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Methodologies used by Midwest Region states for studying teacher supply and demand

NATIONAL CENTER FOR EDUCATION EVALUATION AND REGIONAL ASSISTANCE
Institute of Education Sciences
U.S. Department of Education

ISSUES & ANSWERS REL 2009–No. 080

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September 2009

Prepared by

James J. Lindsay, Ph.D.
Learning Point Associates

Yinmei Wan, Ph.D.
Learning Point Associates

Will Gossin-Wilson
Learning Point Associates

NATIONAL CENTER FOR EDUCATION EVALUATION AND REGIONAL ASSISTANCE
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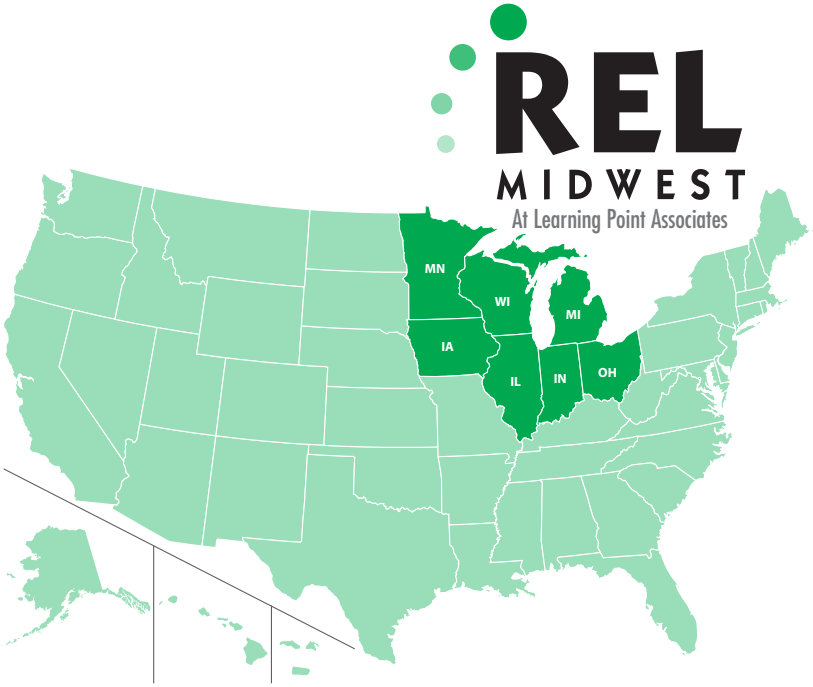

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September 2009

This report was prepared for the Institute of Education Sciences (IES) under Contract ED-06-CO-0019 by Regional Educational Laboratory Midwest administered by Learning Point Associates. The content of the publication does not necessarily reflect the views or policies of IES or the U.S. Department of Education nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.

Lindsay, J. J., Wan, Y., and Gossin-Wilson, W. (2009). *Methodologies used by Midwest Region states for studying teacher supply and demand* (Issues & Answers Report, REL 2008–No. 080). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Midwest. Retrieved from http://ies.ed.gov/ncee/edlabs.

This report is available on the regional educational laboratory web site at http://ies.ed.gov/ncee/edlabs.

Summary

REL 2009–No. 080

Methodologies used by Midwest Region states for studying teacher supply and demand

This report describes how state education agencies in the Midwest Region monitor teacher supply, demand, and shortage; details why they monitor these data; and offers estimates of the monetary costs incurred in performing such studies.

This study responds to a request from state education agencies in the Midwest Region (Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin) to learn more about teacher supply and demand studies conducted in neighboring states.

The study aimed to answer the following research questions:

- What motivates states to assess teacher supply and demand? Are teacher workforce monitoring, projection, and reporting required by state law or code?
- What methodologies do Midwest Region states employ to monitor teacher supply and demand?
- What are the costs of various state approaches?

To address these questions, the study reviewed 27 teacher supply and demand reports produced by and for the Midwest Region states since 2000. Additional information came from interviews with state education agency staff or contractors responsible for producing the reports. A systematic literature review informed the research, helping to define the components of teacher supply and demand. The study findings are framed around those components.

The study found that state education agencies conduct teacher supply and demand studies to comply with federal laws and regulations, including provisions of part B of the Individuals with Disabilities Education Act, federal regulations on loan deferment or forgiveness programs and scholarships, and Title II requirements of the Higher Education Act. Four of the seven Midwest Region states also conduct teacher supply and demand studies to comply with state statutes. The data sources used and the number of data elements analyzed indicate that at least three states go beyond compliance with federal laws or rules. These states gather information from multiple sources to cross-validate their data and to obtain richer types of data to aid policymakers in ensuring adequate staffing. While several states project student enrollment or teacher retirements, only two states produce a forecast of teacher demand.

Midwest Region states' approaches to studying teacher supply and demand vary in complexity

and cost. In a tradeoff between information and cost, more comprehensive studies cost more and produce richer data and more policy-relevant analyses. Respondents reveal that, when determining approaches, states weigh the costs of conducting these studies against the benefits of having detailed information. Two states rely mostly on a single indicator of teacher shortage. Other states use multimethod approaches that combine analyses of state databases with results from surveys of local education agency personnel, representatives of institutions of higher education, and completers of teacher education programs. Although most states have conducted their supply and demand studies since 2000 using the same indicators and analytic methodologies, some states have scaled back their supply and demand studies considerably because of budgetary constraints.

The estimated costs to states of conducting these studies vary considerably, from approximately $10 to $35,000. Studies conducted to obtain only the information required by federal laws or rules and state statutes and rules with the same requirements as the federal reporting were estimated by the study and by state education agency staff to cost less than $4,000. More comprehensive teacher supply and demand studies cost $25,000–$35,000.

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This report describes how state education agencies in the Midwest Region monitor teacher supply, demand, and shortage; details why they monitor these data; and offers estimates of the monetary costs incurred in performing such studies.

WHY THIS STUDY?

The publication in 1983 of *A Nation at Risk* warned policymakers and the public that the impending waves of retiring teachers and rising student enrollments would cause teacher shortages in science and mathematics and other subject areas (National Commission on Excellence in Education 1983). Among the preliminary responses at both national and state levels was to devise methods for empirically confirming the impending threat to school staffing and to create procedures for continually monitoring teacher supply and demand.

At the national level, the Schools and Staffing Surveys (SASS) and Teacher Follow-up Surveys (TFS) of the National Center for Education Statistics (NCES) were expanded to better assess school staffing issues (Haggstrom, Darling-Hammond, and Grissmer 1988). The surveys, along with annual projections of school enrollment and numbers of teachers (a collaboration between NCES and the U.S. Census Bureau), have become a dependable source of information on teacher supply and demand for policymakers and researchers concerned about this issue nationally.

States, too, attempt to monitor the supply, demand, shortage, and surplus of teachers within teaching fields, at a minimum to comply with federal laws and administrative codes. States are required to provide the U.S. Department of Education with a list of teacher shortage areas under codes that allow for loan deferment, loan forgiveness, and scholarships for aspiring teachers in designated shortage fields (34 CFR 653.50, 34 CFR 674.53, 34 CFR 682.210, and 34 CFR 696.12). States also gather supply and demand information for special education teachers, to meet part B of the Individuals with Disabilities Education Act (appendix A describes these federal regulations and laws).

States also may want to gather more in-depth information about teacher supply and demand to better coordinate short- and long-term responses to school staffing challenges. For example, by identifying subject areas and regions in the state that are experiencing shortages, states can help coordinate the production of teachers among teacher preparation institutions. Findings of teacher supply and demand studies can guide production targets for training new teachers and help in monitoring achievement of these targets. In-depth analysis of teacher supply and demand in a state also can inform a range of related policies that affect the teaching profession, including standards of teacher preparation, certification requirements,

in-state and out of state recruitment practices, tenure, compensation systems, and retirement benefits and pension systems. Detailed teacher supply and demand information can help states and local education agencies[1] make adjustments to teacher–student ratios as well.

However, states lack guidance on how to assess teacher demand, the severity of teacher shortages, and the number of teachers available to meet demand. In particular, state education agencies in the Midwest Region have expressed a desire to learn more about methodologies for conducting teacher supply and demand studies. This report offers information on the variety of approaches to studying teacher supply and demand and on how these approaches vary in cost and usefulness for planning.

The study addresses three research questions.[2]

- What motivates states to assess teacher supply and demand? Are teacher workforce monitoring, projection, and reporting required by state law or code?
- What methodologies do Midwest Region states employ to monitor teacher supply and demand?
- What are the costs of various state approaches?

