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ABSTRACT

A comprehensive teacher demand, supply, and shortage (TDSS) model is proposed as a conceptual framework for analyzing and determining the teaching force in bilingual and English-as-a-Second-Language (ESL) education. Available data on the shortage of bilingual education teachers are reviewed, and new national data on their characteristics are presented. Information needs and policy issues are discussed with respect to TDSS in bilingual education. It is suggested that there is a need to consider alternative means to increase the supply of ESL and bilingual teachers in order to improve the retention of qualified experienced teachers and to improve the yield and retention of newly graduated teachers. Appended materials include information on databases relevant to TDSS research; Schools and Staffing Survey (SASS) technical notes; and tables of standard errors for average number of years of teaching in current school of ESL and bilingual education by sector, level, and selected characteristics, 1987-88. Contains 19 references. (LB)

DEMAND, SUPPLY, AND SHORTAGE OF BILINGUAL AND ESL TEACHERS: MODELS, DATA, AND POLICY ISSUES

Erling E. Boe

INTRODUCTION

By the few available measures there was a serious shortage of qualified teachers in the field of bilingual education in the early 1980s — more so, apparently, than in any other teaching field. No recent data have been reported to suggest this circumstance has changed during the intervening years. Beyond these general observations there is little specific knowledge from a national perspective about the sources of supply of and the demand for bilingual and ESL teachers (BETs). Even such a basic datum as the number of limited English proficient (LEP) students, one of the elements in teacher demand computations, is subject to estimates that range from about one to five million (Council of Chief State School Officers, 1990; Macías, 1989). In addition, bilingual education is a complex field with a wide range of instructional approaches, each with different implications for specific teacher qualifications (Bennett, 1988; Wolfson, 1989). This is another important element in teacher demand computations. Until recently no national data base of BETs has been available to support refined supply and demand research in this area. Perhaps for these reasons, no comprehensive attempt has been made to analyze the teacher work force in bilingual education in terms of a supply and demand model from a national perspective. The general purpose of this paper is to begin this task now that a refined data base on the national teaching force, including BETs, is available. More specific purposes are defined in the following paragraphs.

Models

The phrase "teacher supply and demand" encompasses several related concepts such as teacher/student ratio, retention, transfer, and attrition, as well as several sources of supply and several indices of demand. The gross difference between teacher demand and supply defines a shortage or surplus. However, these quantities are conditioned by teacher characteristics such as professional qualifications, racial/ethnic background, multilingual fluency, gender, and age. For example, the amount of teacher shortage depends on how it is specified. There may not be an absolute shortage of mathematics teachers, but there may be a shortage of mathematics teachers with an undergraduate major in mathematics, who are members of a minority group, or who are fluent in a

language other than English. The first purpose of this paper is to review and extend models within which useful distinctions such as these can be made in the analysis of the teacher demand, supply, and shortage (TDSS) and to describe sources of data which can be used to quantify terms included in this framework.

Data

A major policy concern in precollegiate education is the supply of fully qualified teachers. Discussion of teacher shortages over the past decade has focused on science and mathematics teachers, though it has also been widely recognized that serious shortages of fully qualified teachers also exist in bilingual/ESL education, special education, and foreign languages. Based on 1983-84 national survey data, Sietsema (1987), for example, reported a higher teacher shortage in bilingual education than in any other teaching field. Based on a different survey, Akin (1988) similarly concluded that bilingual education was a field of considerable teacher shortage during the mid-1980s. In a recent literature review, Macias (1989) projected a 48 percent shortage in California in 1990 but interpreted national trend data as giving hope that parity between demand and supply could be reached nationally. Given the importance of the teacher shortage problem to the field of bilingual education and the disparate data available, a second purpose of this paper is to review and interpret from a national perspective published data on the demand, supply, and shortage of BETs within TDSS models presented.

Until recently comprehensive national data on TDSS have been lacking for all teaching fields. Recently, however, a wealth of data from the 1987-88 Schools and Staffing Survey (SASS) and its companion, the 1989 Teacher Followup Survey (TFS), both of the National Center for Education Statistics (NCES), has made possible the study of a variety of factors involved in TDSS. Because the size of the sample of BETs included in this survey was substantially increased by a supplement funded by the Office of Bilingual Education and Minority Languages Affairs (OBEMLA), more detailed study of TDSS in this field is possible than would otherwise have been the case. Since little is presently known about BETs from a national perspective, a third purpose of this paper is to present preliminary data on BETs from this supplemental sample.

Policy Issues

The effectiveness of bilingual education and ESL is dependent, in major part, on a supply of fully qualified teachers sufficient to meet specific teacher demands in various languages, grade levels, and geographic regions. The final purpose of this paper is to review policy issues entailed in insuring a sufficient supply from a variety of sources such as newly graduated teachers, retention of qualified teachers, transfer of teachers from other fields, entrants

from the reserve pool, and entrants to the profession by alternative routes. Research opportunities to shed light on such policy issues from studies of national data bases, especially SASS and TFS, will be outlined.

TEACHER DEMAND, SUPPLY, AND SHORTAGE (TDSS) MODELS

Teacher demand, supply, and shortage have been the subject of considerable conceptual analysis and research during the past decade. Two recent and very helpful analyses are by Haggstrom, Darling-Hammond, and Grissmer (1988) and Gilford and Tenenbaum (1990). While the approach to TDSS described here borrows extensively from these sources, it elaborates upon them and also includes development of original teacher transfer and attrition concepts applicable to assessing these phenomena nationally. Accordingly, the purpose of this section is to review and extend TDSS models applicable to analyzing the teaching force in bilingual and ESL education as well as in other teaching fields. The main elements of the approach presented here, considered in order, are (a) alternative definitions of teacher demand, (b) sources of teacher supply, (c) estimating teacher shortage, (d) attrition as the major source of teacher shortage, and (e) other important factors influencing TDSS.

This TDSS framework is national in the sense that it provides for an overall national perspective and for state (or regional) perspectives individually and in relation to each other. It focuses specifically on precollegiate public education but can easily be elaborated and generalized to include private education.

National data quantifying elements of TDSS models can be obtained from several sources, as described in Appendix A. The 1987-88 Schools and Staffing Survey (SASS) of the National Center for Education Statistics (NCES) is now the major source of comprehensive data.

Teacher Demand

Teacher demand is the first component of TDSS models to be considered because it defines the need for a supply of teachers. Demand itself is defined by different variables depending on which of two main model types is used. Smull and Bunsen (1989) described (a) a Prevalence-Based Model, in which demand is driven by the size of the student population and a prespecified teacher/student ratio and (b) a Market-Based Model, in which demand is driven by the number of funded teaching positions.

According to the prevalence model, the total demand for teachers is defined as the number of students divided by a predetermined teacher/student ratio. In practice this ratio is set by policy makers and is constrained by a local

education agency's (LEA) ability to fund teaching positions. Others, such as advocacy groups and researchers, may set any ratios they deem appropriate. Therefore, under the prevalence model, estimates of teacher demand depend upon the assumptions made by the source reporting it and may vary widely. An example of the prevalence type currently in use is the MISER Model (Coelen & Wilson, 1987).

In contrast to the Prevalence-Based Model, the Market-Based Model defines the total demand for teachers as the number of full-time equivalent (FTE) teaching positions approved and funded, usually by LEAs. Estimates of teacher demand under the market model require empirical data and should not vary greatly from one source to another if definitions of teaching positions are comparable and data of reasonable quality are available. An example of the market type currently in use is the New Hires Model (Lauritzen, 1989).

Estimates of total demand for teachers for LEAs, particular states, or the nation as a whole are not particularly helpful, however. Useful estimates of teacher demand, whether computed by either the prevalence or the market approach, should be stratified by teaching field, instructional level, geographic location, and teacher qualifications required (e.g., type of certification, fluency in a language other than English, etc.). Ideally, total demand would be the aggregate of the specific demand for teachers in all these strata.

Teacher Supply

Teacher supply is the second component of TDSS models. It constitutes the response to the need for teachers as determined by computations of teacher demand. From a national perspective the sources of total teacher supply in any year are:

1. experienced teachers continuing from the previous year;

2. new teachers entering the profession from three sources —

    a. recent college graduates,

    b. the reserve pool, and

    c. entrants via alternative routes;

(In any one year the main source of teacher supply is experienced teachers continuing from the previous year. This large stable group is augmented each year by a supply of new teachers that, from a national perspective, comes mainly from two sources. The first is individuals who graduate from college in the previous year; the second is the reserve pool composed of experienced teachers

and inexperienced certificate holders who have delayed their entry to teaching. A third, as yet minor, source of new teachers is the entry of educated and experienced individuals into teaching via "alternative routes." These are individuals who do not have standard teacher preparation, but receive some preservice and, usually, intensive inservice preparation for teaching. State and federal policy is currently moving aggressively in the direction of enlarging this source of new teacher supply.)

3. Viewed from a local (as distinguished from national) perspective, there is the following additional source of "new" teachers in any year:

   transfer of active teachers to one school from another or to one teaching field from another.

This source is here termed "transfer supply" and is broken down into two main factors: (a) school transfer and (b) teaching field transfer. For example, the supply of new mathematics teachers in a particular school may include school transfer in which a mathematics teacher from a different school transfers in. Likewise, the supply of new mathematics teachers in a particular school may include teaching field transfer in which a chemistry teacher changes to a primary assignment in mathematics. It is also possible for a new mathematics teacher in a particular school to have transferred simultaneously from a different school and from a different teaching field.

From a national perspective, of course, transfer supply does not add to the total supply of active teachers; it merely reshuffles the deck. The total body of teachers that continues from one year to the next undergoes some resorting in the field nationally. Most remain in their same positions in their same schools, while others transfer to new schools or to different teaching fields. All these possibilities for continuing teachers are illustrated here in Table 1. The column totals represent the national teaching force, by subject matter field, during the current year (1990-91), which continued from the prior year (1989-90). The rows represent the input sources of these teachers according to their location and teaching field from the prior year (1989-90). The large group of teachers that remains in the same teaching assignment (i.e., in the same school and subject matter) from one year to the next is classified in the diagonal cells (marked by X) of the first horizontal block (same school), while teachers classified in all the other cells of the table represent transfers to a different school and/or a different teaching field from one year to the next. It is this latter group that represents transfer supply. By inspecting the columns for subject matter fields, one can observe the pattern of transfer supply from one location and/or teaching field to another. It should be noted that newly entering teachers in 1990-91 are not represented in this table.

Table 1

Two-Factor Framework for Teacher Transfer Supply

Transfer Supply: School Site Factor (1989-90)	Subject Matter Field (89-90)	Transfer Supply: Subject Matter Field (1990-91) Read	Math	Bilg	TESL	SpEd
1. Same School	Read	X				
	Math		X			
	Bilg			X		
	TESL				X	
	SpEd					X
2. From Different School: Same District	Read	X				
	Math		X			
	Bilg			X		
	TESL				X	
	SpEd					X
3. From Different School: Different District In-State	Read	X				
	Math		X			
	Bilg			X		
	TESL				X	
	SpEd					X
4. From Different School: Different District Out-Of-State	Read	X				
	Math		X			
	Bilg			X		
	TESL				X	
	SpEd					X
5. TOTAL Teachers: 1990-91 >		___	___	___	___	___

NOTES:
1. Diagonal cells (Xs) represent stability from year-to-year in subject matter field, while the off diagonal cells in a column represent transfer supply from different fields.
2. Teachers classified in the diagonal cells (Xs) of "Block 1: Same School" represent the large stable teaching force which continues to teach in the same field in the same school.
3. Teachers classified in Blocks 2, 3, and 4 during the prior year (1989-90) represent sources of transfer supply from different school sites. Those classified in off diagonal cells of these blocks represent combined subject matter field and school site transfer supply.
4. Five subject matter areas have been selected here to illustrate the teaching field transfer supply matrix. Since SASS identifies 32 distinct primary teaching fields, a much larger matrix with up to 27 additional fields can be analyzed.

