school jobs. On the other hand, about 35% of the newly hired TFs in 2007 were hired for high school jobs.

Table 6e: Cohort 2007 – School Type Distribution

Table of School Type by Fellow			
School Type	**Fellow**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
Early Childhood	60 0.64 95.24 0.79	3 0.03 4.76 0.17	63 0.67
Elementary	3161 33.83 91.04 41.66	311 3.33 8.96 17.72	3472 37.16
High School	1439 15.40 70.13 18.96	613 6.56 29.87 34.93	2052 21.96
Junior High-Intermediate-Middle	1370 14.66 75.57 18.05	443 4.74 24.43 25.24	1813 19.40
K-12 all grades	281 3.01 75.34 3.70	92 0.98 24.66 5.24	373 3.99
K-8	945 10.11 84.68 12.45	171 1.83 15.32 9.74	1116 11.94
Secondary School	332 3.55 73.13 4.38	122 1.31 26.87 6.95	454 4.86
Total	7588 81.22	1755 18.78	9343 100.00

Cohort 2008: Sample and Descriptive Statistics

Available data indicated similar population constitution in the cohort of 2008 with the vast majority being female both in terms of total constituents and specifically for TFs and NTFs. Sixty-eight percent of TFs and 79.47% of NTFs in this cohort were women. Overall, 77.19% of the members of this cohort were women (See Table 7a). TFs were only about 20% of the entire population of teachers hired in 2008.

Table 7a: Cohort of 2008 – Gender Distribution

Table of Sex by Fellow			
Sex	**Fellow**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
F	4712 63.64 82.45 79.47	1003 13.55 17.55 68.00	5715 77.19
M	1217 16.44 72.05 20.53	472 6.37 27.95 32.00	1689 22.81
Total	5929 80.08	1475 19.92	7404 100.00

One of the most consistent findings so far has been the reliability with which the representation of female teachers – TFs and NTFs – consistently adheres to the historical and contemporary literature on teacher population in the United States (Tyack, 1974; Lortie, 1975). In each of the 4 cohorts analyzed, female teachers have, again and again, been in the majority.

The ethnic composition of this cohort also mimics what we have already observed in the other 3, i.e., majority white, followed by blacks and Hispanics; mostly in that order. Asians were the least represented (5.82% in total; see Table 7b).

Table 7b: Cohort 2008 – Ethnicity Distribution

Table of Ethnicity by Fellows			
Ethnicity	**Fellows**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
ASIAN	328 4.47 76.81 5.59	99 1.35 23.19 6.75	427 5.82
BLACK	865 11.79 75.74 14.74	277 3.78 24.26 18.89	1142 15.57
HISPAN	789 10.76 78.20 13.44	220 3.00 21.80 15.01	1009 13.75
WHITE	3888 53.00 81.72 66.24	870 11.86 18.28 59.35	4758 64.86
Total	5870 80.02	1466 19.98	7336 100.00

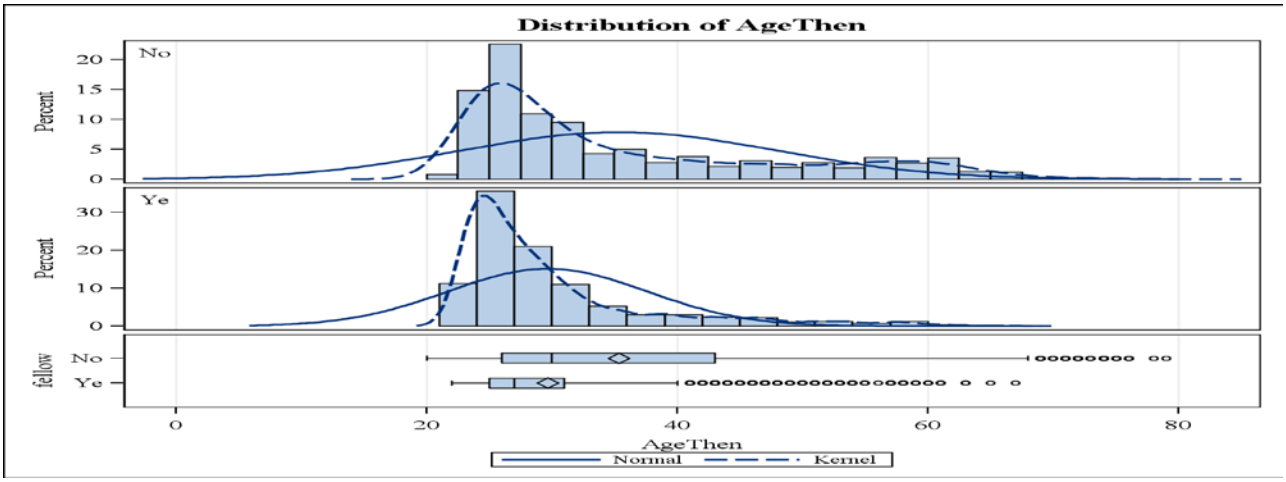
The age distribution of this cohort, though similar to the previous cohorts, has some distinguishing features. This cohort had the highest percentage per capita (67.86%) of newly hired TFs in the 20 – 29 age group out of all the 4 cohorts analyzed. Conversely, it had the lowest percentage, per capita of newly hired TFs in the 30 – 39, 40 – 49, and 50 – 59 age groups.(See Table 7c).

Table 7c: Cohort 2008 – Age Distribution

Table of Age by Fellows			
Age	**Fellows**		
Frequency **Percent** **Row Pct** **Col Pct**	**No**	**Ye**	**Total**
20-29	2922 39.50 74.48 49.34	1001 13.53 25.52 67.86	3923 53.04
30-39	1280 17.30 80.55 21.61	309 4.18 19.45 20.95	1589 21.48
40-49	648 8.76 86.52 10.94	101 1.37 13.48 6.85	749 10.13
50-59	653 8.83 92.36 11.03	54 0.73 7.64 3.66	707 9.56
60 up	419 5.66 97.67 7.08	10 0.14 2.33 0.68	429 5.80
Total	5922 80.06	1475 19.94	7397 100.00

While almost 68% of the TFs hired in this cohort were under the age of 30, less than 50% of the newly hired NTFs were in the same age group of 20 – 29. The distribution of the newly hired 30 – 39 year olds for both the TFs and NTFs were similar – 21.61% for NTFs; 20.95% for TFs. The graphical representation generated by the TTEST procedure in SAS probably paints a relatively more compelling picture of the age distribution (See Figure 11, below).

Figure 11: Cohort 2008 – T-Test Age Distribution



Similar to the other cohorts, the mean age for TFs in this cohort was 29.7; for NTFs, it was 35.3. On average, the TFs program was hiring younger teachers relative to the traditional routes. The policy implications of this will be discussed later.

Available data subject area distribution for this cohort point to some notable descriptive statistics. As in the past cohorts, the proportion of new teachers hired in the areas of common branches, the vocational areas (designated as "other"), and social studies were insignificantly low. The exception were ESL and foreign language where overall low proportion of new teachers did not necessarily mean low proportion for that subgroup. For instance, although only 99 out of 1,518 teachers (or 6.52%) of the TFs were licensed to teach ESL; when compared with the percentage of new teachers hired to teach ESL in 2008, that number balloons up to 35.36% which is a significant proportion of teachers hired to teach ESL that year (See Table 7d). This pattern seemed to be common for the cohorts analyzed in subject areas such as ESL, foreign language, mathematics, special education, and science, perhaps reflecting a clear indication that the NYCDOE depended on the pool of applicants from the NYCTF to fill these vacancies. The larger question in this regard then is: Why were there not enough traditional candidates from

traditional routes in these areas? I will revisit this and other relevant questions in the discussion section of this study.

There was a particularly large proportion of TFs in special education in this cohort. Approximately 41 percent of the newly hired TFs in this group were special education teachers, compared with 16.61% of NTFs (See Table 7d). This is noteworthy because teaching special education students requires highly specialized coursework and swift adaptive understanding in the classroom. Besides, in the inner-city classroom, the demands can be potentially heightened by the troughs of poverty. We see the same trend, to a reasonable degree in mathematics and science. I will submit that teaching mathematics and science, while not completely free of challenges, probably requires discrete skills set different from teaching special education. If higher retention is our hope, this must be carefully considered when a sizeable proportion of newly hired teachers, TFs or NTFs, are hired to teach in these areas.

Table 7d: Cohort 2008 – Subject Area Distribution

Table of Subject by Fellows			
Subject	**Fellows**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
Common Branches	1687 21.85 94.78 27.20	93 1.20 5.22 6.13	1780 23.06
ESL	181 2.34 64.64 2.92	99 1.28 35.36 6.52	280 3.63
English	358 4.64 69.38 5.77	158 2.05 30.62 10.41	516 6.68
Foreign Language	115 1.49 65.71 1.85	60 0.78 34.29 3.95	175 2.27
Math	276 3.58 56.44 4.45	213 2.76 43.56 14.03	489 6.33
Other	1964 25.44 96.46 31.67	72 0.93 3.54 4.74	2036 26.37
Science	214 2.77 51.57 3.45	201 2.60 48.43 13.24	415 5.38
Social Studies	377 4.88 100.00 6.08	0 0.00 0.00 0.00	377 4.88
Special Education	1030 13.34 62.35 16.61	622 8.06 37.65 40.97	1652 21.40
Total	6202 80.34	1518 19.66	7720 100.00

Table 7e: Cohort 2008 – School Type Distribution

Table of School Type by Fellows			
School Type	**Fellows**		
Frequency **Percent** **Row Pct** **Col Pct**	**NO**	**YES**	**Total**
Early Childhood	69 0.98 93.24 1.20	5 0.07 6.76 0.37	74 1.05
Elementary	2412 34.10 92.13 42.04	206 2.91 7.87 15.42	2618 37.01
High school	1085 15.34 71.01 18.91	443 6.26 28.99 33.16	1528 21.60
Junior High-Intermediate-Middle	1031 14.58 73.59 17.97	370 5.23 26.41 27.69	1401 19.81
K-12 all grades	212 3.00 76.26 3.70	66 0.93 23.74 4.94	278 3.93
K-8	635 8.98 84.78 11.07	114 1.61 15.22 8.53	749 10.59
Secondary School	293 4.14 68.94 5.11	132 1.87 31.06 9.88	425 6.01
Total	5737 81.11	1336 18.89	7073 100.00

Its specific nuances in school type distribution aside, cohort 2008 was no different from the others that have been examined thus far. For instance, more than one-third of TFs hired in this cohort were hired to teach at the high school level; close to one-third or approximately 28% were hired to teach at the junior high school (See Table 7e). For this cohort, the percentages of newly hired TFs for high school and junior high school superseded those of the NTFs.

Discrete-Time Survival Analysis of Cohorts 2003 – 2008 and Analysis of Findings

I ran discrete-time survival analysis models – Cox PH models - on the combined cohorts initially starting by controlling for whether or not individuals are TFs using dummy codes 1, 0. Using this as a base model, I continued to use dummy codes (1, 0) to identify cohort members for cohort years 2003, 2004, 2005, 2006, and 2007. Cohort 2008 was the comparison year because it is closest to the end of data collection (2010). I then built on this initial model by adding explanatory variables such as gender, ethnicity, age, subject taught, and school level. To isolate the effects of age, ethnicity, and subject taught and mode of entry into teaching as a TF, I included the interaction variable "age*fellow", "ethnicity*fellow", subject*fellow.

We must recall that the fundamental survival analysis being modeled here is the Cox Proportional Hazards (PH) model:

$$h(t, \mathbf{X}) = h_0(t)e^{\beta(Fellow)} \qquad (1)$$

where,

$h(t, \mathbf{X})$ = hazard at time t for a TF exhibiting a set of predictor variables represented by $\mathbf{X}$

$\mathbf{X}$ = a vector of explanatory variables modeled to predict a TF's hazard

$h_0(t)$ = Baseline hazard function; it is the hazard for the particular TFs when all explanatory variable values are equal to zero (This model can be linearized by dividing both sides of the equation by $h_0(t)$ and then taking

the natural logarithm of both sides)[44] When there are no predictor variables in the model, the Cox model condenses to the baseline hazard. Hence, before including any independent or predictor variables, such as sex, ethnicity, or age, $h_0(t)$ is considered the "baseline" form of the hazard function. It is an **unspecified** function; hence the Cox PH model is often referred to as a **semiparametric** model. (Kleinbaum & Klein, 2005).

$e^{\sum_{i=1}^{p} \beta_i X_i}$ = the exponential expression "*e*" raised to the linear sum of $\beta_i X_i$; where the sum is over the "*p*" predictor variables[45]

Therefore, for all TFs in the cohorts of 2003 through 2008, we have:

$$h(t, \textbf{Fellows}) = h_0(t)e^{(0.21683)} \qquad (2)$$

This yields the hazard ratio at time, t, for TFs as:

$$h(t, \textbf{Fellows}) = 1.242 \qquad (3)$$

This means that on average, TFs were 1.242 times as likely to quit as NTFs. At any given time, a TF in the cohorts under study was 1.242 times as likely to quit relative to a NTF, given that the TF had not quit up to that point. Figure 12 (below) represents the estimated survival probabilities for TFs and NTFs. Figure 12 also shows predicted survival probabilities for TFs

[44] http://www.statsoft.com/textbook/survival-failure-time-analysis/#rcox

[45] Kleinbaum & Klein (2005), p.94.

and NTFs to be around the 80 percent range, and extremely close for both groups, during the first year of teaching. Although by the end of the first year, the estimated probability dropped to under 70 percent for both groups with the predicted rate for TFs slightly higher than that of the NTFs (approximately 0.625 for NTFs and 0.65 for TFs – see Figure 12. I will expand on this later.

It will be helpful to juxtapose the results from the data sets with the predicted survival probabilities to compare the efficacy of the predicted values for the years under study. I have provided such analytical juxtapositions in figures 12 through 14.

Figure 12: Survival Probabilities for Teaching Fellows and Non-Teaching Fellows – 2003-2008

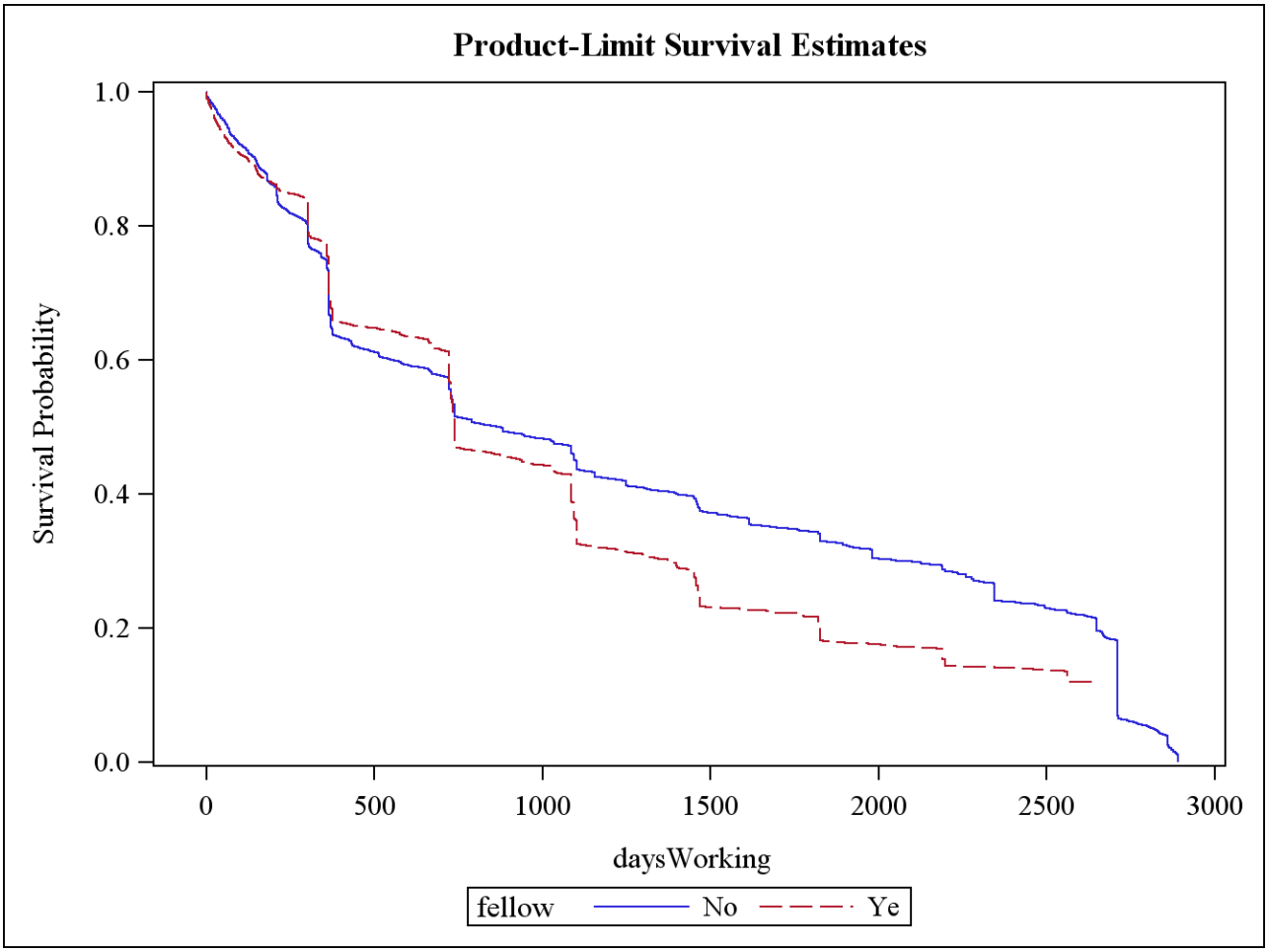


Figure 13: Stayers and Leavers Within **One Year** for ALL Teaching Fellows and Non-Teaching Fellows Cohorts 2003 - 2008

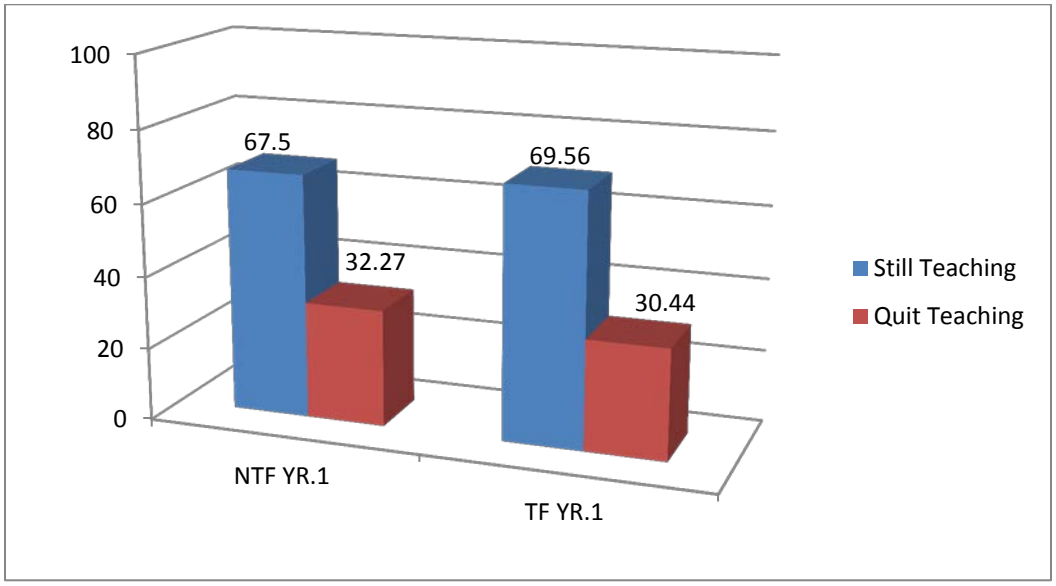


Figure 14: Stayers and Leavers Within **Two Years** for ALL Teaching Fellows and Non-Teaching Fellows Cohorts 2003 - 2008

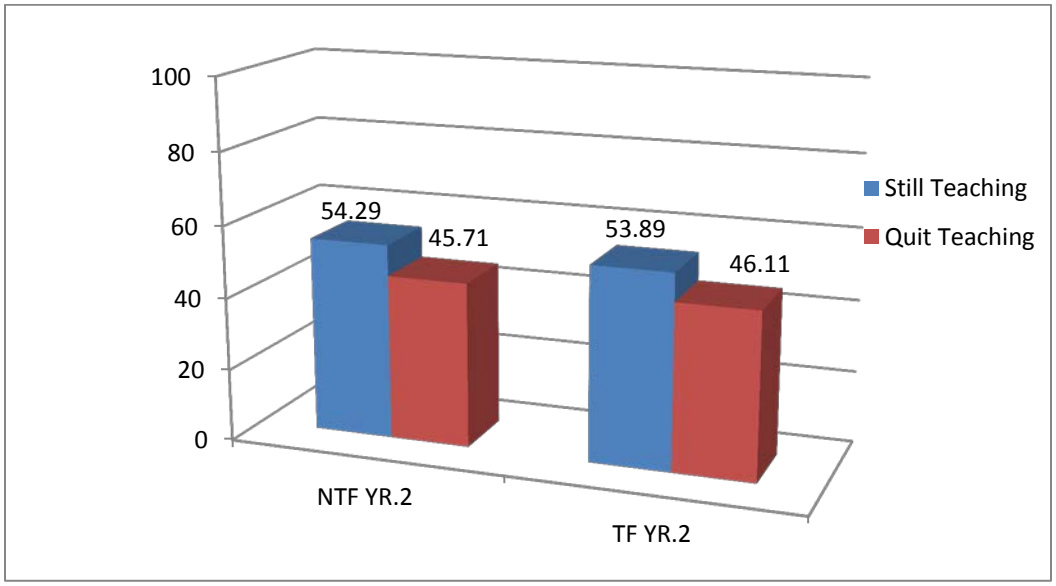


Figure 12 provides survival probabilities for TFs and NTFs in the cohorts under study (2003, 2004, 2005, 2006, 2007, and 2008) over the course of the time being studied – 2003 – 2010. In this graphical representation, survival probabilities are represented on the y-axis while time spent in teaching or more precisely teaching employment duration, measured in number of days, is represented on the x-axis. I used number of days to represent time spent in teaching or teaching employment duration because it is significantly more precise in capturing the duration of employment for the groups of interest. Also, since it is customary for the NYCDOE to hire NTFs anytime during the school year, number of days worked in a school year becomes an important concept in this regard. It must be emphasized though, that this is more likely to happen with NTFs than TFs because TFs traditionally have a more precise starting times – usually August/September or January/February.

Based on figure 12, one can argue that the Product-Limit Survival Estimates (PLSE) actually predicts a slightly higher survival probability for TFs during the first and second years of teaching – although the PLSE predicts a drop in survival probabilities for both groups at the end of year one. For TFs, the predicted drop is from about 0.75 to about 0.65; for NTFs the predicted survivability is slightly less at approximately 0.62. The data shows that 69.56 percent of the TFs and 67.73 percent of NTFs were still working at the end of year one. This was extremely consistent with the predicted values in the PLSE.

In the predicted values for year 2, we see an even larger drop in estimated survival probabilities especially for the TFs from about 0.61 to under 0.5. The estimated survival rate for NTFs in year 2 falls from around 0.58 to about 0.5. The two-year retention rates for both groups reveal significantly consistent numbers with the PLSE: Collectively, about 54 percent of both the TFs and NTFs from the cohorts under study remained in teaching with the NYCDOE at the

end of their second year of teaching (see Figure 14). It is worthwhile to point out that TFs had a sixteen (16) percentage point drop in retention rate from year one to year two while for NTFs, the drop in retention rate was about fourteen (14) percentage points. In year 3, estimated PLSE for TFs is about 0.35 while that of the NTFs remained slightly above 0.4. The PLSE in year 4 for TFs continues to remain low at around 0.22 and about 0.4 for NTFs.

Going back to the Cox PH model, in model 3[46] with the inclusion of gender (sex) and year of entry into teaching ("yearstart") as independent variables, we see that both became statistically significant predictors. I used the year 2008 as the reference year of entry (a) purely for reference purposes only; and (b) because 2008 was the last year that complete data were available in the data sets released to me by the NYCDOE. Relative to 2008 entrants, TFs and NTFs who entered in 2003 were 1.464 times as likely to quit. Contrarily, all other entrants were less likely to quit. This was an unexpected finding. This model also suggests that females were less likely to quit compared to men.

In model 4, ethnicity was added as an explanatory variable. Recall that ethnicity was also a dummy variable coded 0,1, with categories of Asian, black, Hispanic, and white. White was the reference group because it was the group with the largest population of teachers both TFs and NTFs. The results were essentially similar to model 3's except that Asian and black teachers were more likely to quit relative to white teachers (with HR of 1.137 and 1.088 respectively) while the effect size for Hispanic teachers was not significant. Adding the variable age in model 5 did not produce any statistically significant difference, therefore, the results remained essentially the same as in model 4.

[46] Refer to Appendix A10 for all the references to the models in the combined analysis of cohorts 2003 -2008.

The addition of subject taught in model 6, produced some essential results namely, the variable age now became a significant predictor in the sense that the effect size was negative, which means that every additional change in age translated into a decrease in the likelihood of quitting by a factor of 0.999. Also in this model, all the subject areas that were controlled for had large enough positive effect sizes greater than 1 which translates into higher likelihood of quitting compared to special education (the reference group). Teachers who taught common branches (i.e., elementary school teachers) were least likely to quit by a factor of 0.938.

Including the variable "SchoolType" in model 7 did not bring about any major changes to what we had observed prior to the addition of "SchoolType" except that the new variable now became a significant predictor of teacher retention except for those who taught in high schools. The variable of reference was secondary school because this was not an extremely popular school type in NYC; hence traditionally did not house many teachers. Secondary schools represent the 6 – 12 model where middle and high schoolers coexist in the same building and often share faculty. Invariably, there are definitive pros and cons to this type of arrangements with regards to the educational process, etc. but such discussions are outside the realm of the present study. The evidence in model 7 suggests that not only was the type of school that teachers taught a significant predictor of retention, teachers who taught in early childhood, elementary, junior high or middle, K-12, K-8 schools, were less likely to quit compared to those who taught at the secondary school level.

In models 8 and 9, I controlled for interaction terms "Age*Fellow" (model 8), and "Ethnicity*Fellow (model 9). The statistical significance of "Age*Fellow" in the opposite (negative) direction was not a huge surprise as we have already seen this pattern in earlier models (models 5, 6, and 7) when Age was just an explanatory variable. One surprise was the

significance of the interactive term “Ethnicity*Fellow (black) in the opposite (negative) direction. This meant that, in the full model, the evidence suggests that on average, black TFs were less likely to quit, compared to the other TFs in the other ethnic groups.

Chapter V

CONCLUSIONS, DISCUSSIONS, AND IMPLICATIONS

In the preceding chapters, I have examined teacher retention by looking critically at two groups of teachers representing those who entered teaching via a non-traditional route, the New York City Teaching Fellows program (NYCTFP or NYCTF), and those who entered via a more traditional route, which I simply termed the Non-Teaching Fellows (NTFs). There are obvious distinctions between the two modes of entry into teaching. The non-traditional route encourages recent college graduates and career changers to enter teaching partly because of the perception that recent college graduates are more likely to be innovative, energetic and idealistic. This is not to say that beginning teachers entering through the traditional routes are not; however, the conventional wisdom in some quarters, on beginning teachers seems to sometimes favor beginning teachers in nontraditional routes. For the years under study, TFs constituted less than 20% of teachers in any given year (See Table 8, below). The highest was in 2008 when TFs made up 19.66% of the cohort.

Table 8: Hazard Ratios and Percent of Teaching Fellows Still Teaching After 5, 4, 3, and 2 Years by Cohort

	2003	**2004**	**2005**	***2006***	***2007***	***2008***
Total	27,014	20,110	11,263	*10,041*	*10,013*	*7,720*
Non-Teaching Fellows	24,792	18,222	9,258	*8,175*	*8,159*	*6,202*
Teaching Fellows	2,222	1,888	2,005	*1,866*	*1,854*	*1,518*
TFs as a Percent of Total	**8.23%**	**9.39%**	**17.80%**	***18.58%***	***18.52%***	***19.66%***
Teaching Fellows' Hazard Ratio	1.442	1.379	1.235	*1.254*	*1.017*	*1.078*
P-Value	<.0001	<.0001	<.0001	*<.0001*	*0.5938*	*0.0526*
Percent Still Teaching After 5 Years – Cohorts 2003, 2004, 2005	11.07 (NTF = 33.1)	24.05 (NTF = 39.67)	23.59 (NTF = 37.38)	*31.67* (NTF = 43.74)* *Note: Still teaching after 4 years)*	*49.35 (NTF =51.24)* *Note: Still teaching after 3 years)*	*60.61* (NTF 62.43)* *Note: Still teaching after2 years)*

*Interpret with caution as data collection ended in 2010.

The focus of my research is retention (and invariably turnover) of teachers within the NYCDOE. The idea is to paint a picture of the disruptions and instability (if any) that can occur as a result of constant teacher turnover, especially if it is occurring at a particular point in time. The negative impact of such continuous teacher turnover on student learning cannot be overemphasized. I did not consider employment change from say, teacher to assistant principal a quit because the individual who moves upwardly from a teacher to an assistant principal is still being productive in the system, albeit in a different capacity, Neither did I consider transfers from one school to the other, in part because the system still benefits from transfers even though it can be somewhat disruptive. The teacher is still in the system and contributing (hopefully productively) to the student outcomes. I mainly focused on real quits, i.e., those whose employment records showed cessation of work in the NYCDOE.

The choice of survival analysis – the Cox proportional hazards (PH) model - over the other methods, of measuring retention, such as logistic regression, was due largely to its robustness in capturing as much information as possible. The Cox PH model is semi-parametric and this property allows it to get very good estimates of regression coefficients, hazard ratios, and adjusted survival curves in numerous situations that other methods cannot. The measure of effect in Cox PH model is the hazard ratio (HR) and it involves only the coefficients of the covariates. The other major advantage of this method is that unlike logistic regression which uses 0, 1 for outcome, and thereby ignoring survival times and censoring, the Cox PH model uses survival times and censoring – crucial information when deciding survival probabilities (Kleinbaum & Klein, 2005).

As of 2010, less than 10% of the TFs cohort of 2003, and less than 25% of the cohort of 2004 were left in teaching. We saw in the analysis on the cohort of 2005 that approximately

22% of the 11,263 teachers who started together in 2005 were still teaching in 2010. From the cohort of 2006, about 28% were still teaching in 2010. An estimated 36% from the cohort of 2007 were still teaching three years down the line. From the 7,720 who started in 2008, 4,383 or about 57% had left teaching by 2010. The HR for TFs from 2005 and 2006 were 1.235 and 1.254 respectively with a highly significant p-value that was less than 0.0001. Using these HRs as a yardstick, it is reasonable to surmise that on average, TFs may be more likely to quit within the first five years of teaching than NTFs. If one should choose to extend this statement and consider the TFs program as representing, or a proxy for non-traditional routes to teaching, the extrapolation can be that teachers whose mode of entry into teaching is non-traditional, are on average, more likely to quit within the first five years than those who enter via more traditional routes. This requires a more careful look at the results of this study.

We know from the literature that teacher retention is a function of several factors, fundamental amongst which is morale, which is influenced by satisfaction (Cochran-Smith, 2004; Ingersoll, 2003). Job satisfaction in turn is influenced by a number of other factors, salient amongst which are compensation, pre-service preparation, school culture, in-service training, and psychological (including the motivation to teach, and other emotive influences) dynamics (Myers Giacometti, 2005).[47] While the intricacies of how each of these factors affect teacher retention in NYC is beyond the scope of this study, it is within the purview of this research to offer sound explanation based my findings and their linkages with previous research.