To address these questions, the research team examined 27 teacher supply and demand reports of Midwest Region states (Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin) produced since 2000 and catalogued the methodologies described in the reports (see appendix B). Interviews with nine state education agency staff or contractors responsible for the most recent report were conducted to ensure that the research team clearly understood state efforts to assess teacher supply and demand (see appendix C). Respondents also were asked about the motives underlying state education agency efforts to study teacher supply and demand, about other teacher staffing work that they perform, and about the costs of conducting the most recent study. A systematic literature review informed the research, helping define the components of teacher supply and demand (see box 1). The study findings are framed around those components.

The overarching goal of conducting a study of teacher supply and demand is to identify the gap between supply and demand, both generally and for specific teaching fields and regions

COMPONENTS OF TEACHER SUPPLY AND DEMAND

The overarching goal of conducting a study of teacher supply and demand is to identify the gap between supply and demand, both generally and for specific teaching fields and regions. The findings reported here are organized around the main components of teacher supply and demand drawn from a systematic review of the literature (see box 1), as well as the concepts of teacher shortages and surpluses.

Teacher supply and demand studies vary considerably in their disaggregation of data by teaching specialty, teacher grade level (licensure fields or endorsement areas), and geographic area (such as regions in a state and rural or urban areas). Most of the reviewed studies focus on the number of teachers fully certified or licensed in their primary teaching field. Some related studies focus on the number of less qualified teachers (less than fully certified or credentialed in their teaching area) as a single indicator of teacher shortage.

When demand exceeds supply for a given field or region and there is a shortage of teachers, the state or schools might have to take drastic measures to close the gap (such as applying for emergency licenses or conditional permits to allow underqualified teachers to cover some classes or to increase the number of students per class or teacher). When supply exceeds demand and there is a surplus of teachers, candidates seeking jobs and not obtaining them may have to find employment in another state, teaching field, or sector.

BOX 1

Definitions of teacher supply and demand components

The definitions of teacher supply and demand components presented here are consistent with most studies of teacher supply and demand from an education policy perspective.[1]

Demand

Total teacher demand is defined as the number of teachers required to adequately staff schools (Arnold, Choy, and Bobbit 1993; Dolton 2006; Haggstrom, Darling-Hammond, and Grissmer 1988). The definition implies a *prevalence model,* which defines demand as a function of student enrollment and preferred teacher-student ratios, rather than a *market model*, which specifies the number of teachers based on the resources available to a state or school district and allows teacher–student ratios to vary with available resources.[2] States and local education agencies tend to have fixed minimum teacher–student ratios, making the prevalence model more relevant. The following components go into calculating teacher demand:

> *Total demand = number of teaching positions to staff classrooms (number of teachers retained + new demand)*

where number of teachers retained equals number of teachers from previous year minus attrition (retirement, left profession, death or disability, and sometimes mobility), and new demand equals number of additional teachers needed to staff schools (to cover changes in enrollment, vacancies due to attrition, and adjustments for resource and policy changes).

In some studies, *demand* refers to the number of additional teachers needed to make up for teacher attrition, student enrollment changes, and changes to state policy. This report refers to this concept as *new demand.*

Attrition or retention. One challenge in estimating new demand involves determining the number of teachers who have ended their employment or are expected to do so, usually between school years (Grissmer and Kirby 1991). The *attrition rate* is the proportion of teachers who leave their positions, while the *retention rate* is the proportion of teachers who maintain their positions from year to year (calculated as 1 – attrition rate). Some studies define attrition as leaving for any reason. Others break attrition down by the reasons teachers leave (movement to another school, death or disability, involuntary termination, retirement, or other reasons; see, for example, Billingsly 2004; Boe 1990; Haggstrom, Darling-Hammond, and Grissmer 1988; and Grissmer and Kirby 1987). While state-level studies often do not consider teacher mobility as attrition because within-state mobility may not affect final demand figures, local administrators must consider it because they must fill resulting vacancies. Alliance for Excellent Education (2005) estimates the costs to local education agencies nationwide of teacher mobility at $2.7 billion. Researchers who investigate attrition rates often distinguish "leavers," "movers," and "stayers."

Attrition and retention are presented here as components of both demand and supply because older studies are split in defining demand as total demand (with attrition or retention a source of supply only) or as new demand, which includes attrition. Dolton's (2006) recent detailed summary of teacher supply and demand presents teacher attrition and retention as part of supply.

Enrollment. Teacher supply and demand studies typically consider whether changes to K–12 student enrollment will require additional teachers. Enrollment projections for pre-kindergarten and kindergarten often are based on birth rates or population growth, while those for later grades also consider promotion ratios.

Teacher–student ratios. The number of additional teachers needed to compensate for changes in enrollment is based on the desired teacher–student ratio. Policy decisions at state or district levels, resources, and collective bargaining agreements all affect desired ratios.

Supply

Teacher supply. The supply of teachers for a school or district comes from the pool of employed teachers, newly trained teachers from in-state programs, teachers pursuing training through alternative routes, teachers trained in other states who migrate to the area, and experienced teachers who left the profession and are

(CONTINUED)

BOX 1 (CONTINUED)

Definitions of teacher supply and demand components

returning (see Arnold, Choy, and Bobbit 1993 and Haggstrom, Darling-Hammond, and Grissmer 1988). The following components go into calculating teacher supply:

Total supply = number of teachers

where number of teachers includes teachers retained in a school from the previous year, new teachers from traditional pipeline (university or college teacher preparation programs), new teachers from alternative certification programs, teachers from other states, and former teachers reentering the workforce.

Teachers retained from previous year. The largest source of teachers to meet demand is teachers who remain within a school. From a school administrator's perspective teacher retention has mixed cost implications—fewer resources are needed for mentoring or induction of newly hired teachers, but additional resources are needed for salaries of teachers who gain experience.

In-state teacher pipeline. Another source of teachers is recent graduates of a traditional teacher preparation program in an institution of higher education in the state who have become certified. Studies consistently find that only a percentage of graduates end up as teachers (Harris, Camp, and Adkison 2003; Nielson 2001), leading some states to reduce their estimates from this supply source by 10–17 percent (Esch et al. 2004; Gau et al. 2003).

Teachers participating in alternative certification programs. Since 1985, most states have developed alternative routes to certification that allow people trained in other fields to become teachers quickly while simultaneously taking education-related courses. Some states report that as many as 30 percent of new teachers could come from this source (Feistritzer 2008).

Teachers certified in other states. Some states, especially those with high population growth rates, make it easy for teachers certified in other states to teach in the state (for example, Esch et al. 2004), through either reciprocity agreements with other states or streamlined certification. This can be a substantial source of supply (for example, 61 percent of newly hired teachers in Maryland in 2007 were from out of state; Maryland State Department of Education 2008).

Reserve pool/teachers reentering the profession. The "reserve pool" comprises certificated teachers who are willing and able to teach but are not teaching. The pool includes those who have never taught and those who left the profession to pursue other employment opportunities, to care for family members, or to recover from illness or injury. The challenge in estimating supply is to determine how many of these certificated teachers are willing to teach. One indicator for assessing this pool of former teachers is the number of people who "reenter" the workforce each year.

Notes

1. Economists often examine teacher demand as a function of economic, fiscal, and demographic factors such as available resources and the costs of teachers (Hussar and Bailey 2008). For teacher supply, economists often examine not just the numbers of individuals willing and qualified to teach (Dolton 2006), but also factors related to decisions on entering or remaining in the profession made at different times (for example, on certification requirements, teacher pay compared with pay for other professions, and teacher pension systems). Studies by Boyd et al. 2005; Costrell and Podgursky (2008); Douglas and Bird (1985); Hanushek, Kain, and Rivkin (2004); and Podgursky and Springer (2008) provide just a glimpse of the work done from an economic perspective.
2. On a national level the numbers of teachers found in the 10-year forecasts published annually by NCES in *Projections of Education Statistics* are not estimates of demand (Hussar and Bailey 2008). While forecasts prior to 1991 included estimates of teacher supply and demand (with demand forecasts based on enrollment projections, changes in teacher-student ratios, and a constant attrition rate), demand forecasts were discontinued in 1991 following criticism of the demand projections by the National Academy of Sciences. Combining elements of prevalence and market models, projections of the number of teachers are made each year based on past and present enrollment data, teacher–student ratios, state education revenue receipts, and other teacher salary information. The *Projections* series does not provide state-specific forecasts of numbers of teachers.

Some researchers examining the imbalance between teacher supply and demand focus on single indicators such as the number of underprepared teachers (teaching under emergency licenses or conditional permits, teaching out of field, or serving as long-term substitutes) and the number of unfilled vacancies (vacancies that could not be filled with a fully licensed teacher). The rationale is that when local education agencies collectively find the pool of qualified applicants insufficient for the open teaching positions in a given field (demand exceeds supply), the positions will either remain open (a vacancy) or schools will staff the position with someone who is less than fully qualified.

ADVANTAGES AND DISADVANTAGES OF CONDUCTING COMPREHENSIVE TEACHER SUPPLY AND DEMAND STUDIES

Comprehensive teacher supply and demand studies have both advantages and disadvantages.