Estimates of the total supply of teachers from all sources is of limited utility, however. Just as teacher demand should be stratified by teaching field, instructional level, geographic location, and various indices of teacher qualifications, so should estimates of teacher supply. To determine how well the supply of teachers meets the demand for teachers, it is vital to be able to match demand within strata with supply within strata. Realistically, the best estimate of total teacher supply is the aggregate of the specific supply that meets the specifications for the specific demand for teachers in all these strata.

Teacher Shortage

Teacher shortage is the third element to be considered; it is defined by the difference between the demand for and the supply of teachers. Just as estimates of teacher demand and teacher supply should be stratified by teaching field, instructional level, geographic location, and various indices of teacher qualifications, so should estimates of teacher shortage. Relevant national data bases, such as SASS, do this. For example, the demand for teaching positions stratified by field, level, and region can be subdivided into satisfied and unsatisfied (i.e., shortage) demand, as follows:

1. Satisfied Demand for Fully Qualified Teachers -
   total full-time equivalent (FTE) teaching positions filled by teachers holding regular or standard state certification in their fields of assignment[1] and

2. Shortage of Fully Qualified Teachers -
   the number of FTE teaching positions accounted for by less than fully qualified teachers, as follows —

   a. the number of FTE teaching positions filled by teachers holding probationary, provisional, temporary, or emergency state certification in their fields of assignment[2]

   b. the number of FTE teaching positions filled by substitute teachers or left vacant

   c. the number of FTE teaching positions withdrawn or converted to some other subject matter because a suitable candidate could not be appointed.

As indicated above, the definition of a teacher shortage is determined in large part by the qualifications of available individuals, which in practice is

determined in large part by their certification' status. In using certification status to establish whether or not a teacher is fully qualified, it is important to be specific with respect to three necessary conditions: (a) the type of certification, (b) the field of certification, and (c) the field of teaching assignment. Thus, satisfied demand (i.e., the absence of shortage) exists only to the extent that a regularly certified teacher is actually assigned to a teaching role in her/his field of certification. This should be distinguished from the following similar, but misleading, definitions of the supply of bilingual teachers (none of which simultaneously satisfies the three necessary conditions):

1. the size of the national pool of teachers certified in bilingual education - ignoring whether or not fully qualified (as defined above) and ignoring whether or not actually teaching

2. the number of fully qualified bilingual teachers who are actually teaching, ignoring whether or not teaching bilingually; and

3. the number of certified bilingual teachers who are actually teaching bilingually, ignoring whether or not fully qualified.

Though these quantities may be interesting and useful for some purposes, they do not reflect the actual supply of qualified bilingual teachers and should not be used to compute teacher shortage.

In defining teacher shortage, it is, therefore, important to distinguish between a shortage of fully qualified teachers, as defined above, and a shortage of certified teachers who may or may not be fully qualified. This definition of a qualified teacher is used here in examining the problem of bilingual and ESL teacher shortage.

Attrition: The Major Source of Demand for New Teachers

Teacher attrition is the fourth element in TDSS models and is the largest contributor to demand for new teachers. It is important, usually on an annual basis, to distinguish between satisfied and unsatisfied demand. The latter defines teacher shortage and drives teacher recruitment activities. While the measurement of overall teacher shortage is relatively simple, the causes of shortages, especially shortages in specific teaching subject areas and in particular localities, are complex. The sources of demand for new teachers are commonly identified as increments in student enrollment, decrements in the teacher/student ratio, and teacher attrition; teacher attrition is by far the dominant consideration (Haggstrom, Darling-Hammond, and Grissmer, 1988).

Teacher attrition itself is a complex phenomenon which has been analyzed and modeled by several researchers (e.g., Grissmer & Kirby, 1987). Existing attrition models, however, are not sufficiently broad to account for all variations in type of attrition and, therefore, to accommodate relevant data recently available from the 1987-88 SASS and its Spring, 1989 companion, the Teacher Followup Survey (TFS). These data bases make possible the first extensive analysis of teacher attrition from a national perspective. To capitalize on these data, we have formulated an analytic framework termed the "Comprehensive Attrition Model" (CAM) outlined next[4].

In CAM, teacher attrition is first subdivided into two basic types:

1. transfer attrition, which refers to teacher transfer between teaching fields and/or schools;

2. exit attrition, which refers to exit from the teaching profession for some other activity.

The first basic type, transfer attrition, is subdivided into two factors: (a) transfers between teaching fields and (b) transfers between schools. The main components of each transfer factor are as follows:

1. Teaching Field Transfer involves either -

   a. transfer within one field of teaching (e.g., transfer from biology to chemistry in science education or transfer from bilingual to ESL); or

   b. transfer from one field to another (e.g., transfer from special education to science education).

2. School Transfer involves either -

   a. transfer to a different school in the same district; or

   b. transfer to a school in a different district in- state; or

   c. transfer to a school in a different district out-of-state; or

   d. transfer to a private school.

This two-factor framework for transfer attrition can best be concertized as a two-dimensional table with blocks of rows defined by four levels of school transfer and the columns defined by teaching fields, as shown in

simplified form in Table 2[5]. In all, SASS provides sufficient data on a substantial variety of different teaching specializations and, therefore, makes possible the comprehensive analysis of transfer attrition described here.

In Table 2 the column totals represent the national teaching force, by subject matter field, during a prior year (1989-90), which continued in teaching during the subsequent year (1990-91). The rows represent the destination of these teachers in terms of their school location and subject matter field in the current year (1990-91). The large group of teachers that remain in the same teaching assignment (i.e., in the same school and subject matter) from one year to the next is classified in the diagonal cells (marked by X) of the first horizontal block (same school), while teachers classified in all the other cells of the table have transferred to a different school and/or a different teaching field from one year to the next. It is this latter group that represents transfer attrition. By inspecting the columns for subject matter fields, one can observe the pattern of transfer attrition out of one location and/or teaching field to another. It is important to note that teachers exiting the profession after the 1989-90 year and new teachers entering the profession for the 1990-91 year are not represented in this table.

From a national perspective, of course, transfer attrition does not detract from the total supply of active teachers. Transfer attrition from one school or teaching field to another represents transfer supply to the receiving school or field. It is, therefore, useful to compare Table 2 (Teacher Transfer Attrition) with Table 1 (Teacher Transfer Supply) because each organizes the transfer phenomenon from a different angle. The enormous advantage of tracking these teacher transfers from national survey data is that cross-district and state transfers are identified as such. From district or state data, out-transfers may appear to be exit attrition instead of transfer attrition.

In contrast to transfer attrition, exit attrition can be subdivided into the various activities teachers undertake upon leaving teaching (e.g., alternative employment or homemaking) and by other reasons for leaving teaching (e.g., reductions in force or death). SASS, for example, provides a wide range of information about teachers who have exited the profession. The following five post-teaching activities illustrate major categories that can be tabulated from SASS attrition data:

1. employment in a non-teaching education position;
2. employment in a non-education position;
3. return to student status in higher education;
4. homemaking and/or child rearing; or
5. retirement, death, or other.

Table 2

Two-Factor Framework for Teacher Transfer Attrition

Transfer Attrition: School Site Factor (1990-91)	Subject Matter Field (90-91)	Transfer Attrition: Subject Matter Field (1989-90) Read	Math	Bilg	TESL	SpEd
1. Same School	Read	X				
	Math		X			
	Bilg			X		
	TESL				X	
	SpEd					X
2. To Different School: Same District	Read	X				
	Math		X			
	Bilg			X		
	TESL				X	
	SpEd					X
3. To Different School: Different District In-State	Read	X				
	Math		X			
	Bilg			X		
	TESL				X	
	SpEd					X
4. To Different School: Different District Out-Of-State	Read	X				
	Math		X			
	Bilg			X		
	TESL				X	
	SpEd					X
5. TOTAL Teachers: 1989-90 >		___	___	___	___	___

NOTES:

1. Diagonal cells (Xs) represent stability from year-to-year in subject matter field while the off diagonal cells in a column represent transfer attrition from different fields.
2. Teachers classified in the diagonal cells (Xs) of "Block 1: Same School" represent the large stable teaching force which continues to teach in the same field in the same school.
3. Teachers classified in Blocks 2, 3, and 4 during the current year (1990-91) represent transfer attrition to different school sites from the prior year. Those classified in off diagonal cells of these blocks represent combined subject matter field and school site transfer attrition.
4. Five subject matter areas have been selected here to illustrate the teaching field transfer attrition matrix. Since SASS identifies 32 distinct primary teaching fields, a much larger matrix with up to 27 additional fields can be analyzed.

The study of teacher exit attrition from a national perspective is made possible by the Teacher Followup Survey of Spring, 1989, which was administered to the 2500 teachers in the base SASS who exited the profession at the end of the 1987-88 school year. This survey questionnaire was completed by 93 percent of all teachers in the SASS sample who left the profession. In addition to determining their primary activity after leaving teaching, the survey obtained information about their post-teaching income, their plans for the immediate future (including returning to teaching), their reasons for leaving teaching, their dissatisfactions with teaching, and their opinions about working conditions in their new jobs in comparison with their former teaching positions. Furthermore, through linking these followup survey data with data from the base SASS, one can expand to the analysis of exit attrition include a wide range of additional considerations such as variations in work loads and personnel policies.

Factors Influencing Teacher Demand, Supply, and Shortages

A large number of known and unknown factors affects the magnitudes of teacher demand, supply, and shortage. Some of these factors are teacher characteristics which affect the definitions of demand, supply, and shortage, while other factors determine the amount of the supply and the rate of exit attrition. A few of the more important factors, beginning with teacher characteristics, are described in the following paragraphs.

Teacher Certification Status

Teacher shortage is a function of the certification status of existing and prospective new teachers. The possession of standard or regular certification is used here as an operational definition of a fully qualified teacher though some authorities or interest groups may conclude that standard certification requirements in some teaching fields in some states are inadequate. In that event their definition of a fully qualified teacher will include other factors such as academic preparation, experience, and/or special abilities such as fluency in a particular language other than English. Teachers hired with less than full certification are commonly thought not to alleviate the shortage problem but to be a stopgap measure.

Language Fluency

In bilingual education a teacher is expected to be proficient in English and in the non-English native language of the student, whether or not the teacher is otherwise fully certified. To the extent that such teachers do not fill teaching positions, a component of shortage is defined.

Race/Ethnicity

It is often observed that the proportion of minority teachers is much lower than the proportion of minority students and that the first has actually declined in recent years. In the judgment of many there is, therefore, a shortage of minority teachers whether or not the total number of qualified teachers is sufficient.

Teacher Age

Teacher age is a major factor associated with exit attrition rates, with junior and senior teachers exiting the profession at a higher rate than teachers in the middle age range. The age of teachers is, therefore, a predictor of turnover and may be predictive of shortages depending on the replacement supply available.

Economic Considerations

The teaching profession is commonly thought to be price sensitive, with higher salaries attracting a larger supply of qualified new teachers and prolonging the years in service of active teachers. A more subtle consideration is whether or not a teacher is the primary wage earner in a family. Teachers who are secondary wage earners are less likely to transfer to a different geographic area unless the primary wage earner relocates.

Sociological Considerations

Factors such as family structure and number of dependents of teachers are presumed to be related to employment stability. Many teachers exit teaching and later return, sometimes several times. Often this is a function of child-rearing activities. They contribute to both shortage and reserve pool supply statistics. Conversely, teachers who are primary wage earners are more likely to remain in their positions and, therefore, not contribute to turnover rates and potential shortage.

Urbanicity of the School Environment

Teacher shortages, a joint function of high attrition and inadequate supply of qualified candidates, are often reported to be accentuated in rural and inner city areas. Location (i.e., geographic distribution) is, therefore, one major factor to be accounted for in calculating teacher shortage.