My analyses revealed the development of a fairly consistent pattern of teacher retention emerging from both the TFs and NTFs. Time and again, retention drops on or around what I

[47] Myers Giacometti (2005) in a published dissertation thesis identifies a theoretical framework of 7 domains, namely, compensation, pre-service preparation, external forces, school culture, in-service training, motivation to teach, and emotional factors, as being primarily responsible for teacher job satisfaction. Based on my literature review on this topic I have combined motivation to teach and emotional factors into psychological dynamics.

estimated to be the end of the school year. This is reflected in the sharp drop on the product-limit survival estimates curves for each cohort. For instance, in the 2003 cohort, the survival probability estimate for TFs dropped from over 80% before the end of the first year to slightly below 60% at or around year 1 (See Figure B4 in the Appendix). While NTFs in this cohort enjoyed similar estimated survival probability at the same time period (i.e., during their first year), the sharp drops are more noticeable with the TFs estimates. The curves for the NTFs tend to be somewhat more even than the TFs. One possible reason is that in general, TFs tend to be young, idealistic, and impatient, and if the realities of the job do not meet their expectations, they are more likely to leave, relative to NTFs. Hence the sudden distinct drops in the curves at certain intervals. Feelings of career frustration were also cited in the literature (Lynn, 2002, cited in O'Connor, et al., 2011).

The effect size (HR) for gender was rarely, if at all, significant. Being male or female did not make a difference in terms of teacher retention for the groups considered in this study. Suffice it to say that for both TFs and NTFs, female teachers were predominant in the years under study. Ethnicity made a difference. For the years under review, we observed teacher ethnicity distribution that was regularly close to two-thirds white for each cohort year. Also, Asian teachers were commonly in the minority but had higher HR. Consequently, they were more likely to quit more than the other ethnic groups. Teaching Fellows are generally hired to staff low-performing, high-need populations in high poverty areas. Consistent with the literature, it is entirely conceivable that Asian teachers, particularly Asian TFs, did not feel particularly equipped or prepared enough to function effectively in such high-need environments (Malow-Iroff et al., 2004; O'Connor, et al., 2011).

Returning to my working hypotheses: Earlier, I submitted, based on my professional experience, that "TFs do not have a higher retention rate than NTFs." The evidence in this study confirms and corroborates this working hypothesis. In the years under study, TFs were on average, more likely to quit and their retention rate, though almost on par with, or sometimes slightly better than, that of NTFs in the first two years of employment, we see a consistent , often precipitous decline in TFs' retention rates from the third year of employment on.

To the working hypothesis of whether or not the "TFP has developed a recruitment program that finds, and retains (up to a point) educated individuals willing to teach in large, urban schools – many in high-poverty areas", the data in this study shows a relative decrease in the HR for TFs from 2003 through 2008, although these effect sizes are not significant for cohorts 2007 and 2008 (see Table page 125). Also, in 2003, three years after the inception of the TFP, 8.23% of the teaching force in NYC came from the TFP and by 2008, the program supplied close to 20% of the entire cohort. Today, it is estimated that the NYCTFP supplied at least 11% of the teachers in NYC[48] with the overwhelming majority serving in high poverty schools (as defined by the percentage of students receiving free or reduced lunch – Title I). One can subsequently argue that the program has managed to develop a recruitment strategy to attract educated individuals (many of whom might not have otherwise considered teaching), to teach in a large urban setting, like NYC. Today, the program is coming under criticisms because of the large number of absence teacher reserves (ATRs) who now move from one school to the other on a weekly basis because they do not have permanent employment in any school. Since they are employed by the NYCDOE and hence, still governed by collectively bargained contractual agreements between the DOE and the United Federation of Teachers (UFT), they cannot be

[48] https://www.nycteachingfellows.org/purpose/impact.asp

summarily fired. Since there are thousands of teachers in this ATR pool, some observers disagree with the TFP's attempts to continue to recruit teachers when there seem to be a glut of teachers as evidenced by the sizeable ATR teacher pool. Whether or not TFs stay "long enough" in teaching to have an impact is debatable. The evidence in this study suggests an encouraging trend especially for those in the cohort years of 2007 and 2008 – even though retention was relatively poor for those in the cohorts of 2003 – 2006. Depending upon how "impact" is defined, it may take about five years to move from novice, to advanced beginner, to competent (Berliner, 2000). If students' performance on state standardized tests is our measure of "impact", then seven years of teaching is the estimated amount of time that has been shown to maximize students' test performance (ibid). It is noteworthy to point out that while the results of this study show a consistent decrease in TFs' exposure to the risk of quitting for those in the last two cohort years under study (independent HRs for 2007 and 2008 cohorts were 1.017 and 1.078 respectively – see Table 8), the ratios were not statistically significant. Nonetheless, these last two cohort years had better first year retention rates than the other years (approximately 72% and 78% respectively for cohort of 2007 and 2008 compared with 61% for cohort of 2003 and 71% for cohort of 2004 – see Figure 48 in Appendix B).

My fourth working hypothesis relates to when TFs are at the greatest risk of quitting. Current research literature on teacher retention found the first five years of teaching as the toughest, representing when up to 50% of teachers quit the profession (Ingersoll, 2001, 2002). Based on this, I surmised that if we assumed that TFs would behave like "regular" teachers, we should expect their retention pattern to be somewhat similar to what has been consistently found in the retention literature. The evidence in this study shows that the second year of teaching was a critical point for the TFs in this study. From cohort 2003 through cohort 2006, individual

cohort analysis shows statistically significant HRs for TFs indicating that they were more likely to quit relative to NTFs in these respective cohort years. The PLSE for each of these years also predicts a sharper drop on or around the second year of employment (see Figures 18, 24, 30, and 36 in Appendix B) invariably raising the question of why the sharpness of the drop. A closer look at the TFP reveals that the TFs' contractual agreement with the NYCDOE usually ends in two years. It is therefore logical that many Fellows can choose to quit at this juncture if they have not fulfilled the requirements stipulated in their contaract. This explains the sharper-than-usual drop in the second year of teaching for TFs.

Finally, the evidence do suggest that the TFP has changed the teacher recruitment dynamics in the NYC public school system. I have discussed my reasoning at length in my discussion of my second working hypothesis, above.

Revisiting the Research Questions

RQ 1: **Do TFs have a higher retention rate than NTFs?** The evidence in this analysis does not support the conventional wisdom that TFs have a higher retention rate than NTFs. Both groups demonstrated similar quit patterns, especially in the first two years (See Appendix B33 – B34). It appears that both TFs and NTFs of the early cohort years of 2003 and 2004 showed very similar quit rates in the first two years with the TFs showing discernibly higher rates than NTFs in year two (See Appendix B33 – B34). By year three, for practically all the cohorts for which data were analyzed, quit rates for both TFs and NTFs have overtaken retention rates. But again, it appears that TFs' quit rates exceeded NTFs' by up to 17 percentage points in some instances (See Appendix B35 – Cohort 2003, Stayers and Leavers in Year 3). The aggregate four-year predicted survival probabilities from the PLSE for TFs was less than 0.3, and about 0.4 for NTFs. Survival rates for TFs in years four and five in these data sets were at best 32 percent (Cohort of 2006). The four-year survival rate for the TFs in the cohort of 2003 was an abysmal 15.03 percent compared with 35.27 percent for NTFs (See Appendix B36). By the fifth year, it appears that close to 90 percent of the TFs and about 67 percent of the NTFs in the cohort of 2003 had quit teaching. For the 2004 cohort, the figures are not that different: about 76 percent of the TFs and 60 percent of the NTFs had quit by year five. It is worthwhile to remember that when entry year was controlled for, TFs were 1.225 times as likely to quit as NTF (See Appendix A10).

RQ 2: **Compared to NTF, when are TF at the greatest risk of quitting?** The evidence in this data suggests that relative to NTFs, **TFs are at the greatest risk of quitting at the end of their first, second, and third years of teaching.** This is evident in the PLSE (see Figure 18, page 117) where we see the largest drop or rate of change in the survival probability function in the

aggregate curve structure in years one, two, and three, tapering off in years four and beyond. **The evidence suggests that year-2 represents the largest change in the overall survival estimates for the combined cohort groups**. Incidentally, year-two also happens to be the time when TFs are expected to have completed their subsidized master's degree in education. It is important to point out that there is evidence to support the fact that TFs (and NTFs) can quit at just about anytime from the time they are hired. Part of my essential question is in *when* they are at the *greatest risk of quitting*. I was able to answer this question accurately through the use of the PLSE of the Cox PH model because the predicted survival probabilities matched the actual retention patterns of both TFs and NTFs.

RQ 3: **To what extent do age, sex, ethnicity, subject taught, school type, and whether or not an individual is a TF affect quit/stay decision?** In the combined analysis as well as in the individual cohort analysis, whether or not an individual is a TF made a significant difference in retention. Without controlling for the year of entry into teaching, TFs were 1.242 times as likely to quit as NTFs, on average. After controlling for year of entry into teaching, TFs were 1.225 times as likely to quit as NTFs. Therefore, it is safe to say that, in general, the evidence in this data analysis supports the fact that TFs were, on average, more likely to quit relative to NTFs regardless of year of entry into teaching. This is consistent with the predicted PLSE in Figure 18, page 117).

The data suggests that female teachers were less likely to quit whether or not year of entry was controlled for. A surprising finding is that **Asian and black teachers were more likely to quit compared to white teachers regardless of year of entry**. **Without controlling for year of entry, age was a statistically significant predictor (with a HR of 0.999 and a negative parameter estimate) suggesting that as teachers got older, they were less likely to**

quit. This is consistent with previous findings by Ingersoll (2001, 2002, 2003, and 2010), Ingersoll & Smith (2003), and Goldhaber Gross & Player (2009). Surprisingly, when year of entry was not controlled for, age was not a statistically significant predictor but year of entry became highly significant. For instance, members of cohort 2003 were approximately 1.5 times as likely to quit relative to those of 2008 while members of cohorts 2004, 2005, 2006, and 2007 were less likely to quit when compared with cohort 2008 members.

The different subject areas were all statistically significant predictors of teacher retention whether or not year of entry was controlled for. Teachers of English as a Second Language (ESL), English, foreign language, mathematics and science were more likely to quit compared to special education teachers. Elementary school teachers (common branch license holders) were less likely to quit regardless of year of entry into teaching. There were no significant contributions of the interaction terms in the model probably because the essence of the analysis was captured by controlling for the status of the individual teacher as a TF or a NTF, and the year of entry into teaching with the other predictor variables described hitherto buttressing the explanation.

RQ 4: **Do TF stay long enough to have a positive impact on student outcomes?** If "long enough" is defined as one year, yes; otherwise, no. To have a positive impact, teachers must be deemed "effective." The research on teacher effectiveness and teacher quality is still emerging (Darling-Hammond, 1999; Murnane & Steele, 2007; Rivkin, et al., 2005; Rockoff, 2004). Generally, being an effective teacher includes, but it is not limited to, raising student achievement on standardized test scores, such as the New York State Regents examinations that students must pass before graduating from high school. Defining and measuring teacher effectiveness is challenging because of confounding intrinsic and extrinsic individual and school

factors that can impact student achievement (Nye, et al., 2004; Rivkin, et al., 2005). The average estimated time it will take to be a master teacher is about three-to-seven years (Berliner, 2000). Master teachers are generally deemed effective. The evidence in this study shows that an overwhelming majority of TFs would quit by the end of their third year of teaching. The prediction was supported by the actual retention and quit rates of the TFs. In the cohorts for which data were available (cohorts 2003, 2004, 2005, 2006, and 2007), retention rates at the end of the third year of teaching for TFs were approximately 22 percent (cohort of 2003), 35 percent (cohorts 2004 and 2005), 43 percent (cohort 2006), and 49 percent (cohort 2007). These findings suggest that while a proportion of the TFs seemed to stay beyond their third year of teaching, majority did not. It is therefore reasonable to conclude that the evidence in this study does not support the assertion that *most* TFs stay long enough to have a positive impact on student outcomes because they quit before they can properly master the intricacies of the teaching profession.

RQ 5: **To what extent has the NYCTF program changed the dynamics of teacher recruitment in NYC public schools?** The NYCTF program was initiated for dual, interrelated reasons: (a) to curb the endemic teacher shortage problem in NYC schools in the late 1990s; (b) to respond to regulatory changes at the State level to tighten teacher certification (Pabon, 2011). From its inception in 2000, its purpose was to attract, hire, train and retain nontraditional applicants to staff hard-to-staff schools (Stein, 2002). These schools were hard-to-staff because of persistent anemic attendance, and invariably poor graduation rates. Many of the original schools that were catalysts for the formation of the TFP are no longer in existence today because of major systemic restructuring at the NYCDOE that called for the dismantling or in very few cases, downsizing of large high schools into smaller ones as well as closures and phase-outs of

persistently lowest performing schools. Despite the extensive reorganization of the school system, the TFP appears to be a mainstay of teacher recruitment into the NYC school system. Today, the NYCDOE depends on the TFP for up to 30 percent of its beginning teachers (Boyd, et al., 2012) and spends between $20,000 and 30,000 to train one TF. To this end, it is reasonable to argue that it has noticeably affected the dynamics of teacher recruitment in NYC public schools. My analysis also suggests that retention rates amongst later cohorts of 2007 and 2008 seemed to be 10 to 15 percentage points better than earlier cohorts of 2003, 2004, 2005, and 2006, on average. This is consistent with, and may be the rationale for, the findings of Boyd, et al., (2012) stated above on TF as a stable source of beginning teachers.

Discussion of Findings

Many of the findings in this study seem to be consistent with current literature on teacher labor markets. There are however, some surprising results. I focused primarily on understanding the difference in retention patterns between traditionally trained and nontraditionally trained teachers, represented by the NYCTF. The NYCTF program serves as a good example of the alternative teacher certification movement in the United States which has grown significantly over the past couple of decades (See Figure B3 in the Appendix) because it is characterized by a unique focus on career-changing individuals interested in teaching in hard-to-staff, urban schools. This is one of the distinctive characteristics of successful alternative teacher preparation programs (Boyd, et al., 2012). The fundamental aim of such program is to increase teacher supply through the provision of teacher education in what some will describe as an unconventional approach (Blazer, 2012; Goertz, et al., 2011) involving the prospective teacher performing the duties of a teacher while simultaneously learning how to teach. There are of course, different types of these programs ranging from those that focus on attracting recent

college graduates in disciplines other than education into teaching (for example, Teach for America), and those that focus on attracting career changers into teaching, such as the NYCTFP.

Aside from the distinctive feature of this study being the emphasis on the survival patterns of the two training paths: TFs and traditionally trained teachers, it is important to point out that it is not unreasonable to expect differences in the types of candidates that each path attracts and in the placement of teachers during and after training. Boyd, et al., (2008) note that programs such as the TFP attract "a different pool of teachers into New York City schools" (p.328). Using multiple data sources, the authors also found that relative to traditionally trained teachers, TFs were more likely to have attended more selective colleges and score higher on the state teacher preparation tests that measure pre-service teachers' knowledge of liberal arts and science (LAST). This suggests that the TFP probably attracts a different type of candidate than the traditionally-trained programs. Additionally, it is equally important to remember that Fellows are hired mainly to staff "hard-to-fill" positions in underperforming schools (Boyd, et al., 2008, 2012). Teaching Fellows are also much more likely to teach students who have been suspended from school, poor and minority students than traditionally trained teachers (Boyd, et al., 2012). It should therefore come as no surprise that alternatively certified teachers such as the TFs are potentially much more prone to experiencing classroom management issues, including but not limited to, students disrupting lessons, not paying attention, refusing to work, and much more violent stressors such as confronting and/or threatening the teacher (Schonfeld & Feinman, 2012). All this may account for some of the higher turnover rates amongst the TFs found in this study.

The large data sets on TFs and NTFs, though fraught with missing data, afforded me the rare opportunity to analyze a cross section of TFs and NTFs over time. The missing data in these

data sets can be described as missing completely at random (Howell, 2007), because the NYCDOE confirmed, and my analysis suggests that the values of the variables in the data sets are distinct from the likelihood that the variables are missing. In other words, "the probability that X_i is missing is unrelated to the value of X_i or other variables in the analysis" (Howell, 2007, p.210). I elected to simply omit missing data from my analyses because doing so would not lead to biased parameter estimates due to my large sample (or in this case census) sizes, and also because of the nature of the missing data – they are all missing completely at random. My chosen methodology, the Cox PH modeling in survival analysis, enabled improved robustness, and subsequent potential widespread applicability of results. The NYC public school system can be seen as a quintessential large urban school structure, and a microcosm of school systems in general. These findings are therefore potentially applicable to scale.

Generally, the findings from this study showed relative similarities of retention patterns for both TFs and NTFs in the first year of teaching. During this time, predicted survival probabilities (or survivability) hovered around 0.65 to 0.75. The fact that the actual survival or retention rates ranged from 59 percent to 78 percent proved the consistency of the PLSE of the Cox PH model. For the first year of teaching early cohort members (2003 – 2006) of both the TFs and the NTFs demonstrated a more aggressive quit pattern relative to those of later years (2007 – 2008). For example[49], 41 percent of the TFs and 39 percent of the NTFs in the cohort of 2003 quit after the first year of teaching. The 2004 cohort did not fare too well as approximately 28 percent of the TFs and 29 percent of the NTFs quit after the first year of teaching. On the other hand, 25 percent of the TFs and 28 percent of the NTFs in the 2007 cohort, and 22 percent of both the TFs and NTFs, quit after the first year of teaching. I will posit that the lower quit

[49] See Figure B33 in the Appendix for these examples

rates in the 2007 and 2008 cohorts for TFs were probably due to the program paying closer attention to retention issues. By the Fall of 2008, the TFP had been in existence for eight years, which is a long time to learn and make adjustments.

The rate of change for TFs relative to NTFs was also more pronounced in the early years. As indicated earlier, years one, two, and three of teaching marked the highest drops in survival probability estimates for TFs and this was consistent with actual retention rates for this group. One possible explanation is that for many beginning teachers, the first year marks a watershed period. For many this is when they decide whether or not they have chosen the right profession or if this is a potential career track. TFs are in a very peculiar situation because many of them are career changers and it is probably easier for them to quickly decide that teaching may not be the right choice immediately after their first year. The same cannot be said for NTFs who, for the most part, came through the traditional path to teaching. Deciding whether or not one has chosen the right career path after being educated to be *in* that career may be a bit of a challenge for the traditionally trained teachers. It is almost inconceivable to draw a parallel with the medical or other trained professions here. While it is not impossible, it is difficult to conceive of a medical student going through years of training in medical school, only to quit immediately after becoming a medical doctor in his/her first year as a practicing physician. The intriguing finding in this study was the similarity in the quit rates for both TFs and NTFs particularly in the early cohort years, although, as pointed out, TFs seemed to quit at a faster rate. This may require further research.

In general, my findings also reveal consistent survival probability estimates depicting TFs with a higher survival probability relative to NTFs after the first year but until the second year of teaching when it dips below that of the NTFs and remaining lower than that of NTFs thereafter.

The implicit significance of this becomes obvious when one considers the fact that TFs are expected to fulfill education requirements and be State certified within three years of being in the classroom as a teacher. Most of the partnering institutions with the NYCTFP encourage TF to complete their degree requirements within two years. This fact helps us to understand why the survival estimates for TFs dip after the second year of teaching. By the end of the second year, most TFs have figured out whether they would prefer to remain in the profession or not, or whether they will transfer to other school systems. The present study does not include transfers. The incontrovertible fact is that regardless of cohort year, the retention rates for TFs noticeably dipped below that of NTFs starting in year two and became accentuated in years three, four, and five (See Figures B33 – B37 in the Appendix). This finding is consistent with that of at Malow-Iroff, et al., (2004; 2007), where 29 percent of a cohort of TFs in a graduate program self-reported that they would quit teaching upon satisfying their contractual obligation.

Interestingly a comparison of the survival probability estimates of 2003 and 2008 TFs shows consistently higher survivability for the 2008 cohort over a two-year period, and a slightly higher survival estimate within the first year for the 2003 cohort (see Figure B38 in the Appendix). This also supports my previous hypothesis that by 2008, the TFP had learned its lesson and might have begun to figure out ways to improve retention in the program.

Clearly being a TF was a statistically significant predictor of teacher retention, so was year of entry into teaching. TFs were more likely to quit teaching relative to NTFs. Some degree of caution is necessary when interpreting the significance of year of entry as a predictor. First, year of entry should be examined from the perspective of comparison to 2008 which is the last full year for which data was provided. Second, it is possible to see divergence in survival estimates in the first year of teaching compared to the second, third, etc. Third, data collection

for the available data used in this analysis ended in 2010, therefore, there was only two years worth of data to analyze for the cohort of 2008.

Females were less likely to quit when the year of entry was factored into the analysis. The effect size (HR of 0.922) was negligible. Ethnicity was a significant predictor of teacher retention as well. Compared to whites, Asian teachers were more likely to quit, followed by black teachers. Conversely, black TFs were less likely to quit compared to white TFs. A logical deduction from this can be that black TFs were more likely to stay probably because they felt more connected, and understanding toward the population that they served. Such connection and understanding could insulate them against the ubiquitous challenges of everyday teaching described in the literature. This deduction is reasonable because from its inception, the TFP has prioritized the placement of its candidates in low-income, usually predominantly minority schools throughout most of the five boroughs of NYC (See Figures 54 and 55, Appendix B).

The effect size on Hispanic teachers (HR of 1.008) was noteworthy but not significant. Age was a significant predictor of retention and this is consistent with available literature (Ingersoll, 2001; Ingersoll & Merrill, 2010). The evidence in this study seems to conform with current teacher retention literature that younger teachers tend to quit more than older teachers. This should make intuitive sense because as teachers get older, just like in any other professions, they tend to want to remain in teaching for obvious reasons of retirement, health and other benefits. Priorities change as one gets older. Marital responsibilities, raising a family, etc., become increasingly important the older one gets. Older workers therefore have to adjust their career choices accordingly. Society expects younger workers to be less stable on the job relative to older ones. The evidence here suggests that teaching is not an exception.

Subject areas were also significant predictors of teacher retention. I used special education as comparison group because it is one of the most hard-to-staff teaching licenses in the NYC school system. Surprisingly, teachers of English as a Second Language (ESL), English, foreign language, science, math, and social studies had the largest effect sizes relative to special education. Teachers with common branch license, i.e., first grade through sixth or elementary school had a negative effect size. In other words, the evidence suggests that these teachers were less likely to quit compared to special education teachers (See Table A10 in the Appendix). Prior to the study, I expected mathematics and science teachers to have higher effect sizes but I was surprised to see ESL, English, and foreign language teachers with higher effect sizes than math and science teachers. One reason could be that alternative opportunities were opening up for teachers with these licenses either locally or in other parts of the United States due to the increased need for culturally and linguistically diverse educators (Sleeter, 2001; Valle-Riestra et al., 2011). In general, the school level (early childhood, elementary, junior high/middle school, and high school) was also a significant predictor of teacher retention. For the years under review, the evidence shows that teachers at the early childhood level quit less than the other two areas on average. The effect size for high school teachers was not significant although teaching at the junior high/intermediate and elementary school levels yielded significant effect sizes for predicting retention.

Implications and Future Research

In this study, I have attempted to demonstrate the nuances of a specific teacher labor market - the NYC public school system – with a particular focus on an exclusive segment of the teaching force in the school system – the NYCTF. Teacher retention is an important topic because education's ultimate role in society is contingent upon a stable teaching force in elementary and secondary schools. The negative impact of teacher shortage and teacher turnover on instruction has been sufficiently documented (Alliance for Excellent Education, 2005; Barnes et al., 2007; Borman et al., 2008; Boyd et al., 2005; Carey, 2004; Goertz et al., 2011; Ingersoll, 2001, 2002). In an attempt to offset the shortage of teachers as well as conform to federal and State regulations, the NYCDOE implemented the NYCTFP as a way to attract mainly career-changing, college educated, highly skilled individuals into teaching in predominantly hard-to-staff schools with persistent student achievement issues. Thirteen years after its inception, it is worthy to examine the impact of what seem to be such a novel approach back then. Hence the significance of this study.

From this research, we have gained some important insights into teacher retention in NYC public schools. We now know that on average, aggregate retention for TFs and NTFs can be expected to be similar particularly in the first three years of teaching. The third year, on average, can be seen as the point where the retention rates for TFs and NTFs may depart where TFs can begin to consistently display quit rates that are higher than NTFs. We also noticed sizeable declines in the rates at which TFs quit relative to NTFs at the end of each year and this was particularly pronounced in the first three years of teaching. This difference in rates of quitting was present throughout the analysis but tapered off after the third year. This suggests that if the intention of policy is to increase retention, particular attention needs to be placed on

the welfare and well-being of these novice teachers in those early years. It appears that the TFP now has a relatively effective mentoring program in place and this may explain the noticeable improvement in retention rates for the cohorts of 2007 and 2008.

The TFP is often confused with the Teach for America (TFA) program. While both fall under the broad umbrella of alternative paths to teaching, it is important to point out that the NYCTFP differs in principle from the TFA program in that TFA actively seeks first time teachers while the TFP is fundamentally for career-changers. The NYCTFP tends to attract relatively older individuals with some work experience who are looking for ways to contribute altruistically to society via teaching. It is not uncommon to find former bankers, real estate brokers, lawyers, or even former Wall Street types in the TFP. Such is not the case with the TFA which tends to hire relatively younger recent college graduates to teach for about two years. The high attrition rate in TFA teachers is widely known and is beyond the purview of this study.

Without a doubt, Mayor Bloomberg's Children First Initiatives have dramatically transformed the educational landscape in NYC. Many of the underperforming high schools of 3000 – 5000 students have been abolished for smaller, more personalized ones of about 400 – 800 students. Elementary and middle schools were also revamped. More new schools (654 in total as of September 2013) have been built or established in shared campuses around the City. Consistently poor attendance and persistent poor graduation rates in the larger high schools were cited as key rationales for the dissolution (O'Day et al., 2011). Principals and school leadership teams, now have relatively better say in school governance compared to the previous era. A relatively new initiative called the "Open-Market" system allows teachers to actively seek employment in other schools within the system for the next school year starting in April of the school year preceding the school year that the teacher wishes to transfer. This is completely

different from previous practice where older, tenured teachers were allowed to "bump" younger, untenured faculty. It could be one reason why we see the increase in retention for the TFs hired in 2007 and 2008.

We should not be naïve to think that the slightly improved retention patterns in the later years for TFs meant that we could overlook the complex nature of teaching. This would be a mistake. We saw in the literature review how TFs sometimes felt disconnected with their students because of the struggle to develop their understanding of themselves as teachers and their assessment of teaching (Costigan, 2004). Or when they reported the lack of congruence between college coursework and the classroom management issues they faced (O'Connor et al., 2011). Due in part to their less extensive training, TFs were also more likely to encounter classroom management issues – student disrupting lessons, refusing to work, not paying attention, and/or confronting teachers – according to Schonfeld and Feinman (2012). The same authors also found that TFs reported contentious relationships with supervisors, and were more likely to perceive or experience top-down, invasive supervisory styles, which did not augur well for job satisfaction and invariably retention.

Clearly, improving the congruence between classroom coursework and real life teaching can ameliorate some of the reported anxieties of TFs, and ultimately increase retention. This may have to include a continued dialog between the TFP and the partner institutions to address the needs of TFs to increasing job satisfaction and retention. This should include the public school in which a TF is assigned. In other words, a more systemic confluence of support structures for the TFs that involves the higher institution, the K-12 school, the TFP, and the TF to learn to address the needs of the TF from day one. This idea speaks to the notion of "Context-Specific Teacher Education" (CSTE) as outlined in Tamir (2013). CSTE advocates for teacher

preparation that pays very close attention to and actively prepares all teachers to teach in culturally diverse environments as well as equip them to adapt to hard-to-staff environments. One key component of this is the deliberate involvement of the school leader where TFs serve.

Nieto (2003) as reviewed by Bell (2004), advocates for teachers to be treated as "intellectuals and professionals who care deeply about their students and their craft" (p. 128). This somewhat corroborates Schonfeld and Feinman (2012) findings of perceived, acrimonious, top-down, supervisory relationships that TFs reported. Tamir (2013) also found school leaders and administrators to have substantial impact on the lives and career commitments of novice teachers. Because of the universality of these positions, the TFP can benefit from their implementations in the NYC public school system.

Meaningful use of exit interviews should be encouraged to learn about why TFs leave. When used effectively, exit interviews can "uncover organizational characteristics that may contribute to employee turnover" (Giacalone and Duhon, 1990, p. 83). Efforts to retrieve exit interviews for this study were unsuccessful as I was informed that the DOE does not release such data to the public – not even for research purposes.

As extensive and informative as this research project has been for me, I have endeavored to limit my analysis to very specific areas of the teacher labor market outcomes of NYCTFs within a particular period of time. Narrowing down my purview has allowed me to focus exclusively on those areas in which my interest and research questions lie. Future research will benefit from understanding the patterns of, and rationales for TFs who transfer from one school to the other within the NYC school system. Transfers can be almost as disruptive as quits in many cases because schools experiencing transfers still have to figure out how to continue to provide instruction and maintain normalcy as much as possible. In hard-to-staff urban schools,

this can be daunting. Understanding such patterns as where TFs are transferring – a predominant district, school, or geographic location? Or from where most of the transfers are occurring – if that's the case – can illuminate our understanding of what's going on in a particular school or school district. By the same token, more research is needed to understand whether or not TFs are moving to nearby school systems such as Westchester County, Rockland, New Jersey, Long Island, and Connecticut, and why.

The costs of TFs turnover is yet another area that need further research. As indicated earlier, on average, the DOE spends between $20,000 and $30,000 to train one TF. An integral part of the cost structure for this program is the subsidized master's degree in education that Fellows are required to obtain during their two-year commitment. Additionally, each Fellow continues to receive a salary[50]which is based on contractual agreement between the United Federation of Teachers (UFT) and the NYCDOE (See Table 22, Appendix A). Conversely, traditionally trained teachers almost always have to finance their education independently of the DOE. While it appears that the cost for training TFs seems to be higher relative to the cost of training traditional (NTFs) teachers, it will be premature to conclude at this point that the TFP is not a good investment. More research is needed to compare costs, benefits and effectiveness of both tracts for entering teaching in the NYC school system. Presently, while there is some evidence of variability in student outcomes linked to teacher fixed effects (Rivkin, Hanushek, & Kane, 2005), scant, and often mixed evidence is available to compare student outcomes of students taught by TFs versus traditionally trained (NTFs) teachers (Boyd et al., 2005, 2006, 2012; Kane et al., 2008). More research is needed to make conclusive statements in this regard.

[50] According to Boyd et al., (2012), in the NYC school system, the starting salary of teachers with a bachelor's degree went up by 37.1% from $33,186 to $45, 530 between 2000 and 2008.

A critical examination of the retention patterns of TFA and NYCTFs may yield some important information especially since it is becoming more and more evident that alternative teacher preparation is here to stay. In addition to the TFP, NYCDOE is investing heavily in a number of other alternative teacher preparation programs to supply teachers.[51] Such programs include: the NYC Teaching Collaborative - formerly called the NYC Teaching Residency, TFA, New Visions for Public Schools – Hunter College Urban Teacher Residency, I-START Urban Teacher Residency Program, Teaching Residents at Teachers College, Math for America Fellowship Program, Peace Corps Fellows Program, and the American Museum of Natural History – Master of Arts in Teaching Urban Residency Program.[52]to supplement/augment the traditional avenues of recruiting teachers. Research is needed to show how well-adjusted these teachers are to the system.

In theory, each TF is supposed to be provided with a mentor whose responsibility includes liaising with the TF, the graduate school of education where the TF is undertaking his/her required master's degree for licensure, and the K-12 school where the Fellow is assigned to teach, on a regular basis. The issue, according to anecdotal, informal discussions with some Fellows, is the substance (or lack thereof), of such mentoring. Most TFs do not fell that they are receiving the type of support that they need to effectively navigate teaching, especially in the types of settings that most TFs are likely to be placed.

On the other hand, traditionally trained teachers receive a somewhat different, but arguably more efficient, type of support beginning from before they become full-time teachers - in their internships (or student teaching). These are usually longer than that of the TFs and serve

[51] For a summative description of the alternative teacher preparation program available through the NYCDOE, visit: http://schools.nyc.gov/TeachNYC/certification/alternatives.htm

[52] A complete outline of these programs is available. See footnote #46.

to expose the prospective NTF to a variety of situations that they are most likely to face as regularly assigned classroom teachers. Perhaps, the relatively lower attrition rates of NTFs that we see in this study could be attributed to the effectiveness of the support structures that each group received.