Advantages

While the main purpose of states' teacher supply and demand studies may be to identify teaching fields or geographic regions or districts where supply is not meeting demand, these studies serve other functions as well. They can reveal the severity of shortages and provide diagnostic information on which sources of teacher supply are contributing to the shortages. Such studies can inform planning and coordination between a state's K–12 education system and teacher training institutions and guide policy development (for example, policies on teacher retention, incentives to attract people to teaching, alternative routes to certification, simplification of procedures for out-of-state teachers to obtain certificates, and teacher pension systems). The studies can help in evaluating policies or programs as well.

The desire for a multifunctional teacher supply and demand study (one that identifies shortage areas and also aids in planning, policy development, and evaluation) is better met by incorporating estimates of supply- and demand-related components in a study than by relying on a single indicator of teacher shortage. Such multicomponent studies are referred to in this report as *comprehensive* studies of teacher supply and demand.

States that forecast teacher supply and demand components give themselves extra time to make appropriate policy adjustments

States that forecast teacher supply and demand components give themselves extra time to make appropriate policy adjustments. States can determine the accuracy of their forecast models by calculating the percentage error, average percentage error, and mean absolute percentage error of these projections.

Disadvantages

The downside of conducting comprehensive teacher supply and demand studies is the cost in state education agency staff time and resources. State education agencies that want to gather information regularly from schools and local education agencies must first create a data collection protocol and communicate the protocol to school or local education agency personnel. They must run checks of respondents to ensure that forms or protocols are being completed as intended. State education agencies also need to design, build, and populate the appropriate databases.[3]

While establishing a routine data collection process is a one-time cost, there are also annual costs associated with performing a comprehensive teacher supply and demand study. In particular, states must clean, verify, and store the data and perform the relevant analyses.

To comply with federal and state laws that direct a state's chief state school officer to determine teacher shortage areas and report them to the legislature and the U.S. Department of Education, many states use individual indicators of teacher shortage that require little labor or expense to obtain and

analyze. One such indicator is the number of new emergency licenses issued to local education agencies (Lauritzen 1988; U.S. Department of Education 1989). The rationale is that schools that are unable to find fully licensed teachers for a particular course might apply for an emergency license (or conditional permit or waiver) for a teacher who lacks the certificate or endorsement for that subject area. Campeau and Appleby (1987) identify the number of budgeted unfilled teacher vacancies as another single indicator for teacher shortage. Calculating the number of emergency licenses or number of unfilled vacancies per teaching field can give state education agencies the information needed to comply with federal codes. However, studies relying on single indicators fail to provide state education agencies with information on where to target policy adjustments.

The tradeoffs between costs and richness of information become apparent when looking at the approaches to studying teacher supply and demand that have been adopted by Midwest Region states, as summarized in the next section.

TEACHER SUPPLY AND DEMAND MODELS USED IN MIDWEST REGION STATES

This review of Midwest Region states' methodologies for estimating and forecasting components of teacher supply, demand, and shortage is based on reports published by the states (or on research summaries shared by state education agency staff for this project; see appendix B) and on information gathered through interviews with state education agency staff (or contractors) who performed the studies (nine people were interviewed; see appendix C). Box 2 describes the methodology used to identify state approaches. This section provides state-by-state descriptions of the types of data and data sources used to assess teacher supply and demand in each state's most recent report, information from interviewees on the purpose and context

BOX 2

Study methods

The study sought to obtain all teacher supply and demand research reports produced by Midwest Region state education agencies since January 1, 2000. Most of the reports were obtained by searching state education agency web sites and following up with state education agency personnel, usually the staff person listed in the report. These people were contacted to determine whether the reports represented the entirety of work that the state education agency had done on teacher supply and demand and to identify the best person to interview about the state's approach to studying teacher supply and demand. In the one state with no supply and demand reports on the state education agency web site, the contact person shared a copy of the research summary, which is generally available only within the agency. The respondent for that state also verified that the research summary produced each year had the same format and presented the same analyses as those run on the most recently collected data. In two states the contact people recommended interviewing independent contractors and following up with the state education agency with other questions. If there were additional reports, copies were requested.

For each report or research summary obtained, the research team listed the types of data sources and analyses. Categories of sources and analyses emerged from this process. Two staff people reviewed all the reports and determined which categories of data sources and analyses would be included. These document reviewers were consistent more than 99 percent of the time. The document reviewers' codings were validated through state education agency respondents' descriptions of their efforts to study teacher supply and demand. The categories are presented in table 1 in the report.

A structured protocol was used for the interviews (see appendix C), but interviewers probed for more information when necessary. The interviews focused on the components of teacher supply and demand that were most prevalent in the literature on the topic (see box 1). However, the research team also asked whether the state education agency conducted other research activities or analyses related to teacher supply and demand that might not appear in the reports posted on the web or shared with the research team.

TABLE 1

Data examined in most recent teacher supply and demand studies conducted by Midwest Region states, 2007 and 2008

Data source and component	State A	State B	State C	State D	State E	State F	State G
Analysis of state data							
Demand components							
Number of job postings on state web site			✔				
Expected student enrollments				✔	✔		
Demographics of current workforce				✔			
Cross-local education agency mobility				✔	✔[a]	✔	
Cross-field mobility							✔
Teacher attrition/retention rate, year to year, all teachers				✔	✔		✔
Teacher attrition/retention rate, new teacher survival over time						✔	✔
Retirement/age of workforce				✔		✔	✔
Supply components							
New certificates/licenses issued, in-state					✔	✔	
New certificates/licenses issued, teachers from other states					✔	✔	
Number of reentries					✔		
Number of completers, traditional programs		✔	✔		✔[b]	✔	✔
Number of completers, alternate certification							✔
Pipeline yield (number of completers obtaining certificates)					✔	✔	
General indicators of supply-demand balance							
Emergency or conditional permits, out-of-field teachers, long-term substitutes	✔	✔	✔			✔	✔
Number of vacancies in fall					✔	✔	
Local education agency administrators' impressions of supply					✔		
Surveys/special data collections[c]							
Demand components							
Surveys of completers, outmigration							✔
Surveys of completers, attrition							✔
Supply components							
Survey of teacher preparation institutions on program completers					✔[d]		
Survey of completers, pipeline yield							✔
Local education agency surveys, applicants per vacancy						✔	✔
General indicators of supply–demand balance							
Local education agency surveys on emergency licenses or conditional permits							✔
Local education agency surveys on administrators' impressions of over- or undersupply						✔	✔
Overall: estimates demand?	No	No	No	Yes[e]	Yes	No	No

a. Includes mobility across educator fields.

b. Includes teachers trained though traditional or alternative routes.

c. All three states that conduct surveys as part of their teacher supply and demand report (States E, F, and G) provide response rates for the surveys and caveats regarding potential reporting bias when response rates are low. However they do not provide any norms for judging the quality of the data or any analyses of the characteristics of nonresponse.

d. The return rates on these surveys are clearly listed in the reports, and displays of trend data clearly indicate years for which return rates were less than 100 percent.

e. Enrollment based.

Source: Authors' analysis based on reviews of reports and interviews with state education agency staff or contractors; see text for details.

State A's analysis of teacher supply and demand focuses on the number of emergency licenses requested each year by all local education agencies

of the reports, and cost estimates for the most recent report in each state. Table 1 summarizes the data sources and components of the reports by state.

In general, the number of distinct data elements used in Midwest Region states' approaches to assessing teacher supply and demand varies considerably. Studies ranged from analyses of emergency licenses to multimethod approaches, including counts of teachers "surviving" over time within teacher-level databases and surveys of local education agency personnel, teacher preparation institutions, and completers of teacher education programs. Only two states attempted to forecast demand for teachers.

To keep the focus on the methodologies used by the state education agencies, the names of states that use a particular approach are omitted (see tables 1 and 2). The models used by Midwest Region states are presented from least comprehensive to most comprehensive.

State A—analysis of emergency licenses or conditional permits

State A had no publicly available report on teacher supply and demand. The state does conduct an annual analysis to meet federal requirements, but the information—three pie charts and a table—is presented only to senior state education agency administrators and the chief state school officer. The most recent two-page data summary was shared with project staff for this study.

Information from state education agency databases. The annual analysis focuses on the number of emergency licenses requested each year by all local education agencies. Agencies must apply for these permits, and the permits database is continuously updated. The analysis breaks down the emergency licenses by teacher field, local education agency, and geographic setting (urban, rural, or suburban). According to the state respondent, the state education agency also collects data related to other components of supply and demand (such as enrollments, teachers obtaining certification through alternative routes, and numbers of completers from traditional teacher preparation programs). However, that information is used to meet other federal reporting requirements (such as Title II reports), rather than to provide a more comprehensive picture of teacher supply and demand in the state.