DATA RELEVANT TO TDSS

Review of TDSS Research in Bilingual and ESL Education

Organized and reported information relevant to the demand, supply, and shortage of BETs from a national perspective is extremely limited, and estimates of one key element (the number of limited English proficient school-age children in the nation) vary so widely as to be of marginal utility. The purpose of this section is to review and interpret available literature within the TDSS framework described in the prior section. This review often distinguishes data that apply (a) only to bilingual teachers, (b) only to ESL teachers, and (c) to bilingual and ESL teachers (BETs) combined.

BETs Demand

The determination of demand for BETs is complex and controversial. Complexity results from the multiplicity of factors involved in defining demand and the availability of two models (i.e., the prevalence and market models) by which demand can be estimated. Controversy is the result of varying assumptions made about teacher/student ratio and of the selection of an appropriate estimate of the number of LEP students from various data sources, which provide counts ranging from about one to five million.

Use of the Prevalence-Based Model to estimate total demand for BETs requires data on the number of LEP students nationally and a judgment of a reasonable teacher/student ratio. The authors of this paper prefer to use the number of about 1.5 million LEP students estimated by a 1985-86 survey conducted by the U.S. General Accounting Office (GAO, 1987) and a teacher/student ratio of 1:25. Using these numbers, we estimate a prevalence-based demand for 60,000 BETs.

However, Macias (1989) computed a much larger demand for BETs using the prevalence approach. He prefers to use a projection of 2.5 million LEP students age 4-15 years for 1985 made by Oxford, et al. (1984) and a teacher/student ratio of 1:20 (the lowest of three ratios he suggested). Using these numbers, Macias estimates the demand for BETs at 140,000. If instead we use the GAO count of LEP students (1.5 million) and the same teacher/student ratio of Macias (1:20), then the demand for BETs is estimated to be 75,000. In our judgment, the most reasonable estimate of BETs demand using the prevalence method seems to be about 60,000 to 75,000 as of 1985.

The prevalence method can be used to provide a good estimate of the number of teaching positions that should exist for BETs under the set of assumptions made about student counts and preferred teacher/student ratio.

However, it does not provide an estimate of how many teaching positions for BETs actually exist. In a more practical sense, the latter estimate is the realistic demand. This estimate is provided by the alternative market approach. Fortunately, some national data from 1983-84 on established teaching positions for bilingual teachers (but not for ESL teachers) are available from a published, though widely overlooked, source (Sietsema, 1987). Using these data, we have computed an estimated 25,345 FTE positions for bilingual teachers at the elementary level and 4,818 position at the secondary level in both public and private schools. Only about 3 percent were in private schools, however.

Thus, the total market-based demand for bilingual teachers (excluding ESL) is about 30,000, or about half the 60,000 prevalence-based demand for both bilingual and ESL teachers that we estimated above. Unfortunately, no firm estimates for the numbers of both active bilingual and ESL teachers are available from the same data base. Macias, however, reported data from 1981 showing that 32,000 trained ESL teachers were active in their field (1989, p. 7). He later cited data from Waggoner and O'Malley (1984) indicating that, in 1980, approximately 28,000 certified bilingual teachers were using a non-English language in the classroom. Two aspects of these data are interesting. First, one can infer that the distribution of active ESL/bilingual teachers was roughly 50/50. Secondly, the figure of 28,000 active certified bilingual teachers using a non-English language is close to our estimate from Sietsema's (1987) data of about 30,000 FTE bilingual teacher positions. Given these estimates, it is not unreasonable to assume that, in the early 1980s, a market-based demand for about 60,000 BETs (comprised of about 30,000 bilingual positions and 30,000 ESL positions) existed. Interestingly, the total number of positions estimated in accordance with the market model (60,000) is equivalent to the number of teachers estimated in accordance with the prevalence model (also 60,000).

BETs Supply

With respect to the total national supply of ESL teachers, Macias (1989, p. 7) cited unpublished figures for 1981 that 32,000 trained ESL teachers were actually teaching ESL; apparently 26,000 of these were teaching through the non-English language. With respect to the total national supply of bilingual teachers, data reported by Waggoner and O'Malley (1984) for 1980 indicated that 28,000 active teachers were certified in bilingual education and used a non-English language in the classroom. The type of certification held by these 54,000 combined ESL and bilingual teachers was not reported. The credibility of the estimate of 28,000 active bilingual teachers is supported by data from a NCES national survey of teacher demand and shortage in 1983-84 (Sietsema, 1987). It estimated approximately 29,000 certified (of all types) FTE teachers with bilingual education as their primary field of assignment.

The supply data reported above did not include information on the sources of supply (i.e., the number of continuing teachers, recent college graduates, new entrants from the reserve pool, and transfers from other teaching fields). Sietsema (1987) also reported that about 90 percent of the active bilingual teachers were fully certified in their field and that about 85 percent were teaching at the elementary level. Other than this, little or nothing is known specifically from national survey data about the qualifications or characteristics of BETs actually teaching in these fields.

One source of new BETs is recent college graduates. In 1986-87 our nation's colleges and universities reported graduating 868 bilingual/bicultural and 665 ESL teachers at both the baccalaureate and masters degree levels (Snyder, 1989). These graduation counts were increased from 301 in bilingual/bicultural and 687 in ESL in 1982-83, the first year for which national graduation data were reported by NCES in these teaching fields (Snyder, 1987). While the number of bilingual/bicultural majors almost tripled in just four years, the total number of graduates (868) is still quite small in absolute terms. Furthermore, there are no data on the proportion of these new graduates who actually enter bilingual teaching upon graduation (i.e., the yield), nor are there data on the retention in bilingual teaching of those who do enter. Available national data do not inspire confidence in the production of recent college graduates in bilingual and ESL majors as the solution to the teacher supply problem.

BETs Shortage

It might appear from the BETs supply and demand numbers reviewed here that the difference between them (i.e., the shortage) is not great. However, all available evidence indicates serious shortages of BETs. The apparent contradiction can be explained by the fact that the earlier conclusion is obtained from teacher data that fail to account for variation in teacher qualifications, distribution by location and teaching level, and teacher characteristics such fluency in a language of instruction other than English and multicultural sensitivity. The only national data on shortage of bilingual teachers (but not ESL teachers) that have been reported in terms of some of these refined dimensions were collected by NCES in its 1983-1984 Survey of Teacher Demand and Shortage (Sietsema, 1987). It is based on a representative national sample of 2,540 LEAs in the public sector and 1,000 private schools. Data reported by Sietsema on bilingual and selected other teaching fields have been abstracted from his tables and reorganized here in Table 3 to identify specific teacher shortages. Shortage is here defined by two components: (a) teaching positions filled with unqualified personnel (defined as those holding provisional, temporary, or emergency certification); and (b) positions for which there was a shortage of certified candidates (defined as positions left vacant,

filled with a substitute teacher, discontinued, or transferred to another teaching field).

The data in Table 3 show that, in 1983-84, there was a much greater shortage of bilingual teachers than in either special or general education at the elementary level and that the bulk of the shortage was the result of the appointment of unqualified teachers.

The number of FTE positions for which there was a shortage of qualified teachers in bilingual education was approximately 3,200, or about 13 percent of total demand. The shortage rate for bilingual teachers at the secondary level was equivalent, but the number of such teachers at this level is relatively modest. Nonetheless, the shortage percentage of bilingual teachers at the secondary level (viz., 13 percent) was three times greater than that in mathematics and science education and in special education and equalled only by the shortage percentage in foreign languages. If these data accurately estimate the total shortage of bilingual teachers at both the elementary and secondary levels two years later in 1985 and if the total shortage of ESL teachers was approximately equal, then one obtains an estimate of the total shortage of qualified bilingual and ESL teachers combined of about 8,000 FTE teachers. This amount of shortage is ten times higher than the estimated yield of 800 practicing teachers[6] obtained from the production of about 1500 newly- graduated BETs in 1986-87 as reported by Snyder (1989). Thus, unless dramatic (and as yet undocumented) increases in the annual number of newly graduated BETS have occurred over the past five years, it seems obvious that the shortage of BETs will not be redressed by the production of our teacher education institutions.

The final source of data to be reviewed on the shortage of bilingual teachers comes from a series of annual surveys of its members conducted by the Association for School, College and University Staffing, Inc. (Akin, 1988). Placement offices of 502 member institutions were asked to rate the relative demand for teachers by teaching field. Responses received (about 50 percent of those surveyed) have indicated that bilingual education has consistently been rated as a "teaching field with considerable teacher shortage" (the highest category of shortage used) over the eight-year period from 1982-1989. Overall, the teaching fields of bilingual, special, mathematics, and science education were equivalent in their teacher demand ratings in these surveys. Because the member institutions are not necessarily a representative sample of American higher education institutions and because the response rates to the surveys are only on the order of 50 percent, the shortage ratings based thereon cannot be interpreted with confidence. The consistent pattern over time reported by some 250 teacher training institutions, however, is consistent with other data reviewed here that show a serious shortage of BETs.

Table 3.--Average years teaching in current school of English as a second language and bilingual education by sector, level, and selected characteristics: 1987-88

Characteristic	Total	Public		Private	
		Elementary	Secondary	Elementary	Secondary
Total teachers	6.0	6.0	6.3	3.8	6.2
Sex					
Male	6.9	5.4	8.0	5.6	8.9
Female	5.8	6.0	5.6	3.7	5.0
Not reported	9.0	10.3	---	---	---
Race					
Am. Indian, Aleut, Eskimo	5.0	3.4	6.9	4.2	---
Asian or Pacific Islander	5.9	6.6	4.5	4.5	---
Black	6.0	6.0	6.2	---	---
White	6.1	6.1	6.6	3.7	6.3
Not reported	5.0	5.2	4.2	---	---
Ethnic origin					
Hispanic	6.2	6.2	5.9	4.0	12.3
Non-Hispanic	5.9	5.7	6.6	3.6	4.8
Not reported	7.2	8.7	4.7	---	--
Age					
Less than 30	2.1	2.0	2.4	2.1	1.8
30 to 39	5.0	5.2	4.6	4.1	3.4
40 to 49	6.6	6.5	6.9	4.0	6.9
50 or more	9.5	9.3	9.8	6.8	14.3
Not reported	6.5	8.8	3.3	---	6.2
Marital Status					
Married	6.4	6.4	6.8	3.9	6.3
Widowed, divorced, or separated	5.9	5.5	7.3	3.4	5.0
Never married	4.6	4.8	3.8	3.5	7.2
Not reported	4.9	7.1	1.8	---	---
Region					
Northeast	5.5	5.6	5.3	3.7	7.1
North central	7.3	6.4	8.4	3.6	4.4
South	6.6	7.1	5.3	4.4	6.5
West	5.6	5.3	6.7	3.9	4.6

--Too few cases for a reliable estimate.

NOTE: Details may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

In summary, this review of available research on the demand, supply, and shortage of BETs has revealed that there is little sound nationally-representative information on both bilingual and ESL teachers, and available information typically comes from different sources. Nonetheless, we can conclude: (a) that there is a serious shortage, overall, of qualified teachers active in these fields; (b) that a conservative estimate of the shortage based on the market model is 8000 qualified teachers; (c) that the concentration of bilingual teachers and the shortage thereof is at the elementary level; and (d) that teacher preparation; institutions are not graduating BETs at a rate sufficient to overcome the shortage, even over a period of years. As of the early 1980s, when relevant data were collected, it is clear that many more qualified BETs were needed to fill available positions. It is also clear that much better research is required to examine the dynamics of the BETs labor market if effective policies are to be adopted to redress existing needs for a sufficient supply of qualified teachers.