In the final analysis, I hope this study has produced enough meaningful answers in the teacher retention debate. Although its focus is NYC, available literature suggests that its findings can be applicable beyond its local context. I also hope that it will raise enough questions to motivate future research in the areas beyond its purview. The undeniable policy implication from this study is: **context and school leadership matter enormously in teacher retention**. Policy adaptations must provide avenues for the beginning teacher, TF or NTF, to have a comprehensive understanding of, and be fully prepared to adapt to, the contexts of the teaching environment – the school, the neighborhood, the students, the families, etc. The contextual understanding breeds the awareness necessary to adapt if/when needed. Enlightened school leaders become catalysts for the beginning teacher – coaching, listening, encouraging, coaxing, and admonishing when necessary. The stakes are too high to continue to allow more than 50 percent of teachers to leave within the first five years. As this study has shown, the retention rates for TFs were far below the national average.

Arguably, the teachers who quit probably do not belong in teaching and might have made poor teachers. It is not impossible. At the same time, it is also equally conceivable that a good number of those who leave will leave with unfulfilled potential of becoming very effective. For every one of the potentially highly effective teacher who quits, the nation stands to lose more than $440,000 in the labor market per probable class taught (Hanushek, 2011). The NYCDOE spends on average $20,000 to $30,000 to train each TF. The economic loss to the NYC school

system when a TF leaves while beyond the scope of this study, appears to be substantial. The social costs loom even larger. It is time to act on the policy suggestions coming from studies like this.

Perhaps the most important policy implication of this study is in uncovering the "net" positive effects of the NYCTF program. Apart from the fact that the NYC school system now relies on the TFP as a steady source of teacher recruitment for up to 11% of its annual teaching force[53], it can be argued that the program has successfully discovered an approach to attract applicants who would have otherwise not be attracted into teaching because they were initially trained in other fields. While data on their learning as teachers are currently sparse, this study has contributed significantly to the knowledge on their retention. The critical recommendation is to use this knowledge to address the drastic drop in TFs' retention (starting in the second and continuing in the other years of teaching), through some of the approaches discussed above. The alternative will be to continue to hire from what some observers have described as a lower quality pool. The needs of the students in the underperforming, low income schools that TFs mostly serve have been well documented and alluded to in the literature review. I have also discussed the findings of other researchers that have shown that that on average, TFs tend to be better prepared academically as demonstrated by their relatively higher S.A.T. scores and undergraduate academic concentrations. TFs therefore have the potential to become quality teachers. Students generally benefit from quality teachers; underperforming, low-income students benefit even more.

What is desperately needed now is (a) the understanding of what is causing TFs to depart so rapidly starting in the second year of teaching; and (b) a systemic approach applying some of

[53] https://www.nycteachingfellows.org/purpose/impact.asp. This was as of 2010. It is highly likely that this percentage has increased as of 2013.

the principles described above to address this retention issue. It is in the best interest of all stakeholders to continue to strengthen the teaching force through systemic collaboration and cohesion of both the traditional and non-traditional paths to teaching – such as the NYC Teaching Fellows Program. While I have empirically demonstrated in this study that TFs have a tendency to quit teaching early in their careers, especially in the first two-to-three years, this does not mean that the program should be abolished. In fact, I would strongly suggest, based on this study and personal experience - first as a middle and high school teacher, then as a high school administrator - that the designers of the program should learn from the results of studies like this and implement systems to correct the complications that have been empirically documented.

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APPENDIX A

TABLE 9a: Event dropout rates and number and distribution of 15-through 24-year-olds who dropped out of grades 10-12, by selected background characteristics: October 2005

Characteristic	Event dropout rate (percent)		Number of event dropouts (thousands)		Population enrolled[1] (thousands)	Pct. of all dropouts		Pct. of Pop. enrolled
Total	3.8		414		10,870	100.0		100
Sex								
Male	4.2		233		5,515	56.3		51
Female	3.4		181		5,355	43.7		49
Race/ethnicity[2]								
White, non-Hispanic	2.8		196		6,897	47.3		64
Black, non-Hispanic	7.3		112		1,538	27.2		14
Hispanic	5.0		86		1,717	20.8		16
Asian/Pacific Islander, non-Hispanic	1.6	!	6	!	411	1.5	!	3.8
More than one race	4.9	!	12	!	241	2.9	!	2.2
Family income[3]								
Low income	8.9		137		1,544	33.1		14
Middle income	3.8		228		5,990	55.2		51
High income	1.5		49		3,326	11.7		31
Age[4]								
15–16	2.1		72		3,347	17.4		31
17	2.4		93		3,797	22.5		35
18	3.9		105		2,693	25.3		25
19	9.1		64		702	15.4		6.5
20–24	24.4		81		331	19.5		3.0
Recency of immigration								
Born outside the 50 states and District of Columbia								
Hispanic	5.9		25		418	6.0		3.8
Non-Hispanic	5.0		22		440	5.3		4.0
First generation[5]								
Hispanic	5.5		40		738	9.8		6.8
Non-Hispanic	1.2	!	9	!	759	2.2	!	7.0
Second generation or higher[5]								
Hispanic	3.7	!	21	!	562	5.0		5.2
Non-Hispanic	3.7		297		7,954	71.8		73
Region								

Northeast	3.8	79	2,074	19.1	19
Midwest	3.1	80	2,570	19.4	24
South	4.4	165	3,754	39.9	35
West	3.6	90	2,472	21.7	23

! Interpret data with caution. Because of relatively large standard errors, estimates are unstable.

[1] This is an estimate of the population of 15- through 24-year-olds enrolled during the previous year in high school based on the number of students still enrolled in the current year and the number of students who either graduated or dropped out the previous year.

[2] Respondents were able to identify themselves as being "more than one race." The White, non-Hispanic; Black, non-Hispanic; and Asian/Pacific Islander, non-Hispanic categories consist of individuals who considered themselves to be one race and who did not identify as Hispanic. Non-Hispanics who identified as multiracial are included in the "more than one race" category. The Hispanic category consists of Hispanics of all races and racial combinations. Because of small sample size, American Indians/Alaska Natives are included in the total but are not shown separately.

[3] Low income is defined as the bottom 20 percent of all family incomes for 2005; middle income is between 20 and 80 percent of all family incomes; and high income is the top 20 percent of all family incomes.

[4] Age when a person dropped out may be 1 year younger, because the dropout event could occur at any time over a 12-month period.

[5] Individuals defined as "first generation" were born in the 50 states or the District of Columbia, and one or both of their parents were born outside the 50 states or the District of Columbia. Individuals defined as "second generation or higher" were born in the 50 states or the District of Columbia, as were both of their parents.

NOTE: The event dropout rate indicates percentage of youth ages 15 through 24 who dropped out of grades 10–12 between one October and the next (e.g., October 2004 to October 2005). Dropping out is defined as leaving school without a high school Diploma or equivalent credential such as a General Educational Development (GED) certificate. Detail may not add to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics (NCES 2007-059, JUNE 2007).

TABLE 9b: Event dropout rates for public school students in grades 9–12, by state: School years 1993–94 through 2001–02

State	Event dropout rate (percent)								
	1993–94	1994–95	1995–96	1996–97	1997–98	1998–99	1999–2000	2000–01	2001–02
Alabama[1]	5.8	6.2	5.6	5.3	4.8	4.4	4.5	4.1	3.7
Alaska[2]	—	—	5.6	4.9	4.6	5.3	5.5	8.2	8.1
Arizona[1]	13.7	9.6	10.2	10.0	9.4	8.4	—	10.9	10.5
Arkansas	5.3	4.9	4.1	5.0	5.4	6.0	5.7	5.3	5.3
California	—	—	—	—	—	—	—	—	—
Colorado	—	—	—	—	—	—	—	—	—
Connecticut	4.8	4.9	4.8	3.9	3.5	3.3	3.1	3.0	2.6
Delaware	4.6	4.6	4.5	4.5	4.7	4.1	4.1	4.2	6.2
District of Columbia	9.5	10.6	—	—	12.8	8.2	7.2	—	—
Florida[1]	—	—	—	—	—	—	—	4.4	3.7
Georgia	8.7	9.0	8.5	8.2	7.3	7.4	7.2	7.2	6.5
Hawaii[2]	—	—	—	—	5.2	5.3	5.3	5.7	5.1
Idaho[2]	8.5	9.2	8.0	7.2	6.7	6.9	—	5.6	3.9
Illinois[1]	6.8	6.6	6.4	6.6	6.9	6.5	6.2	6.0	6.4
Indiana	—	—	—	—	—	—	—	—	2.3
Iowa	3.2	3.5	3.1	2.9	2.9	2.5	2.5	2.7	2.4
Kansas	—	—	—	—	—	—	—	3.2	3.1
Kentucky	—	—	—	—	5.2	4.9	5.0	4.6	4.0
Louisiana[3]	4.7	3.5	11.6	11.6	11.4	10.0	9.2	8.3	7.0
Maine	3.1	3.4	3.1	3.2	3.2	3.3	3.3	3.1	2.8
Maryland[1]	5.2	5.2	4.8	4.9	4.3	4.4	4.1	4.1	3.9
Massachusetts	3.7	3.6	3.4	3.4	3.2	3.6	3.5	3.4	—
Michigan	—	—	—	—	—	—	—	—	—
Minnesota	5.1	5.2	5.2	5.5	4.9	4.5	4.3	4.0	3.8
Mississippi	6.1	6.4	6.2	6.0	5.8	5.0	4.9	4.6	3.9
Missouri	7.0	7.0	6.5	5.8	5.2	4.8	4.4	4.2	3.6
Montana	—	—	5.6	5.1	4.4	4.5	4.2	4.2	3.9
Nebraska	4.6	4.5	4.5	4.3	4.4	4.2	4.0	4.0	4.2
Nevada	9.8	10.3	9.6	10.2	10.1	7.9	6.2	5.2	6.4
New Hampshire	—	—	—	—	—	—	—	5.4	4.0
New Jersey[1]	4.3	4.0	4.1	3.7	3.5	3.1	3.1	2.8	2.5
New Mexico	8.1	8.5	8.3	7.5	7.1	6.7	6.0	5.3	5.2
New York[1]	—	—	—	—	3.2	4.0	4.1	3.8	7.1
North Carolina	—	—	—	—	—	—	—	6.3	5.7
North Dakota	2.7	2.5	2.5	2.7	2.8	2.4	2.7	2.2	2.0

Ohio[2]	—	—	—	—	—	—	—	—	3.1
Oklahoma[2]	4.6	5.8	5.7	5.9	5.8	5.2	5.4	5.2	4.4
Oregon	7.3	7.1	7.0	—	6.8	6.3	6.2	5.3	4.9
Pennsylvania	3.8	4.1	4.0	3.9	3.9	3.7	4.0	3.6	3.3
Rhode Island	4.9	4.6	4.6	4.7	4.9	4.5	4.8	5.0	4.3
South Carolina	—	—	—	—	—	—	—	3.3	3.3
South Dakota[2]	5.3	5.3	5.7	4.5	3.1	4.5	3.5	3.9	2.8
Tennessee[1]	4.8	5.0	4.9	5.1	5.0	4.6	4.2	4.3	3.8
Texas	—	—	—	—	—	—	5.0	4.2	3.8
Utah	3.1	3.5	4.4	4.5	5.2	4.7	4.1	3.7	3.7
Vermont[1]	4.8	4.7	5.3	5.0	5.2	4.6	4.7	4.7	4.0
Virginia[2]	4.8	5.2	4.7	4.6	4.8	4.5	3.9	3.5	2.9
Washington	—	—	—	—	—	—	—	—	7.1
West Virginia	3.8	4.2	3.8	4.1	4.1	4.9	4.2	4.2	3.7
Wisconsin[2]	3.1	2.7	2.4	2.7	2.8	1.8	2.6	2.3	1.9
Wyoming[2]	6.5	6.7	5.7	6.2	6.4	5.1	5.7	6.4	5.8

— Not available. These states do not report dropouts that are consistent with the NCES definition.
[1] These states used an alternative calendar for each year shown, reporting students who drop out between one July and the next. The rates from both calendar approaches are comparable (see Winglee et al. 2000).
[2] The following states reported data using the alternative calendar of one July to the next in the years indicated: Alaska (1995–96, 1999–2000, 2000–01, and 2001–02), Hawaii (2000–01), Idaho (1993–94 through 1998–99), Ohio (1993–94), Oklahoma (1993–94 through 2000–01), South Dakota (1993–94 through 1998–99), Virginia (1993–94 through 1999–2000), Wisconsin (1993–94 through 1996–97 and 1998–99), and Wyoming (1993–94).
[3] Effective in the 1995–96 school year, Louisiana changed its dropout data collection from school-level aggregate counts reported to districts to an individual student-record system. The apparent increase in the dropout rate is partly due to the resulting increased ability to track students.
NOTE: These event dropout rates measure the percentage of public school students in grades 9–12 who dropped out of school between one October and the next (e.g., October 2001 to October 2002). Data are reported by states to the U.S. Department of Education, National Center for Education Statistics. Common Core of Data (CCD) includes public school students only. For event dropout rates by state for the 1991–92 through 1992–93 school years, see Young (2003), *Public High School Dropouts and Completers from the Common Core of Data: School Year 2000–01* (NCES 2004-310). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Some estimates differ from previously published reports because of updates to the estimates.

SOURCE: U.S. Department of Education, National Center for Education Statistics (NCES 2007-059, JUNE 2007).

TABLE 9c: Status dropout rates, number of status dropouts, and population of 16-through 24-year-olds: October 1972 through October 2005

Year[1]	Status dropout rate (percent)	Number of status dropouts (thousands)	Population (thousands)
1972	14.6	4,769	32,643
1973	14.1	4,717	33,430
1974	14.3	4,847	33,968
1975	13.9	4,823	34,700
1976	14.1	4,980	35,222
1977	14.1	5,031	35,658
1978	14.2	5,113	35,931
1979	14.6	5,264	36,131
1980	14.1	5,085	36,143
1981	13.9	5,143	36,945
1982	13.9	5,056	36,452
1983	13.7	4,905	35,884
1984	13.1	4,626	35,204
1985	12.6	4,325	34,382
1986	12.2	4,141	33,945
1987	12.7	4,252	33,452
1988	12.9	4,230	32,893
1989	12.6	4,038	32,007
1990	12.1	3,797	31,443
1991	12.5	3,881	31,171
1992	11.0	3,410	30,944
1993	11.0	3,396	30,845
1994	11.5	3,727	32,560
1995	12.0	3,876	32,379
1996	11.1	3,611	32,452
1997	11.0	3,624	32,960
1998	11.8	3,942	33,445
1999	11.2	3,829	34,173
2000	10.9	3,776	34,568
2001	10.7	3,774	35,195
2002	10.5	3,721	35,495
2003	9.9	3,552	36,017
2005	10.3	3,766	36,504

2004	9.4	3,458	36,761

[1] Estimates beginning in 1987 reflect new editing procedures for cases with missing data on school enrollment items. Estimates
beginning in 1992 reflect new wording of the educational attainment item. Estimates beginning in 1994 reflect changes due to newly instituted computer-assisted interviewing. For details about changes in the Current Population Survey (CPS) over time, please see Kaufman, Alt, and Chapman (2004).
NOTE: The status dropout rate indicates the percentage of 16- through 24-year-olds who are not enrolled in high school and who lack a high school credential. High school credential includes a high school diploma or equivalent credential such as a General Educational Development (GED) certificate.
SOURCE: U.S. Department of Commerce, Census Bureau, Current Population Survey (CPS), October (1972–2005).

SOURCE: U.S. Department of Education, National Center for Education Statistics (NCES 2007-059, JUNE 2007).

Table 10a: The Estimated Cost of Teacher Attrition by State

The Cost of Teacher Attrition by State						
State	**Total Number of Teachers***	**Teachers Leaving the Profession****	**Cost Related to Teachers Who Leave the Profession*****	**Teachers Transferring to Other Schools****	**Cost Related Teachers Who Transfer to Other Schools*****	**Total Teacher Turnover Cost (Not Including Retirements)**
AL	50,577	2,632	**$28,969,359**	3,815	**$41,987,258**	**$70,956,618**
AK	8,318	568	**$7,920,331**	761	**$10,611,317**	**$18,531,647**
AZ	48,088	3,977	**$44,026,392**	4,009	**$44,379,821**	**$88,406,214**
AR	30,191	1,434	**$14,361,155**	2,369	**$23,725,427**	**$38,086,582**
CA	279,945	14,417	**$206,213,616**	17,444	**$249,518,976**	**$455,732,592**
CO	42,345	3,637	**$41,635,928**	3,050	**$34,919,145**	**$76,555,073**
CT	42,122	2,019	**$31,359,651**	2,315	**$35,965,870**	**$67,325,521**
DE	7,528	363	**$4,841,971**	687	**$9,162,186**	**$14,004,157**
DC	5,708	426	**$6,017,796**	487	**$6,871,872**	**$12,889,668**
FL	128,436	7,152	**$78,790,723**	10,244	**$112,854,050**	**$191,644,774**
GA	87,839	6,642	**$81,736,892**	8,419	**$103,609,330**	**$185,346,221**
HI	12,057	1,282	**$15,607,820**	681	**$8,287,407**	**$23,895,228**
ID	14,451	800	**$8,530,747**	1,360	**$14,507,442**	**$23,038,188**
IL	137,204	5,662	**$78,961,817**	10,405	**$145,106,049**	**$224,067,866**
IN	61,135	2,138	**$26,843,846**	3,781	**$47,469,200**	**$74,313,045**

	Total Number of Teachers*	Teachers Leaving the Profession**	Cost Related to Teachers Who Leave the Profession***	Teachers Transferring to Other Schools**	Cost Related Teachers Who Transfer to Other Schools***	Total Teacher Turnover Cost (Not Including Retirements)
IA	38,116	1,882	**$20,144,334**	2,804	**$30,013,404**	**$50,157,738**
KS	34,134	2,158	**$22,649,585**	2,732	**$28,669,378**	**$51,318,964**
KY	42,842	1,650	**$18,010,556**	4,080	**$44,526,937**	**$62,537,493**
LA	50,806	3,099	**$30,776,968**	4,638	**$46,065,876**	**$76,842,844**
ME	17,508	994	**$10,606,424**	967	**$10,318,166**	**$20,924,590**
MD	54,553	3,378	**$44,644,190**	5,249	**$69,365,028**	**$114,009,218**
MA	78,199	4,011	**$56,049,714**	4,277	**$59,762,606**	**$115,812,320**
MI	100,221	4,558	**$67,056,880**	7,610	**$111,971,866**	**$179,028,746**
MN	57,791	3,315	**$39,579,507**	4,454	**$53,188,209**	**$92,767,715**
MS	33,009	1,935	**$18,492,272**	2,109	**$20,159,747**	**$38,652,018**
MO	64,094	4,036	**$43,169,611**	6,401	**$68,474,496**	**$111,644,106**
MT	11,921	573	**$5,525,286**	911	**$8,780,211**	**$14,305,497**
NE	23,086	1,120	**$11,166,635**	1,570	**$15,654,627**	**$26,821,262**
NV	17,253	1,086	**$12,830,603**	2,341	**$27,660,052**	**$40,490,655**
NH	14,957	645	**$7,299,916**	903	**$10,220,329**	**$17,520,245**
NJ	98,310	4,655	**$72,633,486**	4,994	**$77,928,873**	**$150,562,359**
NM	21,086	1,255	**$12,254,139**	1,601	**$15,632,756**	**$27,886,896**
NY	208,278	13,760	**$210,614,387**	9,999	**$153,046,225**	**$363,660,611**
NC	85,573	7,148	**$84,497,347**	8,804	**$104,067,934**	**$188,565,281**
ND	9,246	398	**$3,563,447**	554	**$4,965,650**	**$8,529,097**
OH	123,370	8,900	**$110,627,905**	7,708	**$95,816,606**	**$206,444,511**

State	Total Number of Teachers*	Teachers Leaving the Profession**	Cost Related to Teachers Who Leave the Profession***	Teachers Transferring to Other Schools**	Cost Related Teachers Who Transfer to Other Schools***	Total Teacher Turnover Cost (Not Including Retirements)
OK	45,739	2,455	**$23,047,221**	3,542	**$33,258,194**	**$56,305,415**
OR	28,361	1,524	**$19,354,114**	2,140	**$27,179,712**	**$46,533,826**
PA	126,915	6,100	**$88,432,504**	6,233	**$90,358,337**	**$178,790,841**
RI	11,582	396	**$5,592,175**	772	**$10,898,365**	**$16,490,540**
SC	43,723	2,822	**$30,551,316**	4,067	**$44,026,758**	**$74,578,074**
SD	11,538	611	**$5,328,932**	868	**$7,569,478**	**$12,898,410**
TN	58,275	2,971	**$32,378,057**	5,090	**$55,472,856**	**$87,850,913**
TX	266,661	19,034	**$214,509,448**	25,768	**$290,407,937**	**$504,917,385**
UT	23,346	1,736	**$18,203,284**	1,426	**$14,944,657**	**$33,147,941**
VT	9,186	593	**$6,715,307**	510	**$5,773,916**	**$12,489,223**
VA	80,987	5,337	**$62,031,275**	7,319	**$85,074,850**	**$147,106,125**
WA	54,573	3,096	**$38,120,738**	2,996	**$36,889,448**	**$75,010,187**
WV	22,552	636	**$6,677,984**	1,776	**$18,649,644**	**$25,327,629**
WI	67,221	2,033	**$25,093,968**	3,114	**$38,448,836**	**$63,542,804**
WY	7,839	393	**$4,026,798**	546	**$5,587,750**	**$9,614,549**
Total	2,998,795	173,439	**$2,158,074,356**	220,700	**$2,709,805,065**	**$4,867,879,421**

*U.S. Department of Education, National Center for Education, Statistics Schools and Staffing Survey, 1999–2000 (“Public School Teacher Questionnaire,” “Private School Teacher Questionnaire,” and “Public Charter School Teacher Questionnaire”), and 2000–01 Teacher Follow-up Survey (“Questionnaire for Current Teachers” and “Questionnaire for Former Teachers,” Table 1.01). Washington, DC.

**State estimations based on analysis by Richard Ingersoll, Professor of Education and Sociology, University of Pennsylvania, from the National Center for Education Statistics Student and Staffing Survey, and therefore include a slight margin of error. Additional data available at http://www.gse.upenn.edu/faculty_research/Shortage-RMI-09-2003.pdf.

***The Department of Labor conservatively estimates that attrition costs an employer 30 percent of the leaving employee's salary. Teacher salary data was taken from the National Education Association's Estimates of School Statistics, 1969–70 through 2002–03, and prepared August 2003. Available online at http://nces.ed.gov//programs/digest/d03/tables/dt078.asp.

SOURCE: Alliance for Excellent Education (2005). *Teacher Attrition: A costly loss to the nation and to the states. Issue Brief August 2005*. Retrieved April 8, 2010, from: http://www.all4ed.org/files/archive/publications/TeacherAttrition.pdf

Table 10b: Cost of Teacher Turnover in Selected School Districts

School District	Annual Cost of Teacher Turnover
Atlanta, Georgia	10,920,000
Baltimore, Maryland	19,013,750
Boston, Massachusetts	13,020,000
Cleveland, Ohio	12,538,750
Dallas, Texas	28,892,500
Detroit, Michigan	26,565,000
Denver, Colorado	14,988,750
Fairfax, Virginia	28,350,000
Hartford, Connecticut	4,462,500
Houston, Texas	35,043,750
Los Angeles, California	94,211,250
Louisville, Kentucky	18,208,750
Memphis, Tennessee	21,866,250
Miami, Florida	47,755,000
Nashville, Tennessee	14,393,750
New York City, New York	115,221,250
Oakland, California	12,005,000
Philadelphia, Pennsylvania	29,662,500
Pittsburgh, Pennsylvania	8,890,000
Prince Georges County, Maryland	23,292,500
Richmond, Virginia	6,072,500
San Francisco, California	11,865,000
Seattle, Washington	10,596,250
Washington, D.C.	16,598,750

SOURCE: NCTAF:
http://www.nctaf.org/resources/demonstration_projects/turnover/documents/CTTPolicyBrief6-19.pdf

Table 11a: Stayers and Leavers **Within One** Year for ALL **Non-Teaching Fellows** Cohorts 2003 - 2008

Year 1	Frequency	Percent	Cumulative Frequency	Cumulative Percent	PLSE
Quit Teaching	24138	**32.27**	24138	32.27	37.50
Still Teaching	50670	**67.73**	74808	100.00	62.50

Table 11b: Stayers and Leavers **Within One** Year for ALL **Teaching Fellows** Cohorts 2003 - 2008

Year 1	Frequency	Percent	Cumulative Frequency	Cumulative Percent	PLSE
Quit Teaching	3456	**30.44**	3456	30.44	**35.00**
Still Teaching	7897	**69.56**	11353	100.00	**65.00**

Table 11c: Stayers and Leavers **Within Two Years** for ALL **Non-Teaching Fellows** Cohorts 2003 - 2008

Year 2	Frequency	Percent	Cumulative Frequency	Cumulative Percent	PLSE
Quit Teaching	34197	45.71	34197	45.71	50.00
Still Teaching	40611	**54.29**	74808	100.00	50.00

Table 11d: Stayers and Leavers **Within Two Years** for ALL **Teaching Fellows** Cohorts 2003 - 2008

Year 2	Frequency	Percent	Cumulative Frequency	Cumulative Percent	PLSE
Quit Teaching	5235	46.11	5235	46.11	53.00
Still Teaching	6118	**53.89**	11353	100.00	47.00

Table 12: Combined Survival Analysis Models for Cohort Years 2003 - 2008

Estimates of maximum likelihood analysis, including parameter estimates, standard errors, and hazard ratios from combined survival analysis modeling of cohort years 2003 - 2008.

	1* **	**2*** **	**3*** **
N	86,152	86,152	72,473
Predictor	**Baseline**		
TF	**0.021683*** **[54]	**0.20289*** **	**0.04341** **[55]
	(0.01166)	(0.01180)	(0.01274)
	1.242* **	**1.225** **	**1.044** **
Sex			**-0.08095*** **
			(0.00986)
			0.922 **
YearStart			
2003		**-0.06444** **	**0.38121*** **
		(0.01720)	(0.01781)
		0.938 **	**1.464*** **
2004		**-0.09785*** **	**-0.27204*** **
		(0.01745)	(0.01847)
		0.907* **	**0.762*** **
2005		**0.03788** **	**-0.20328*** **
		(0.01871)	(0.02039)
		1.039 **	**0.816*** **
2006		-0.001431	**-0.16924*** **
		(0.01932)	(0.02060)
		0.986	**0.844*** **
2007		**-0.06807** **	**-0.09340*** **
		(0.01871)	(0.02045)
		0.934 **	**0.911*** **

[54] *** Significant at p <0.0001

[55] ** Significant at p<0.05

Table 12: Combined Survival Analysis Models for Cohort Years 2003 – 2008 (continued)

Estimates of maximum likelihood analysis, including parameter estimates, standard errors, and hazard ratios from combined survival analysis modeling of cohort years 2003 - 2008.

		4* **	**5*** **	**6*** **
N		71,883	71,819	68,546
Predictor				
TF		**0.03807****	**0.03820****	0.01377
		(0.01279)	(0.01322)	(0.01445)
		1.039 **	**1.039****	1.014
Sex		**-0.08316*****	**-0.08288*****	**-0.04087****
		(0.00990)	(0.00992)	(0.01057)
		0.920***	**0.920*****	**0.960****
Ethnicity				
	Asian	0.12824*****	**0.12848*****	**0.08375*****
		(0.01903)	(0.01906)	(0.01974)
		1.137***	**1.137*****	**1.087*****
	Black	**0.08431*****	**0.08492*****	**0.09950*****
		(0.04417)	(0.01165)	(0.01201)
		1.088***	**1.089*****	**1.105*****
	Hispanic	0.00834	0.00816	-0.00628
		(0.01335)	(0.01336)	(0.01395)
		1.008	1.008	0.994
Age			0.00000147728	**-0.00114****
			(0.0003637)	(0.01395)
			1.000	**0.999****
YearStart				
	2003	**0.37554 *****	**0.37465*****	**0.40356*****
		(0.01789)	(0.01808)	(0.01841)
		1.456***	**1.454*****	**1.497*****
	2004	**-0.027508*****	**-0.27596*****	**-0.28883*****
		(0.01855)	(0.01909)	(0.01945)
		0.760***	**0.759*****	**0.749*****
	2005	**-0.20424*****	**-0.20451*****	**-0.16590*****
		(0.002048)	(0.02059)	(0.02071)
		0.815***	**0.815*****	**0.847*****
	2006	**-0.17156*****	**-0.17190*****	**-0.17579*****
		(0.02069)	(0.02071)	(0.02119)
		0.842***	**0.842*****	**0.839*****
	2007	**-0.09538*****	**-0.09611*****	**-0.11357*****
		(0.02054)	(0.02055)	(0.02089)
		0.909***	**0.908*****	**0.893*****

Table 12: Combined Survival Analysis Models for Cohort Years 2003 – 2008 (continued)

	6*
Predictor	
Subject	
CB	**-0.06384*** ** (0.01551) 0.938
ESL	**0.38039*** ** (0.02701) **1.463*** **
English	**0.29497*** ** (0.01997) **1.343*** **
Foreign L.	**0.27653*** ** (0.03408) **1.319*** **
Mathematics	**0.26409*** ** (0.02028) **1.302*** **
Other	**0.17958*** ** (0.01495) **1.197*** **
Science	**0.27905*** ** (0.02336) **1.322*** **
Soc. St.	**0.08318** ** (0.02423) **1.087** **

Table 12: Combined Survival Analysis Models for Cohort Years 2003 – 2008 (continued)

		7* **	**8*** **[56]	**9*** **[57]
N		60,101	60,101	60,101
Predictor				
TF		-0.00805 (0.01554) 0.992	**0.35079*** ** (0.05603)	**0.36835*** ** (0.05690)
Sex		-0.00730 (0.01187) 0.993	-0.01138 (0.01188) 0.989	-0.00966 (0.01189) 0.990
Ethnicity				
	Asian	0.00592 (0.02211) 1.006	0.00539 (0.02211) 1.005	-0.00141 (0.02455)
	Black	**0.06812*** ** (0.01344) **1.070*** **	**0.06836*** ** (0.01344) **1.071*** **	**0.09702*** ** (0.01449)
	Hispanic	-0.02257 (0.01532) 0.978	-0.02172 (0.01532) 0.979	-0.01437 (0.01658)
Age		**-0.00197*** ** (0.0004411) **0.998*** **	**-0.00122** ** 0.0004551	**-0.00131** ** (0.0004556)
Subject				
	CB	**-0.03896** ** (0.01766) **0.962** **	**-0.03853** ** (0.01766) **0.962** **	**-0.04079** ** (0.01766) **0.960** **
	ESL	**0.29983*** ** (0.003005) **1.350*** **	**0.29791*** ** (0.03006) **1.347*** **	**0.29363*** ** (0.03007) **1.341*** **
	English	**0.20881*** ** (0.02293) **1.232*** **	**0.20470*** ** (0.02293) **1.227*** **	0.20087*** (0.02293) **1.222*** **
	Foreign L.	**0.20179*** ** (0.03732) **1.224****	**0.19152*** ** (0.03734) **1.211*** **	**0.18712*** ** (0.03735) **1.206*** **

56 Predictors without hazard ratios have interaction terms. The results of the interaction terms are extensive and not included here but are available in my technical notes, which is available upon request.

[57] See footnote #50.