Respondent perspectives on context and purpose. The respondent stated that the annual analyses are conducted to identify teacher shortage fields to comply with federal codes and regulations. The respondent added that no other work is done on the topic since teacher supply and demand are not

TABLE 2
Legislative requirements and costs associated with most recent teacher supply and demand studies conducted by Midwest Region states, 2007 and 2008

Additional information	State A	State B	State C	State D	State E	State F	State G
State law?	No	Yes	Yes	No	Yes	Yes	No
Estimated cost, hours	0.25 hours[a]	10 hours across 5 staff[a]	50 hours across 3–4 staff[a]	Contract amount	0.33 full-time equivalent	Cost listed in report	Billed on contract
Estimated cost, dollars	$10	<$500	<$4,000	$27,500[b]	<$35,000	$25,137	$30,000[b]

Note: Costs include benefit costs, based on information from states' human resources offices.

a. Respondents in these states provided cost estimates in number of hours required to perform the analyses. Hours were converted to dollars using salary information from state salary databases developed in 2007 by news media outlets through Freedom of Information Act requests to states.

b. These amounts, provided by independent contractors, do not include costs associated with state education agency project coordination or with the time required by state education agency database managers.

Source: Authors' analysis based on reviews of reports and interviews with state education agency staff or contractors; see text for details.

presently a high-priority for the state education agency. However, agency staff do pay more attention to teacher shortages when state policymakers are considering new legislation.

Cost estimate. The respondent stated that it took about 15 minutes to perform the analysis each year. Based on the respondent's annual salary and benefits in 2007, that translates to about $10.[4]

State B—analysis of emergency licenses or conditional permits and number of program completers

State B conducts analyses that are similar to those of State A. However, the shortage areas are made public each year in a one- or two-page memo that is also sent to the U.S. Department of Education to comply with federal regulations and to the state legislature to comply with a state law.

Information from state education agency databases. State B monitors teacher supply and demand using analyses of emergency licenses or conditional permits to identify fields and local education agencies experiencing shortages. As local education agencies report challenges in hiring fully licensed teachers for open positions, the database is continually updated.

The respondent noted that the state education agency collects other data related to teacher supply and demand components but that these data elements are not used to examine teacher staffing patterns. For example, the state collects data on the annual number of completers from teacher education institutions in the state and informs the institutions about areas of shortage. However, the information on emergency licenses or conditional permits and on number of program completers is not combined into a comprehensive report on teacher supply and demand that is made public.

Respondent perspectives on context and purpose. The respondent confirmed that the purpose of the state education agency analysis of emergency licenses or conditional permits was to comply with federal regulations and state law. State law requires identification of shortage areas so that conditions for reemployment of retired teachers can be established. The respondent also stated that there was a general belief at the state education agency that higher education institutions in the state were producing many more teachers than there were teaching positions. Thus, the agency did not consider the issue of teacher supply and demand to be a high priority. However, the respondent was unable to point to a particular data source to support the belief in an imbalance between supply and demand, other than anecdotal sources indicating that most new teachers trained in the state were forced to leave the state to obtain teaching positions.

State B monitors teacher supply and demand using analyses of emergency licenses or conditional permits to identify fields and local education agencies experiencing shortages

Cost estimate. The respondent stated that the data analysis takes about two to three hours and that additional time is required for the database administrators and license approval staff, bringing the total to about 10 hours. The combined costs of salary and benefits was estimated at less than $500.

State C—emergency licenses or conditional permits, program completers, and job vacancies

State C's teacher supply and demand study is made public each year in a two-page memo that lists teaching fields with shortages and briefly describes the sources used to determine the shortage areas.

Information from state education agency databases. The memo bases the shortage areas on numbers of emergency licenses or conditional permits issued, number and frequency of job postings, and projected numbers of completers from teacher preparation programs. The respondent clarified how these data elements were used to identify shortage areas:

> *[Number of job openings (by endorsement field) + number of conditional permits (by endorsement field)] / Number of licensed teachers with endorsements in the field.*

The data for the denominator come from the state's license database, which is continually updated. The respondent stated that an endorsement area is identified as having a shortage when the quotient is greater than 5 percent. State education agency staff members then identify the number of program completers for that endorsement area (as reported annually by teacher preparation programs) to determine whether the number of prospective teachers will be sufficient to fill the vacant positions. These comparisons of vacancies and numbers of prospective teachers are made without explicit decision rules. If the state education agency staff consider the numbers of new teachers as adequate, they may remove that endorsement field from the list. Additional endorsement areas may be added to the shortage list if members of the state's teacher-licensing board hear of difficulties in hiring particular types of teachers during informal conversations with school and district administrators.

The respondent stated that the state education agency also collects data on student enrollment, teacher retirement, and teacher attrition, which are often listed as components of teacher supply and demand. Although the state education agency does look at long-term trends among these components and informs teacher preparation institutions of the possible need to increase teacher production based on these trends, the respondent stated that data from these components are not compiled within a comprehensive research summary or formal report.

Respondent perspectives on context and purpose. The respondent confirmed that the purpose of the annual listing of shortage areas is to fulfill federal requirements and state administrative code. The state administrative code requires that the chief state school officer annually identify teacher shortage areas for the purposes of forgiveness of state-supported college loans. The state code does not specify how shortage areas are to be determined, nor does it require any information beyond that required to meet federal codes.

State C's teacher supply and demand study is made public each year in a two page memo that lists teaching fields with shortages and briefly describes the sources used to determine the shortage areas

Cost estimate. The respondent estimated that about 50 hours across three to four state education agency staff were needed to produce the list of shortage areas. That translates to roughly $4,000, including adjustments made by the state's teacher-licensing board and chief state school officer.

State D—focus on multiple components through analysis of state databases

State D has attempted to conduct regular teacher supply and demand studies that track supply and demand components and include specific analyses of interest to policymakers. However, the state has been unable to conduct these studies regularly (studies were conducted in 2002, 2004, 2005, and 2007) or to establish a consistent set of components to track over time. Unlike older reports, the most recent teacher supply and demand report (2007) contains only analyses of data from state databases.

Information from state education agency databases and other state data sources. The databases used for the most recent teacher supply and demand study included student enrollment data (based on annual enrollment counts supplied by all local education agencies and charter and community schools each fall), teacher workforce data from the state education data management system (populated by annual reports supplied by local education agencies and charter and community schools each fall), and state teacher retirement data (continuously updated). With these databases, those conducting the teacher supply and demand study were able to report on several characteristics of demand: enrollment (supplemented by population-based 10-year enrollment projections and 10-year demand projections), teacher attrition rates (survival of teachers year-to-year and over multiple years), and retirement trends (based on teachers' ages and retirement rate trend data in the retirement databases). The report also includes a detailed study of teacher mobility trends (identifying the types of local education agencies that teachers are leaving and going to).

The respondent for this state (an independent contractor who had worked on several of the state's supply and demand studies) stated that the most recent report was based on data availability within the state education agency. The respondent indicated that for previous supply and demand studies, the contractor's research team had access to other types of supply component data (such as counts of completers of teacher preparation programs in the state, survey data from local education agencies on teacher vacancies, surveys of samples of teachers in the "reserve pool") but that the state education agency was unable to obtain updated information on program completers from the state's higher education governance body and was no longer supporting the survey work.

Synthesis of information in report. State D's findings are disaggregated by teacher subject area, but the subject areas listed are broader than those in other states. For example, State D presents the attrition and mobility rates of "science teachers" but does not disaggregate the findings further (for example, for teachers of chemistry, physics, and biology). The state's most recent report includes demand estimates and some estimates of supply components (attrition and mobility rates, total workforce numbers), but teacher demand and supply estimates are not reported at the same level of aggregation. This inconsistency, combined with the lack of information on certain key components of teacher supply (program completers, migration of teachers from out of state, reentry of teachers), makes it challenging to ascertain from the report alone whether the supply of teachers in various teaching fields is adequate to meet future demand.

Respondent perspectives on context and purpose. The respondent was unaware of any other teacher supply and demand work conducted by the state education agency or of any studies planned for the near future (confirmed through an independent query with a senior-level contact in the state education agency). The respondent thought that these studies were conducted not to comply with any state code or statute (confirmed by an independent search of state statutes and administrative codes) but rather to respond to an inquiry from the state board of education. The chief state school officer expanded on the board's request by pressing the state education agency to develop a regular reporting system on teacher supply and demand. Despite the state chief's wishes, the agency has not settled on a consistent set of data elements on teacher supply and demand to analyze regularly. Only the analysis of teacher attrition rates has remained consistent across reports.