BETs Characteristics: Preliminary SASS Data

As observed in the prior section, little is known about the characteristics of BETs from national survey data, and even less is known about how they compare with characteristics of teachers overall. Many of these characteristics are relevant to understanding teacher supply, demand, and shortage. For example, teacher shortage is a function of qualifications which are based, in part, on training, certification, and experience. As another example, retention is a function of age, gender, and marital status. Preliminary analyses of BETs from NCES's 1987-88 Schools and Staffing Survey have been completed recently but not yet published. The purpose of this section is to report some of these new analyses and to compare BETs characteristics with those of teachers overall.

The data reported here[7] for BETs were obtained from national survey responses of 1,853 teachers who use a language other than English to instruct LEP students and/or who teach ESL. These data are compared with survey responses of 41,000 public school teachers and 6,700 private school teachers drawn from all teaching fields.

The distributions of BETs and of teachers overall are shown in tables 4 and 5, respectively, by sector (public and private), level (elementary and secondary), and personal characteristics (e.g., gender, age, race, etc.). Comparison of the "Total" columns of these two tables reveals the following general trends:

1. A high percentage of BETs is female (83 percent); this is a higher percentage than for all teachers (71 percent). The main source of this

Table 4.--Percent of teachers of English as a second language and bilingual education, by sector, school level and selected characteristics: 1987-88.

Characteristic	Total	Public		Private	
		Elementary	Secondary	Elementary	Secondary
Total teachers	100.0%	100.0%	100.0%	100.0%	100.0%
Sex					
Male	16.5	10.2	31.7	6.4	30.0
Female	82.9	89.0	67.9	93.6	70.0
Not reported	0.7	0.8	---	---	---
Race					
American Indian, Aleut, Eskimo	1.6	0.8	1.9	8.7	---
Asian or Pacific Islander	5.6	5.5	5.3	8.2	---
Black	4.5	5.5	2.8	---	---
White	80.9	79.4	82.8	83.1	95.7
Not reported	7.9	8.8	7.1	---	---
Ethnic origin					
Hispanic	38.8	44.4	28.3	29.6	17.8
Non-Hispanic	59.3	53.9	59.3	69.6	81.6
Not reported	1.9	1.7	2.7	---	---
Age					
Less than 30	12.8	13.9	7.9	28.3	18.7
30 to 39	35.9	36.9	34.0	39.6	26.3
40 to 49	29.1	27.9	32.5	21.7	34.9
50 or more	20.5	20.0	23.5	10.2	16.2
Not reported	1.6	1.4	2.3	---	3.9
Marital Status					
Married	66.3	66.1	66.3	71.5	66.6
Widowed, divorced, or separated	15.9	16.1	16.5	9.9	11.7
Never married	16.7	16.8	16.1	16.9	19.2
Not reported	1.1	0.9	1.2	---	---
Region					
Northeast	20.4	17.6	25.7	26.3	30.2
North central	8.8	5.7	17.0	7.8	5.3
South	29.5	32.2	20.9	31.0	46.1
West	41.3	44.5	36.4	34.9	18.6

--Too few cases for a reliable estimate.

NOTE: Details may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 5.--Percent of total public and private teachers, by sector, school level, and selected characteristics: 1987-88

Characteristic	Total	Public		Private	
		Elementary	Secondary	Elementary	Secondary
Total teachers	100.0%	100.0%	100.0%	100.0%	100.0%
Sex					
Male	28.4	12.4	46.8	8.0	36.7
Female	71.1	87.1	52.7	92.0	63.1
Not reported	0.6	0.5	0.6	---	0.2
Race					
American Indian, Aleut, Eskimo	1.1	1.0	1.1	1.0	0.8
Asian or Pacific Islander	1.0	1.0	0.8	1.1	1.5
Black	7.5	8.8	7.5	3.0	1.6
White	88.9	88.6	88.9	93.5	94.4
Not reported	1.6	1.6	1.6	1.3	1.8
Ethnic origin					
Hispanic	2.9	3.3	2.5	2.2	3.4
Non-Hispanic	95.1	94.7	95.4	95.9	94.5
Not reported	2.1	2.1	2.1	1.8	2.1
Age					
Less than 30	12.2	12.2	10.5	20.8	17.1
30 to 39	32.6	33.6	31.5	32.5	32.1
40 to 49	34.2	32.6	37.0	26.6	30.3
50 or more	19.7	20.2	19.7	16.7	18.9
Not reported	1.3	1.3	1.2	1.4	1.6
Marital Status					
Married	71.7	71.9	73.6	64.0	64.0
Widowed, divorced, or separated	11.4	12.6	11.3	7.6	7.6
Never married	15.9	14.7	14.2	26.9	26.7
Not reported	0.9	0.9	0.8	1.6	1.7
Region					
Northeast	22.2	20.5	22.2	25.4	32.9
North central	26.3	25.7	26.9	30.0	22.6
South	34.6	36.0	34.4	30.3	28.6
West	16.9	17.8	16.5	14.3	15.9

--Too few cases for a reliable estimate.

NOTE: Details may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

difference is the higher percentage of female BETs at the secondary level in public schools.

2. The comparison of the racial distributions of BETs and teachers overall is clouded by the relatively high percentage of BETs who did not respond to this question (8 percent). However, it is clear that the Asian and Pacific Islander composition of BETs (5 percent) is much higher than that for all teachers (1 percent). Given the substantial number of Asian LEP students, estimated by Macias (1989) to be over 4 percent of all students in 1990, this evidence of a considerable supply of teachers of Asian origin is encouraging.

3. The percentage of BETs of Hispanic origin (39 percent) is quite high and is much higher than that for all teachers (3 percent). Nonetheless, it is only about half the percentage of Spanish speaking LEP students (75 percent in 1990) estimated by Macias (1989). While these data may suggest that the supply of teachers of Hispanic national origin is insufficient to the specific demand for teachers of this origin, it does not address the supply and/or demand for Spanish-speaking BETs.

4. The age distributions of BETs and teachers overall are comparable. The observation that approximately 20 percent are over the age of 49 does not suggest a massive shortage of teachers resulting from retirement in the near term.

5. As to marital status, a significantly higher percentage of BETs than all teachers was not married (34 percent vs. 28 percent, respectively). Since married teachers are usually more stable in their teaching appointments, this difference suggests that the attrition rate of BETs may be elevated slightly for this reason. For both groups of teachers, the percentage married is quite high in absolute terms.

The average number of years of full-time teaching experience of BETs and of teachers overall is shown in Tables 6 and 7, respectively, by sector, level, and personal characteristics. Overall, BETs have about two and a half years less experience than all teachers (11.1 years vs. 13.5 years). The average number of years of teaching experience does not vary dramatically for any teacher characteristic variable other than for the age variable (which is expected). Though BETs are somewhat less experienced on the average than all teachers, both groups have over ten years of experience — enough to suggest that lack of experience is not a major consideration, on the whole, to determining the qualifications of either group.

Degree attainment percentages of BETs and of teachers overall are shown in Tables 8 and 9, respectively. Both groups include only a small

Table 6.--Average number of years of full-time teaching experience of teachers of English as a second language and bilingual education, by sector, school level, and selected characteristics: 1987-88.

Characteristic	Total	Public		Private	
		Elementary	Secondary	Elementary	Secondary
Total teachers	11.1	11.1	11.7	7.1	9.6
Sex					
Male	12.0	10.2	13.5	7.6	12.4
Female	10.9	11.2	10.8	7.0	8.0
Not reported	11.7	10.8	17.0	---	---
Race					
Am. Indian, Aleut, Eskimo	10.3	11.5	9.4	10.6	---
Asian or Pacific Islander	10.3	11.7	5.8	15.8	---
Black	12.7	12.5	13.8	---	---
White	11.3	11.3	12.1	5.8	9.3
Not reported	9.2	8.6	10.7	---	---
Ethnic origin					
Hispanic	10.7	10.5	11.6	9.2	17.4
Non-Hispanic	11.4	11.7	11.8	6.1	7.6
Not reported	10.8	11.1	10.5	---	---
Age					
Less than 30	2.5	2.6	2.6	2.2	1.6
30 to 39	8.4	8.8	7.7	7.1	7.1
40 to 49	12.9	13.2	12.9	9.4	10.3
50 or more	18.6	18.4	19.0	15.5	20.9
Not reported	10.1	11.7	8.7	---	5.6
Marital Status					
Married	11.3	11.4	11.8	7.6	8.7
Widowed, divorced, or separated	13.5	13.3	14.7	6.4	9.0
Never married	8.2	8.1	7.9	7.1	12.8
Not reported	11.4	11.3	15.4	---	---
Region					
Northeast	9.6	9.5	10.1	5.5	10.5
North central	12.0	10.6	13.6	5.1	7.5
South	11.6	12.1	11.0	6.8	9.5
West	11.3	11.1	12.3	8.9	7.8

--Too few cases for a reliable estimate.
NOTE: Details may not add to totals due to rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 7.--Average number of years of full-time teaching experience of total public and private teachers, by sector, school level, and selected characteristics: 1987-88

Characteristic	Total	Public		Private	
		Elementary	Secondary	Elementary	Secondary
Total teachers	13.5	13.5	14.3	10.0	11.2
Sex					
Male	15.6	15.5	16.0	10.6	12.3
Female	12.6	13.2	12.7	10.1	10.6
Not reported	14.6	15.1	14.8	---	2.8
Race					
Am. Indian, Aleut, Eskimo	13.5	13.5	14.0	11.1	12.2
Asian or Pacific Islander	13.3	14.8	12.9	11.3	8.7
Black	15.4	15.5	15.8	7.9	10.3
White	13.3	13.2	14.2	10.0	11.3
Not reported	13.6	13.8	14.2	11.3	10.8
Ethnic origin					
Hispanic	11.3	11.0	12.4	10.3	8.6
Non-Hispanic	13.5	13.5	14.3	10.0	11.2
Not reported	15.6	15.9	16.0	11.5	13.8
Age					
Less than 30	3.1	3.2	3.2	2.9	2.6
30 to 39	9.0	9.3	9.2	7.0	7.1
40 to 49	15.3	15.2	16.2	10.9	12.6
50 or more	22.8	22.5	23.3	22.1	22.8
Not reported	15.8	16.7	16.4	11.8	9.2
Marital Status					
Married	13.7	13.6	14.7	9.3	10.7
Widowed, divorced, or separated	15.5	15.9	15.7	11.9	11.7
Never married	11.2	11.5	10.7	11.2	12.2
Not reported	14.4	15.4	14.7	10.2	12.9
Region					
Northeast	14.3	14.2	15.5	9.3	8.9
North central	14.1	14.3	14.7	10.7	11.9
South	12.6	12.6	13.1	9.8	11.0
West	13.3	13.1	14.5	9.3	8.9

--Too few cases for a reliable estimate.

NOTE: Details may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 8.--Percent of teachers of English as a second language and bilingual education, by sector, school level, and highest degree earned: 1987-88

Characteristic	Total	Public		Private	
		Elementary	Secondary	Elementary	Secondary
Total teachers	100.0%	100.0%	100.0%	100.0%	100.0%
No degree	1.2	0.5	0.7	10.1	13.8
Associate's degree	0.5	---	0.5	6.3	---
Bachelor's degree	54.6	59.1	44.5	66.6	---
Master's degree	33.5	30.4	41.8	14.1	46.0
Education specialist	8.3	8.4	9.1	---	2.9
Ph.D.	1.6	1.1	2.9	---	---
First professional	0.3	---	0.4	---	---

--Too few cases for a reliable estimate.
NOTE: Details may not add to totals due to rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 9.--Percent of total public and private teachers, by sector, school level, and highest degree earned: 1987-88

Characteristic	Total	Public		Private	
		Elementary	Secondary	Elementary	Secondary
Total teachers	100.0%	100.0%	100.0%	100.0%	100.0%
No degree	0.5	0.04	0.4	3.8	1.9
Associate's degree	0.6	0.02	0.9	1.8	1.1
Bachelor's degree	53.2	56.8	47.3	70.9	50.9
Master's degree	38.8	36.9	43.2	21.0	39.2
Education specialist	5.9	5.6	7.0	2.1	3.7
Ph.D.	0.9	0.5	1.1	0.3	2.8
First professional	0.1	0.1	0.2	0.1	0.4
Not reported	---	---	---	---	---

--Too few cases for a reliable estimate.