Table 12: Combined Survival Analysis Models for Cohort Years 2003 – 2008 (continued)

	7* **	**8*** **	**9**
N	60,101	60,101	
Predictor			
Mathematics	**0.17552*** **	**0.17295*** **	**0.16893*** **
	(0.02322)	(0.02322)	(0.01688)
	1.192* **	**1.189*** **	**1.184*** **
Other	**0.10897*** **	**0.10340*** **	**0.10050*** **
	(0.01686)	(0.01687)	(0.01688)
	1.115* **	**1.109*** **	**1.106*** **
Science	**0.19527*** **	**0.18879*** **	**0.18321*** **
	(0.02636)	(0.02637)	(0.02639)
	1.216* **	**1.208*** **	**1.201*** **
Soc. St.	-0.02597	-0.02672	-0.02877
	(0.02750)	(0.02750)	(0.02750)
	0.974	0.974	0.972
SchoolType			
Early Childhood	**-0.17216** **	**-0.17363** **	**-0.17547** **
	(0.06601)	(0.06601)	(0.06601)
	0.842 **	**0.841** **	**0.839** **
Elementary	**-0.18648*** **	**-0.18728*** **	**-0.18758*** **
	(0.02659)	(0.02659)	(0.02659)
	0.830* **	**0.829*** **	**0.829*** **
High School	-0.03434	-0.03557	-0.03544
	(0.02555)	(0.02555)	(0.02555)
	0.966	0.965	0.965
JHS	**-0.15948*** **	**-0.15917*** **	**-0.15807*** **
	(0.02630)	(0.02630)	(0.02630)
	0.853* **	**0.853*** **	**0.854*** **
K-12	**-0.37144*** **	**-0.37235*** **	**-0.37451*** **
	(0.03702)	(0.03702)	(0.03703)
	0.690* **	**0,689*** **	**0.688*** **
K-8	**-0.18422*** **	**-0.18516*** **	**-0.18608*** **
	(0.02911)	(0.02911)	(0.02911)
	0.832* **	**0.831*** **	**0.830*** **

Table 12: Combined Survival Analysis Models for Cohort Years 2003 – 2008 (continued)

	7* **	**8**	**9**
N	60,101	60,101	60,101
Predictor			
Age*Fellow		**-0.01102*** ** (0.00167)	**-0.01035*** ** (0.00167)
Ethnicity*Fellow (Asian)			0.02557 (0.05566)
Ethnicity*Fellow (Black)			**-0.19175*** ** (0.03827)
Ethnicity*Fellow (Hispanic)			-0.05205 (0.04245)
YearStart			
2003	**0.41619*** ** (0.02012) **1.516*** **	**0.42003*** ** (0.02013) **1.522*** **	**0.41806*** ** (0.02014) **1.519*** **
2004	**-0.32147*** ** (0.02136) **0.725*** **	**-32304*** ** (0.02137) **0.724*** **	**-0.32223*** ** (0.02230) **0.725*** **
2005	**-0.16730*** ** (0.02229) **0.846*** **	**-0.16398*** ** (0.02230) **0.849*** **	**-0.16470*** ** (0.02230) **0.848*** **
2006	**-0.16793*** ** (0.02270) **0.845*** **	**-0.16494*** ** (0.02270) **0.848*** **	**-0.16500*** ** (0.02271) **0.848*** **
2007	**-0.07145** ** (0.02228) **0.931** **	**-0.06880** ** (0.02229) **0.934** **	**-0.06891** ** (0.02229) **0.933** **

Table 13: Cohort 2003: Survival Analysis Models

Estimates of maximum likelihood analysis, including parameter estimates, standard errors, and hazard ratios from survival analysis modeling of cohort 2003.

	1* **	**2*** **	**3*** **
N	27,006	19,400	19,311
Predictor	**Baseline**		
TF	**0.36619**	**-0.09974**	**-0.10482**
	(0.02334)	(0.02381)	(0.02385)
	1.442	0.905	0.900
Sex		-0.21006	-0.21070
		(0.01692)	(0.01697)
		0.811	0.810
Ethnicity			
Asian			**0.21713**
			(0.03431)
			1.243
Black			**0.06014**
			(0.01916)
			1.062
Hispanic			**-0.03629**
			(0.02287)
			0.964

Table 13 - Cohort 2003: Survival Analysis Models (continued)

		4* **	**5*** **	**6*** **
N		19,278	18,057	14,590
TF		-0.08635	**-0.09357**	-0.08616
		(0.02468)	(0.02749)	(0.02972)
		0.917	0.911	0.917
Sex		-0.20702	-0.08701	0.00543
		(0.01704)	(0.01811)	(0.02104)
		0.813	0.917	1.005
Ethnicity				
	Asian	**0.21973**	**0.12524**	0.05711
		(0.03432)	(0.03577)	(0.04090)
		1.246	1.133	1.059
	Black	**0.05529**	**0.04080**	**0.05722**
		(0.01927)	(0.01989)	(0.02295)
		1.057	1.042	1.059
	Hispanic	**-0.03714**	**-0.06898**	-0.05151
		(0.02290)	(0.02404)	(0.02725)
		0.964	0.933	0.950
AgeThen		0.00191	**-0.0003712**	**-0.00425**
		(0.0006419)	(0.0007079)	(0.0008040)
		1.002	1.000	0.996
Subject				
	CB		**-0.24522**	-0.10952
			(0.02928)	(0.03431)
			0.783	0.896
	ESL		**0.36769**	**0.34464**
			(0.05619)	(0.06306)
			1.444	1.411
	English		0.47025	0.26314
			(0.03636)	(0.04286)
			1.600	1.301
	Foreign L.		0.67400	0.36102
			(0.06401)	(0.07160)
			1.962	1.435
	Mathematics		0.51788	0.36226
			(0.03709)	(0.04321)
			1.678	1.437

Table 13 - Cohort 2003: Survival Analysis Models (continued)

	4***	5***	6***
Predictor			
	Other	0.25114 (0.02720) 1.285	0.17413 (0.03191) 1.190
	Science	**0.53197** (0.04297) 1.702	**0.26011** (0.04949) 1.297
	Soc. St.	0.39666 (0.04314) 1.487	0.13254 (0.05030) 1.142
SchoolType			
	Early Childhood		-0.55089 (0.11380) 0.576
	Elementary		-0.69327 (0.05160) 0.500
	High School		0.22697 (0.04965) 1.255
	JHS		-0.74573 (0.05127) 0.474
	K-12		-0.90994 (0.07225) 0.403
	K-8		-0.72213 (0.05668) 0.486

Table 13 - Cohort 2003: Survival Analysis Models (continued)

		7* **	**8*** **	**9*** **
N		14,590	14,590	14,590
Predictor				
TF		**0.31139** (0.10662)	**0.33353** (0.10818)	0.17652 (0.13193)
Sex		0.00256 (0.02105) 1.003	0.00367 (0.02105) 1.004	0.00422 (0.02107) 1.004
Ethnicity				
	Asian	0.05378 (0.04091) 1.055	0.04392 (0.04502)	0.03791 (0.04511)
	Black	**0.05625** (0.02295) 1.058	**0.07792** (0.02410)	**0.07772** (0.02411)
	Hispanic	-0.05003 (0.02726) 0.951	**-0.04391** (0.02864)	**-0.04392** (0.02866)
Age		**-0.00336** (0.0008360)	**-0.00342** (0.0008368)	**-0.00358** (0.0008398)
Subject				
	CB	-0.11065 (0.03428) 0.895	-0.11066 (0.03429) 0.895	**-0.14739** (0.03717)
	ESL	**0.34089** (0.06305) 1.406	**0.34189** (0.06308) 1.408	**0.34069** (0.06738)
	English	0.25721 (0.04286) 1.293	0.25308 (0.04290) 1.288	0.22416 (0.04719)
	Foreign L.	0.35481 (0.07160) 1.426	0.35111 (0.07164) 1.421	0.32707 (0.07389)
	Mathematics	0.35817 (0.04323) 1.431	0.35413 (0.04327) 1.425	0.35716 (0.04913)

Table 13 - Cohort 2003: Survival Analysis Models (continued)

	7	8	9
Other	0.16644 (0.03194) 1.181	0.16450 (0.03195) 1.179	0.13657 (0.03411)
Science	**0.25400** (0.0.04950) 1.289	**0.24919** (0.04953) 1.283	0.22466 (0.05321)
Soc. St.	0.12854 (0.05030) 1.137	0.12654 (0.05030) 1.135	0.07801 (0.05405)
SchoolType			
Early Childhood	-0.54976 (0.11380) 0.577	-0.55123 (0.11384) 0.576	-0.54747 (0.11388) 0.578
Elementary	-0.69424 (0.05161) 0.499	-0.69394 (0.05161) 0.500	-0.69087 (0.05164) 0.501
High School	0.22706 (0.04965) 1.255	0.22854 (0.04965) 1.257	0.23453 (0.04974) 1.264
JHS	-0.74459 (0.05127) 0.475	-0.74212 (0.05128) 0.476	-0.73391 (0.05135) 0.480
K-12	-0.90792 (0.07227) 0.403	-0.91014 (0.07229) 0.402	-0.90404 (0.07233) 0.405
K-8	-0.72392 (0.05669) 0.485	-0.72342 (0.05670) 0.485	-0.71775 (0.05675) 0.488
Age*Fellow	-0.01157 (0.00302)	-0.01108 (0.00301)	-0.00997 (0.00307)
Ethnicity*Fellow (Asian)		0.04949 (0.10721)	0.06956 (0.10780)

Table 13 - Cohort 2003: Survival Analysis Models (continued)

7	8	9
Ethnicity*Fellow (Black)	-0.22344 (0.07948)	-0.23311 (0.07996)
Ethnicity*Fellow (Hispanic)	-0.05468 (0.09209)	-0.07380 (0.09332)
Subject*Fellow (CB)		**0.22122** (0.08614)
Subject*Fellow (ESL)		-0.07706 (0.19340)
Subject*Fellow (English)		**0.13219** (0.10391)
Subject*Fellow (Foreign Language)		**0.07563** (0.33063)
Subject*Fellow (Mathematics)		0.01682 (0.09592)
Subject*Fellow (Other)		0.25901 (0.12020)
Subject*Fellow (Science)		0.10724 (0.13749)
Subject*Fellow (Social Studies)		0.32650 (0.14167)

Table 14: Cohort 2004: Survival Analysis Models

Estimates of maximum likelihood analysis, including parameter estimates, standard errors, and hazard ratios from survival analysis modeling of cohort 2004.

	1* **	**2*** **	**3*** **
N	20,110	18,290	18,139
Predictor	**Baseline**		
TF	**0.32131** (0.02673) 1.379	**0.22669** (0.03107) 1.254	**0.21676** (0.03127) 1.242
Sex		0.07561 (0.01860) 1.079	0.07076 (0.01868) 1.073
Ethnicity			
Asian			**0.07622** (0.03782) 1.079
Black			**0.12843** (0.02336) 1.137
Hispanic			**0.05242** (0.02804) 1.054

Table 14 - Cohort 2004: Survival Analysis Models (continued)

		4* **	**5*** **	**6*** **
N		18,125	17,274	14,926
TF		0.04139	**0.02788**	0.00788
		(0.03297)	(0.03602)	(0.03870)
		1.042	1.028	1.008
Sex		0.04403	0.04938	0.03952
		(0.01878)	(0.02031)	(0.02303)
		1.045	1.051	1.040
Ethnicity				
	Asian	**0.03535**	**0.01673**	-0.08349
		(0.03793)	(0.03998)	(0.04531)
		1.036	1.017	0.920
	Black	**0.15097**	**0.17060**	**0.09489**
		(0.02341)	(0.02404)	(0.02738)
		1.163	1.186	1.100
	Hispanic	**0.03297**	**0.03553**	-0.01490
		(0.02807)	(0.02950)	(0.03251)
		1.034	1.036	0.985
Age		-0.01178	**-0.01172**	**-0.01113**
		(0.0007234)	(0.0007846)	(0.0008679)
		0.988	0.988	0.989
Subject				
	CB		**-0.02946**	-0.17115
			(0.03198)	(0.03825)
			0.971	0.843
	ESL		**0.10984**	**0.05993**
			(0.06013)	(0.06718)
			1.116	1.062
	English		0.18579	0.19062
			(0.03938)	(0.04611)
			1.204	1.210
	Foreign L.		-0.01827	0.03333
			(0.06392)	(0.07128)
			0.982	1.034
	Mathematics		0.11988	0.13978
			(0.04028)	(0.04703)
			1.127	1.150

Table 14 - Cohort 2004: Survival Analysis Models (continued)

	4***	5***	6***
Predictor			
	Other	0.10474 (0.02957) 1.110	0.04854 (0.03446) 1.050
	Science	**0.09725** (0.04638) 1.102	**0.11122** (0.05372) 1.118
	Soc. St.	-0.17446 (0.04640) 0.840	-0.20662 (0.05439) 0.813
School Type			
	Early Childhood		0.06812 (0.16388) 1.070
	Elementary		0.00481 (0.05845) 1.005
	High School		-0.27793 (0.05523) 0.757
	JHS		-0.0007393 (0.05890) 0.999
	K-12		-0.30955 (0.07684) 0.734
	K-8		0.05939 (0.06457) 1.061

Table 14 - Cohort 2004: Survival Analysis Models (continued)

		7***	**8*****	**9*****
N		14,926	14,926	14,926
Predictor				
TF		**-0.09560** (0.15319)	**-0.06489** (0.15529)	-0.19209 (0.16919)
Sex		0.04009 (0.0305) 1.041	0.04142 (0.02306) 1.042	0.04126 (0.02308) 1.042
Ethnicity				
	Asian	-0.08386 (0.04531) 0.920	-0.11242 (0.04817)	-0.11488 (0.04831)
	Black	**0.09477** (0.02738) 1.099	**0.11351** (0.02873)	**0.11197** (0.02873)
	Hispanic	-0.01484 (0.03251) 0.985	**0.0007218** (0.03421)	**0.00350** (0.03422)
Age		**-0.01125** (0.0008840)	**-0.01131** (0.0008848)	**-0.01137** (0.0008864)
Subject				
	CB	-0.17124 (0.03826) 0.843	-0.17421 (0.03826) 0.840	**-0.19555** (0.04058)
	ESL	**0.05977** (0.06717) 1.062	**0.05983** (0.06716) 1.062	**0.0001646** (0.07310)
	English	0.19144 (0.04612) 1.211	0.18964 (0.04612) 1.209	0.15526 (0.05037)
	Foreign L.	0.03404 (0.07129) 1.035	0.03060 (0.07132) 1.031	-0.02320 (0.07451)
	Mathematics	0.13971 (0.04703) 1.150	0.13657 (0.04705) 1.146	0.15498 (0.05209)

Table 14 - Cohort 2004: Survival Analysis Models (continued)

	7	8	9
Other	0.04916 (0.03447) 1.050	0.04643 (0.03447) 1.048	0.02559 (0.03646)
Science	**0.11167** (0.05372) 1.118	**0.10791** (0.05373) 1.114	0.07626 (0.05743)
Soc. St.	-0.20639 (0.05439) 0.814	-0.20652 (0.05440) 0.813	-0.23143 (0.05641)
School Type			
Early Childhood	0.06931 (0.16389) 1.072	0.07692 (0.16395) 1.080	0.08489 (0.16407) 1.089
Elementary	0.00473 (0.05845) 1.005	0.00408 (0.05846) 1.004	0.00953 (0.05853) 1.010
High School	-0.27749 (0.05523) 0.758	-0.27871 (0.05524) 0.757	-0.27134 (0.05532) 0.762
JHS	-0.00140 (0.05891) 0.999	-0.00233 (0.05891) 0.998	0.00759 (0.05900) 1.008
K-12	-0.30987 (0.07685) 0.734	-0.31092 (0.07684) 0.733	-0.30647 (0.07691) 0.736
K-8	0.05932 (0.06457) 1.061	0.05807 (0.06458) 1.060	0.06355 (0.06467) 1.066
Age*Fellow	0.00304 (0.00435)	0.00332 (0.00434)	0.00458 (0.00437)
Ethnicity*Fellow (Asian)		0.26326 (0.13947)	0.25998 (0.14047)

Table 14 - Cohort 2004: Survival Analysis Models (continued)

7	8	9
Ethnicity*Fellow (Black)	-0.19018 (0.09365)	-0.18299 (0.09425)
Ethnicity*Fellow (Hispanic)	-0.15677 (0.10751)	-0.20572 (0.11205)
Subject*Fellow (CB)		**0.13588** (0.11255)
Subject*Fellow (ESL)		0.38890 (0.18109)
Subject*Fellow (English)		**0.17956** (0.11471)
Subject*Fellow (Foreign Language)		**0.70605** (0.25592)
Subject*Fellow (Mathematics)		-0.09865 (0.11068)
Subject*Fellow (Other)		0.21656 (0.16957)
Subject*Fellow (Science)		0.19776 (0.15473)
Subject*Fellow (Social Studies)		0.22617 (0.25621)

Table 15: Cohort 2005: Survival Analysis Models

Estimates of maximum likelihood analysis, including parameter estimates, standard errors, and hazard ratios from survival analysis modeling of cohort 2005.

	1* **	**2*** **	**3*** **
N	11,263	8,952	8,855
Predictor	**Baseline**		
TF	**0.21134*** **	**0.21308*** **	**0.19920*** **
	(0.02779)	(0.03356)	(0.03376)
	1.235	1.237	1.220
Sex		-0.01341	-0.02308
		(0.03010)	(0.03024)
		0.987	0.977
Ethnicity			
Asian			**0.28155*** **
			(0.05410)
			1.325
Black			**0.13667*** **
			(0.03418)
			1.146
Hispanic			**0.10182** **
			(0.03865)
			1.107

Table 15 - Cohort 2005: Survival Analysis Models (continued)

		4* **	**5*** **	**6*** **
N		8,852	8,734	7,913
TF		**0.11342****	0.04802	0.10346
		(0.03489)	(0.03932)	(0.04217)
		1.120	1.049	1.109
Sex		-0.02906	-0.02040	0.01807
		(0.03023)	(0.03150)	(0.03498)
		0.971	0.980	1.018
Ethnicity				
	Asian	**0.23711*****	**0.20621****	0.06015
		(0.05428)	(0.05485)	(0.06346)
		1.268	1.229	1.062
	Black	**0.16874*****	**0.18723*****	**0.15463*****
		(0.03438)	(0.03477)	(0.03793)
		1.184	1.206	1.167
	Hispanic	**0.10643****	**0.10915****	0.07365
		(0.03866)	(0.03970)	(0.04293)
		1.112	1.115	1.076
Age		**-0.00975*****	**-0.01147*****	**-0.01222*****
		(0.00107)	(0.00111)	(0.00120)
		0.990	0.989	0.988
Subject				
	CB		**-0.11818****	-0.07392
			(0.04143)	(0.04645)
			0.889	0.929
	ESL		**0.45760*****	**0.44632*****
			(0.07030)	(0.07726)
			1.580	1.563
	English		-0.01134	-0.01544
			(0.05927)	(0.06660)
			0.989	0.985
	Foreign L.		0.05917	0.15598
			(0.10159)	(0.10820)
			1.061	1.169
	Mathematics		0.01891	-0.02916
			(0.05709)	(0.06468)
			1.019	0.971

Table 15 - Cohort 2005: Survival Analysis Models (continued)

	4***	5***	6***
Predictor			
	Other	-0.01086 (0.04257) 0.989	-0.01005 (0.04650) 0.971
	Science	**0.28644***** (0.06880) 1.332	**0.22465***** (0.07987) 1.252
	Soc. St.	-0.13755 (0.07406) 0.871	-0.11229 (0.08244) 0.894
SchoolType			
	Early Childhood		-0.27870 (0.21459) 0.757
	Elementary		-0.02779 (0.07058) 0.973
	High School		-0.07165 (0.06970) 0.931
	JHS		0.03901 (0.06932) 1.040
	K-12		0.05063 (0.09392) 1.052
	K-8		0.00343 (0.07672) 1.003

Table 15 - Cohort 2005: Survival Analysis Models (continued)

		7* **	**8*** **	**9*** **
N		7,913	7,913	7,913
Predictor				
TF		**0.34047****	**0.36598****	0.22069
		(0.15042)	(0.15345)	(0.16644)
Sex		0.01301	0.01387	0.01207
		(0.03509)	(0.03512)	(0.03517)
		1.013	1.014	1.012
Ethnicity				
	Asian	0.05778	0.05713	0.04610
		(0.06348)	(0.07142)	(0.07171)
		1.059		
	Black	**0.15521*****	**0.17543*****	**0.17570*****
		(0.03793)	(0.04212)	(0.04213)
		1.168		
	Hispanic	0.07342	**0.09853****	**0.10660****
		(0.04292)	(0.04778)	(0.04213)
		1.076		
Age		**-0.01165*****	**-0.01175*****	**-0.01190*****
		(0.00125)	(0.00125)	(0.00126)
Subject				
	CB	-0.07391	-0.07591	**-0.11765****
		(0.04644)	(0.04646)	(0.05162)
		0.929	0.927	
	ESL	**0.44914*****	**0.44465*****	**0.52233*****
		(0.07728)	(0.07734)	(0.09508)
		1.567	1.560	
	English	-0.01811	-0.02158	-0.12586
		(0.06661)	(0.06664)	(0.08156)
		0.982	0.979	
	Foreign L.	0.14976	0.14288	-0.02125
		(0.10825)	(0.10840)	(0.12671)
		1.162	1.154	
	Mathematics	-0.03052	-0.03557	0.00746
		(0.06469)	(0.06479)	(0.08977)
		0.970	0.965	

Table 15 - Cohort 2005: Survival Analysis Models (continued)

	7	8	9
Other	-0.01309 (0.04652) 0.987	-0.01461 (0.04654) 0.985	-0.05286 (0.05178)
Science	**0.22126***** (0.07989) 1.248	**0.21718**** (0.07997) 1.243	0.15718 (0.09601)
Soc. St.	-0.11377 (0.08243) 0.892	-0.11322 (0.08244) 0.893	-0.16287 (0.08765)
School Type			
Early Childhood	-0.28145 (0.21459) 0.755	-0.28193 (0.21460) 0.754	-0.30262 (0.21473)
Elementary	-0.03062 (0.07062) 0.970	-0.02823 (0.07065) 0.972	-0.03852 (0.07088)
High School	-0.07224 (0.06970) 0.930	-0.07218 (0.06971) 0.930	-0.07672 (0.06975)
JHS	0.03595 (0.06935) 1.037	0.03883 (0.06940) 1.040	0.03543 (0.06956)
K-12	0.04682 (0.09397) 1.048	0.04843 (0.09398) 1.050	0.04258 (0.09411)
K-8	0.00126 (0.07674) 1.001	0.00217 (0.07675) 1.002	-0.00610 (0.07696)
Age*Fellow	-0.00728 (0.00446)	-0.00692 (0.00448)	-0.00504 (0.00450)
Ethnicity*Fellow (Asian)		-0.00170 (0.15433)	0.03878 (0.15508)

Table 15 - Cohort 2005: Survival Analysis Models (continued)

7	8	9
Ethnicity*Fellow (Black)	-0.10607 (0.09561)	-0.11106 (0.09631)
Ethnicity*Fellow (Hispanic)	-0.12723 (0.10624)	-0.15260 (0.11037)
Subject*Fellow (CB)		**0.27992**** (0.13362)
Subject*Fellow (ESL)		-0.22932 (0.16209)
Subject*Fellow (English)		**0.29973**** (0.13292)
Subject*Fellow (Foreign Language)		**0.67346**** (0.23601)
Subject*Fellow (Mathematics)		-0.06474 (0.12381)
Subject*Fellow (Other)		0.17677 (0.17560)
Subject*Fellow (Science)		0.16046 (0.16515)
Subject*Fellow (Social Studies)		0.28753 (0.31769)

Table 16: Cohort 2006: Survival Analysis Models

Estimates of maximum likelihood analysis, including parameter estimates, standard errors, and hazard ratios from survival analysis modeling of cohort 2006.

	1	**2**	**3**
N	10,041	8,796	8,714
Predictor	**Baseline**		
TF	**0.22623***** (0.02999) 1.254	**0.23760***** (0.03324) 1.268	**0.23379***** (0.03349) 1.263
Sex		-0.01250 (0.03137) 0.988	-0.00452 (0.03156) 0.995
Ethnicity			
Asian			**0.13183**** (0.05564) 1.141
Black			0.06077 (0.03662) 1.063
Hispanic			**0.08874**** (0.03949) 1.093

Table 16 - Cohort 2006: Survival Analysis Models (continued)

	4	**5*** **	**6**
N	8,712	8,080	7,455
Predictor			
TF	**0.20340*** **	**0.16689*** **	**0.15686** **
	(0.03440)	(0.03847)	(0.04088)
	1.226	1.182	1.170
Sex	-0.00605	-0.01804	0.02145
	(0.03155)	(0.03397)	(0.03698)
	0.994	0.982	1.022
Ethnicity			
Asian	**0.12108** **	0.07341	-0.03580
	(0.05571)	(0.05753)	(0.06438)
	1.129	1.076	0.965
Black	**0.07260** **	**0.09045** **	**0.07710** *
	(0.03677)	(0.03945)	(0.04221)
	1.075	1.095	1.080
Hispanic	**0.08857** **	**0.09476** **	**0.07770** *
	(0.03948)	(0.04189)	(0.04491)
	1.093	1.099	1.081
AgeThen	**-0.00415*** **	0.00103	-0.000273
	(0.00111)	(0.00132)	(0.00144)
	0.996	1.001	1.000
Subject			
CB		0.03148	0.03007
		(0.04591)	(0.05009)
		1.032	1.031
ESL		**0.48739*** **	**0.38127*** **
		(0.06889)	(0.07793)
		1.628	1.464
English		**0.12928** **	**-0.12466** *
		(0.05949)	(0.06679)
		1.138	1.133
Foreign L.		-0.03388	-0.00881
		(0.12106)	(0.12934)
		0.967	0.991
Mathematics		0.05495	0.01306
		(0.05996)	(0.06757)
		1.056	1.013

Table 16 - Cohort 2006: Survival Analysis Models (continued)

	4	**5*** **	**6*** **
N	8,712	8,080	7,455
Predictor			
Other		-0.01061 (0.04717) 0.989	-0.03859 (0.05118) 0.962
Science		0.12230 (0.07022) 1.130	**0.17395**** (0.07738) 1.190
Soc. St.		-0.01318 (0.07621) 0.987	-0.00714 (0.08403) 1.007
SchoolType			
Early Childhood			0.02876 (0.17348) 1.029
Elementary			-0.02425 (0.07123) 0.976
High School			-0.06519 (0.06901) 0.937
JHS			**0.11992*** (0.06906) 1.127
K-12			-0.08942 (0.010777) 0.914
K-8			0.05815 (0.07735) 1.060

Table 16 - Cohort 2006: Survival Analysis Models (continued)

	7* **	**8*** **	**9*** **
N	7,455	7,455	7,455
Predictor			
TF	**0.67354*** ** (0.15203)	**0.69891*** ** (0.15326)	**0.61692** ** (0.16627)
Sex	0.01288 (0.03702) 1.013	0.01261 (0.03705) 1.013	0.01267 (0.03713) 1.013
Ethnicity			
Asian	-0.03511 (0.06439) 0.965	-0.03359 (0.07634)	-0.04193 (0.07665)
Black	**0.07945*** (0.04219) 1.083	**0.15133** ** (0.04807)	**0.15104** ** (0.04810)
Hispanic	**0.08115*** (0.04491) 1.085	**0.09659*** (0.05073)	**0.09237*** (0.05098)
Age	0.00156 (0.00152) 1.001	0.00138 (0.00153)	0.00123 (0.00153)
Subject			
CB	0.02956 (0.05004) 1.030	0.02519 (0.05007) 1.026	-0.01255 (0.05730)
ESL	**0.37393*** ** (0.07795) 1.453	**0.36099*** ** (0.07808) 1.435	**0.44626*** ** (0.10036)
English	**0.11110*** (0.06688) 1.118	0.10168 (0.06690) 1.107	0.06028 (0.08057)

Table 16 - Cohort 2006: Survival Analysis Models (continued)

		7* **	**8*** **	**9*** **
N		7,455	7,455	7,455
	Foreign L.	-0.03453	-0.04667	-0.15776
		(0.12947)	(0.12950)	(0.16574)
		0.966	0.954	
	Mathematics	0.00279	-0.00175	-0.04851
		(0.06767)	(0.06777)	(0.09151)
		1.003	0.998	
	Other	-0.05865	-0.06313	-0.09422
		(0.05148)	(0.05159)	(0.05875)
		0.943	0.939	
	Science	**0.15928****	**0.15648****	0.13092
		(0.07750)	(0.07758)	(0.09941)
		1.173	1.169	
	Soc. St.	0.00103	-0.00318	-0.05225
		(0.08405)	(0.08411)	(0.09134)
		1.001	0.997	
SchoolType				
	Early Chld	0.00867	0.00341	-0.00501
		(0.17358)	(0.17358)	(0.17366)
		1.009	1.003	0.995
	Elementary	-0.02801	-0.03101	-0.03767
		(0.07128)	(0.07136)	(0.07171)
		0.972	0.969	0.963
	High School	-0.05828	-0.06201	-0.05600
		(0.06902)	(0.06904)	(0.06911)
		0.943	0.940	0.946
	JHS	**0.11842***	**0.11567***	**0.11545***
		(0.06907)	(0.06911)	(0.06917)
		1.126	1.123	1.122

Table 16 - Cohort 2006: Survival Analysis Models (continued)

	7* **	**8*** **	**9*** **
N	7,455	7,455	7,455
K-12	-0.09847 (0.10787) 0.906	-0.10063 (0.10789) 0.904	-0.10457 (0.10795) 0.901
K-8	0.05408 (0.07741) 1.056	0.04967 (0.07746) 1.051	-0.04930 (0.07760) 1.051
Age*Fellow	**-0.01663** (0.00477)	**-0.01548**** (0.00477)	**-0.01471**** (0.00478)
Ethnicity*Fellow (Asian)		-0.02394 (0.14013)	0.00633 (0.14199)
Ethnicity*Fellow (Black)		**-0.28641**** (0.09859)	**-0.29040**** (0.09928)
Ethnicity*Fellow (Hispanic)		-0.07387 (0.10761)	-0.10258 (0.11533)
Subject*Fellow (CB)			**0.21824*** (0.12761)
Subject*Fellow (ESL)			-0.21663 (0.15853)
Subject*Fellow (English)			0.09234 (0.13731)
Subject*Fellow (Foreign Language)			0.28136 (0.25913)

Table 16 - Cohort 2006: Survival Analysis Models (continued)

	7* **	**8*** **	**9*** **
N	7,455	7,455	7,455
Subject*Fellow (Mathematics)			0.08780 (0.12658)
Subject*Fellow (Other)			0.15269 (0.18852)
Subject*Fellow (Science)			0.03899 (0.14882)
Subject*Fellow (Social Studies)			0.30664 (0.28573)

Table 17: Cohort 2007: Survival Analysis Models

Estimates of maximum likelihood analysis, including parameter estimates, standard errors, and hazard ratios from survival analysis modeling of cohort 2007.