State D has attempted to conduct regular teacher supply and demand studies that track supply and demand components and include specific analyses of interest to policymakers

Cost estimate. The respondent also provided the contract amounts for work on each of the supply and demand studies. For the first year's report, the evaluation firm billed the state education agency roughly $40,000 to perform the study. Subsequent studies were less costly to the state because the evaluation firm had become familiar with the databases and had already developed the analysis strategy. Moreover, the state education agency and state board of education had scaled back the analyses to focus on only the most policy-relevant components. The later supply and demand studies cost between $20,000 and $30,000; the latest report cost $27,500. These cost estimates do not include the time of the state education agency computer programmers to retrieve the data or that of other state education agency staff to supervise the contractor's work.

State E—multimethod approach: analysis of state database combined with impressions of local education agency administrators and survey of higher education institutions

Unlike the approaches to teacher supply and demand studies presented to this point, the remaining Midwest Region states have consistently employed other methods to complement the analysis of information from databases maintained by the state education agency. The teacher supply and demand studies conducted by State E, in particular,

State E's annual supply and demand report includes analyses based on databases containing teacher records, student enrollments, teacher license information, and local education agency information on unfilled positions and impressions of areas of teacher shortage

include an annual survey of all teacher preparation institutions in the state.

Information from state education agency databases. State E's annual supply and demand report includes analyses based on databases containing teacher records, student enrollments (both updated each fall using information from mandatory reports from all local education agencies), teacher license information (updated continually by the state education agency's teacher licensing division), and local education agency information on unfilled positions and impressions of areas of teacher shortage (collected each fall). Ten-year projections of enrollment are provided, based on live-birth statistics (shared by the state's department of public health) and current school enrollments. These data sources are used to report raw enrollment numbers and numbers of teachers retained from year to year (both components of demand) and workforce growth, number of licenses issued, number of reentering teachers, and number of teacher candidates in the pipeline (components of supply).

The respondent noted that although the state education agency has access to some other components, such as teachers' ages for estimating numbers of teachers likely to retire in the near future, it analyzes that information only when requested by the board of education. And several other components of teacher supply and demand for which the state education agency has data (such as long-term attrition rates for teachers) are no longer included in supply and demand reports because of resource constraints.

Information from the survey. In addition to the regularly collected and mandated database elements analyzed for the annual report, State E also includes analyses of numbers of completers of teacher preparation programs from its annual survey of higher education institutions. The respondent noted that response rates on surveys of teacher preparation institutions fluctuate between 68 percent and 100 percent.[5] The variable response rates undermine the utility of the program completer numbers over time.

Synthesis of information in report. State E's annual report includes three types of syntheses of teacher supply and demand components: a comparison of the number of new licenses issued (by teaching field) in the previous year and the number of teachers hired in those fields in the following year, tallies of the number of unfilled positions by teaching field, and summaries of ratings by local education agency administrators of the adequacy of the supply of teachers for various teaching fields. Consistency across these three indices of teacher shortage is demonstrated with side by side comparisons, disaggregated by teaching field. The report also includes four-year projections of teachers needed by teaching field based on the number of new educators hired over the previous seven years rather than on projections of school enrollment.

While the side by side comparisons help show the consistency of the information, the information on various components is often disaggregated differently, making it difficult to ascertain whether shortages within teaching fields are related to trends in various components. For example, information on some components is listed at a broad level (number of reentering educators by "administrative," "instructional," "other certified staff," and "school service personnel" categories). Other information is disaggregated further (number of completers is broken down into "early childhood," "elementary," "secondary," and "K-12" programs) or disaggregated by teaching field (shortage areas by teaching field).

Respondent perspectives on context and purpose. The respondent, who has worked on the state's supply and demand studies since 2000, stated that the state education agency has been interested in conducting other types of forecasts but that budgetary constraints have prevented the agency from doing so.

The respondent confirmed that the state education agency is required by administrative code to present this report to the legislature by January 1 of each year. The state code requires the state education agency to report the supply and demand for educators (teachers, administrators, support staff) by field, content area, and level; to report state and regional analyses of oversupply and undersupply of educators, by field, content area, and level; and to project areas of high and low demand for educators. The state code requires a more comprehensive teacher supply and demand study than that needed to comply with federal reporting requirements (as listed in appendix A). The state code appears to offer some room for interpretation. The respondent indicated that in the initial years following enactment of the state code, when the state education agency had more budgetary and personnel resources, the supply and demand studies were more comprehensive (for example, they included projected retirements and long-term studies of attrition). However, with leaner budgets, the state education agency has scaled back the reports to focus just on the analyses necessary to meet the state's administrative code.

Cost estimate. Preparing the report takes approximately one-third of the respondent's time. The cost of the most recent report, factoring in salary, benefits, and review of the findings, is estimated at less than $35,000. This estimate excludes the costs of the surveys.

State F—multimethod approach: analysis of state database combined with survey of local education agencies

State F produces its teacher supply and demand report every two years. These reports include data from state education agency databases, information gathered annually by the state chapter of the American Association of Colleges of Teacher Education (AACTE), and information from a supplemental survey of local education agencies.

Information from state education agency databases and other state data sources. Among the data elements drawn from State F's databases are teacher staffing data (updated each fall) and teacher license data (continually updated). Data on conditional permits or waivers are from the state's regulatory body on teacher training (continually updated as local education agencies request conditional permits or waivers). The state's AACTE chapter shares data collected annually from teacher preparation institutions on number of completers of teacher preparation programs (by subject area).

These data sources provide information on teacher supply (program completers, number of initial licenses from in-state- and out-of-state-trained teachers, number of unexpired licenses), by licensure area. On the demand side, the biennial supply and demand report includes an analysis of teacher retirement over time.

Not found in the report is database information on student enrollment, which is often used for understanding past, present, and future demand for teachers. Rather than using actual counts of students to round out the picture of teacher demand, the report relies on local education agency administrators' perceptions of demand for teachers and of the supply-demand balance (as gathered in the biennial survey of local education agency administrators).

Information from surveys. Local education agency administrators' perceptions of the supply-demand balance for various teaching fields are just one type of information requested on the biennial survey of local education agency administrators. These perceptions are anchored earlier in the survey by items asking administrators to report the number of teacher vacancies and applicants per vacancy by licensure area.

State F's biennial teacher supply and demand report reports include data from state education agency databases, information gathered annually by the state chapter of the American Association of Colleges of Teacher Education, and information from a supplemental survey of local education agencies

The report makes clear the limitations of the survey data, including the marginal response rate (60 percent). However, no standards are presented for judging the quality of the data, given this response rate.

Synthesis of information in report. Many of the findings in the state's teacher supply and demand study are presented according to the licensure areas that local education agency and charter school administrators perceive as experiencing shortages. Licensure areas experiencing teacher surpluses (according to administrators' perceptions) are listed as well.

The report presents a detailed examination of the number of new teachers who retain their positions over time, by region. Included with the retention and attrition information is a summary of teachers' reasons for leaving. However, neither the general retention information nor data on teachers' reasons for leaving are disaggregated by licensure area. Finally, the report provides counts of emergency licenses or conditional permits by region and year. The emergency licenses or conditional permit information is presented by licensure areas with the largest shortages, as reported by district and charter school administrators.

The report also clearly presents the limitations of the supply and demand study, including limitations of the state's regular teacher staffing data collection system, of administrator perceptions of teacher shortage areas, and of district and charter school survey data because of the low response rate. Another limitation is the lack of consistency of reporting on components by the same category of analysis. Teacher supply and retirement information is presented by licensure field, while retention and emergency licenses or conditional permits and waiver information is not. Finally, while the report synthesizes some information (for example, it presents the number of teacher retirements alongside the number of new licenses granted for the areas of teacher shortage, giving an idea of the rate at which departing teachers are being replaced by newly trained teachers), it does not synthesize all the components into a larger picture of teacher shortages by licensure area.

The report for State G includes regularly collected data, data gathered from a survey of local education agencies in the state, and data from a survey of graduates of the public and private teacher preparation programs in the state

Respondent perspectives on context and purpose. The respondents for State F were the authors of the most recent report. According to respondent statements and information in the reports, the format and data incorporated in the reports have remained consistent since the state legislature passed the statute requiring these biennial reports. The statute stipulates that the chief state school officer must survey all local education agencies within the state to ascertain patterns of early retirement of teachers and shortages of regular and substitute teachers by subject area and region. The report must also describe the progress of local education agencies in hiring teachers and substitute teachers in the areas of shortage and present five-year projections of teacher demand for each local education agency. The information required by state statute goes beyond the identification of shortage areas required by federal code.

Cost estimate. State statutes require that mandated reports present the costs incurred by the agency in producing the report. The most recent teacher supply and demand report listed a cost of $25,137.94. According to the respondents, that cost includes all the staff time (and associated benefits) but not the costs of administering the local education agency survey. However, those costs were minimized by introducing the survey to local education agencies by email and conducting the survey online.