NOTE: Details may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

percentage (under 2 percent) of teachers with less than a bachelor's degree, and both groups have an equivalent percentage of teachers (54.6 percent and 53.2 percent, respectively) for whom the bachelor's degree is the highest earned. The percentage of teachers in both groups with post-bachelor's degrees is comparable (about 54 percent). Thus, lack of higher education, as measured by degrees earned, is not a factor in defining teacher qualifications for either group, and BETs are equivalent to all teachers in their higher education thus measured. Of course, these data do not indicate whether any of the degrees earned is in an academic or professional education field directly relevant to a teacher's primary assignment, an important consideration in determining a teacher's qualifications.

Finally, Table 10 presents data on the college major and certification status of BETs. These data indicate that 91 percent of BETs were certified (at any level — regular, provisional, emergency, etc.) in their primary teaching field while the other 9 percent were not certified at all. These findings suggest a deterioration in the qualifications of BETs since 1983-84, as indicated in the data of Table 3. In 1983-84 fewer than 1 percent of full-time equivalent teaching positions in bilingual education were not filled with a teacher holding some kind of certification according to LEA administrative offices reporting these data. By contrast, Table 10 shows that 9.1 percent of BETs were not certified in their primary teaching field. This suggests a serious decline in the qualifications of BETs in their primary assignment. This apparent decline has contributed to the shortage of qualified BETs.

Though the preliminary analyses from SASS reported here in Tables 4 through 10 provide some insight into the composition of the teaching force in bilingual and ESL education, they do not table 10 answer many other important questions about the demand, supply,and shortage of BETs from a national perspective. For example, national estimates of BETs who are fully certified and who are not fully certified in their primary teaching assignments are needed to compute the size of the supply who are qualified in this respect. Also on the supply side, we need to know the sources tapped to bring new teachers into bilingual and ESL teaching positions and the qualifications of recruits from various sources. This and much more important information can be obtained by further analyses of SASS data from 1987-88.

TDSS INFORMATION NEEDS AND POLICY ISSUES

The previous sections of this paper have shown: (a) that national models have been developed that are useful in the analysis of teacher demand, supply, and shortage issues applicable to bilingual and ESL education; (b) that, for the first time, a wealth of nationally representative data has recently become available from the 1987-88 Schools and Staffing Survey which can support a detailed analysis of demand, supply, and shortage of BETs; and (c) that

Table 10.--Percent of public school teachers of English as a second language and bilingual education, with various levels of qualification: 1987-88.

Qualifications	Percentage
Majored and certified	34.7
Majored, but not certified	2.5
No major, but certified	56.2
Not major, not certified	6.6

NOTE: Details may not add to totals due to rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, School and Staffing Survey, 1987-88.

previous efforts to analyze the teaching force in bilingual and ESL education have been lacking in refinement and have been hampered by inadequate data. The purposes of this final section are: (a) to identify areas in which further information is needed; (b) to specify policy issues entailed in ensuring a sufficient supply of qualified BETs; and (c) to identify research opportunities that are responsive to needs for further information which, in turn, will contribute to a better understanding of such policy issues.

Information Needs

A great deal of factual data is required to compute realistic and useful measures of teacher demand, supply, and shortage in any subject matter field. Much of it is now available from the NCES 1987-88 Schools and Staffing Survey. Because SASS data have not yet been intensively exploited to determine their full capability of yielding precise and credible measures of many of the fine-grained concepts that are part of the national TDSS framework, this data base invites "testing" of its full potential. If limitations are discovered, information about them may be used to refine and improve future surveys because SASS is scheduled to be administered every two years beginning in 1991. Reference to SASS data in the following description of information needs is made with this caveat in mind.

BETs Demand Data

Gross demand for teachers can be computed by either or both of two methods. To compute teacher demand in accordance with the Market-Based Model, the following specific information is needed:

- the number of BETs teaching positions created and funded by LEAs, stratified by teaching field, grade level, state or region, and teacher characteristics such as certification status, non-English language abilities, and ethnic origin.

Most of these data are provided by SASS in one form or other with the major exception of requirements for teacher language abilities. Acquisition of current data on teacher proficiency in a non-English language, stratified by grade level, teaching field, and state, could be obtained by inclusion of pertinent items in future administrations of SASS or by new surveys focused on this topic.

To compute teacher demand in accordance with the Prevalence- Based Model the following specific information is needed:

- The number of LEP students, stratified by native language, grade level, and geographic distribution, and some consensus on an acceptable teacher/student ratio.

LEP student data are generated by a variety of sources (Council of Chief State School Officers, 1990; Macias, 1989), typically yielding widely varying estimates depending on the definitions of LEP students and on the data gathering methods used. A major new survey undertaking would be required to measure uniformly the number of limited English proficiency students and perhaps to stratify them by degree of limited English proficiency and native language.

BETs Supply Data

Since the demand for BETs is normally framed in terms of fully qualified teachers, the quantification of the supply of BETs is meaningful only if supply data pertain specifically to fully qualified teachers. Therefore, the first step is to define the key characteristics of qualified bilingual teachers and ESL teachers. Such definitions might include educational background, certification status (i.e., type and subject matter), proficiency in a language other than English, and cultural origins. Once these specifications are established, the following information is needed about teacher supply:

- the number of qualified BETs, stratified by teaching field, grade level, and state or region, who entered their present teaching positions in a particular year through each of the five supply sources identified in TDSS models; and

- the number of unqualified BETs filling available positions, similarly stratified, who entered their present teaching positions in a particular year through each of the five sources of supply.

Most of these data are provided by SASS. Two of the critical components of new teacher supply provided by SASS are recent college graduates and entrants from the active reserve pool. However, the potential of these sources of supply is partly a function of the sizes of the respective pools from which they were drawn. If the yield from these pools is only modest, there is considerable potential for increasing the recruitment of new teachers from these pools by improving working conditions that make teaching more appealing. Data on the pool of relevant college graduates are found in the NCES Survey of Recent College Graduates, while data on the size and composition of the active reserve pool will require special focused studies.

BETs Shortage Data

Once the BETs demand and supply data are available, it will be easy to determine the specific loci of teacher shortages by subtracting the supply of qualified teachers from the demand, all within particular strata. Since recruitment and hiring of new teachers occur mainly on an annual cycle, the following

information is needed to measure the demand for new qualified teachers unfilled by continuing qualified teachers:

- the number of teachers exiting the teaching profession, stratified by teaching field, grade level, state or region, and teacher qualifications;

- the number of positions filled in the prior year by unqualified teachers or left vacant, stratified by teaching field, grade level, state or region, and teacher qualifications; and

- the number of qualified teachers who may transfer from one teaching position to another for which they are not qualified, stratified by teaching field, grade level, state or region, and teacher qualifications.

Most of these data are provided by SASS. However, the tracking of changes in teacher demand from one year to the next, which impact the need for new teachers, will require the following additional information:

- numerical changes in the size of the student population, stratified by native language, grade level, and geographic distribution; and

- numerical changes in target teacher/student ratios or class sizes set by policy makers.

Data on the latter two factors will be difficult to obtain. Changes in student numbers and characteristics can be tracked with successive cross-sectional surveys, such as conducted by the U.S. Census Bureau. Policy changes can be tracked by new surveys addressed to LEA and state administrative offices.

If all the teacher shortage data identified here were available, both the degree and character of teacher shortages could be described with reasonable precision, including the annual demand for new teacher hires. Teacher shortages could also be stratified along dimensions important to providing a supply of teachers with the right qualifications, at the right grade level, at the right locations.

Major Policy Issues in TDSS of Bilingual and ESL Education

To the extent that the information about demand, supply, and shortage identified above is produced, the dynamics of the teacher work force in bilingual and ESL education will be understood in depth from a national perspective. To the extent the dynamics of this teacher work force is understood, it will be possible to address many policy issues directly relevant to

creating and maintaining a qualified work force. Some of the these major policy issues are identified next. Productive resolution of some of these issues would be furthered by special focused studies with SASS or other data bases and by original policy-driven empirical research.

Issue: What Attributes Define a Qualified Teacher?

Without a clear definition of a fully qualified teacher, it is not possible to measure the demand for qualified teachers or the supply or the shortage. Variations in specifications for qualified teachers will have tremendous bearing on demand, supply, and shortage. If fluency in the native language of LEP students were a specification for all ESL teachers, then the shortage would no doubt be much greater. Weak specifications would make recruitment of qualified teacher easier and would reduce the shortage ratio but might not serve well the needs of LEP students. The empirical influence on teacher shortage computations of different policy alternatives in setting teacher qualifications could be the subject of policy-based research with SASS and other data sources.

Issue: How Can Teacher Supply be Enhanced Most Productively?

The supply of fully qualified BETs can be enhanced by a variety of means such as increasing the production of new teachers, attracting qualified teachers out of the reserve pool, promoting alternative routes into teaching careers, and lengthening the average years of service of active teachers. In designing federal and state policy, programs, and funding leading to an increase in the supply of teachers, it would be very useful to know how much potential each of these alternative means will have on reducing teacher shortage; how productive new policy initiatives might be in these different arenas; and what the comparative cost/effectiveness ratios would be for alternative initiatives. Research data from SASS and other data bases can shed light on the potential of different sources of supply to reduce teacher shortage estimates and can, therefore, contribute to estimating the relative cost/effectiveness of different approaches.

Issue: What Working Conditions Can be Manipulated, and at What Cost, to Improve Retention of Qualified Teachers?

Policy makers can alter working conditions, such as teacher/student ratios, salary levels, benefits, availability of teacher aides, and the professional climate of schools, that can contribute to retention of qualified teachers and reduce teacher burnout. Policy-driven research can be directed to examine the potential of manipulating various working conditions to promote teacher retention and to project the relative cost/effectiveness of alternative policies. The SASS data base, in conjunction with data from the Teacher

Followup Survey, can be used to study working conditions associated with teacher decisions to remain in or to leave their primary teaching assignment.

Issue: Why do Fully Qualified Teachers Leave the Profession, and What Policies Can be Adopted to Reduce Exit Attrition?

A teacher's decision to leave the profession may be based on negative factors in the profession (e.g., poor working conditions), and/or on positive factors inherent in available alternatives (e.g., higher salaries). While education policy cannot affect the absolute attractiveness of non-education alternatives open to teachers, it can affect the relative attractiveness of these alternatives by creating more attractive conditions in the teaching profession — perhaps the vary ones (such as salary) that seem most appealing on the outside. SASS and the longitudinal Teacher Followup Survey provide an unprecedented opportunity to study factors involved in the attrition of a representative national sample of teachers. The identification of incentives for leaving and incentives for staying would be very useful information for formation of education policy designed to reduce attrition of qualified teachers and, thereby, reduce the shortage. The productivity and cost of policy alternatives could be analyzed to provide cost/effectiveness estimates.

Issue: To What Extent Do Qualified Teachers Leave Teaching Temporarily, and What Policies Can be Established to Induce Them to Return to Teaching With Minimal Delay?

It is known that many teachers leave and reenter teaching, perhaps several times. Why do they do this, and what can be done to induce them to return? SASS contains extensive data on teacher career patterns. In addition, the Teacher Followup Survey provides longitudinal data on characteristics of teachers who leave and return and the reasons why. Knowledge of why teachers return after a period of absence might lead to policies designed to enhance these positive factors.