	1	**2**	**3**
N	10,012	9,631	9,531
Predictor	**Baseline**		
TF	0.01735 (0.03253) 1.017	0.01991 (0.03351) 1.020	0.01122 (0.03382) 1.011
Sex		-0.05577 (0.03060) 0.946	-0.05828 (0.03075) 0.943
Ethnicity			
Asian			0.08915 (0.05479) 1.093
Black			0.04670 (0.03667) 1.048
Hispanic			0.04379 (0.03860) 1.045

Table 17 - Cohort 2007: Survival Analysis Models (Continued)

		4**	**5*****	**6*****
N		9,527	9,076	8,473
TF		-0.00604	-0.00771	-0.00817
		(0.03456)	(0.03885)	(0.04081)
		0.994	0.992	0.992
Sex		-0.05887	-0.05863	-0.02513
		(0.03077)	(0.03287)	(0.03533)
		0.943	0.943	0.975
Ethnicity				
	Asian	0.07973	0.05358	0.05823
		(0.05493)	(0.05689)	(0.05992)
		1.083	1.055	1.060
	Black	0.05499	0.05009	0.02151
		(0.03681)	(0.03837)	(0.04109)
		1.057	1.051	1.022
	Hispanic	0.04546	0.02939	0.02003
		(0.03860)	(0.04040)	(0.04279)
		1.047	1.030	1.020
Age		**-0.00268****	**0.00309****	0.00212
		(0.00110)	(0.00128)	(0.00141)
		0.997	1.003	1.002
Subject				
	CB		**0.15478****	**0.18409****
			(0.04555)	(0.04961)
			1.167	1.202
	ESL		**0.44960*****	**0.35816*****
			(0.07031)	(0.07625)
			1.568	1.431
	English		**0.18596****	0.10667
			(0.05840)	(0.06458)
			1.204	1.113
	Foreign L.		**0.43725*****	**0.36559****
			(0.09338)	(0.09999)
			1.548	1.441
	Mathematics		**0.17731****	0.03698
			(0.05928)	(0.06622)
			1.194	1.038

Table 17 - Cohort 2007: Survival Analysis Models (Continued)

	4***	5***	6***
Predictor			
	Other	0.07444 (0.04664) 1.077	0.01043 (0.05045) 1.010
	Science	**0.16119**** (0.06699) 1.175	0.11135 (0.07254) 1.118
	Soc. St.	0.10030 (0.07303) 1.106	0.05935 (0.07888) 1.061
SchoolType			
	Early Childhood		-0.22412 (0.18180) 0.799
	Elementary		**-0.23683**** (0.07092) 0.789
	High School		**-0.18929**** (0.06824) 0.828
	JHS		-0.02802 (0.06874) 0.972
	K-12		**-0.35485**** (0.10380) 0.701
	K-8		**-0.15982**** (0.07630) 0.852

Table 17 - Cohort 2007: Survival Analysis Models (Continued)

		7* **	**8*** **	**9*** **
N		8,473	8,473	8,473
Predictor				
TF		**0.49534****	**0.54164****	**0.61677****
		(0.14709)	(0.14848)	(0.16325)
Sex		-0.03651	-0.03326	-0.03535
		(0.03542)	(0.03545)	(0.03545)
		0.964	0.967	0.965
Ethnicity				
	Asian	0.05609	0.10677	0.08730
		(0.05994)	(0.06847)	(0.06886)
		1.058		
	Black	0.02269	0.06733	0.06702
		(0.04108)	(0.04634)	(0.04637)
		1.023		
	Hispanic	0.02466	0.04851	0.04612
		(0.04279)	(0.04839)	(0.04859)
		1.025		
Age		**0.00393****	**0.00380****	**0.00380****
		(0.00149)	(0.00149)	(0.00149)
Subject				
	CB	**0.18198****	**0.18144****	**0.19037****
		(0.04956)	(0.04970)	(0.05609)
		1.200	1.199	
	ESL	**0.35426*****	**0.34684*****	**0.39632*****
		(0.07627)	(0.07645)	(0.09844)
		1.425	1.415	
	English	0.09175	0.06469	0.09086
		(0.06469)	(0.06469)	(0.07861)
		1.096	1.095	
	Foreign L.	**0.33355****	**0.32710****	**0.37696****
		(0.10033)	(0.10038)	(0.12470)
		1.396	1.387	
	Mathematics	0.02462	0.02508	0.13976
		(0.06633)	(0.06641)	(0.08716)
		1.025	1.025	

Table 17 - Cohort 2007: Survival Analysis Models (Continued)

	7	8	9
Other	-0.00928 (0.05074) 0.991	-0.00812 (0.05084) 0.992	0.00784 (0.05775)
Science	0.09548 (0.07269) 1.100	0.09242 (0.07285) 1.097	**0.16936*** (0.09681)
Soc. St.	0.04990 (0.07892) 1.051	0.05416 (0.07899) 1.056	0.07095 (0.08401)
SchoolType			
Early Childhood	-0.22762 (0.18179) 0.796	-0.22967 (0.18184) 0.795	-0.22501 (0.18203) 0.799
Elementary	**-0.24321**** (0.07092) 0.784	**-0.24051**** (0.07094) 0.786	**-0.23657**** (0.07134) 0.789
High School	**-0.18642**** (0.06824) 0.830	**-0.18633**** (0.06826) 0.830	**-0.18603**** (0.06834) 0.830
JHS	-0.03264 (0.06875) 0.968	-0.02988 (0.06876) 0.971	-0.02681 (0.06890) 0.974
K-12	**-0.37223**** (0.10394) 0.689	**-0.37528**** (0.10407) 0.687	**-0.37337**** (0.10419) 0.688
K-8	-0.16462 (0.07630) 0.848	**-0.16299**** (0.07632) 0.850	**-0.16065**** (0.07655) 0.852
Age*Fellow	**-0.01645**** (0.00467)	**-0.01564**** (0.00469)	**-0.01641**** (0.00474)
Ethnicity*Fellow (Asian)		-0.21167 (0.13789)	-0.16533 (0.13982)

Table 17 - Cohort 2007: Survival Analysis Models (Continued)

7	8	9
Ethnicity*Fellow (Black)	-0.20340 (0.09854)	**-0.20597**** (0.09915)
Ethnicity*Fellow (Hispanic)	-0.11653 (0.10241)	-0.15609 (0.10844)
Subject*Fellow (CB)		**0.16564** (0.14142)
Subject*Fellow (ESL)		-0.12230 (0.15454)
Subject*Fellow (English)		**0.02446** (0.13176)
Subject*Fellow (Foreign Language)		**-0.12988** (0.20489)
Subject*Fellow (Mathematics)		**-0.25687**** (0.12720)
Subject*Fellow (Other)		0.08424 (0.18901)
Subject*Fellow (Science)		-0.17042 (0.13925)
Subject*Fellow (Social Studies)		**3.12546**** (1.01759)

Table 18: Cohort 2008: Survival Analysis Models

Estimates of maximum likelihood analysis, including parameter estimates, standard errors, and hazard ratios from survival analysis modeling of cohort 2008.

	1*	**2****	**3****
N	7,720	7,404	7,333
Predictor	**Baseline**		
TF	**0.07494**	**0.07277**	**0.07817**
	(0.03866)	(0.04005)	(0.04021)
	1.078	1.075	1.081
Sex		-0.09849	-0.09712
		(0.03715)	(0.03736)
		0.906	0.907
Ethnicity			
Asian			**0.04480**
			(0.06872)
			1.046
Black			**0.00944**
			(0.04417)
			1.009
Hispanic			**-0.08272**
			(0.04777)
			0.921

Table 18 - Cohort 2008: Survival Analysis Models (continued)

		4**	**5*****	**6*****
N		7,325	7,325	6,744
TF		0.10798	**0.13555**	0.00285
		(0.04126)	(0.04604)	(0.05109)
		1.114	1.145	1.003
Sex		-0.09366	-0.11485	-0.12233
		(0.03741)	(0.03864)	(0.04243)
		0.911	0.892	0.885
Ethnicity				
	Asian	**0.05802**	**0.03488**	0.05311
		(0.06881)	(0.06912)	(0.07404)
		1.060	1.036	1.055
	Black	**-0.00530**	**0.02051**	**0.01408**
		(0.04438)	(0.04461)	(0.04821)
		0.995	1.021	1.014
	Hispanic	**-0.09251**	**-0.09221**	-0.09328
		(0.04790)	(0.04878)	(0.05250)
		0.912	0.912	0.911
AgeThen		0.00427	**0.00454**	**0.00429**
		(0.00127)	(0.00128)	(0.00138)
		1.004	1.005	1.004
Subject				
	CB		**0.27872**	0.21518
			(0.04936)	(0.05410)
			1.321	1.240
	ESL		**0.55882**	**0.51373**
			(0.08061)	(0.08989)
			1.749	1.672
	English		0.23428	0.14401
			(0.06978)	(0.08079)
			1.264	1.155
	Foreign L.		0.27805	0.33572
			(0.10801)	(0.11706)
			1.321	1.399
	Mathematics		0.18424	0.02867
			(0.07265)	(0.08594)
			1.202	1.029

Table 18 - Cohort 2008: Survival Analysis Models (continued)

	4**	5***	6***
Predictor			
	Other	0.08305 (0.05203) 1.087	-0.03990 (0.05653) 0.961
	Science	**0.07055** (0.07753) 1.073	**0.18334** (0.08384) 1.201
	Soc. St.	0.08974 (0.08484) 1.094	0.10567 (0.09271) 1.111
SchoolType			
	Early Childhood		0.01061 (0.19192) 1.011
	Elementary		0.13927 (0.08502) 1.149
	High School		-0.06032 (0.08400) 0.941
	JHS		0.14086 (0.08290) 1.151
	K-12		-0.08830 (0.12053) 0.915
	K-8		0.05601 (0.09332) 1.058

Table 18 - Cohort 2008: Survival Analysis Models (continued)

		7* **	**8*** **	**9*** **
N		6,744	6,744	7,913
Predictor				
TF		**0.19797** (0.17835)	**0.15981** (0.18111)	0.17904 (0.19610)
Sex		-0.12567 (0.04251) 0.882	-0.12664 (0.04256) 0.881	-0.12743 (0.04259) 0.880
Ethnicity				
	Asian	0.05614 (0.07409) 1.058	0.02359 (0.08359)	0.02071 (0.08370)
	Black	**0.01582** (0.04823) 1.016	**0.00157** (0.05401)	**0.00509** (0.05407)
	Hispanic	-0.09274 (0.05250) 0.911	**-0.12066** (0.05849)	**-0.12684** (0.05884)
Age		**0.00469** (0.00143)	**0.00470** (0.00143)	**0.00472** (0.00143)
Subject				
	CB	0.21306 (0.05411) 1.237	0.21129 (0.05415) 1.235	**0.21294** (0.05850)
	ESL	**0.51001** (0.08994) 1.665	**0.50996** (0.09008) 1.665	**0.55505** (0.10657)
	English	0.14092 (0.08082) 1.151	0.14415 (0.08087) 1.155	0.14582 (0.09679)
	Foreign L.	0.32522 (0.111738) 1.384	0.32608 (0.11752) 1.386	0.39621 (0.14427)
	Mathematics	0.02905 (0.08593) 1.029	0.02885 (0.08619) 1.029	0.13136 (0.10854)

Table 18 - Cohort 2008: Survival Analysis Models (continued)

	7	8	9
Other	-0.04338 (0.05659) 0.958	-0.04417 (0.05659) 0.957	-0.04020 (0.06110)
Science	**0.17950** (0.08391) 1.197	**0.18094** (0.08410) 1.198	0.10217 (0.11302)
Soc. St.	0.10293 (0.09272) 1.108	0.09877 (0.09277) 1.104	0.10584 (0.09620)
SchoolType			
Early Childhood	0.01015 (0.19192) 1.010	0.00859 (0.19194) 1.009	0.01689 (0.19216) 1.017
Elementary	0.13769 (0.08502) 1.148	0.13442 (0.08509) 1.144	0.13690 (0.08551) 1.147
High School	-0.05907 (0.08402) 0.943	-0.06045 (0.08411) 0.941	-0.06004 (0.08415) 0.942
JHS	0.14108 (0.08290) 1.152	0.13640 (0.08303) 1.146	0.13734 (0.08309) 1.147
K-12	-0.09101 (0.12055) 0.913	-0.09201 (0.12059) 0.912	-0.09189 (0.12066) 0.912
K-8	0.05444 (0.09332) 1.056	0.05318 (0.09337) 1.055	0.05654 (0.09356) 1.058
Age*Fellow	-0.00661 (0.00581)	-0.00699 (0.00587)	-0.00686 (0.00590)
Ethnicity*Fellow (Asian)		0.16496 (0.17990)	0.18254 (0.18161)

Table 18 - Cohort 2008: Survival Analysis Models (continued)

7	8	9
Ethnicity*Fellow (Black)	0.08010 (0.11943)	0.06274 (0.12069)
Ethnicity*Fellow (Hispanic)	0.14796 (0.12888)	0.14104 (0.13761)
Subject*Fellow (CB)		**0.07492** (0.17905)
Subject*Fellow (ESL)		-0.15084 (0.19724)
Subject*Fellow (English)		**-0.0007036** (0.16882)
Subject*Fellow (Foreign Language)		**-0.18803** (0.24329)
Subject*Fellow (Mathematics)		-0.25180 (0.17159)
Subject*Fellow (Other)		0.10498 (0.29086)
Subject*Fellow (Science)		0.16315 (0.16258)
Subject*Fellow (Social Studies)		

Table 19: Cohorts 2003 – 2008: Distribution by Subject Area for TFs and NTFs							
	Year	**TF as a Percentage of Total Teachers Hired**	**NTF as a Percentage of Total Teachers Hired**		Year	**TF as a Percentage of Total Teachers Hired**	**NTF as a Percentage of Total Teachers Hired**
Math	2003	**26**	**74**	English As a Second Language	2003	13	87
	2004	**21**	**79**		2004	12	88
	2005	**50**	**49**		2005	**38**	**62**
	2006	**46**	**54**		2006	**42**	**58**
	2007	**45**	**55**		2007	**38**	**62**
	2008	**44**	**56**		2008	**35**	**65**
Science	2003	11	89	English	2003	16	84
	2004	10	90		2004	17	83
	2005	24	76		2005	**33**	**67**
	2006	**37**	**63**		2006	26	74
	2007	**47**	**53**		2007	27	73
	2008	**48**	**52**		2008	**31**	**69**
Special Education	2003	20	80	Foreign Language	2003	6	94
	2004	19	81		2004	5	95
	2005	**40**	**60**		2005	**20**	**80**
	2006	**44**	**56**		2006	**32**	**68**
	2007	**41**	**59**		2007	**33**	**67**
	2008	**38**	**62**		2008	**34**	**66**
Common Branches	2003	11	89	Social Studies	2003	11	89
	2004	5	96		2004	2	98
	2005	4	96		2005	4	96
	2006	6	94		2006	5	95
	2007	4	96		2007	0.22	99
	2008	5	95		2008	0	100

Table 20: Cohorts 2003 - 2008: Distribution by School Type for TFs & NTFs							
	Year	**TF as a Percentage of Total Teachers Hired**	**NTF as a Percentage of Total Teachers Hired**		Year	**TF as a Percentage of Total Teachers Hired**	**NTF as a Percentage of Total Teachers Hired**
Early Childhood	2003	6	94	K-12	2003	14	86
	2004	24	76		2004	15	85
	2005	9	91		2005	26	74
	2006	21	79		2006	24	76
	2007	5	95		2007	25	75
	2008	7	93		2008	24	76
Elementary	2003	7	93	K-8	2003	11	89
	2004	8	92		2004	11	89
	2005	9	91		2005	14	86
	2006	11	89		2006	15	85
	2007	9	91		2007	15	85
	2008	8	92		2008	15	85
High School	2003	8	92	Secondary School	2003	11	89
	2004	8	92		2004	18	82
	2005	31	69		2005	29	71
	2006	28	72		2006	26	74
	2007	30	70		2007	27	73
	2008	29	71		2008	31	69
JHS	2003	11	89				
	2004	16	84				
	2005	20	80				
	2006	23	77				
	2007	24	76				
	2008	26	74				

Table 21: Cohorts 2003-2008: Distribution by Ethnicity for TFs and NTFs				
White	**Year**	**Percent**	**TFs**	**NTFs**
	2003	60	7	53
	2004	67	6	62
	2005	67	12	55
	2006	66	11	55
	2007	64	11	54
	2008	65	12	53
Black	2003	21	2	19
	2004	16	2	14
	2005	15	3	12
	2006	15	3	12
	2007	16	4	12
	2008	16	4	12
Hispanic	2003	14	1	12
	2004	11	1	10
	2005	12	2	10
	2006	13	2	10
	2007	14	3	11
	2008	14	3	11
Asian	2003	5	0.82	4
	2004	6	0.59	5
	2005	6	1	5
	2006	6	1	5
	2007	6	1	5
	2008	6	1	5

Table 22: Teachers Salary Schedule Effective May 19, 2008

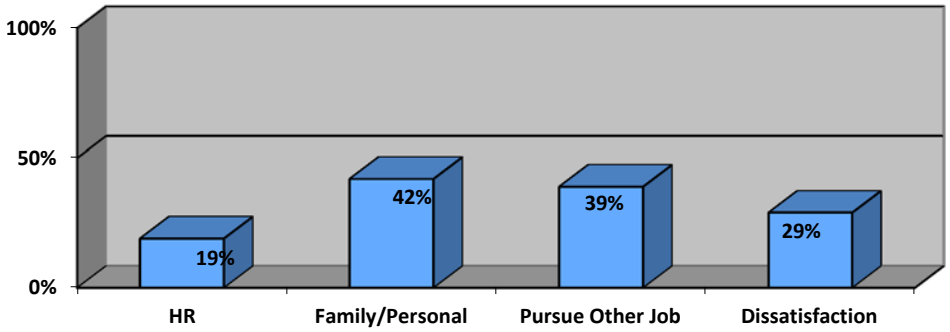
Teachers Salary Schedule - May 19, 2008

	BA		BA+30		EARNED MA OR EQUIV		MA+30	EARNED MA OR EQUIV+30
	C1	C1+PD	C2	C2+ID	C2+PD	C2+ID+PD	C6	C6+PD
1A	$45,530	$49,831	$47,124	$50,071	$51,425	$54,372	$53,019	$57,320
1B	$45,530	$49,831	$47,124	$50,071	$51,425	$54,372	$53,019	$57,320
2A	$48,434	$52,735	$50,028	$52,975	$54,329	$57,276	$55,923	$60,224
2B	$48,434	$52,735	$50,028	$52,975	$54,329	$57,276	$55,923	$60,224
3A	$48,836	$53,137	$50,430	$53,377	$54,731	$57,678	$56,325	$60,626
3B	$48,836	$53,137	$50,430	$53,377	$54,731	$57,678	$56,325	$60,626
4A	$49,543	$53,844	$51,137	$54,084	$55,438	$58,385	$57,032	$61,333
4B	$49,543	$53,844	$51,137	$54,084	$55,438	$58,385	$57,032	$61,333
5A	$50,153	$54,454	$51,747	$54,694	$56,048	$58,995	$57,642	$61,943
5B	$50,153	$54,454	$51,747	$54,694	$56,048	$58,995	$57,642	$61,943
6A	$50,812	$55,113	$52,406	$55,353	$56,707	$59,654	$58,301	$62,602
6A+L5	$51,812	$56,113	$53,406	$56,353	$57,707	$60,654	$59,301	$63,602
6B	$51,744	$56,045	$53,338	$56,285	$57,639	$60,586	$59,233	$63,534
6B+L5	$52,744	$57,045	$54,338	$57,285	$58,639	$61,586	$60,233	$64,534
7A	$53,128	$57,429	$54,722	$57,669	$59,023	$61,970	$60,617	$64,918
7A+L5	$54,128	$58,429	$55,722	$58,669	$60,023	$62,970	$61,617	$65,918
7B	$56,370	$60,671	$57,964	$60,911	$62,265	$65,212	$63,859	$68,160
7B+L5	$57,370	$61,671	$58,964	$61,911	$63,265	$66,212	$64,859	$69,160
8A	$59,404	$63,705	$60,998	$63,945	$65,299	$68,246	$66,893	$71,194
8A+L5	$60,404	$64,705	$61,998	$64,945	$66,299	$69,246	$67,893	$72,194
8B	$63,006	$67,307	$64,600	$67,547	$68,901	$71,848	$70,495	$74,796
8B+L5	$64,006	$68,307	$65,600	$68,547	$69,901	$72,848	$71,495	$75,796
8B+L10	$67,095	$71,396	$68,689	$71,636	$72,990	$75,937	$74,584	$78,885
8B+L13	$69,197	$73,498	$70,791	$73,738	$75,092	$78,039	$76,686	$80,987
8B+L15	$73,636	$77,937	$75,230	$78,177	$79,531	$82,478	$81,125	$85,426
8B+L18	$74,800	$79,101	$76,394	$79,341	$80,695	$83,642	$82,289	$86,590
8B+L20	$83,412	$87,713	$85,006	$87,953	$89,307	$92,254	$90,901	$95,202
8B+L22	$88,259	$92,560	$89,853	$92,800	$94,154	$97,101	$95,748	$100,049
L5	$1,000							
L10	$4,089							
L13	$6,191							
L15	$10,630							
L18	$11,794							

L20	$20,406							
L22	$25,253							
Source: http://www.uft.org/our-rights/salary-schedules/teachers								

APPENDIX B

Figure 15: Reasons Beginning Teachers Leave the Profession



SOURCE: Adapted from: Ingersoll, R.M., & Smith, T.M. (2003), p.31[58]

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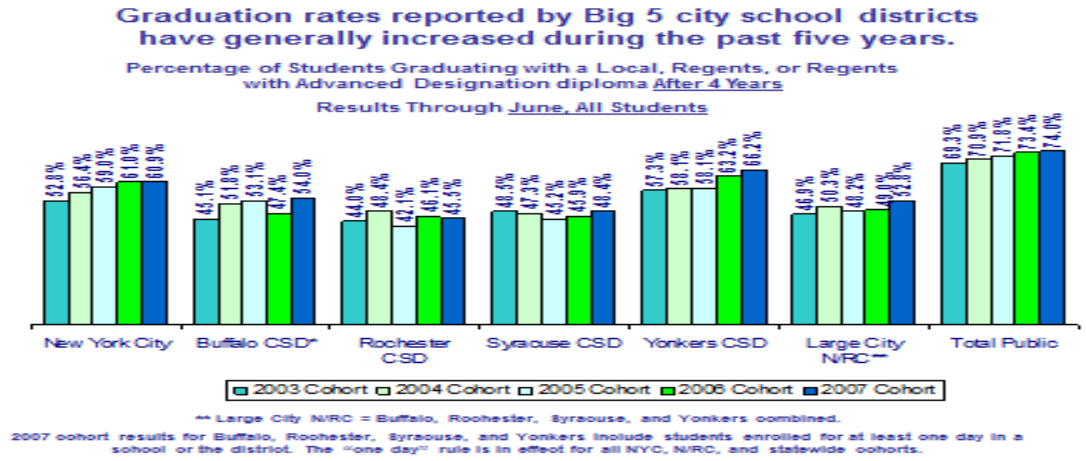
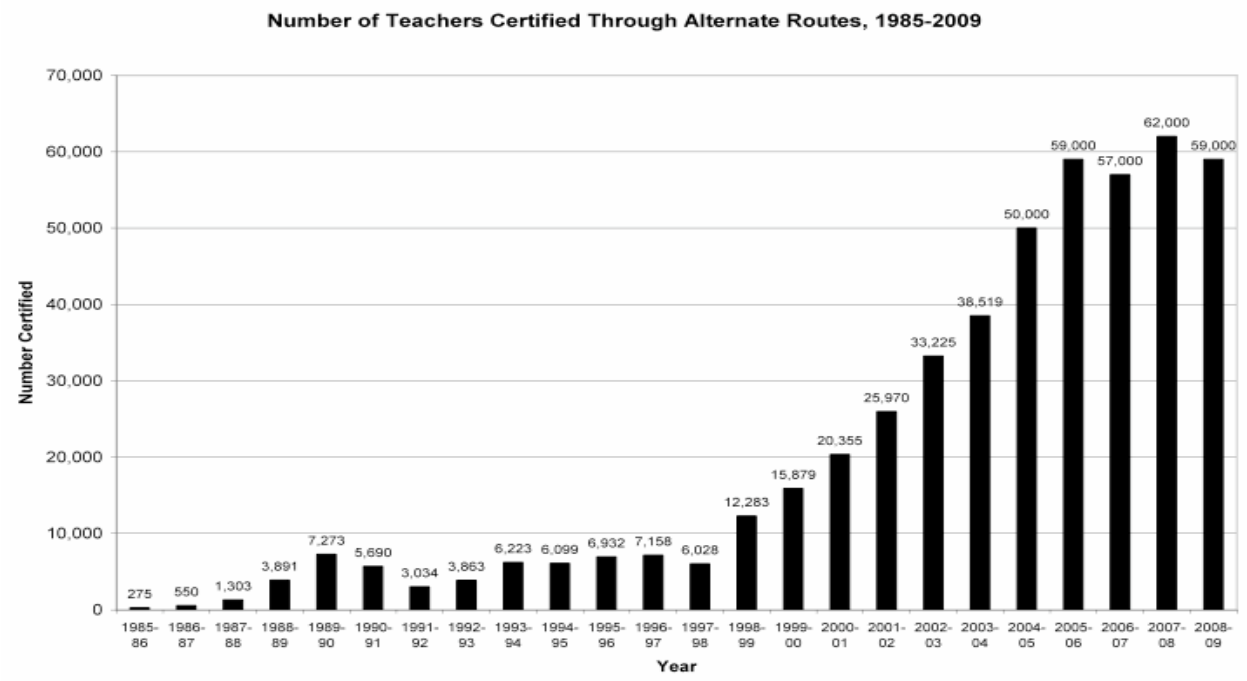
Figure 16: High School Graduation Rates for NYC and the "Big 5" School Districts in NYS – 2007 - 2010



Source: NYSED

[58] The original percentages were culled by Ingersoll and Smith (2003) from NCES 1994-1995 TFS. Figures include rounding errors, and double counts, interpret cautiously.

Figure 17: The Growth of Alternative Teaching Certification



Source: National Center for Alternative Certification
http://www.teach-now.org/intro.cfm