State G—multimethod approach: analysis of state database information combined with survey data collected from local education agencies and program completers

The report for State G also includes regularly collected data (collected annually from all local education agencies and included in state education agency databases), data gathered from a survey

of local education agencies in the state, and data from a survey of graduates of the public and private teacher preparation programs in the state.

Information from state education agency databases. State databases provide information on several teacher demand components, including year to year teacher attrition rates, attrition rates of cohorts of new teachers over time, number of teachers switching from special education to general education (cross-field mobility), and the ages of the teacher workforce. On the supply side, the researchers report data from higher education institutions on the number of completers of teacher preparation programs by endorsement area and the number of new alternatively certified teachers. The analysis of state data also includes the number of emergency licenses or conditional permits by teaching field.

Although the state education agency has the information, the supply and demand report does not include an analysis of student enrollment trends. Nor does the report provide information on teachers reentering the profession after time away.

Information from surveys. To supplement the analyses of state databases, the researchers also conduct a survey of local education agencies in the state on the number of vacancies by teaching fields during the previous year, number of applicants for the vacancies, and number of emergency licenses or conditional permits requested by teaching field. Local education agency personnel responding to the survey also rate teacher endorsement areas on a five-point scale, from "extreme shortage" to "extreme oversupply."

The researchers conducting the teacher supply and demand study also conduct a survey of a 15 percent probability sample of the most recent cohort of graduates of teacher preparation programs in the state and follow-up surveys of those who responded to the previous four annual completer surveys. That survey gathers information on program completers' current employment (teaching or not teaching) and type of position (full-time, part-time, substitute) and whether the teaching position is in or outside the state. The survey is intended to provide the researchers with another view of teacher attrition, pipeline yield, and outmigration of teachers.

Unlike some of the other state reports reviewed here, State G's report summarizes most of the data on supply and demand components in a consistent fashion by teaching field

The authors of the report specify the response rates for the local education agency survey (62 percent) and the survey of program completers (45 percent for the most recent cohort), but provide no assessment of the quality of information based on these response rates.[6] Nor do the authors analyze patterns of nonresponse.

Synthesis of information in report. Unlike some of the other state reports reviewed here, State G's report summarizes most of the data on supply and demand components in a consistent fashion—by teaching field. An exception is teacher attrition, which is reported by year (but retirement information—age ranges of teachers—is broken down by teaching field). While information is gathered on numerous components related to teacher supply and demand, the overall picture of supply, demand, and shortage in the report is presented as the results of three analyses: the number of emergency licenses granted, the ratio of applicants to vacancies reported in the local education agency survey, and local education agency administrators' perceptions of expected supply, demand, and teacher shortage areas in the coming five years.

The authors of the report lay out the limitations of the findings, based on the quality of the data sources, clarity of the state data collection system and protocols, and the protocols and response rates of the surveys.

Respondent perspectives on context and purpose. The respondent for this state was one of the reports' main authors (a contractor who has been doing this state's annual supply and demand study since 2001). The respondent provided some context

The lack of consistency in teacher supply and demand forecast models used by Midwest Region states precluded analysis of their accuracy

regarding the state's interest in conducting studies of teacher supply and demand. Although not required by state law, this state education agency has conducted an annual teacher supply and demand report for the last 29 years. The original purpose of these studies was to provide the information required by the Education of All Handicapped Children Act, the predecessor to the Individuals with Disabilities Education Act of 1990. Since the state education agency already had to collect data on special education teachers, it decided to collect the same types of information on general education teachers as well.

The annual reports provide data trends on various demand and supply components, and the data have been gathered in a consistent manner since 2000. During some years, however, the state education agency requested that the contractors also investigate other staffing-related issues. For example, the 2007 report incorporated in the survey of local education agencies questions on the impact of state policy and funding on teacher hiring, attrition, and retirement. The 2000 report included a study of teacher supply and demand reports for all 50 states and the District of Columbia.

Cost estimate. The respondent stated that the state education agency budgets approximately $40,000 a year for the teacher supply and demand study. However, the work in recent years required drawing only $30,000 a year from the state contract. This cost to the state includes survey data collection but not the costs of state database managers to draw the necessary data or the costs of state education agency staff to coordinate the researchers' efforts or review drafts of the report.

Summary of findings

Based on reviews of states' teacher supply and demand reports and interviews with state education agency personnel or contractors who prepare these reports, this study found that states calculate areas of teacher shortage in part to comply with federal codes of regulations (see description in Appendix A), part B of Individuals with Disabilities Education Act, and sometimes Title II requirements under the Higher Education Act. Four Midwest Region state education agencies are also required by state statute or administrative code to conduct studies of teacher supply and demand. The regulations in two of these states (States B and C) are similar to federal regulations; the regulations in the other two states require more comprehensive studies. Among the three states without state regulations requiring a teacher supply and demand study, one state conducts an analysis of emergency licenses to comply with federal regulations and a separate analysis to comply with Title II reporting requirements. The other two state education agencies conduct more comprehensive studies to inform policymakers.

Two states focus on analysis of the licensure areas in which emergency licenses or conditional permits are requested. Another state bases its study on emergency licenses or conditional permits but supplements those findings with information on job postings on a state teacher employment web site, on completers of teacher preparation institutions, and on informal data sharing by members of the state's licensure regulating board. Three states go beyond what is required by federal reporting requirements and attempt to inform state policymakers by conducting more comprehensive analyses on teacher supply and demand components within their states. One state conducted more comprehensive studies in the past but has scaled back its efforts since 2004 for budgetary reasons.

The lack of consistency in teacher supply and demand forecast models used by Midwest Region states precluded analysis of their accuracy. Only one state consistently employs a forecasting model of student enrollments. The mean absolute percentage error calculated on three consistent applications of four-year enrollment forecasts used in that state (State E) was 1 percent, which is considered "highly accurate" (Lewis 1982). That state's projection of teacher demand was not described

in enough detail to assess whether it was being consistently applied across the years.

Finally, the approaches that Midwest Region states use to assess teacher supply and demand vary considerably in cost. Models applied to obtain only the information required by federal laws or state statutes (States A, B, and C) were estimated to cost less than $4,000 (see table 2). More comprehensive teacher supply and demand models that are meant to both comply with federal and state laws and provide more detailed information to state policymakers cost $25,000–$35,000. Costs have tended to drop over time as those conducting the studies gain experience with state databases and develop a standard set of procedures for drawing and analyzing data for each report.

INTERPRETING MIDWEST REGION STATE EFFORTS TO STUDY TEACHER SUPPLY AND DEMAND

This review found that several issues affect interpretations of Midwest Region state efforts to study teacher supply and demand, including two methodological concerns (reliance on low-response survey data and on administrators' impressions of shortages) and consideration of the tradeoffs implied between report comprehensiveness and cost.

Cautions about studies' reliance on impressions data and surveys

During this review of Midwest Region states' approaches to studying teacher supply and demand, project staff—and technical reviewers of this report—noted two potential methodological concerns: reliance on administrators' impressions of teacher supply and reliance on survey data when response rates are low (less than 70 percent).

Three of the Midwest Region states formally asked local education agency administrators to give their impressions of teacher supply for various teaching fields. For each of these states, administrators provided their impression of teacher supply using the following response options: extreme shortage, slight shortage, balance/no shortage, slight oversupply, and extreme oversupply.

It is usually inadvisable to rely on impressions such as these because of the variability among respondents in interpreting the response scale. Actual count data are considered more reliable (Fowler and Cosenza 2009). The Midwest Region states that included impression data in their supply and demand report compensated for the weakness of this approach in at least two ways. First, these states requested that respondents provide actual count data (number of unfilled vacancies, numbers of applicants and vacancies) before asking them for their impressions, thus anchoring administrators' impressions by the counts already provided. Second, none of these states relied on impressions as a sole indicator of teacher shortage or surplus. They also reported information on emergency licenses or conditional permits, unfilled positions, ratios of newly licensed teachers to vacancies, and applicant to vacancy ratios. Fowler and Cosenza (2009) recommend that researchers validate subjective data or impressions by correlating them with more objective data. State G provided validity information on local education agency administrators' impressions by reporting a strong correlation ($r = .91$) with the applicant to vacancy ratio.