Issue: How Can Teacher Training be Designed to Improve the Rate at Which Graduates Enter Teaching and Remain in Teaching?

If teacher training programs could be designed to enhance the yield of practicing teachers from among those graduating and if the programs could be designed to enhance the retention of these new teachers, then teacher shortages could be reduced. Policy-based research could be directed to examine the attributes of teacher training programs that are exceptionally productive in these respects. SASS contains a wealth of information about the educational and work histories of practicing teachers, and this could be linked by special studies to the characteristics of teacher training programs.

Issue: What Personal Attributes of Prospective Teachers Are Predictive of Success in Teacher Preparation Programs, of Entry into the Teaching Profession, and of Retention in the Profession, and What Policies Can be Adopted to Identify and Recruit Such Individuals into Teacher Education?

Enhanced yield and retention of students graduating from teacher preparation programs will obviously reduce the shortage of fully qualified teachers. Original focused research could be designed to identify selected personal characteristics predictive of entering and remaining in the teaching profession, and these may then be used to guide recruitment and induction of individuals into teacher preparation programs.

SUMMARY, DISCUSSION, AND CONCLUSION

Summary and Discussion

By the few available measures, there has been (and presumably continues to be) a serious shortage of qualified teachers in the field of bilingual education — more so, apparently, than in any other teaching field. Beyond this, there is little specific knowledge from a national perspective about the sources of supply of and the demand for bilingual and ESL teachers (BETs). The general purpose of this paper is to initiate a comprehensive analysis of the teacher work force in bilingual and ESL education in terms of supply and demand from a national perspective. This task is particularly timely now that a refined national data base has become available in the 1987-88 Schools and Staffing Survey (SASS) of the National Center for Education Statistics. This paper addresses three main topics:

- models: the description of several models for conceptualizing teacher demand, supply, and shortage (TDSS);
- data: the review and interpretation of published data on demand, supply, and shortage of BETs in accordance with the models presented; and the reporting of previously unpublished preliminary data on the characteristics of BETs from the 1987-88 SASS; and
- information needs and policy issues: the specification of major data needs to compute realistic and useful measures of demand, supply, and shortage of BETs; and the specification of major policy issues entailed in insuring a sufficient supply of fully qualified BETs.

Models

In general, TDSS can be conceptualized in terms of either a Prevalence Based Model or a Market Based Model. Teacher demand in the prevalence model is estimated by dividing the total number of students by the number of students to be assigned to each teacher. In contrast, teacher demand in the market model is determined by enumerating the number of approved and funded teaching positions. The total national supply of teachers, under both models, is derived from the following four main sources: (a) teachers continuing from the prior year, (b) new teachers entering directly from teacher preparation programs, (c) new teachers entering from a reserve pool composed of former teachers and of graduates of teacher preparation programs who delayed entry into teaching, and (d) new teachers entering the profession via alternative routes.

At the state or local level, a fifth source of new teachers is the transfer of practicing teachers from one school to another, one district to another, and/or one state to another. This transfer supply, of course, represents transfer attrition for schools from which teachers leave. An attrition model should distinguish between transfer attrition and exit attrition (i.e., teachers leaving the teaching profession for some other activity) because the former affects supply, while the latter affects demand. A Comprehensive Attrition Model was developed for this purpose and presented here.

In computation of the gross shortage of teachers, the total supply is subtracted from the total demand. However, shortage is usually intended to mean the shortage of fully qualified teachers as distinguished, for example, from teachers who do not hold regular or standard certification. A definition of fully qualified teachers could also include specifications for fluency in a language other than English, ethnicity, subject matter training, and other factors. However defined, the total supply of fully qualified teachers is subtracted from the total demand to compute shortage (or surplus, as occurs in some fields such as physical education).

In conclusion, several specific TDSS models are now capable of guiding efforts to estimate teacher demand, supply, and shortage. Furthermore, a new national data base (SASS) is available to provide most of the important data needed to generate such estimations.

Data

Organized and reported information relevant to the demand, supply, and shortage of BETs from a national perspective is extremely limited, and estimates of one key element to computing demand (viz., the number of LEP school-age children in the nation) vary so widely as to be of marginal utility.

The best national data are from a 1983-84 survey conducted by the National Center for Education Statistics. It showed that the shortage of fully qualified bilingual teachers was about 13 percent of bilingual teaching positions at the elementary and secondary levels, a shortage percentage much greater than that for science, mathematics, and special education. Only the shortage for foreign language teachers at the secondary level was comparable. Other evidence reviewed suggested considerable shortage of bilingual teachers, at least during the mid-1980s.

Preliminary national data from the 1987-88 SASS on characteristics of BETs indicated that: (a) BETs tended to be predominantly female (83 percent vs. 71 percent for teachers overall); (b) more BETs were of Asian and Pacific Islander background than were all teachers (5 percent vs. 1 percent); (c) a much higher percentage of BETs than of all teachers was of Hispanic origin (39 percent vs. 3 percent); (d) the percentages of both BETs and all teachers above the age of 50 were comparable (about 20 percent); (e) a somewhat smaller percentage of BETs than all teachers was not married (34 percent vs. 28 percent); (f) the average years of experience and education of BETs and all teachers were comparable; and (g) nine percent of BETs was not certified (at any level) to teach in their field. This percentage was much higher than the 1 percent reported four years earlier. Overall, these data raise questions about the qualifications of BETs in terms of sufficient level of certification and sufficient ethnic representation. The age distribution data do not suggest a massive shortage of BETs resulting from retirement in the near term.

Though the preliminary analyses from SASS reported herein provide some insight into the composition of the teaching force in bilingual and ESL education, they do not answer many other important questions about the demand, supply,and shortage of BETs from a national perspective. For example, national estimates of BETs who are fully certified and who are not fully certified in their primary teaching assignments are needed to compute the size of the supply who are qualified in this respect. This and much more important information can be obtained by further analyses of SASS data from 1987-88.

Policy Issues

The analysis of TDSS policy issues in bilingual and ESL education requires a great deal of factual data to compute realistic and useful measures of teacher demand, supply, and shortage. Much of it is now available from the NCES 1987-88 Schools and Staffing Survey, though it has not yet been intensively exploited to its full capability to yield precise and credible measures of many of the fine-grained concepts that are part of TDSS models. Such major data needs to include: (a) the number of BETs teaching positions funded by LEAs, stratified by a number of factors such as teaching subject, grade level,

non-English language requirements, etc.; (b) the number of LEP students needing instruction; (c) the number and qualifications of BETs, also by appropriate strata; (d) the proportionate sources of supply of BETs; (e) the numbers of BETs leaving the field annually, either for other teaching positions or for other activities; and (f) estimates of the shortage of BETs, also by appropriate strata.

To the extent that such information about demand, supply, and shortage identified above is produced, the dynamics of the teacher work force in bilingual and ESL education will be understood in depth from a national perspective. In turn, to the extent the dynamics of this teacher work force is understood, it will be possible to address many policy issues directly relevant to creating and maintaining a qualified work force. Some of the these major policy issues are:

- What attributes define qualified bilingual and ESL teachers?
- How can supply of BETs be enhanced most productively?
- What working conditions can be manipulated, and at what cost, to improve retention of qualified BETs?
- Why do fully qualified teachers leave the profession, and what policies can be adopted to reduce exit attrition?
- To what extent do qualified BETs leave teaching temporarily, and what policies can be established to induce them to return to teaching with minimal delay?
- How can teacher training be designed to improve the rate at which graduates enter and remain in teaching?
- What personal attributes of prospective teachers are predictive of success in teacher preparation programs, of entry into the teaching profession, and of retention in the profession, and what policies can be adopted to identify and recruit such individuals into teacher education?

Conclusions

Although the analysis of teacher demand, supply, and shortage in bilingual and ESL education is a complex matter, this paper has shown (a) that analytic tools are available in terms of conceptual models that can be applied to the task, and (b) that a powerful new data base, the 1987-88 Schools and

Staffing Survey, is capable of supporting intricate empirical studies of a wide variety of central factors. Thus, there is now great potential to understand much more deeply than heretofore the dynamics of the teacher labor force in bilingual and ESL education and to formulate and test policy alternatives that have promise for reducing the serious shortage of qualified teachers in these closely related fields.

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END NOTES

[1]If the number of fully-qualified applicants in a field of teaching exceeds the demand (as in physical education), a teacher surplus exists.

[2]Though this definition of teacher shortage is reasonable, of teachers with probationary certificates (those who have completed all requirements for a regular or standard state certificate except for the completion of a probationary period) could be regarded as fully-qualified for this purpose.

[3]As developed in detail by Gilford and Tanenbaum (1990), the definition of a qualified teacher in terms of certification status is the weakest common indicator of quality. Nonetheless, certification status applies especially to public school teachers, whereas private school teachers typically are not required to establish a certification status.

[4]CAN, as presented here, is developed with respect to teachers in public schools. It could easily be elaborated further to account for teachers in private schools, and private school teacher data in SASS will support analysis of teacher attrition in the private school sector.

[5]Transfer attrition to private schools, for example, could be added as a fifth horizontal block.

[6]Frankel and Stowe's (1990) data indicate that about 60% of newly graduated teachers actually assume a teaching position in the following year. It is possible the percentage of BETs entering teaching is higher, but even an 80% rate would add only 280 more BETs nationally that the 60% rate.

[7]The results presented in this paper are from the new NCES Schools and Staffing Survey. Although they have undergone initial review, they should be viewed as preliminary since additional processing to impute for missing values, etc., is yet to be done. NCES believes that the general patterns seen will continue to hold when the data are finalized, though individual numbers may change. Technical notes pertaining to the SASS data reported here are presented in Appendix A. The standard errors for the statistics reported in Tables 4 through 10 are presented in Tables 4S through 10S of Appendix B. All comparisons cited in the text are statisticallyt significant at the .05 level unless toherwise noted.

[8]The other SASS samples were as follows: 5594 public school districts and the administrators (principals) of schools in the public and private school samples.

APPENDIX A

Data Bases Relevant to TDSS Research

DATA BASES RELEVANT TO TDSS RESEARCH

Use of the national TDSS framework described above requires quantification of the parameters specified. Until recently, however, no adequate data base existed for analyzing TDSS from a national perspective. Fortunately, the NCES Schools and Staffing Survey (1987-88), in combination with its associated Teacher Followup Survey (1989), now provides a rich data base adequate to this purpose. Accordingly, the purpose of this section is to describe these two surveys and other data bases relevant to TDSS.

The Schools and Staffing Survey

The Schools and Staffing Survey was first administered during the 1987-88 school year and is planned to be administered biennially beginning in 1991. It was composed of four basic questionnaires with minor variations for units in the public and private sectors, as shown in Table 1 along with other basic descriptive information.

Teacher Demand and Shortage Questionnaire

This survey of public school districts and private schools concentrated on demand for and shortages of teachers and on a variety of policies affecting demand and shortage.

Administrator Questionnaire

This survey of school principals concentrated on their background characteristics and qualifications and their perceptions of school conditions.

School Questionnaire

This survey of schools concentrated on programs, policies, conditions, student characteristics, staffing patterns, and turnover.