Figure 18: Cohort **2003:** Product-Limit Survival Probability Estimates

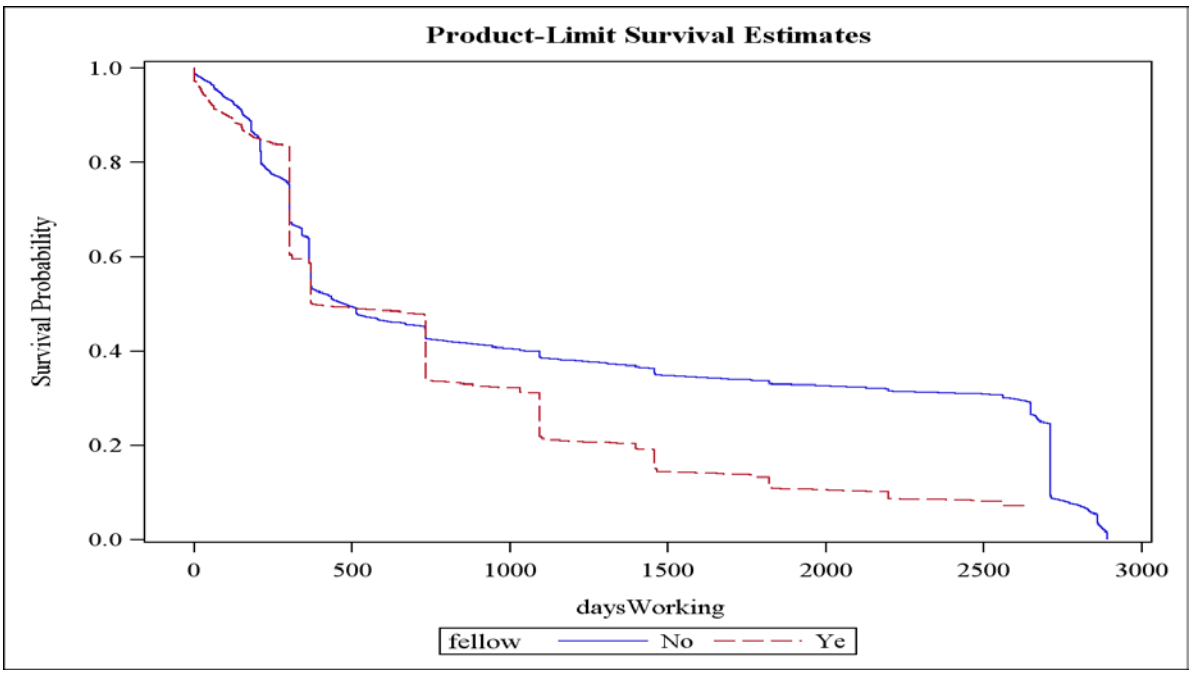


Figure 19: Cohort **2003** – Year 1

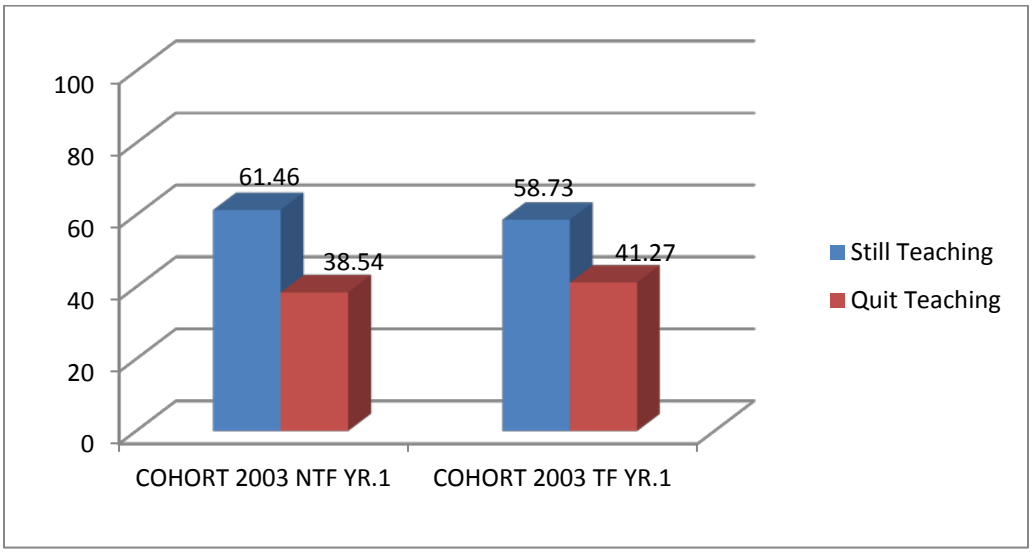


Figure 20: Cohort **2003** – Year 2

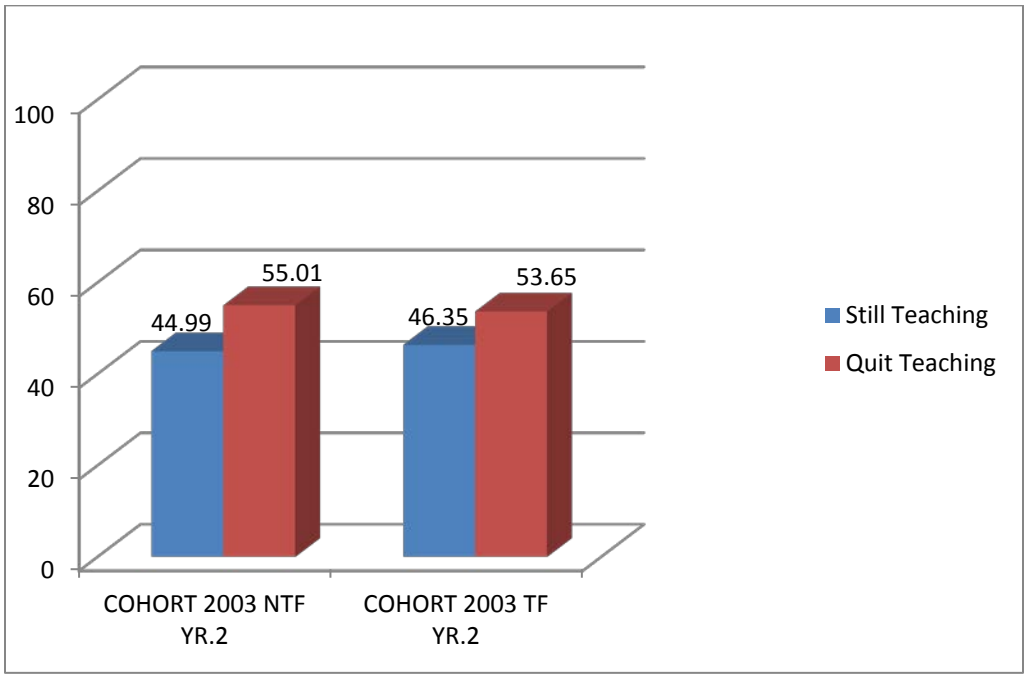


Figure 21: Cohort **2003** – Year 3

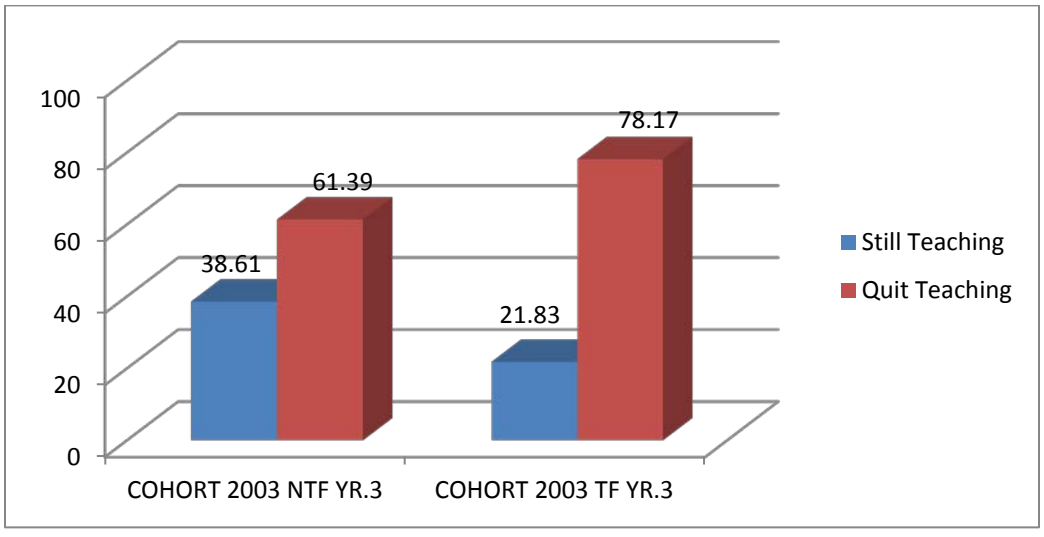


Figure 22: Cohort **2003** – Year 4

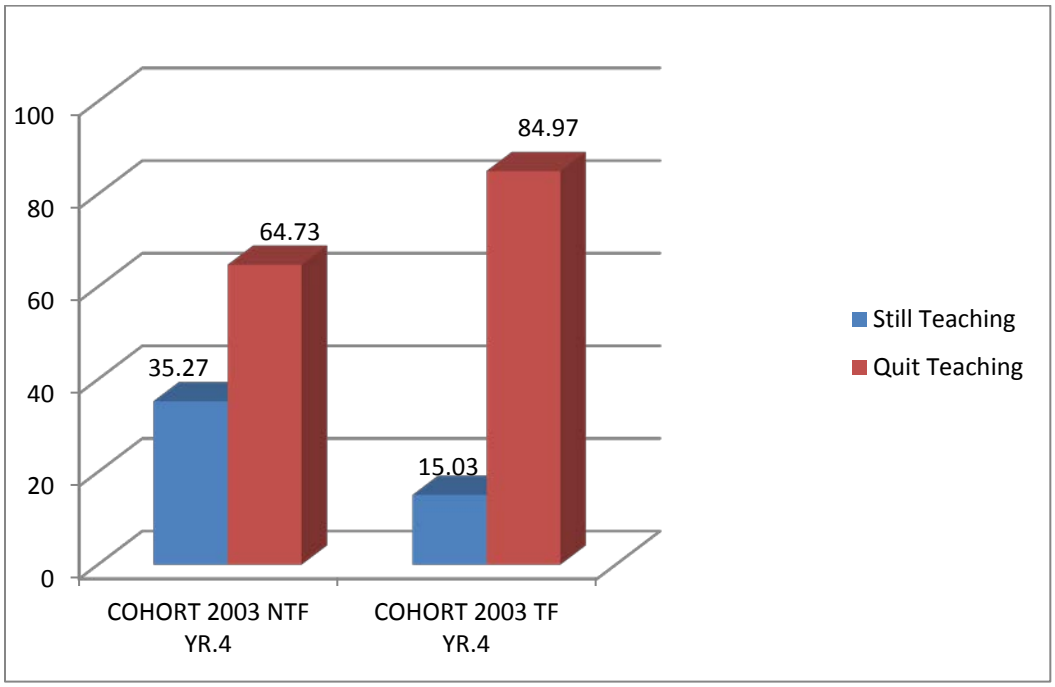


Figure 23: Cohort **2003** – Year 5

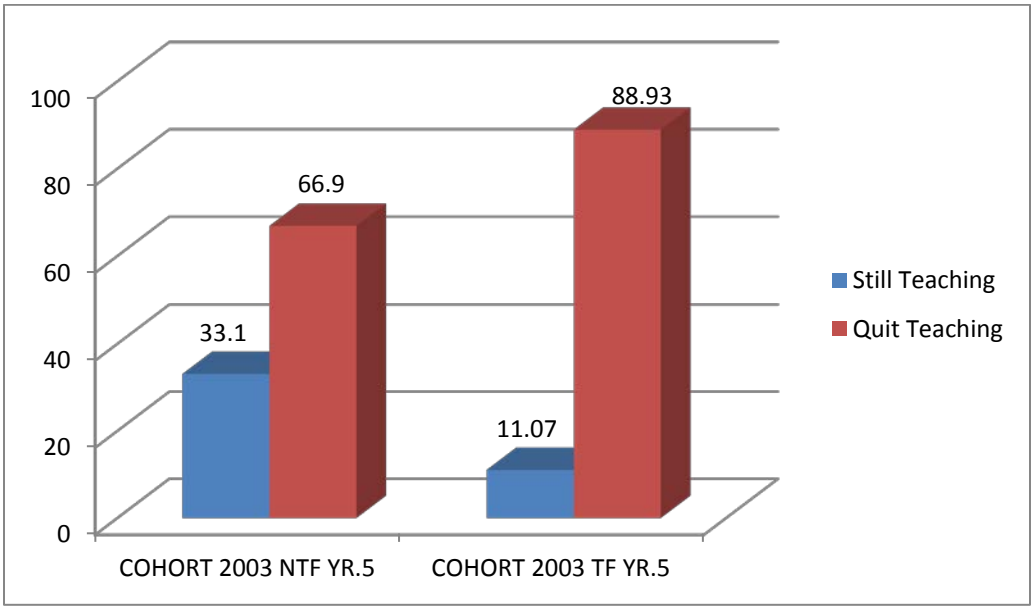


Figure 24: Cohort **2004**: Product-Limit Survival Probability Estimates

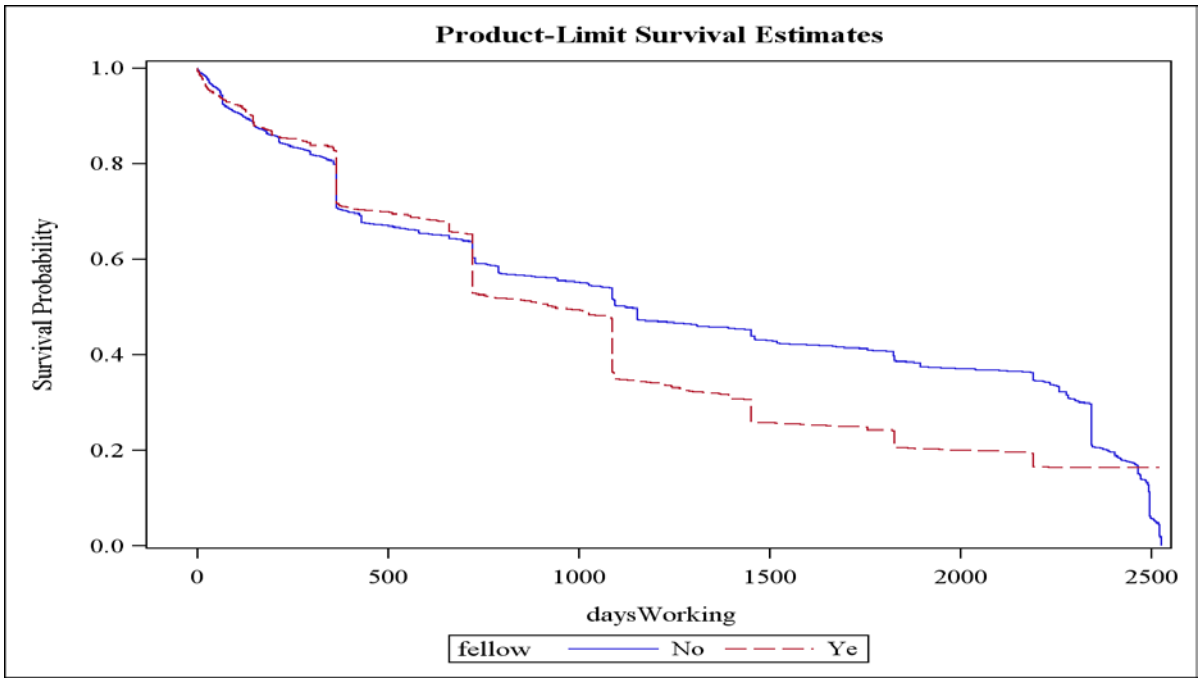


Figure 25: Cohort **2004** – Year 1

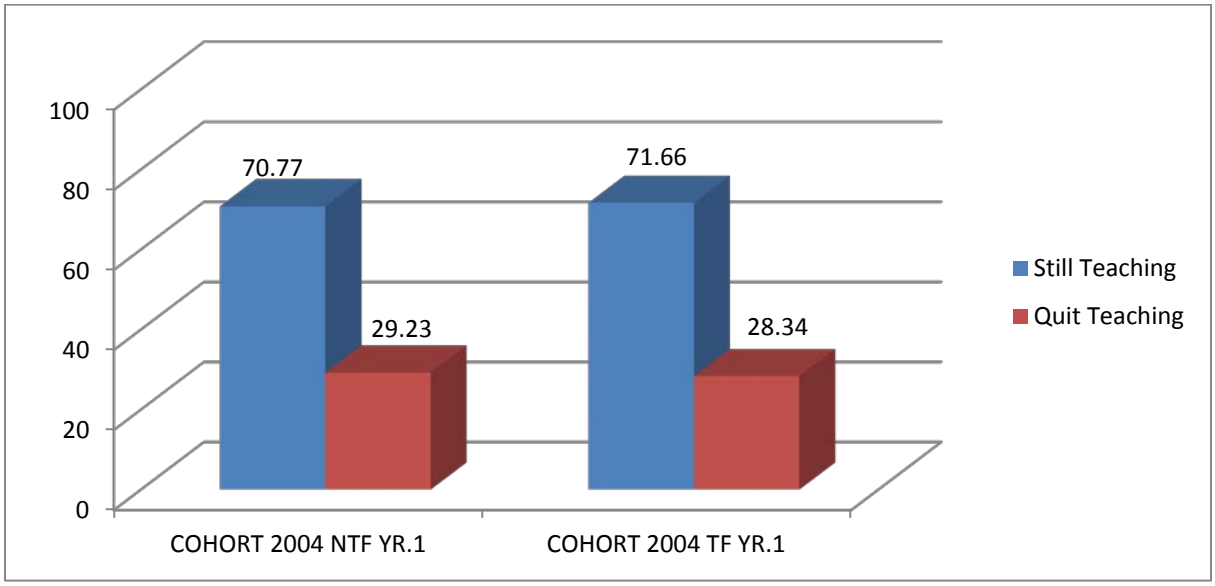


Figure 26: Cohort **2004** – Year 2

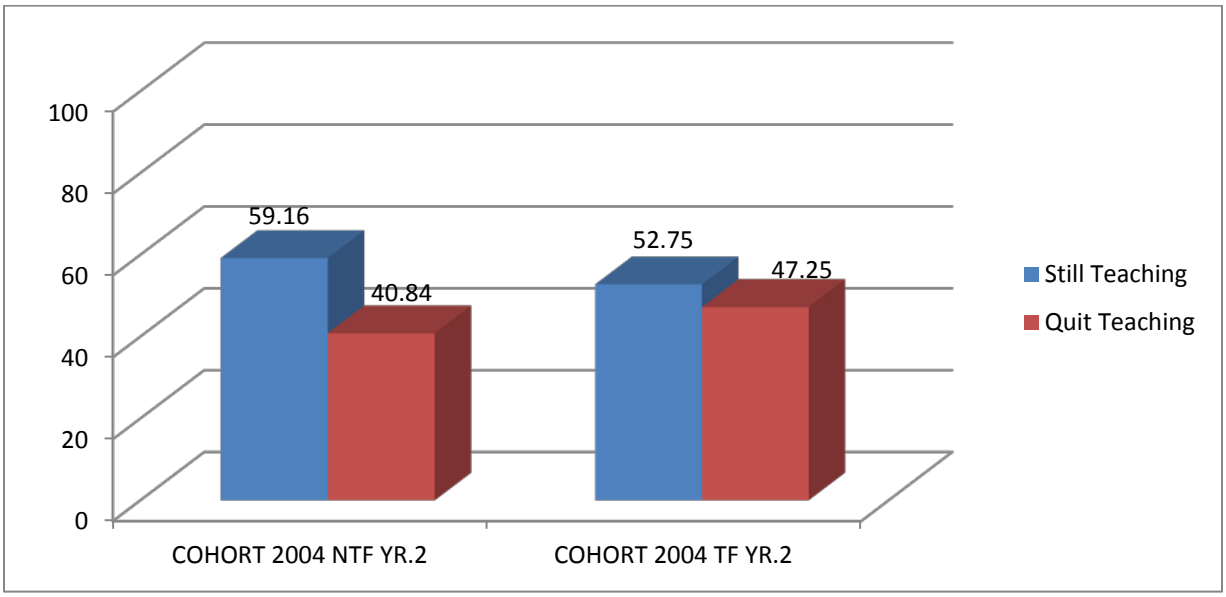


Figure 27: Cohort **2004** – Year 3

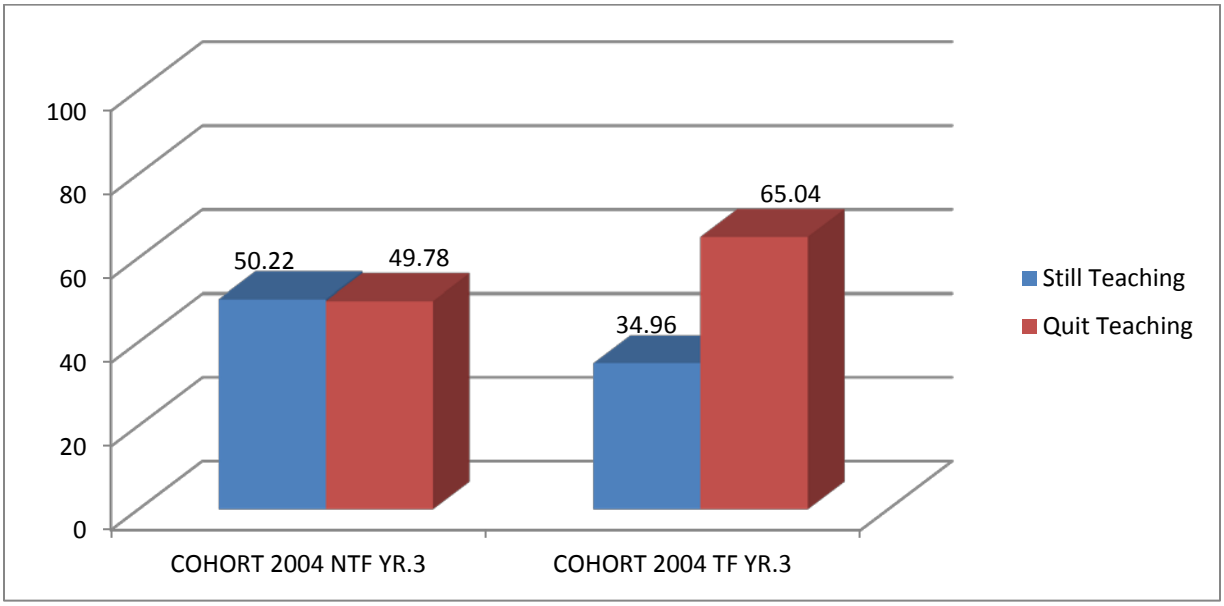


Figure 28: Cohort **2004** – Year 4

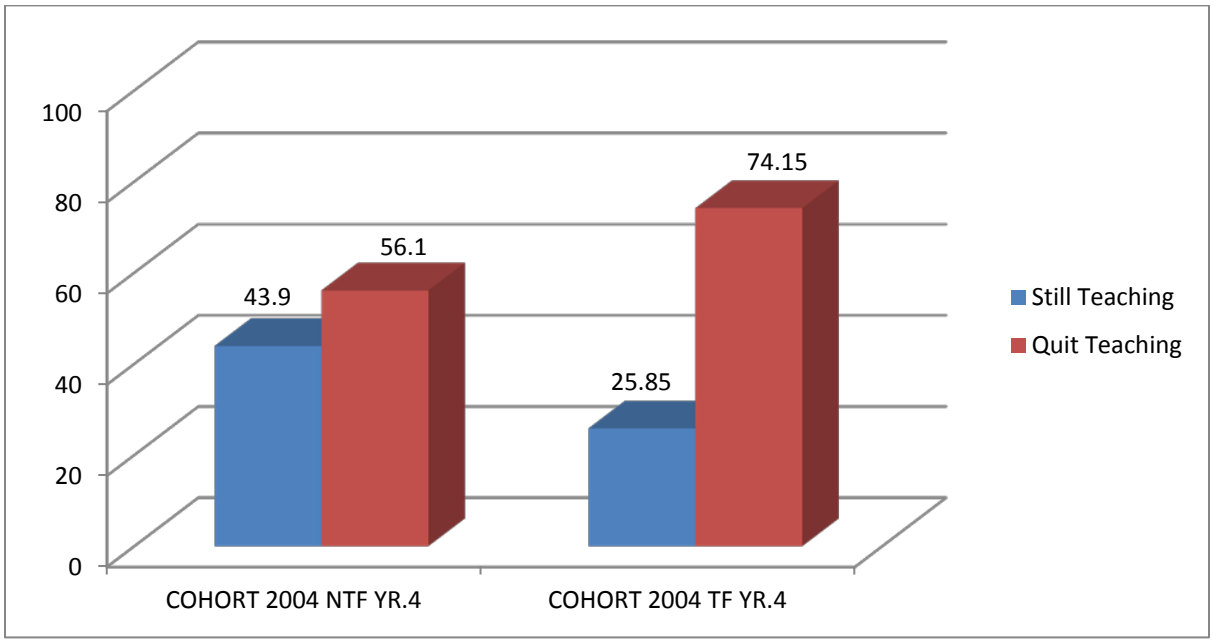


Figure 29: Cohort **2004** – Year 5

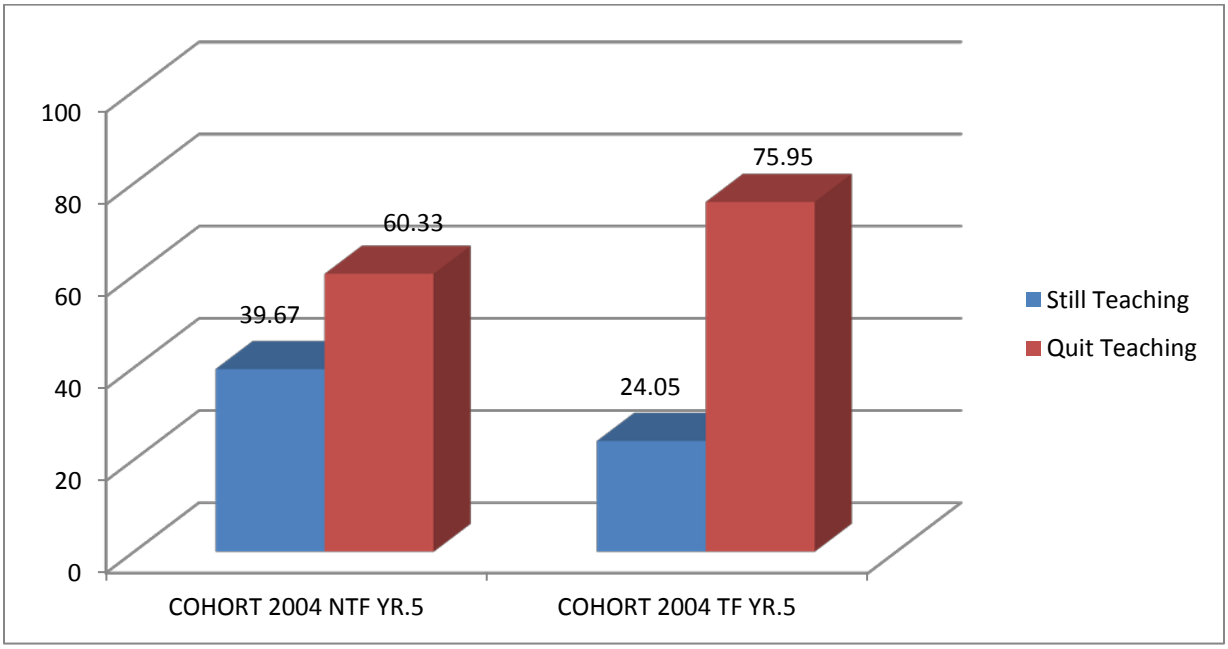


Figure 30: Cohort **2005**: Product-Limit Survival Probability Estimates

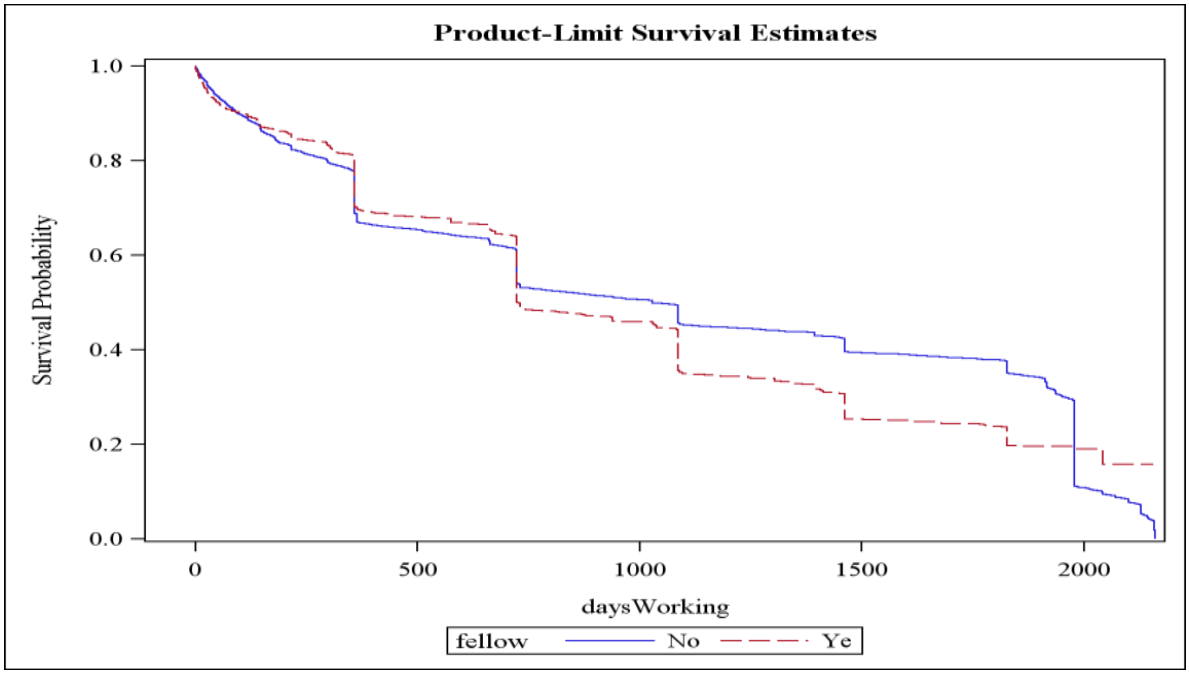


Figure 31: Cohort **2005** – Year 1

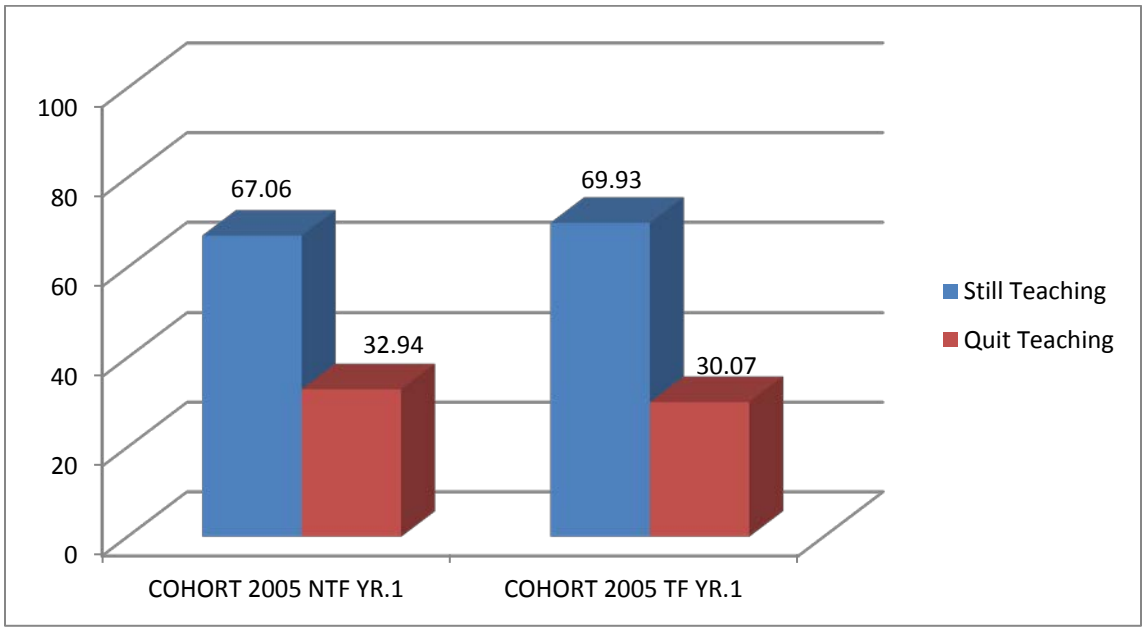


Figure 32: Cohort **2005** – Year 2

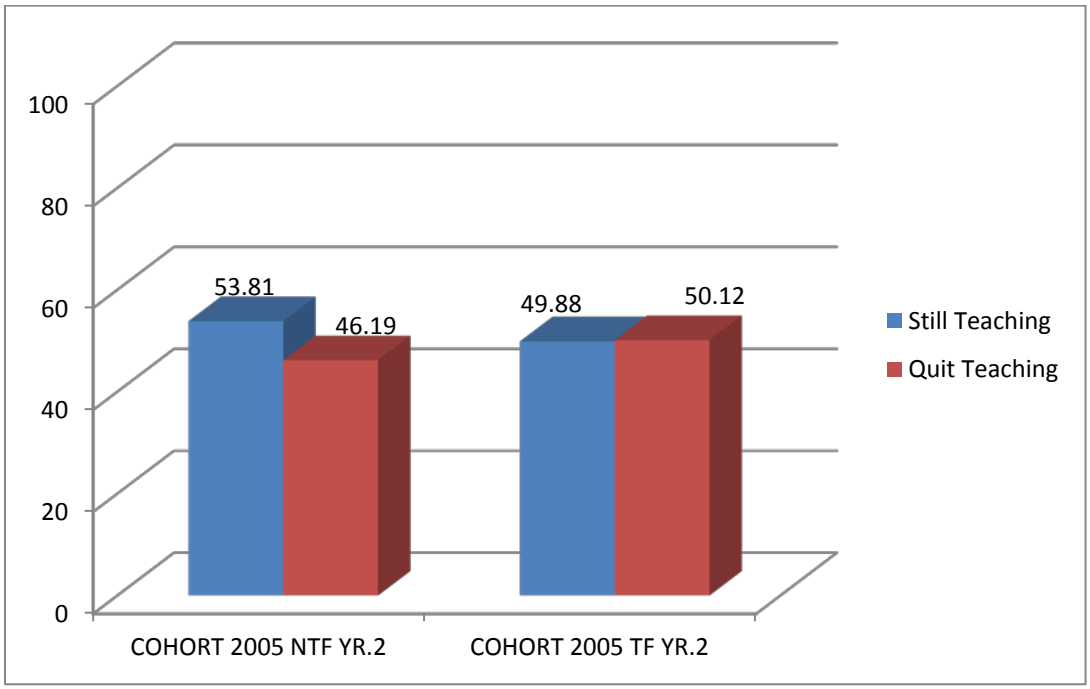


Figure 33: Cohort **2005** – Year 3

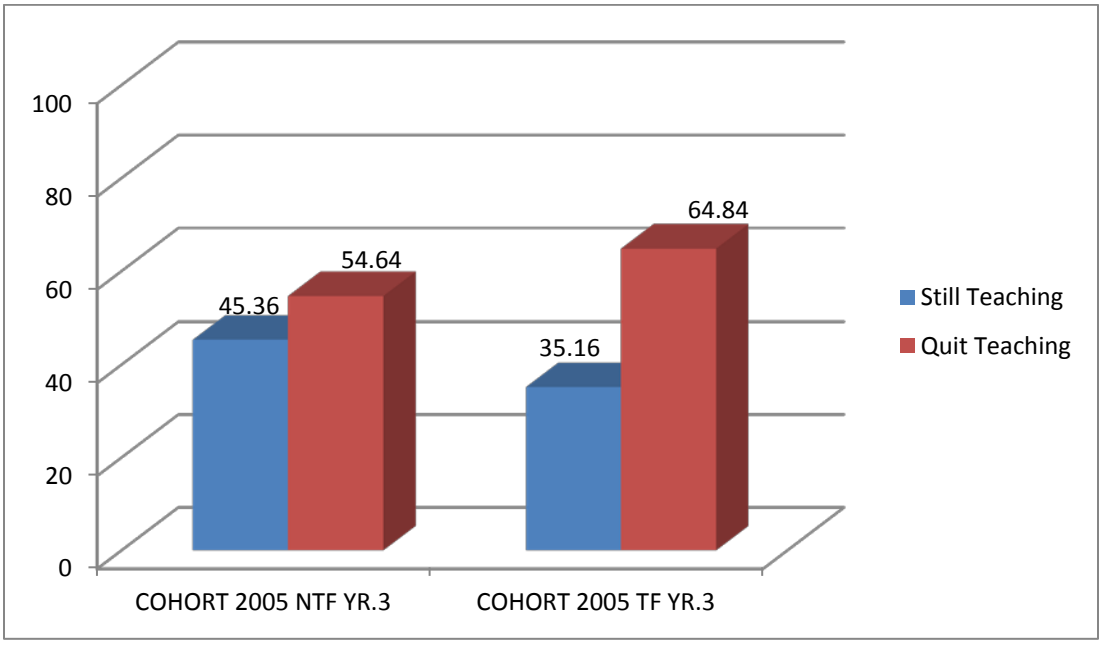