A second methodological issue concerns survey response rates. Several researchers (such as Mangione and Van Ness 2009) provide guidelines for determining when researchers should be concerned by the amount of nonresponse. Mangione and Van Ness specify that for mail surveys, response rates over 70 percent are considered very good to excellent, meaning that they are unlikely to show bias. Rates between 60 percent and 70 percent are acceptable but should

Project staff and technical reviewers noted two potential methodological concerns related to Midwest Region states' approaches to studying teacher supply and demand: reliance on administrators' impressions of teacher supply and reliance on survey data when response rates are low

Information gathered through interviews indicates that the state education agencies in states that spent less than $4,000 annually to generate their list of shortage areas either do not consider teacher staffing to be a big enough priority to justify the cost of conducting a more comprehensive study or that they lack guidance on how to conduct such a study

trigger an exploration of the characteristics of nonresponse. Response rates between 50 percent and 60 percent may be acceptable provided there is corroborating information showing similar results. Finally, response rates below 50 percent are not scientifically acceptable.[7]

For States F and G, which surveyed local education agency administrators about vacancies and impressions of shortages, the researchers obtained the corroborating evidence on emergency licenses or conditional permits to support the results. State F also did a cursory analysis of nonresponse, by type of local education agency. For State G's survey of completers of teacher preparation institutions within state, however, the 45 percent response rate is in the category of "not scientifically acceptable," by Mangione and Van Ness (2009) guidelines. Although the authors of that state report cautioned readers about the poor response rate and offered some possible explanations, the survey data were used in the report. In situations like this, where response rates are so poor, policymakers might be better served if such information were not included in the annual report.

Comprehensiveness and cost tradeoffs

Several Midwest Region states attempt to identify teaching fields experiencing shortages by relying on a single indicator of teacher supply and demand—the number of emergency licenses or conditional permits. Analysis of this single indicator is sufficient to meet federal requirements under the Individuals with Disabilities Education Act and other federal codes.

However, there are at least two disadvantages to this approach. One concerns measurement. Certainty regarding accurate measurement of a construct (teacher demand and supply) rises with the number of indicators used. Any one indicator has some error associated with its measurement, so there is a risk in basing policy decisions on a single indicator with an unknown amount of error. With emergency licenses or conditional permits, local education agency administrators may have differing interpretations of state education agency rules on the need to apply for such licenses or permits, and some applications could have been misfiled or lost. A second disadvantage is that a single indicator lacks the diagnostic information needed to inform policymakers. Policymakers who know that there are large numbers of program completers in chemistry every year but that the attrition rate for these teachers is abnormally high are better able to propose corrective policies to avoid shortages than policymakers who know only about the shortage.

Table 3 presents the components of teacher supply and demand covered in each Midwest Region state's reports. It clearly shows the tradeoffs between comprehensiveness and cost. The approaches taken by States A, B, and C rely mainly on single indicators as a means of complying with federal and state laws. These states spent less than $4,000 annually to generate their list of shortage areas. Information gathered through interviews indicates that the state education agencies in these states either do not consider teacher staffing to be a big enough priority to justify the cost of conducting a more comprehensive study or that they lack guidance on how to conduct such a study. By contrast, States E, F, and G either have statutes or administrative rules requiring more comprehensive studies of teacher supply and demand or have chosen to prepare a comprehensive teacher supply and demand study (see tables 2 and 3). Previous analyses and reports for States D and E addressed more supply and demand components than their most recent studies have (see table 3). Their recent supply and demand studies have been pared back because of resource constraints and other pressing priorities.

TABLE 3

Teacher supply and demand components measured in most recent Midwest Region state supply and demand studies, 2007 and 2008

Cost and demand and supply components	State A	State B	State C	State D	State E	State F	State G
Cost estimate	$10[a]	<$500[a]	<$4,000[a]	$27,500[b]	<$35,000	$25,137	$30,000[b]
Demand components							
Number of teachers retained				✔	✔	✔	✔
Teacher attrition/retirement				✔	[c]	✔	✔
Teacher attrition, other leavers				✔		✔	
Teacher attrition, in-state movers				✔		✔	✔
Teacher attrition, outmigration					✔	✔	
Expected student enrollment				✔	✔		
Teacher-student ratios							
Supply components							
Teacher retention				✔	✔	✔	
In-state pipeline		✔	✔	[c]	✔[d]	✔	✔
In-state alternate route				[c]	✔[d]		✔
Pipeline yield (number of completers obtaining certificates)				[c]	✔	✔	
Teachers from other states					✔	✔	
Reentries					✔		
Single indicators for supply-demand balance							
Emergency or conditional permits, out-of-field teachers, long-term substitutes	✔	✔	✔	[c]		✔	
Number of vacancies			✔	[c]	✔	✔	
Local education agency surveys on administrators' impressions of over- or undersupply					✔	✔	✔

a. Respondents in these states provided cost estimates in number of hours required to perform the analyses. Hours were converted to dollars using salary information from state salary databases developed in 2007 by news media outlets through Freedom of Information Act requests to states.

b. These amounts, provided by independent contractors, do not include costs associated with state education agency project coordination or with the time required by state education agency database managers.

c. Measured in previous reports.

d. Reported together as a single figure.

Source: Authors' analysis based on reviews of reports and interviews with state education agency staff or contractors; see text for details.

Only two Midwest Region states (D and E) conducted projections as part of their work on teacher supply and demand, and these were only on enrollments and demand for new teachers. The respondent for State D indicated no interest at the state education agency to do more comprehensive projections, and the respondent for State E indicated that plans to conduct such forecasts were set aside because of budget cuts. Respondents from the other states said that they did not do teacher supply and demand-related forecasts.

Respondent comments indicate that these states weigh the costs of conducting studies against the benefits of having detailed information on components. The respondent in State D mentioned that the state has had to put aside plans to routinely conduct teacher supply and demand studies because of cost concerns. A respondent for another state mentioned that the state has trimmed policy-relevant analyses from its supply and demand model because of budget constraints. The state education agency is trying to determine

the minimum analyses needed to comply with the state statute.

STUDY LIMITATIONS

Despite a systematic and objective approach to uncovering the information for this report, three limitations apply.

First, the cost estimates (see tables 2 and 3) should be considered rough estimates. During interviews, most respondents estimated the number of hours required to prepare the reports rather than specifying the costs in dollar amounts. The project team for this report then converted these time figures into dollar amounts, using information on the salaries of the people mentioned as working on the reports. These estimates were then sent to the respondents for adjustment. The estimate for State A was not confirmed by state education agency staff (the respondent had left the agency); however, it seems clear that the state's approach would cost less than that of all the other states.

A second limitation is that respondents might not have been aware of internal studies or documents that tied the data elements together to give a better picture of teacher supply and demand than appeared in these reports. Respondents were asked if they were aware of other analyses or reports by the state education agency on teacher supply and demand. Nearly all respondents replied no. The respondent for State B was an exception (see table 1); the formal report on teacher shortage areas is based on emergency licenses or conditional permits, but state education agency leaders then combine that information with the number of program completers supplied in Title II reports to make policy decisions.

A third limitation is the small number of state education agency staff or contractors who could be interviewed. Because this project could interview only nine people across the seven Midwest Region states, a strategic decision was made to focus on the state education agency staff or contractors who conducted these studies. In some cases, they were unable to provide in-depth contextual information on the impetus for the studies or on how the supply and demand information is used.

APPENDIX A
DESCRIPTIONS OF CODES OF FEDERAL REGULATION AND FEDERAL LAW RELATED TO TEACHER SHORTAGE AREAS

This appendix briefly describes federal codes related to teacher shortage areas.

Sections of Federal Code of Regulations, Title 34 (education) related to identification of teacher shortage areas.

34 CFR 653.50. This federal code established Paul Douglas Scholarships for those seeking employment in teaching or already teaching in teacher shortage areas (funding for these scholarships was discontinued after 1996/97). Scholarship recipients are required to teach for two years for every one year of scholarship assistance received. Teachers in state-designated shortage areas need to teach for only one year for every year of scholarship assistance received. These scholarships are no longer offered or funded, but recipients are still required to report to the state education agency if they discontinue teaching before meeting their obligatory term of service or move from teaching in a state-identified shortage area to an area not experiencing shortage. The shortage areas are identified by the state education agency in each state and approved by U. S. Department of Education.

34 CFR 674.53. This federal code concerns cancellation of loans procured under the federal Perkins Loan Program on the basis of employment as a teacher in math, science, foreign languages, bilingual education, or another teacher shortage area identified by the state education agency. An institution of higher learning must cancel up to 100 percent of a federal Perkins Loan or national direct student loan if the borrower becomes qualified to teach in one of these shortage areas and teaches in that field full time for a complete academic one year.

34 CFR 682.210. This federal code calls for the deferment of loans procured under the Federal Family Education Loan Program (FFEL) on the basis of employment as a teacher in a teacher shortage area. Teachers can defer repayment of FFEL loans if they can document to their lender that they are teaching in a field identified by the chief state school officer for their state and approved by the U.S. secretary of education.

Section (6)(ii) identifies criteria to be used by the chief state school officer to determine areas of teacher shortage:

- Teaching positions that are unfilled.
- Teaching positions that are filled by teachers who are certified by irregular, provisional, temporary, or emergency certification.
- Teaching positions that are filled by teachers who are certified, but who are teaching in academic subject areas other than their area of preparation.

Section (7) stipulates that the chief state school officer can propose alternative written procedures for identifying areas of teacher shortage, which must be approved by the U.S. Secretary of Education in writing.