Teachers Questionnaire

This survey of teachers concentrated on their demographic and socioeconomic characteristics, work histories, qualifications and teaching assignments, working conditions, and perceptions of school climate. It provides for a detailed analysis of the sources of teacher supply, including transfers among schools and/or teaching fields. (Table 1)

SASS was designed so that schools were the primary sampling unit. Once a school was selected for the sample, the principal of that school was selected for the Administrator Questionnaire and a sample of four to eight

Table 1

Description of the Schools and Staffing Survey (SASS)

Questionnaire	Sector		
	Public	Private	Both
1. Teacher Demand and Shortage	X	X	
2. Administrator			X
3. School	X	X	
4. Teacher	X	X	

Sample Size

1. Public Sector	2. Private Sector
A. 5,600 Districts	A. - - -
B. 9,300 Schools	B. 3,500 Schools
C. 9,300 Principals	C. 3,500 Principals
D. 52,000 Teachers	D. 13,000 Teachers

Samples Representative Of

1. Public and private schools, principals, and teachers nationally
2. Elementary and secondary education levels nationally
3. Each state in the public sector

teachers from that school was selected for the Teacher Questionnaire. Finally, in the public sector, the district in which the school was located was selected for the Teacher Demand and Shortage Questionnaire. This design, therefore, permits the linking of data from one questionnaire to another. For example, teachers' perceptions of school climate can be compared with the perceptions of the principals of their schools. As another example, teacher attrition from schools can be analyzed from the perspective of district policies relevant to teacher demand and shortage.

SASS was administered in the form of mail questionnaires with extensive telephone followup. Consequently, questionnaire response rates were high — on the order of 90 percent in the public sector and 80 percent in the private sector.

SASS also has a small but important longitudinal component termed the Teacher Followup Survey. During Spring, 1989, one year after the base survey, the approximately 2500 teachers who left the teaching profession at the end of the 1987-88 school year were sent the Questionnaire for Former Teachers. In addition, a representative sample of approximately 4700 teachers who remained active in the profession were sent the Questionnaire for Current Teachers. This latter group was subdivided equally into: (a) teachers who remained in the same school and (b) teachers who transferred to a different school. The response rate for this survey was 93 percent for teachers who left and 97 percent for teachers who remained in the profession.

The Teacher Followup Survey, linked with SASS, permits, for the first time at the national level, the study of attrition from the profession of a representative sample of teachers. Furthermore, three further followup surveys of these teachers are planned for 1992, 1993, and 1995. Consequently, it will also be possible to study, from a national perspective, reentry into the profession of experienced teachers from the reserve pool.

Other National Surveys

A variety of national sample surveys during the 1980s include data relevant to one or more of the data elements identified above in the national TDSS framework. All but one have been conducted by NCES. The exception is periodic surveys of public school teachers by the National Education Association (NEA, 1987). Unfortunately, information on BETs is not one of the teaching fields on which NEA reports data.

Other than SASS, the NCES survey most relevant to TDSS is the 1983-84 Survey of Teacher Demand and Shortage (Sietsema, 1987). It includes data specific to the shortage of bilingual teachers. Other NCES surveys which provide data relevant to some TDSS variables include: (a) the 1985

Public School Survey — Teacher Questionnaire; (b) the 1985-86 National Survey of Private Schools - A Teacher Questionnaire; (c) the 1987 Recent College Graduate Study (Frankel and Stowe, 1990); (d) the Teacher Supplement and Questionnaire to the National Longitudinal Study of 1972; (e) the Teacher Survey of the National Education Longitudinal Study of 1988; and (f) the annual Higher Education General Information Surveys, which report the number of college graduates by field of study (including both bilingual education and ESL).

Other Data Sources

Other than national surveys, the principal sources of TDSS data are state administrative records applicable to its teacher work force. The most recent and extensive study (Macias, 1989) of TDSS with respect to BETs was based in substantial part on teacher data from administrative records of California, Texas, and New York. A major effort is currently underway at the Massachusetts Institute for Social and Economic Research (Coelen and Wilson, 1987) to assemble and refine administrative records pertaining to teachers and student enrollment from all New England states plus New York for the past decade or more. When complete, this data base will permit forecasting of teacher demand and shortages by econometric methods in the Northeastern Region. Many other researchers (e.g., Murnane and Olson, 1990) have likewise used state data bases for studying TDSS. In addition to not providing an overall national perspective, these state data bases do not normally record out-of-state transfer attrition which, from the perspective of a particular state, therefore appears to be exit attrition.

Finally, some TDSS data are not available from either national surveys or state administrative records. For example, the size and composition of the active reserve pool (i.e., qualified teachers seeking teaching appointments) is an important consideration in assessing the potential supply of new teachers from this source. To capture such information, special focused studies are typically required (e.g., see Friedman and Salinas, 1990).

APPENDIX B

SASS Technical Notes

SASS TECHNICAL NOTES

For Public and Private School Teachers Questionnaires

Introduction

The data for this paper were collected on the Public School and Private School Teachers Questionnaires, two of seven questionnaires comprising the 1987-88 Schools and Staffing Survey (SASS), a survey developed by the U.S. Department of Education's National Center for Education Statistics (NCES) and conducted by the U.S. Bureau of the Census.

SASS was a mail survey which collected public and private sector data on the nation's elementary and secondary teaching force, aspects of teacher supply and demand, teacher workplace conditions, characteristics of school administrators, and school policies and practices. The seven questionnaires of the SASS are as follows:

1. The Teacher Demand and Shortage Questionnaire for Public School Districts (LEAs);
2. The Teacher Demand and Shortage Questionnaire for Private Schools;
3. The School Administrator Questionnaire;
4. The Public School Questionnaire;
5. The Private School Questionnaire;
6. The Public School Teachers Questionnaire; and
7. The Private School Teachers Questionnaire.

Sample Selection

All 56,242 public and 11,529 private school teachers in the teacher samples were selected from the 9,317 public and 3,513 private school samples.

A list which included all full-time and part-time teachers, itinerant teachers, and long-term substitutes was obtained from each sample school. Within each school, teachers were stratified by experience; one stratum included new teachers, and a second stratum included all other teachers. New teachers were those who, counting the 1987-88 school year, were in the first, second, or third

year of their teaching career in either a public or private school system. Within each teacher stratum, teachers were sorted by subject (General Elementary Education, Special Education, Mathematics, Science, English, Social Science, Vocational Education, other).

The public and private school teacher samples were designed to include a basic sample and a bilingual/ESL(English as a Second Language) supplement. The bilingual/ESL supplement included teachers who use a native language other than English to instruct students with limited English proficiency (bilingual) and teachers providing students of limited English proficiency with intensive instruction in English (ESL). The supplement was funded by the Department of Education's Office of Bilingual Education and Minority Language Affairs (OBEMLA) in order to obtain more reliable estimates of bilingual/ESL education teachers.

The basic sample of teachers required for each of the public and private school strata was allocated to the sample schools in each stratum so that the teacher weights were equal. The specified average teacher sample size for each sample school (four, eight, and six teachers for each public elementary, secondary, and combined school, respectively; and four, five, and three teachers for each private elementary, secondary, and combined school, respectively) was then allocated to the two teacher strata to obtain an oversampling of new private school teachers at a fixed rate and proportional allocation of public school teachers. Finally, a systematic sampling scheme was then applied to select the basic sample within each teacher stratum. An independent systematic sampling scheme was applied to bilingual teachers in each sample school to select the bilingual supplement. To control the number of teachers in each of the six bilingual strata (California, Texas, Florida, Illinois, New York, and all other states), the supplement was subsampled systematically with equal probabilities by stratum. Teachers selected in both the supplement and the basic sample were unduplicated so that each teacher appears only once.

The sample sizes were as follows:

-Public nonbilingual 53,394 -Private nonbilingual 11,248

-Public bilingual 2,848 -Private bilingual 281

Data Collection

The Teachers Questionnaires were mailed to the sampled schools in February, 1988. Approximately ten days after this mailout, a letter was sent to the survey coordinator in each school identifying the school's sample teachers and requesting the coordinator to remind the sample teachers to complete and return their questionnaires. Approximately six weeks after the

mailout, a second set of questionnaires, for sample teachers who had not returned the first questionnaire, was sent in a package to the school coordinators for distribution to nonresponding teachers. During the time of this second mailout, each coordinator was telephoned and asked to remind those teachers who had not returned the first questionnaire to complete the second one and mail it back. A telephone follow-up was conducted during April, May, and June. Because of the large number of nonrespondents and the necessity for completing the follow-up prior to the closing of schools for the summer, only a subsample of nonresponding teachers was included in this effort. This subsample of nonresponding teachers had their weights adjusted to represent the nonresponding teachers who were not selected for the followup.

Questionnaire Response Rates

Weighted response rates were 86.4 percent for the Public School Teachers Questionnaire and 79.1 percent for the Private School Teachers Questionnaire.

Item Description

The Public and Private School Teachers Questionnaires are almost identical and are available from NCES and/or the author.

Effects of Item Nonresponse

There was no explicit imputation for item nonresponse. Not imputing for item nonresponse leads to a bias in the estimates. In tables which present averages, the nature of this bias is unknown.

Standard Errors

The estimates in these tables are based on samples and are subject to sampling variability. Standard errors were estimated using a balanced repeated replication procedure that incorporates the design features of this complex sample survey. The standard errors provide indications of the accuracy of each estimate. If all possible samples of the same size were surveyed under the same conditions, an interval of 1.96 standard errors below to 1.96 standard errors above a particular statistic would include the universe value in approximately 95 percent of the cases. Note, however, that the standard errors in the tables do not take into account the effects of biases due to item nonresponse, measurement error, data processing error, or other systematic error.

Definition of Teacher

For purposes of this survey, a teacher was any full-time or part-time regular teacher whose primary assignment was teaching in any teaching field in any grade K-12. Itinerant teachers were not included, nor were long-term substitutes who were filling the role of a regular teacher on an indefinite basis. Teachers classified as Elementary or Secondary had to meet one of the following conditions:

Elementary

1. a teacher who checked the "ungraded" option only in item 24 (which asks for grades being taught) and was designated as an Elementary teacher on the list of teachers obtained from each sample school (code "0", "1", or "2" for variable name TSUBJ in the tape documentation);

2. a teacher who checked 6th grade or lower and no grade higher than 6th in item 24, or 6th grade or lower and "ungraded" and no grade higher than 6th;

3. a teacher who checked 6th grade or lower and 7th grade or higher and entered a primary assignment code of "01", "02", or "03" in item 16a;

4. a teacher who checked 7th and 8th grades only in item 24 and entered a primary assignment code of "01", "02", or "03" in item 16a;

5. a teacher who checked 6th grade or lower and 7th grade or higher in item 24 and entered a primary assignment code of Special Education in item 16a and was designated as an Elementary teacher on the list of teachers obtained from each sample school (code "0", "1", or "2" for variable name TSUBJ);

6. a teacher who checked 7th and 8th grades only in item 24 and entered a primary assignment code of Special Education in item 16a and was designated as an Elementary teacher on the list of teachers obtained from each sample school (code "0", "1", or "2" for variable name TSUBJ); and

Secondary

1. a teacher who checked the "ungraded" option only in item 24 and was designated as a Secondary teacher on the list of teachers obtained from each sample school (code "0", "1", or "2" for variable name TSUBJ in the tape documentation);

2. a teacher who checked 6th grade or lower and 7th grade or higher in item 24 and entered a primary assignment code greater than 03 in item 16a;

3. a teacher who checked 9th grade or higher, or 9th grade or higher and "ungraded";

4. a teacher who checked 7th and 8th grades only in item 24 and entered a primary assignment code of "04" or higher but not Special Education in item 16a;

5. a teacher who checked 7th and 8th grades only in item 24 and entered a primary assignment code of Special Education in item 16a and was designated as a Secondary t··her on the list of teachers obtained from each sample school (code ›3" or higher for variable name TSUBJ); and

6. all other teachers who checked 6th grade or lower and 7th grade or higher in item 24, or 7th and 8th grades only, and were not categorized above as either Elementary or Secondary.

Acknowledgments

The draft manuscript of this report was reviewed by Susan Ahmed of the Statistical Standards and Methodology Division. Robert S. Burton, Elementary/Secondary Education Statistics Division, was the mathematical-statistical consultant for these notes.

For More Information

For information about purchasing SASS data tapes on public and private school teachers, call Information Services, Office of Education Research and Improvement, U.S. Department of Education (1-800-424 1616).