Figure 34: Cohort **2005** – Year 4

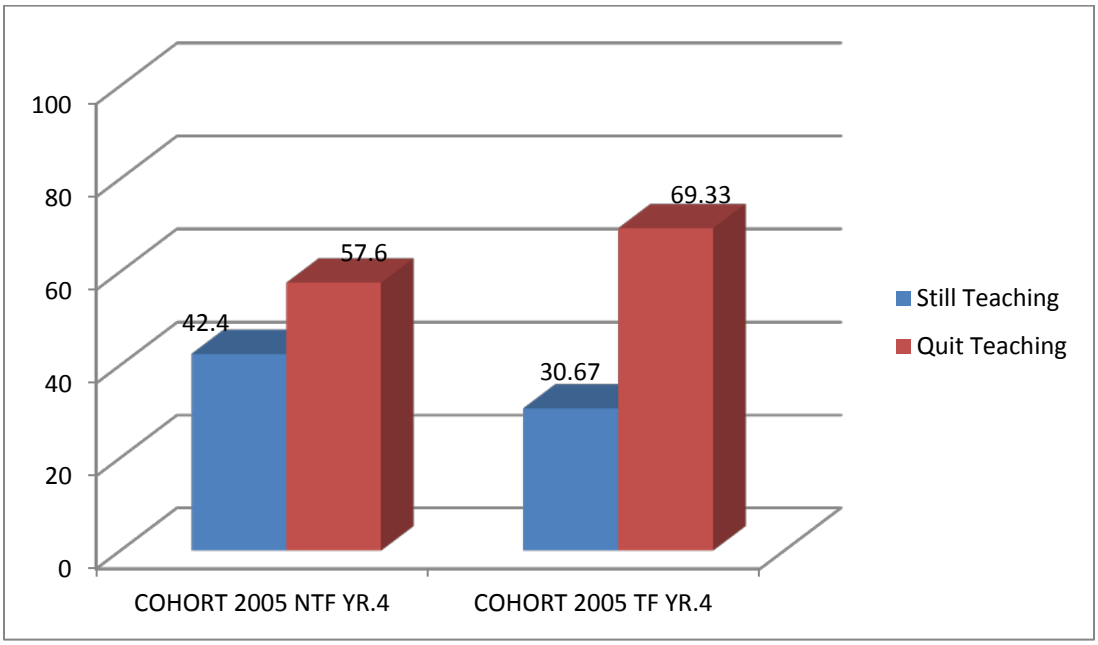


Figure 35: Cohort **2005** – Year 5

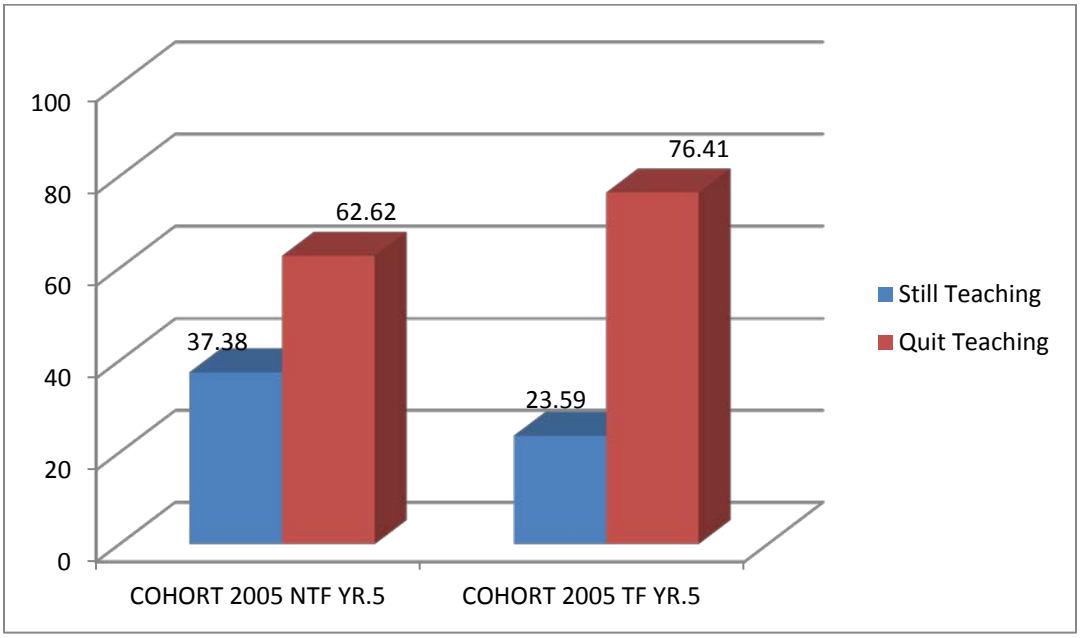


Figure 36: Cohort **2006**: Product-Limit Survival Probability Estimates

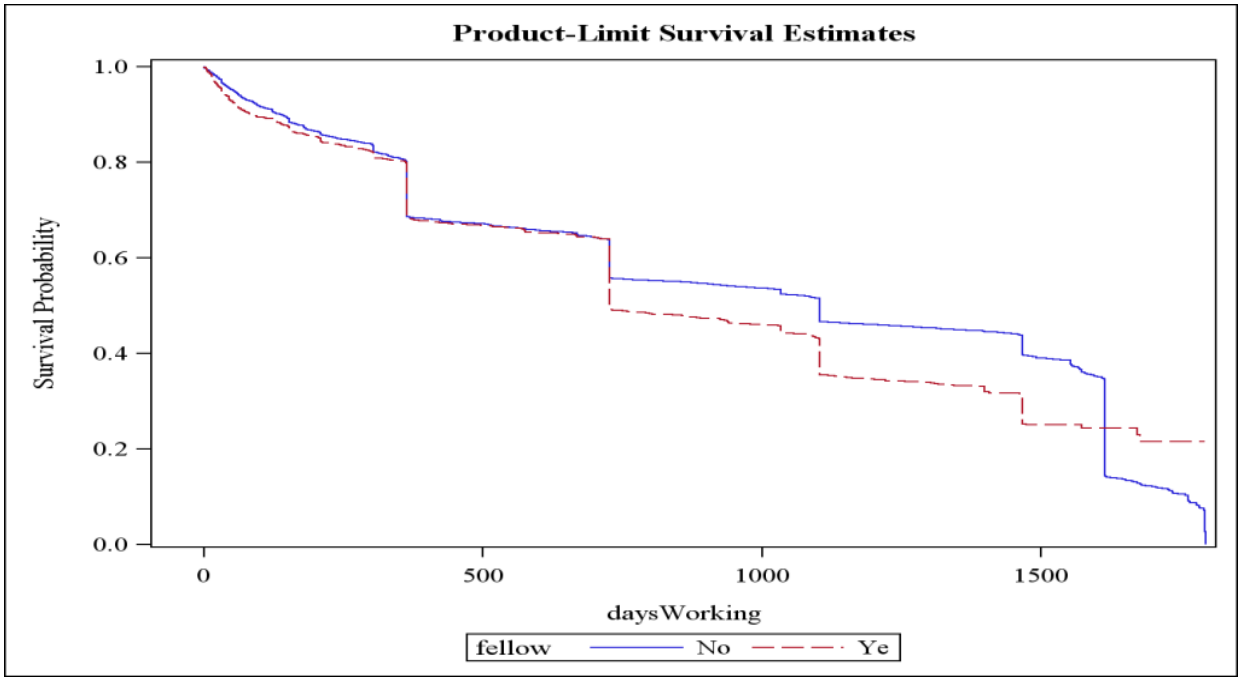


Figure 37: Cohort **2006** – Year 1

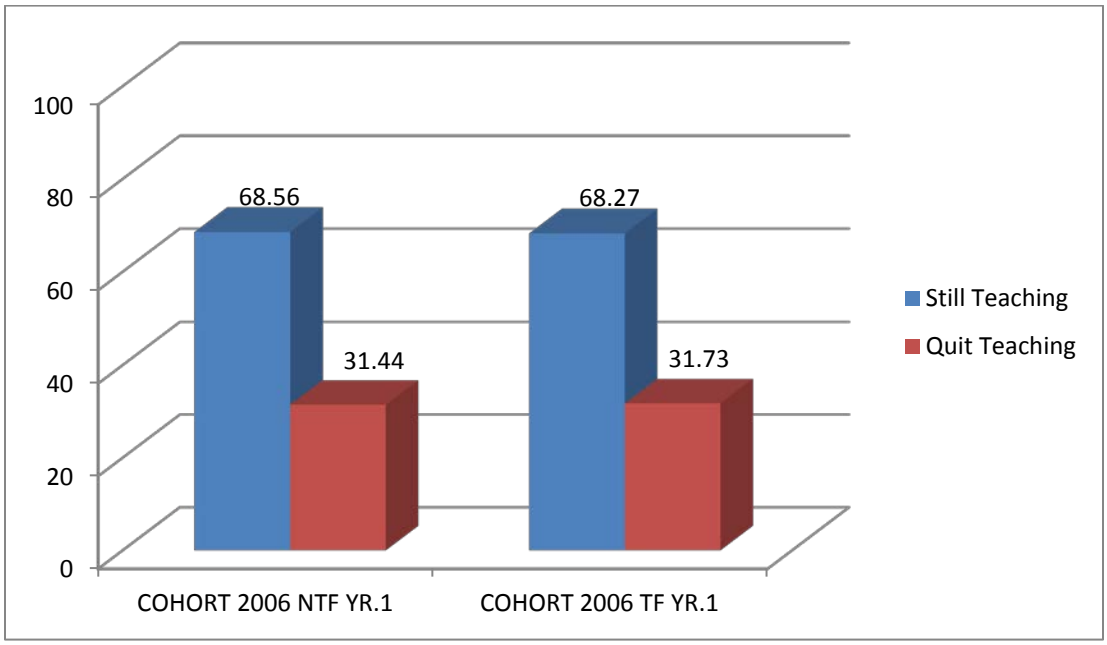


Figure 38: Cohort **2006** – Year 2

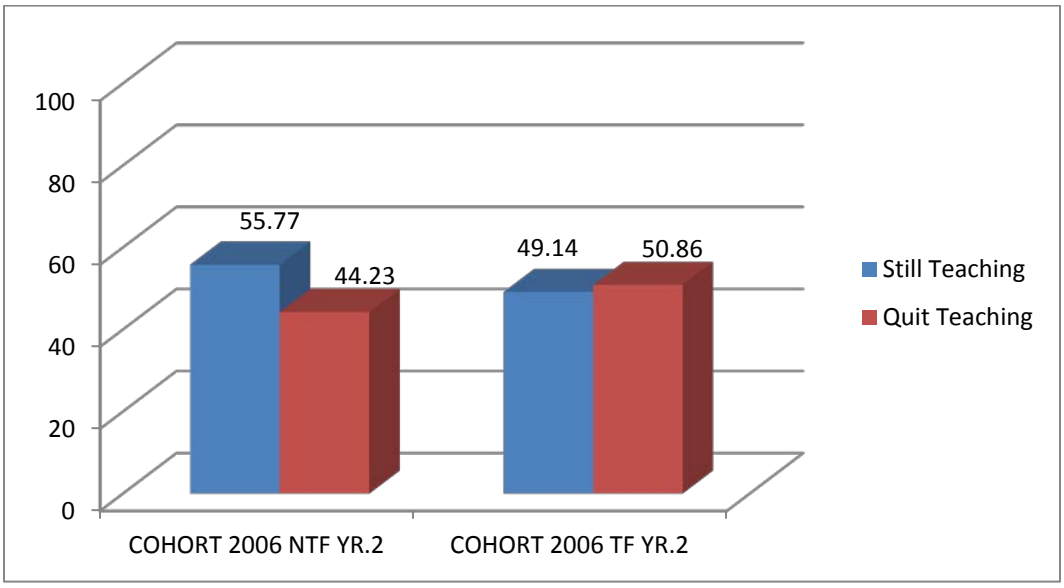


Figure 39: Cohort **2006** – Year 3

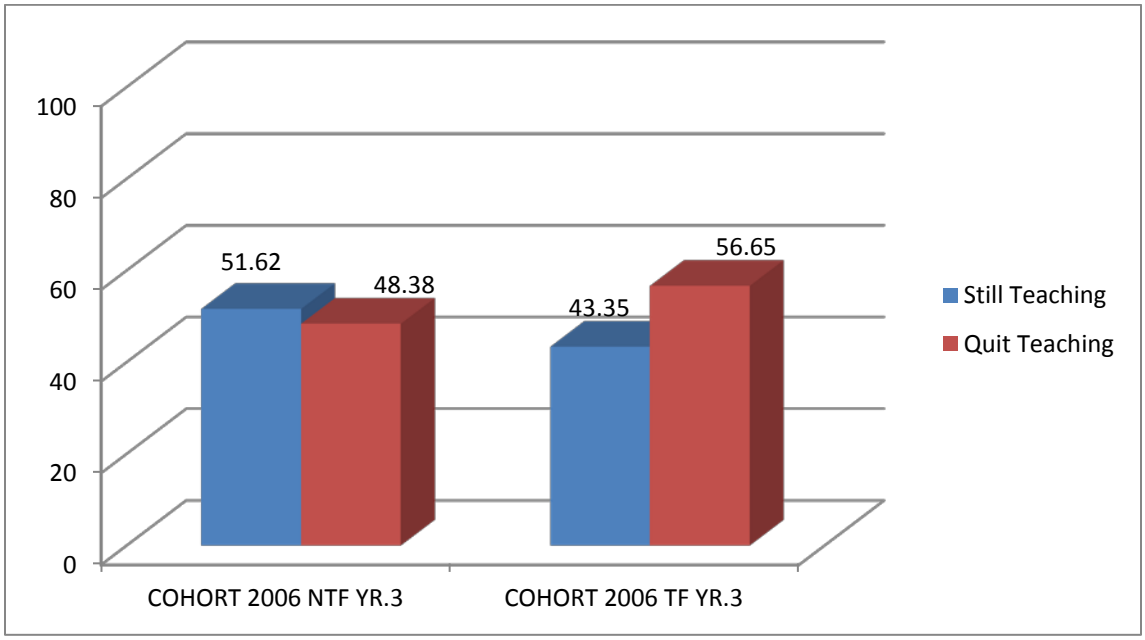


Figure 40: Cohort **2006** – Year 4

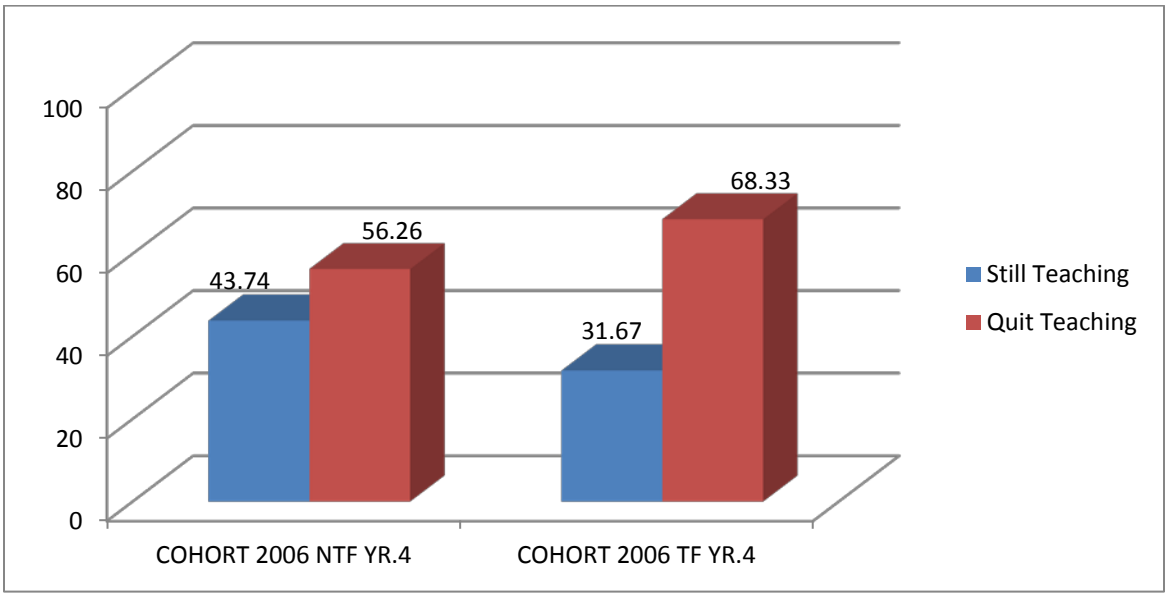


Figure 41: Cohort **2007**: Product-Limit Survival Probability Estimates

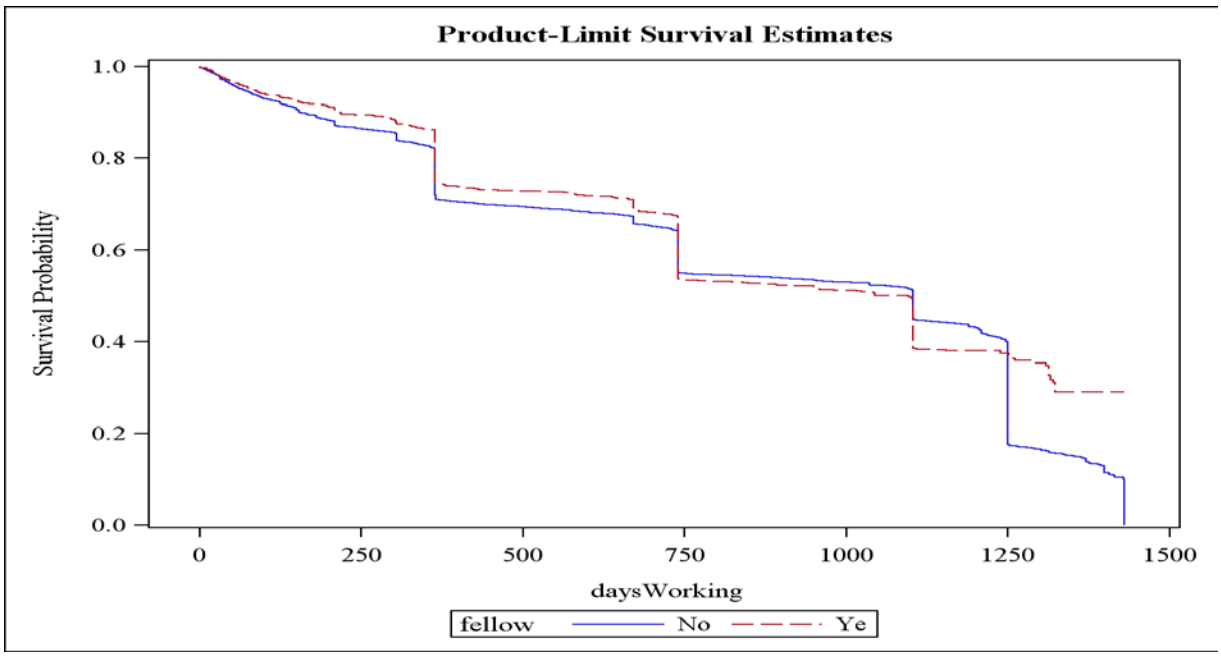


Figure 42: Cohort **2007** – Year 1

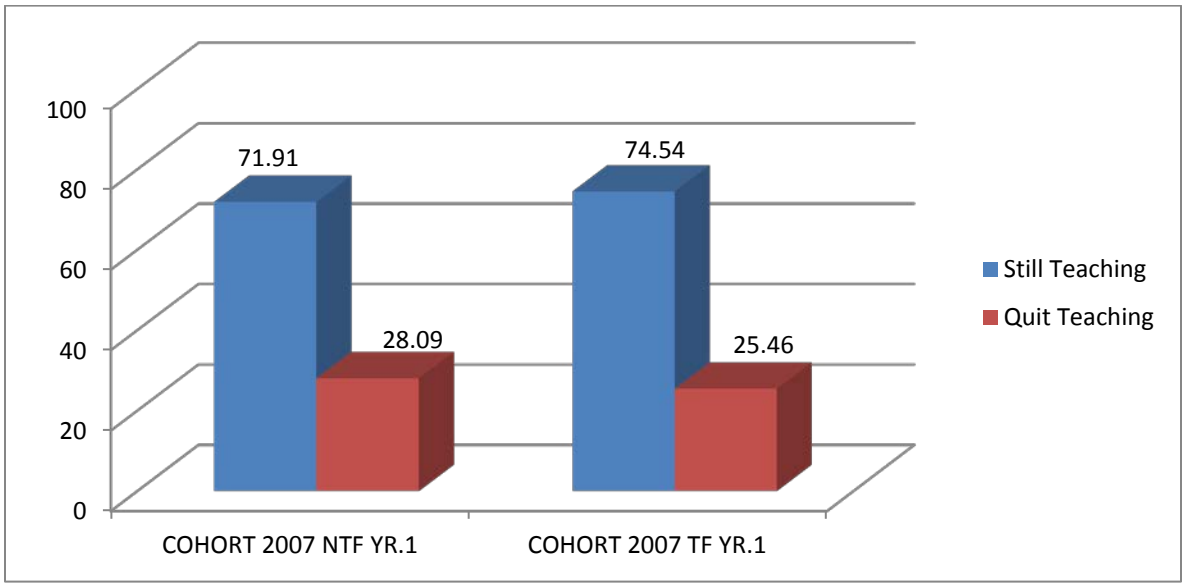


Figure 43: Cohort **2007** – Year 2

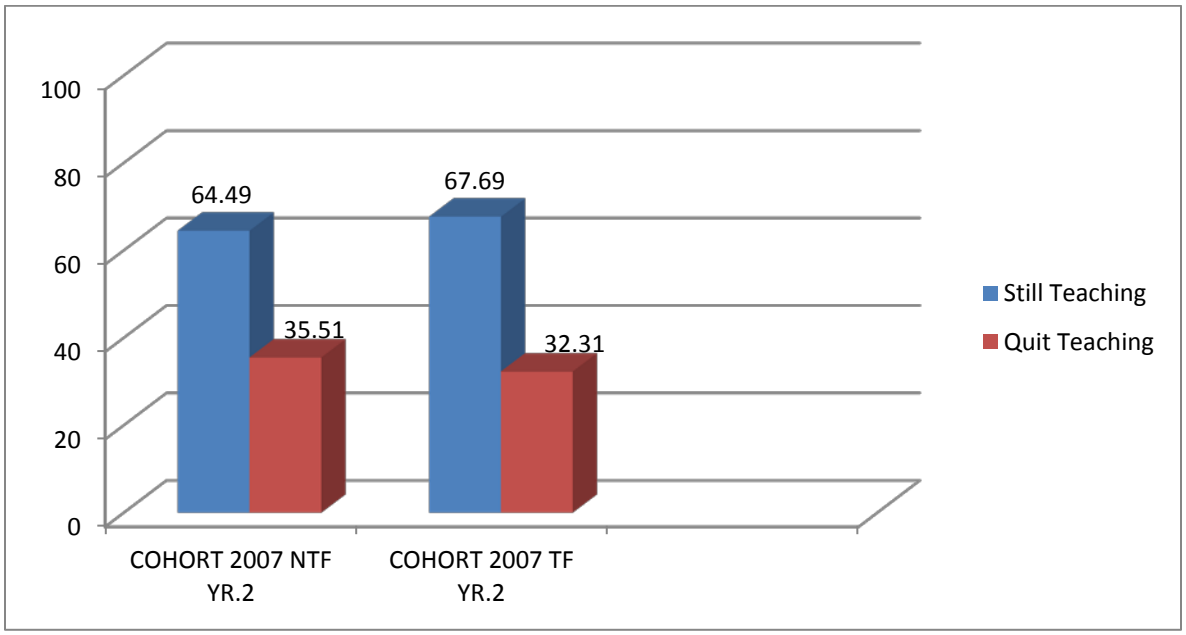


Figure 44: Cohort **2007** – Year 3

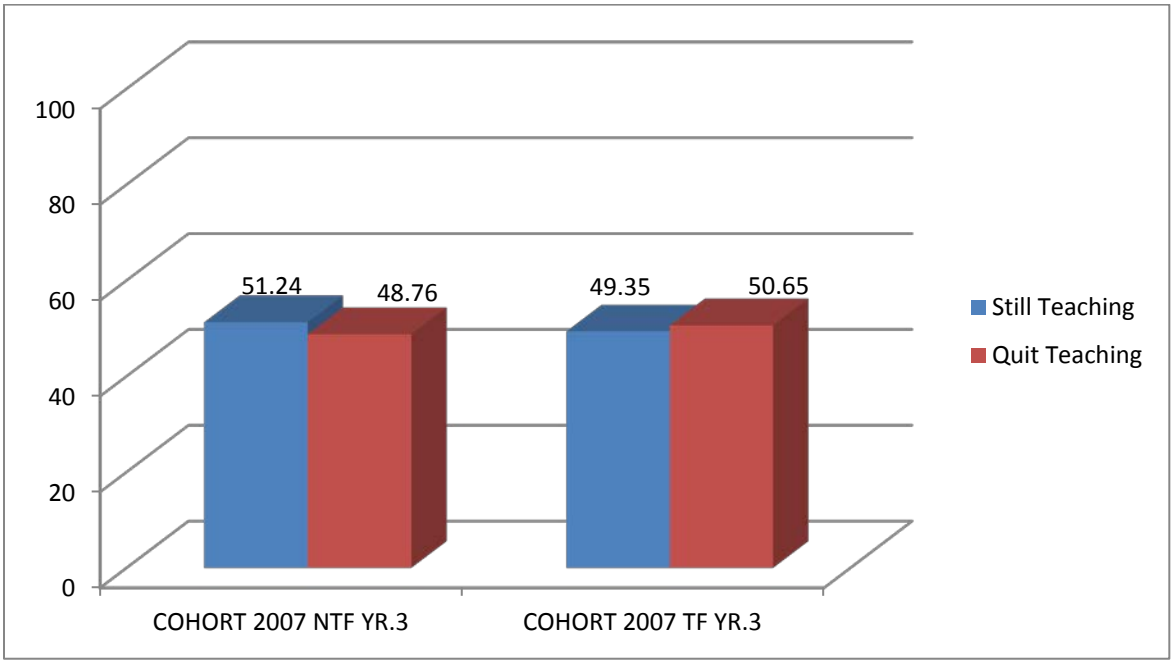


Figure 45: Cohort **2008**: Product-Limit Survival Probability Estimates

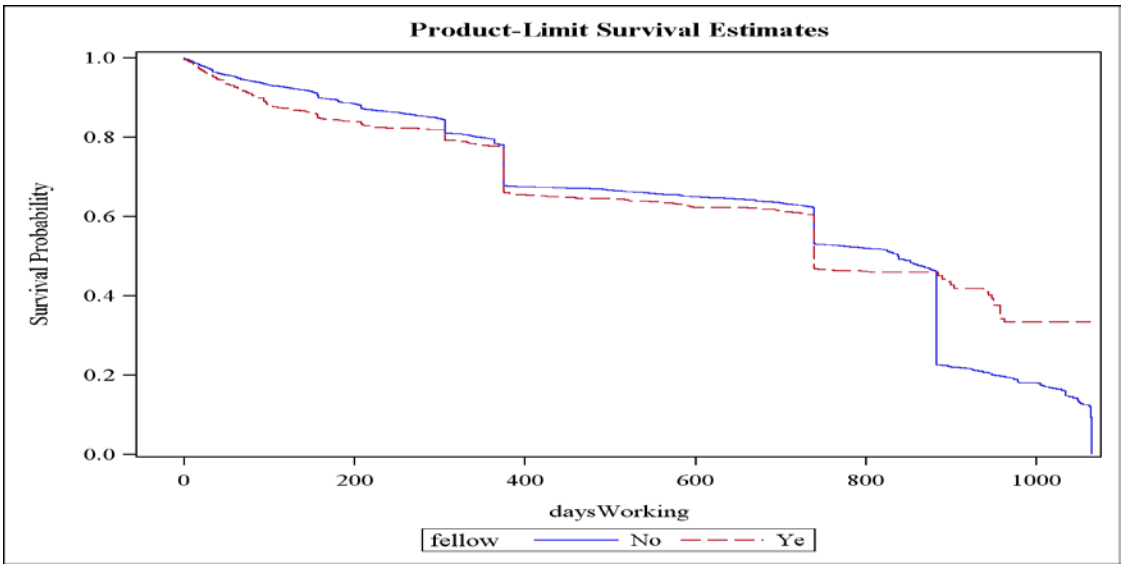


Figure 46: Cohort **2008** – Year 1

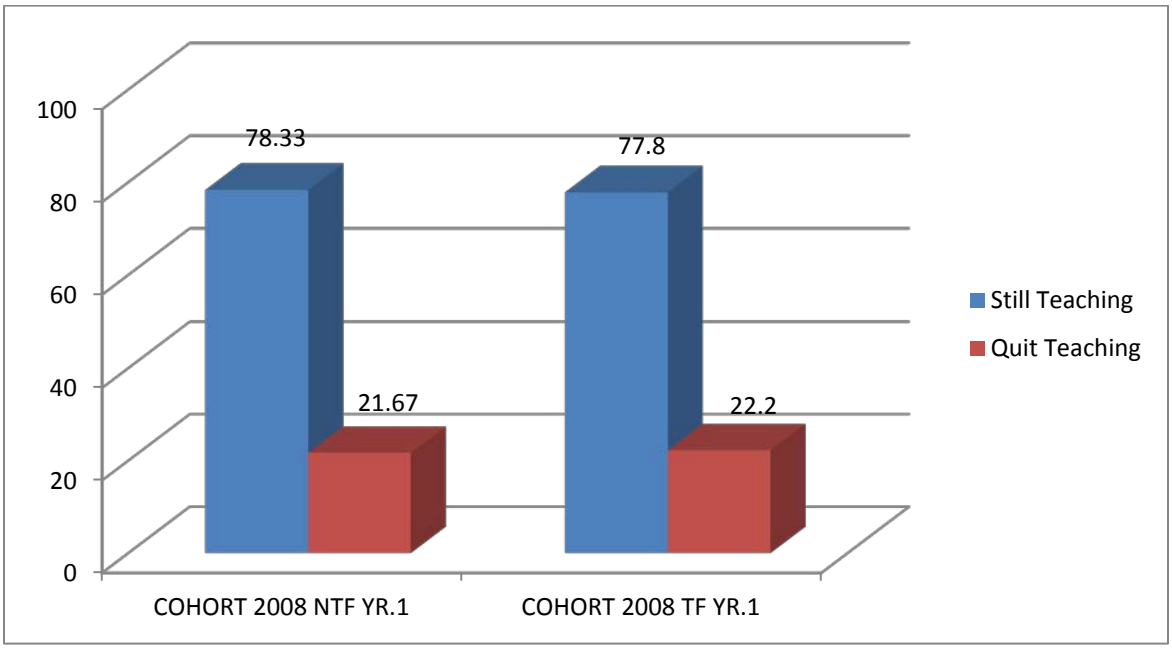


Figure 47: Cohort **2008** – Year 2

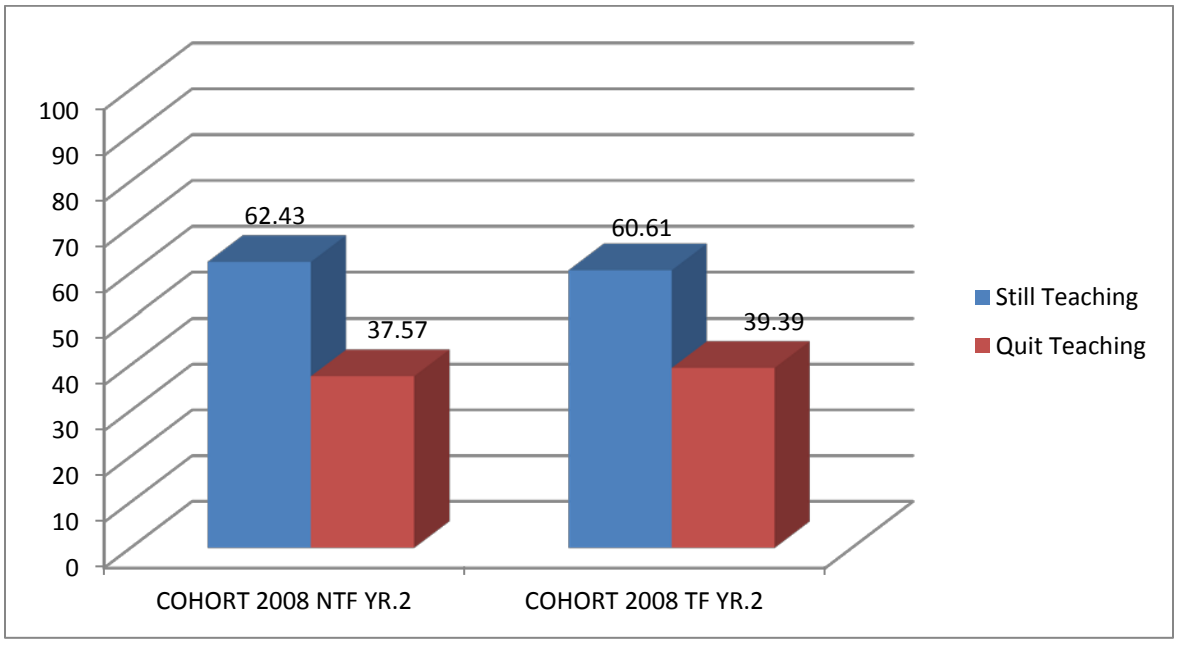
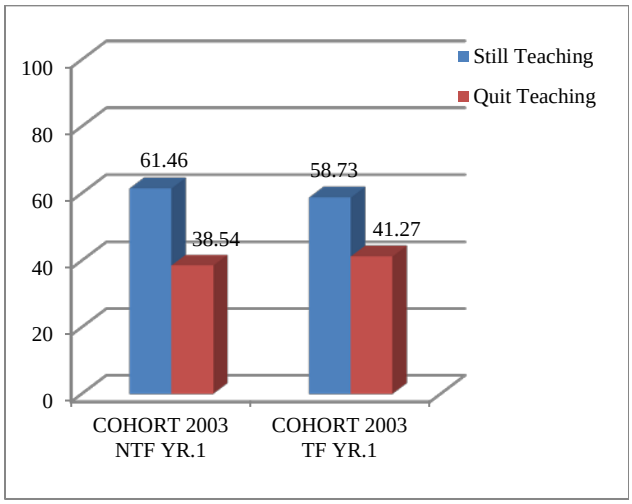
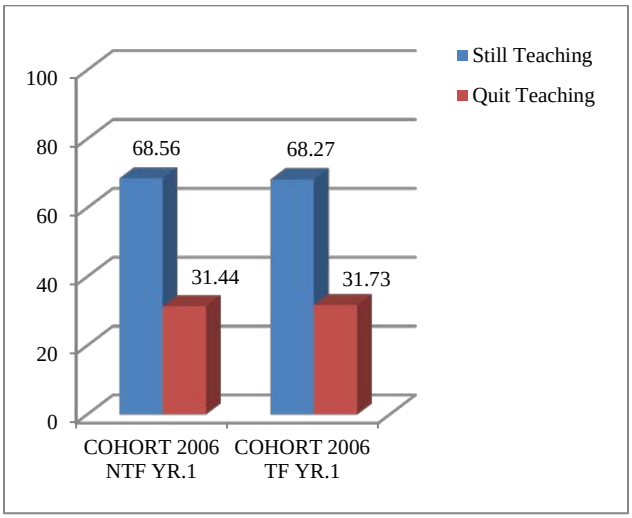
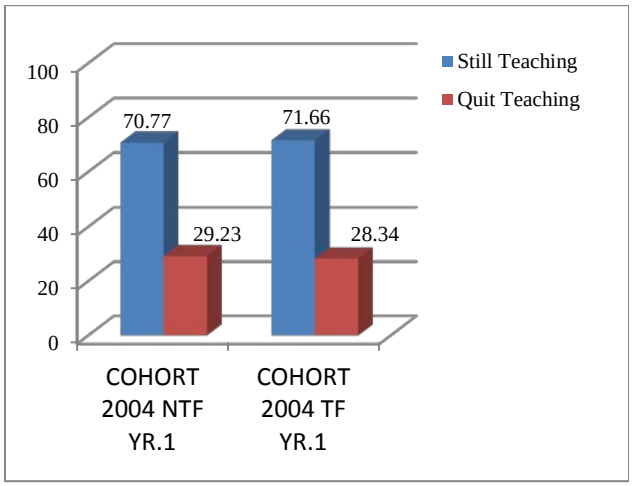
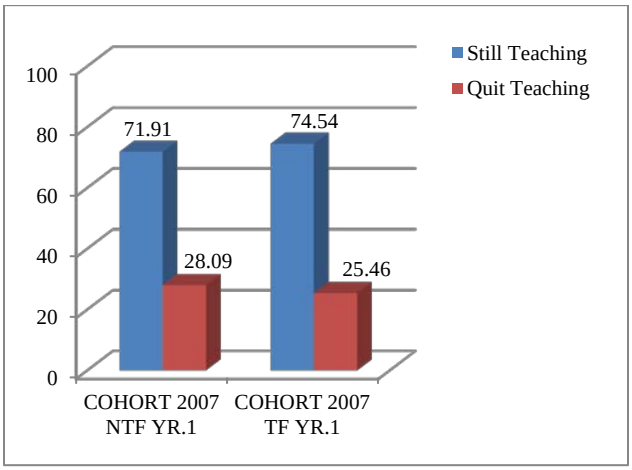


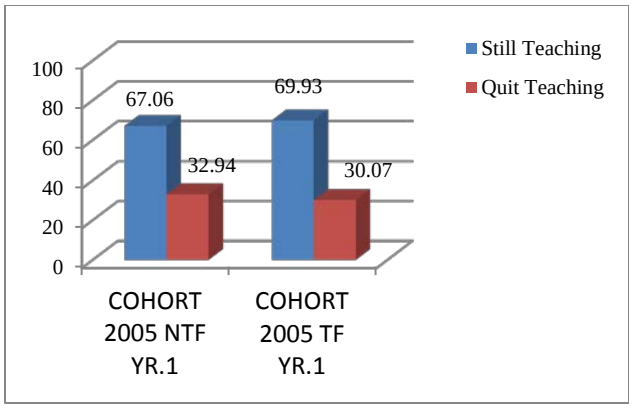
Figure 48: Cohorts 2003 – 2008: Stayers and Leavers in **Year 1**











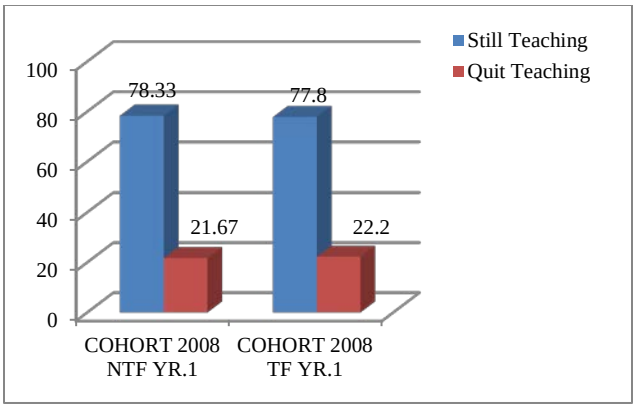
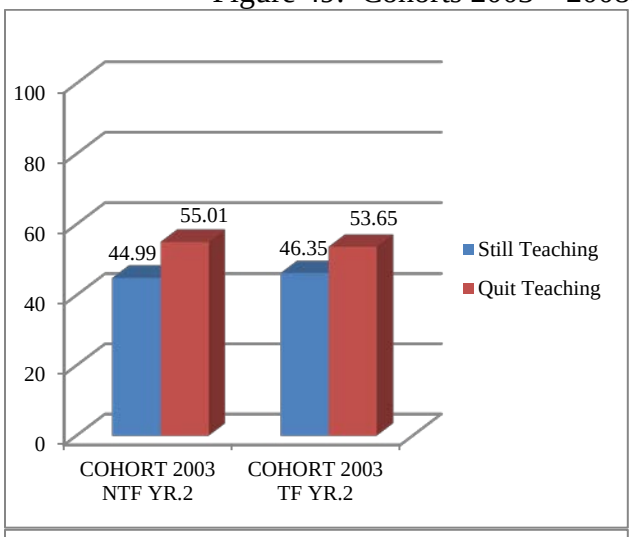
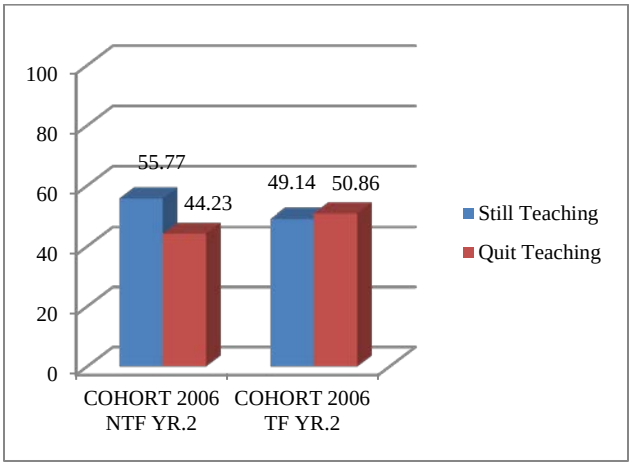
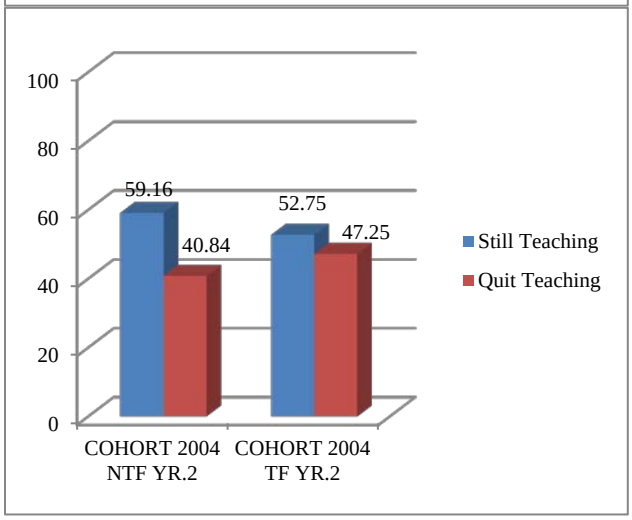
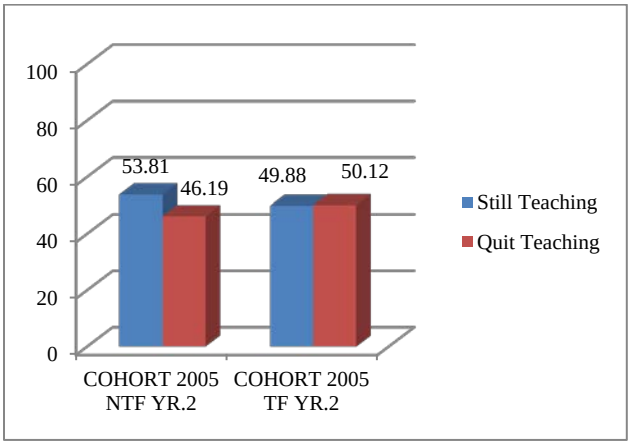


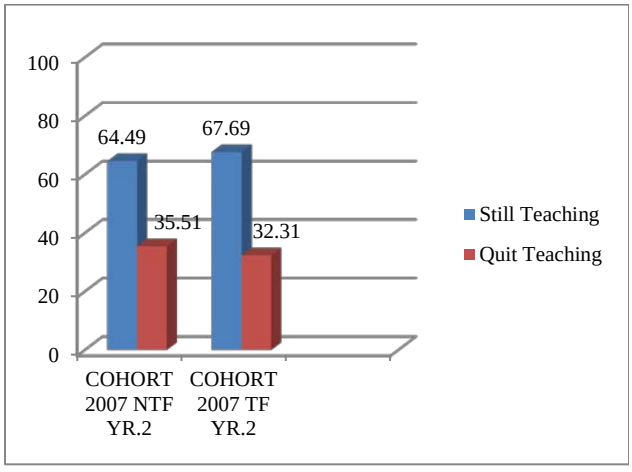
Figure 49: Cohorts 2003 – 2008: Stayers and Leavers in **Year 2**











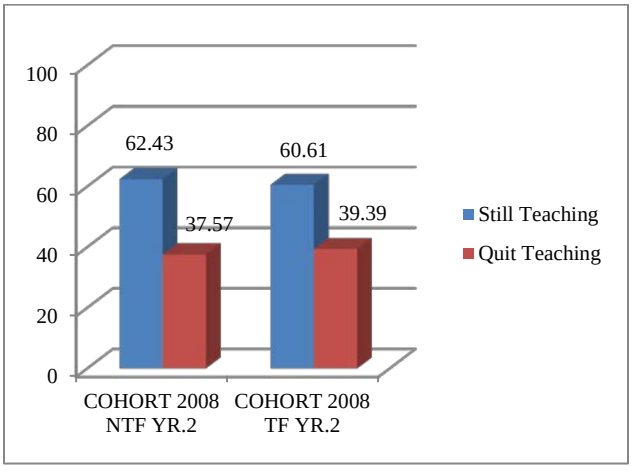
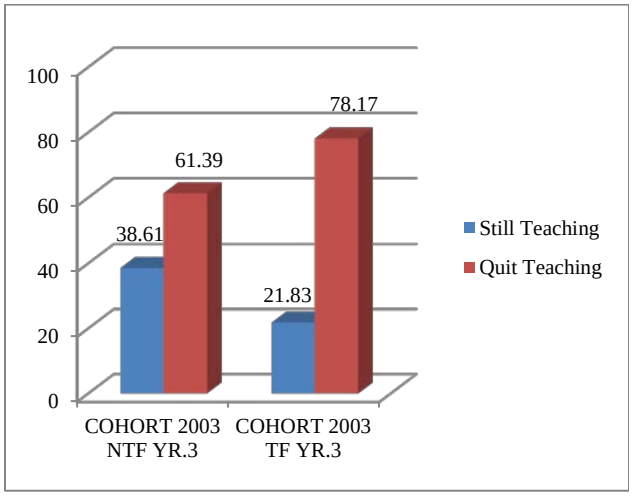
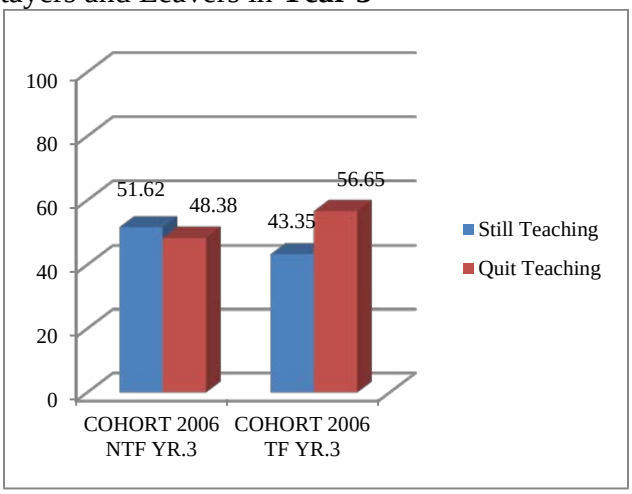
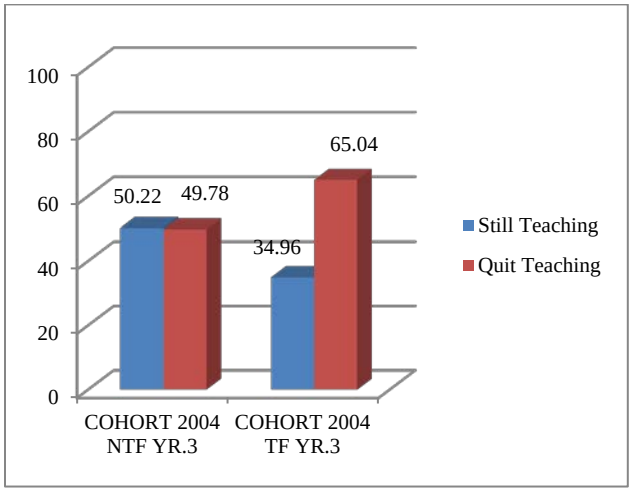
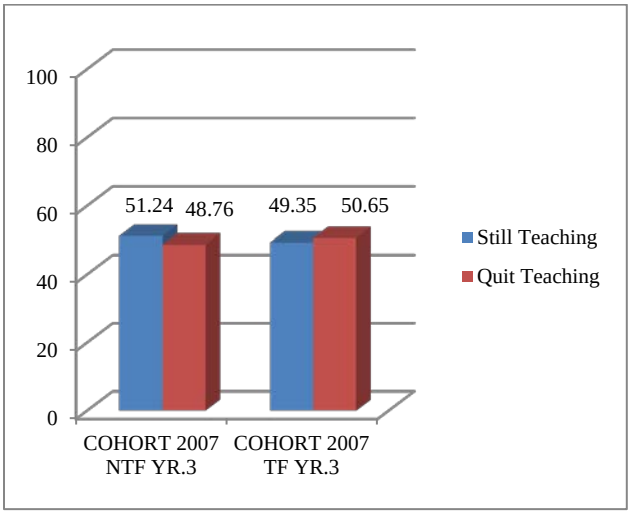


Figure 50: Cohorts 2003 – 2007: Stayers and Leavers in **Year 3**









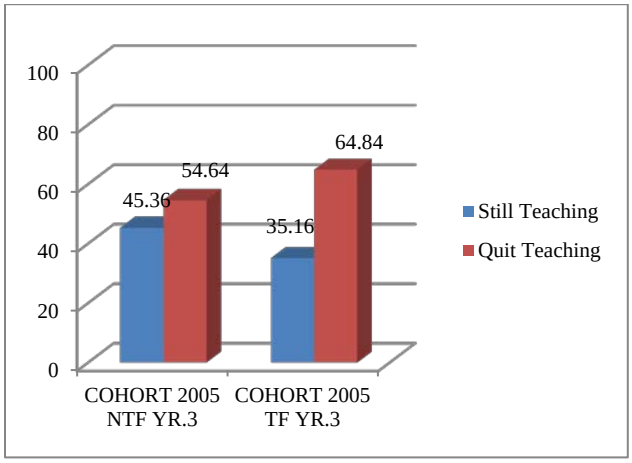
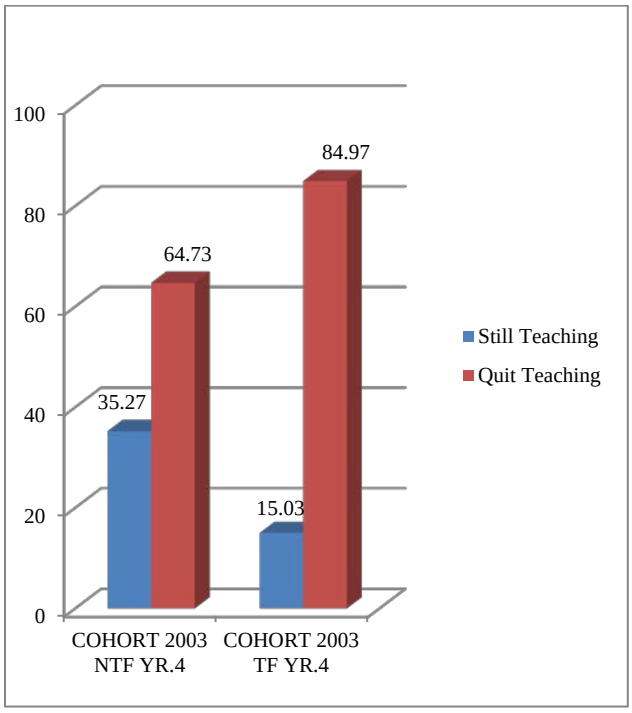
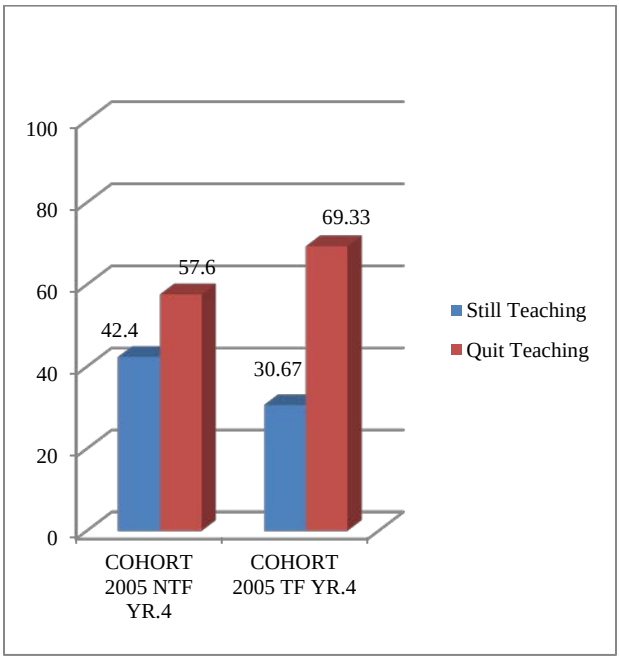
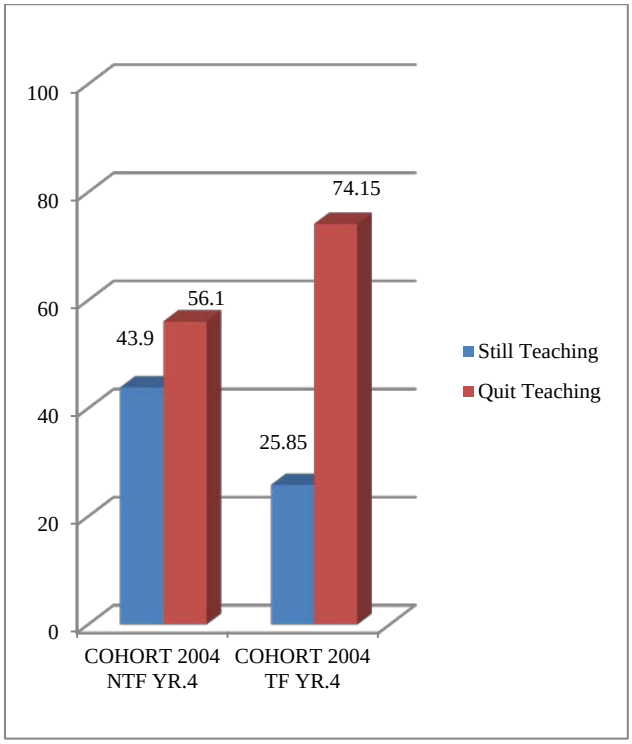


Figure 51: Cohorts 2003 – 2006: Stayers and Leavers in **Year 4**







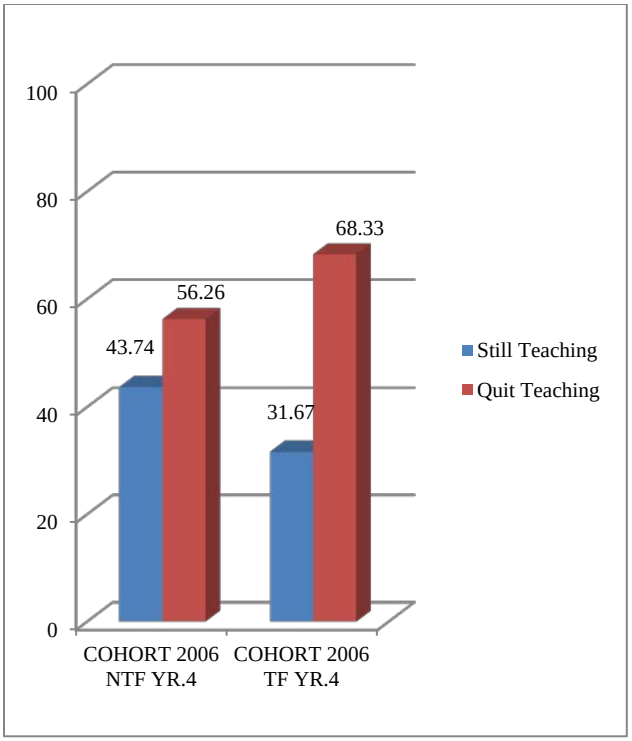
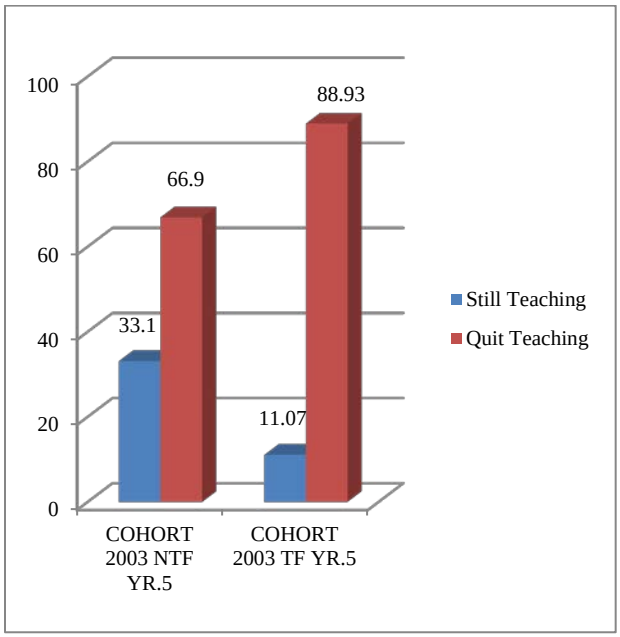
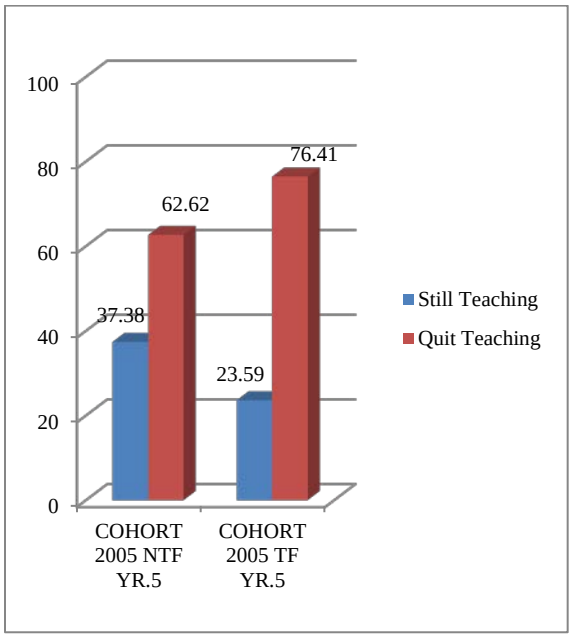


Figure 52: Cohorts 2003 – 2005: Stayers and Leavers in **Year 5**





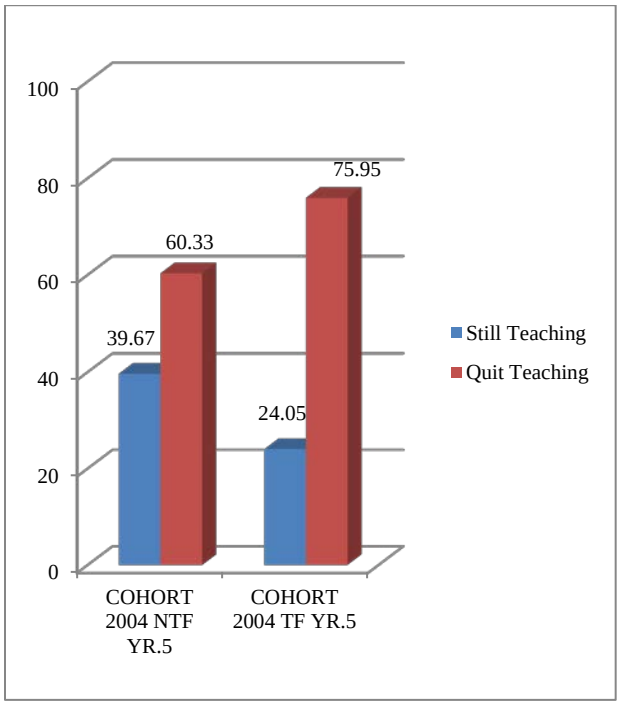


Figure 53: Cohorts **2003 and 2008**: Product-Limit Survival Probability Estimates for Teaching Fellows

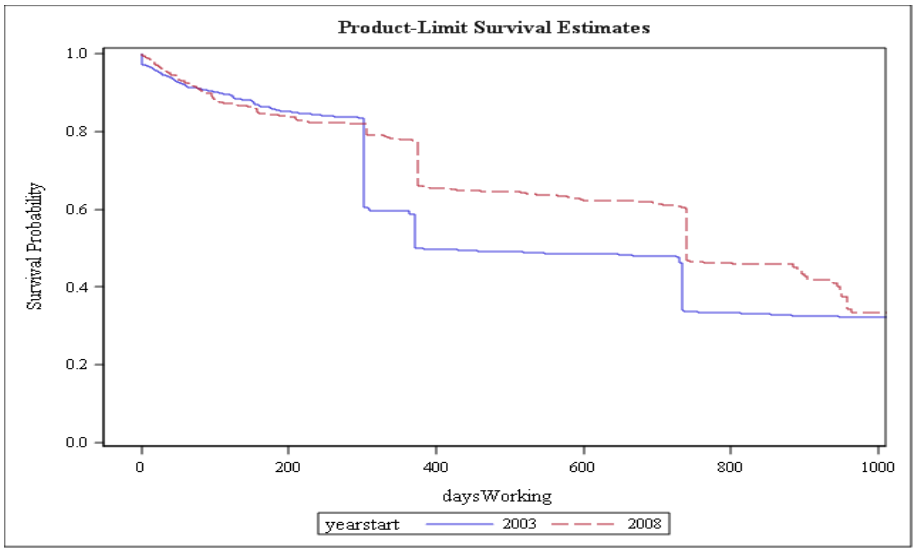
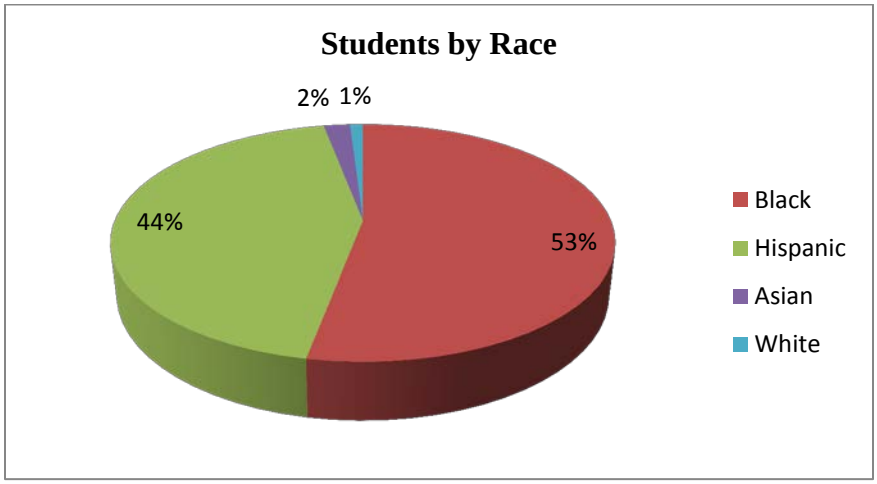


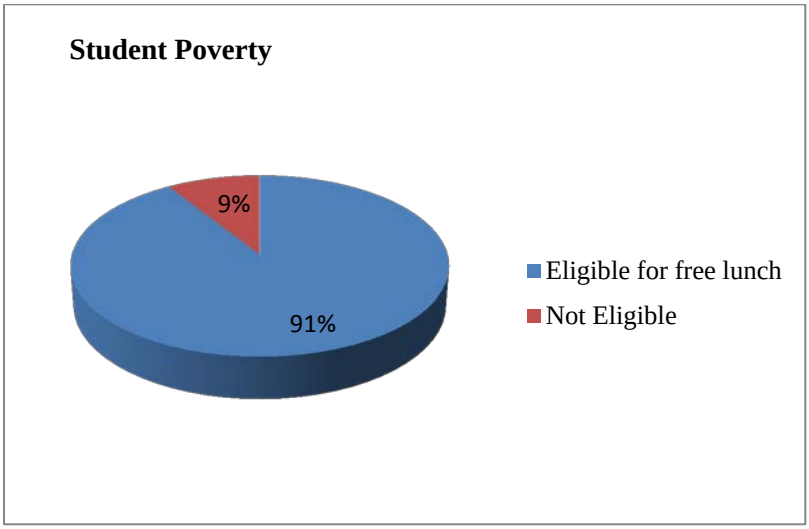
Figure 54: Racial Composition of Schools Where Teaching Fellows Were More Likely to be Placed[59]



Source: Viteritti, J.P. & Kosar, K. (2001). The tip of the iceberg: SURR schools and academic failure in New York City. *Civic Report No. 16 July 2001*. Center for Civic Innovation at the Manhattan Institute.

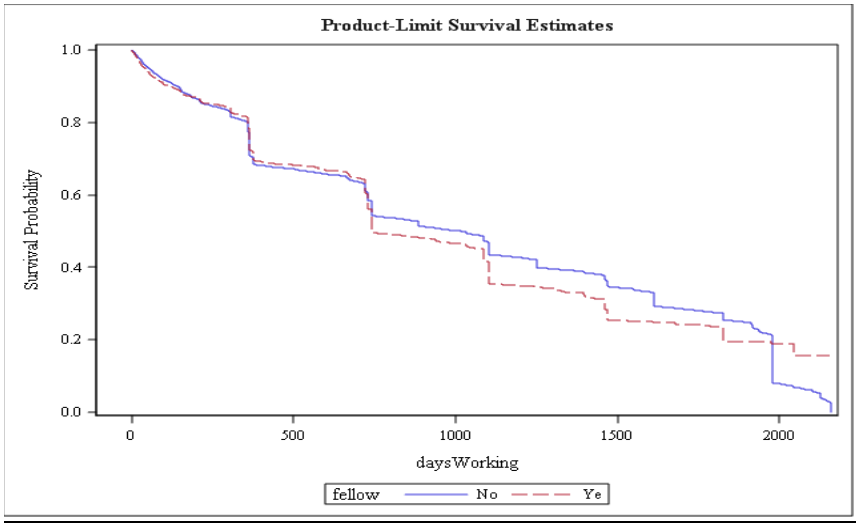
[59] The racial composition of schools where Fellows were more likely to be placed in 2001 is practically similar to what still obtains today and what obtained in the years that my study covered.

Figure 55: Student Poverty at Schools Where Teaching Fellows Were More Likely to be Placed[60]



Source: Viteritti, J.P. & Kosar, K. (2001). The tip of the iceberg: SURR schools and academic failure in New York City. *Civic Report No. 16 July 2001*. Center for Civic Innovation at the Manhattan Institute.

Figure 56: Survival Probabilities for Teaching Fellows and Non-Teaching Fellows – 2005-2008



[60] Student poverty at schools where Fellows were more likely to be placed in 2001 is essentially the same for the period under study in my research as well as today (in 2014).