For more information about these technical notes, contact Sharon A. Bobbitt, Elementary and Secondary Education Statistics Division, National Center for Education Statistics, U.S. Department of Education, 555 New Jersey Avenue N.W., Washington, D.C., 20208-5651, telephone (202) 357-6461.

APPENDIX C

Tables of Standard Errors

Table 38.--Standard errors for average years teaching in current school of English as a second language and bilingual education by sector, level, and selected characteristics: 1987-88 (table 3)

Characteristic	Total	Public		Private	
		Elementary	Secondary	Elementary	Secondary
Total teachers	0.17	0.21	0.36	0.67	1.09
Sex					
Male	0.56	0.62	0.84	2.79	2.21
Female	0.18	0.23	0.26	0.68	1.10
Not reported	2.40	2.78	---	---	---
Race					
Am. Indian, Aleut, Eskimo	0.83	1.02	1.72	2.61	---
Asian or Pacific Islander	0.56	0.82	0.62	2.31	---
Black	0.62	0.71	1.52	---	---
White	0.20	0.23	0.40	0.77	1.10
Not reported	0.46	0.57	0.88	---	---
Ethnic origin					
Hispanic	0.23	0.28	0.40	1.23	4.07
Non-Hispanic	0.24	0.31	0.50	0.80	0.81
Not reported	0.88	1.75	1.29	---	---
Age					
Less than 30	0.09	0.10	0.26	0.68	0.94
30 to 39	0.19	0.22	0.39	1.22	0.80
40 to 49	0.28	0.35	0.56	0.99	1.05
50 or more	0.51	0.64	0.78	2.07	3.40
Not reported	1.00	1.81	0.91	---	2.96
Marital Status					
Married	0.18	0.20	0.48	0.70	1.50
Widowed, divorced, or separated	0.40	0.50	0.71	1.85	3.96
Never married	0.32	0.43	0.45	1.80	3.34
Not reported	1.45	2.18	0.58	---	---
Region					
Northeast	0.41	0.58	0.43	1.80	2.40
North central	0.74	0.94	1.27	1.91	2.64
South	0.33	0.38	0.58	1.25	2.29
West	0.29	0.34	0.49	1.16	1.76

--Too few cases for a reliable estimate.

NOTE: Details may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 48.--Standard errors for percent of teachers of English as a second language and bilingual education, by sector, school level, and selected characteristics: 1987-88 (Table 4).

Characteristic	Total	Public		Private	
		Elementary	Secondary	Elementary	Secondary
Sample size	1,848	1,118	614	64	52
Sex					
Male	1.18	1.14	2.36	4.08	7.88
Female	1.18	1.19	2.33	4.08	7.88
Not reported	0.19	0.26	---	0.00	0.00
Race					
Am. Indian, Aleut, Eskimo	0.28	0.24	0.51	5.18	---
Asian or Pacific Islander	0.61	0.85	1.15	5.00	---
Black	0.74	0.99	0.78	---	---
White	0.84	1.17	1.76	7.38	3.24
Not reported	0.60	0.85	1.25	---	---
Ethnic origin					
Hispanic	1.49	2.29	2.52	7.13	7.97
Non-Hispanic	1.53	2.24	1.53	7.15	7.95
Not reported	0.37	0.45	0.76	---	---
Age					
Less than 30	0.95	1.16	1.50	7.50	9.50
30 to 39	1.14	1.49	2.08	5.92	6.90
40 to 49	1.03	1.34	2.43	6.65	10.82
50 or more	1.34	1.68	2.15	3.53	6.90
Not reported	0.31	0.32	0.73	---	2.59
Marital Status					
Married	1.21	1.62	1.71	8.66	8.68
Widowed, divorced, or separated	1.27	1.63	1.75	4.02	6.23
Never married	0.90	1.09	1.49	6.03	7.13
Not reported	0.27	0.29	0.66	---	---
Region					
Northeast	1.18	1.17	2.56	6.52	9.86
North central	1.15	0.93	3.11	3.97	3.15
South	1.92	2.46	1.79	11.13	13.30
West	1.94	2.34	3.29	9.28	7.18

--Too few cases for a reliable estimate.

NOTE: Details may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 58.--Standard errors for percent of total public and private teachers by sector, school level, and selected characteristics: 1987-88 (Table 5)

Characteristic	Total	Public		Private	
		Elementary	Secondary	Elementary	Secondary
Sample size	47,357	17,391	23,202	3,981	2,783
Sex					
Male	0.24	0.26	0.37	0.62	1.44
Female	0.24	0.26	0.38	0.61	1.45
Not reported	0.04	0.03	0.05	---	0.11
Race					
Am. Indian, Aleut, Eskimo	0.46	0.07	0.08	0.16	0.19
Asian or Pacific Islander	0.05	0.07	0.05	0.34	0.33
Black	0.18	0.27	0.27	0.39	0.27
White	0.21	0.31	0.29	0.60	0.54
Not reported	0.07	0.12	0.09	0.25	0.25
Ethnic origin					
Hispanic	0.10	0.20	0.11	0.33	0.71
Non-Hispanic	0.14	0.25	0.15	0.[illegible]	0.67
Not reported	0.07	0.13	0.10	0.30	0.35
Age					
Less than 30	0.16	0.25	0.20	0.84	1.04
30 to 39	0.24	0.46	0.34	0.87	1.07
40 to 49	0.23	0.48	0.34	1.12	1.22
50 or more	0.22	0.37	0.30	1.00	1.02
Not reported	0.06	0.08	0.09	0.27	0.27
Marital Status					
Married	0.25	0.42	0.37	1.22	1.10
Widowed, divorced, or separated	0.17	0.28	0.26	0.60	0.71
Never married	0.22	0.33	0.28	1.09	0.93
Not reported	0.06	0.08	0.08	0.39	0.33
Region					
Northeast	0.24	0.30	0.33	1.17	1.66
North central	0.23	0.37	0.43	1.24	1.00
South	0.25	0.37	0.41	1.68	1.84
West	0.18	0.29	0.28	0.82	1.20

--Too few cases for a reliable estimate.

NOTE: Details may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 65.--Standard errors for average number of years of full-time teaching experience of teachers of English as a second language and bilingual education, by sector, school level, and selected characteristics: 1987-88 (Table 6)

Characteristic	Total	Public		Private	
		Elementary	Secondary	Elementary	Secondary
Total teachers	0.23	0.28	0.44	0.98	1.43
Sex					
Male	0.65	0.69	0.97	4.58	2.47
Female	0.24	0.32	0.32	0.99	1.66
Not reported	2.72	3.19	2.04	---	---
Race					
Am. Indian, Aleut, Eskimo	1.22	2.16	2.57	4.70	---
Asian or Pacific Islander	0.73	1.09	1.18	3.11	---
Black	0.81	0.92	2.54	---	---
White	0.26	0.31	0.46	1.04	1.47
Not reported	0.62	0.58	1.77	---	---
Ethnic origin					
Hispanic	0.33	0.44	0.81	2.28	2.66
Non-Hispanic	0.32	0.39	0.55	1.07	1.42
Not reported	1.23	2.02	2.11	---	--
Age					
Less than 30	0.12	0.12	0.28	0.79	1.63
30 to 39	0.16	0.22	0.35	1.17	1.03
40 to 49	0.32	0.47	0.55	3.36	1.95
50 or more	0.58	0.78	1.08	2.85	3.85
Not reported	1.31	1.91	1.51	---	2.68
Marital Status					
Married	0.28	0.31	0.54	1.29	1.88
Widowed, divorced, or seperated	0.61	0.75	1.02	2.20	3.71
Never married	0.63	0.53	0.81	2.51	4.81
Not reported	1.97	3.16	2.54	---	---
Region					
Northeast	0.34	0.50	0.64	1.08	2.85
North central	0.69	0.69	1.10	2.46	5.81
South	0.48	0.58	0.79	1.81	3.25
West	0.37	0.45	0.88	2.43	2.49

--Too few cases for a reliable estimate.

NOTE: Details may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 7E.--Standard errors for average number of years of full-time teaching experience of total public and private science teachers, by sector, school level, and selected characteristics: 1987-88 (Table 7)

Characteristic	Total	Public		Private	
		Elementary	Secondary	Elementary	Secondary
Total teachers	0.05	0.07	0.05	0.21	0.27
Sex					
Male	0.08	0.21	0.08	0.65	0.69
Female	0.05	0.07	0.09	0.23	0.36
Not reported	0.71	1.10	0.93	---	1.76
Race					
Am. Indian, Aleut, Eskimo	0.43	0.78	0.58	2.36	3.18
Asian or Pacific Islander	0.46	0.71	0.79	1.62	1.83
Black	0.19	0.26	0.26	0.81	2.33
White	0.05	0.07	0.05	0.21	0.29
Not reported	0.45	0.76	0.46	2.41	1.69
Ethnic origin					
Hispanic	0.22	0.33	0.44	1.80	1.20
Non-Hispanic	0.04	0.07	0.05	0.21	0.27
Not reported	0.37	0.65	0.43	1.16	2.01
Age					
Less than 30	0.03	0.05	0.05	0.07	0.12
30 to 39	0.05	0.06	0.06	0.25	0.20
40 to 49	0.06	0.10	0.09	0.26	0.39
50 or more	0.14	0.20	0.14	0.86	0.87
Not reported	0.62	0.77	0.66	1.56	1.36
Marital Status					
Married	0.05	0.06	0.06	0.30	0.31
Widowed, divorced, or separated	0.14	0.18	0.19	0.74	0.92
Never married	0.13	0.22	0.17	0.41	0.67
Not reported	0.50	0.86	0.73	1.46	2.56
Region					
Northeast	0.12	0.15	0.15	0.42	0.48
North central	0.10	0.16	0.13	0.28	0.45
South	0.09	0.12	0.12	0.65	0.51
West	0.10	0.15	0.14	0.42	0.48

--Too few cases for a reliable estimate.

NOTE: Details may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 8S.--Standard errors for percent of teachers of English as a second language and bilingual education, by sector, school level, and highest degree earned: 1987-88 (Table 8)

Characteristic	Total	Public		Private	
		Elementary	Secondary	Elementary	Secondary
Sample size	1,848	1,118	614	64	52
No degree	0.44	0.35	0.38	8.10	11.14
Associate's degree	0.27	---	0.35	4.44	---
Bachelor's degree	1.25	1.43	2.35	5.46	---
Master's degree	1.18	1.27	2.28	6.60	12.11
Education specialist	0.83	0.92	1.34	---	2.45
Ph.D.	0.31	0.30	0.80	---	---
First professional	0.14	---	0.22	---	---

--Too few cases for a reliable estimate.

NOTE: Details may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 9S.--Standard errors for percent of total public and private teachers, by sector, school level, and highest degree earned: 1987-88 (Table 9)

Characteristic	Total	Public		Private	
		Elementary	Secondary	Elementary	Secondary
Sample size	47,357	17,391	23,202	3,981	2,783
No degree	0.05	0.01	0.04	0.57	0.33
Associate's degree	0.04	0.01	0.07	0.33	0.27
Bachelor's degree	0.29	0.45	0.37	1.00	1.01
Master's degree	0.28	0.45	0.36	0.85	1.06
Education specialist	0.12	0.22	0.18	0.33	0.57
Ph.D.	0.05	0.06	0.07	0.13	0.52
First professional	0.02	0.02	0.03	0.06	0.14
Not reported	---	---	---	---	---

--Too few cases for a reliable estimate.

NOTE: Details may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1987-88.

Table 10S.--Standard errors for percent of public school teachers of English as a second language and bilingual education, with various levels of qualification: 1987-88 (Table 10).

Qualifications	Standard errors of percent
Majored and certified	1.85
Majored, but not certified	0.68
No major, but certified	2.03
Not major, not certified	1.10

NOTE: Details may not add to totals due to rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, School and Staffing Survey, 1987-88.