34 CFR 698.12. This federal code governs the Teacher Education Assistance for College and Higher Education (TEACH) grant programs for people considering teaching in designated shortage areas in schools serving low-income households. The TEACH grant program offers scholarships of $4,000 a year to students in teacher education programs who intend to teach in a school that serves students from low-income households. Scholarship recipients must promise to teach for four years within an eight-year span in a "high-need field" within a school serving students from low-income households. Scholarships of recipients unable to meet the service obligations will be converted into federal direct unsubsidized Stafford Loans, to be repaid to the U.S. Department of Education with interest charged from the date of disbursement.

For this federal code high-need fields are identified as:

- Bilingual education and English language acquisition.
- Foreign language.
- Mathematics.
- Reading specialist.
- Science.
- Special education.
- Other identified teacher shortage area, as of the time the student begins teaching, listed in the U.S. Department of Education's Annual Teacher Shortage area national listing. This list is developed through the mechanism specified under 34 CFR 682.210 (deferment of FFEL loans, described above).

Sections of Federal law related to identification of teacher shortage areas

20 U.S.C. 1418: Individuals with Disability Education Act, part B. Current personnel data reporting requirements for states under part B of the Individuals with Disability Education Act include counts of fully employed and certified special education teachers and special education teachers who are employed but not fully certified. These counts are required for each category of disability specified for each school year by the U. S. Department of Education.

APPENDIX B
THE LITERATURE REVIEW FOR FORECAST MODELS

An original research question for this project, eventually dropped, was "How well do the methodologies used by Midwest Region states compare with the most rigorous and accurate supply and demand forecast models identified in the literature?" To address this question, the project team conducted a search of literature databases for reports that summarized empirical studies of teacher supply and demand or any of the components of teacher supply and demand, as specified by Haggstrom, Darling-Hammond, and Grissmer (1988): teacher demand, teacher attrition or teacher retention, teacher mobility, teacher retirement, student enrollment, teacher–student ratios, teacher supply, teacher pipeline (number of completers from traditional or alternative certification programs), teacher reserve pool or number of teachers reentering the workforce, and inmigration of teachers. The five-member literature review team sought studies that included forecasts of these constructs.

The literature search

The project team began by identifying relevant literature databases. The candidates were Digital Dissertations, EBSCO's Education Research Complete, EdResearch Online, Education Full Text, ERIC, Stat-USA Internet, and Web of Science.

The search string was designed to be broad enough to detect research reports that used terms related to teacher supply and demand but not so broad as to result in an unmanageable number of false positives. The search string was:

(teacher OR educator) AND (supply OR demand OR projection OR forecast* OR estimate* OR labor OR labour OR jobs OR workforce OR shortage OR surplus)*

Searches were limited to studies conducted since 1983, on populations in the United States, and with reports written in English.[8] The search also was restricted to studies detailed in academic journals, abstracts, articles, bibliographies, book entries, errata, literature reviews, or reports.

The search string and delimiters were entered first into EBSCO's Education Research Complete and ERIC. The number of relevant reports detected by these searches alone (1,318 from EBSCO and 9,434 from ERIC) was judged to be the maximum that could be screened by the review team in the time allowed. The project manager therefore decided to limit the literature review to reports found in these two databases. The overall results of the literature search are depicted in figure B1.

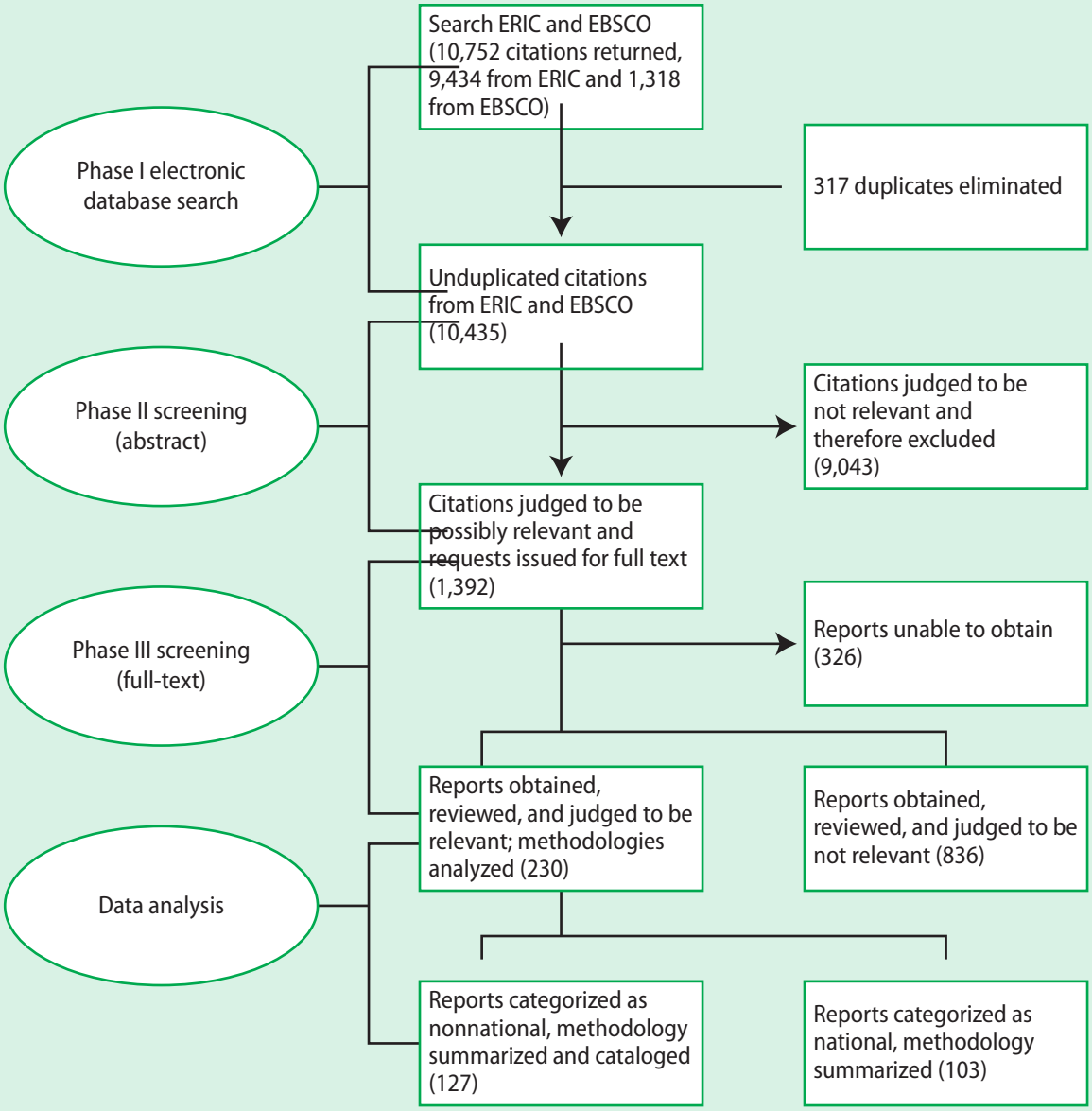
Reviewing reports for relevance

These literature database searches yielded the complete citation of the reports, the names of the authors, and the abstracts. The results were imported into a database programmed to enable the review team to initially judge each report's relevance based on the contents of the abstract. Copies of most reports (1,066 of 1,392) deemed "possibly relevant or uncertain" during the abstract screen were then obtained, with the help of a reference librarian. The literature review team then judged the relevance of these full reports and entered their judgments into the database.

These were the criteria for relevance:

- The report included results of an empirical application of teacher supply and demand model. Reports that repackaged analyses from other reports were not included.
- The findings included some assessment of one or more of the following constructs: teacher supply (including number of teachers retained, number of teachers prepared through traditional or alternative certification programs, number of teachers in the teacher reserve pool, and teachers migrating from outside the state) and teacher demand (including number of teachers lost through

FIGURE B1
Literature search results



Source: Authors' analysis.

attrition or number of teachers retained, student enrollment, and teacher–student ratio).

- The report included definitions of the these constructs (or other available documents clearly described the methodology).[9]

- For reports conducted by states in the Midwest Region, only those conducted before 2000 were included in the literature review; reports prepared in 2000 or later were to be reviewed in a separate part of this project.

Before judging relevance, the literature review team members received a copy of the proposal for this project, written instructions on abstract/report screening, and the criteria for relevance. The team members met initially to discuss the process and the criteria for determining relevance and to learn how to use the report database to view abstracts and record judgments of relevance.

The team members then received 15 abstracts to review and judge as relevant, not relevant, or uncertain. Team members were instructed to mark "do not know" if they had any uncertainty about whether the report included a measure of teacher supply and demand or relevant components.

The review team was fairly consistent on this initial screening of 15 sample abstracts (13 out of 15 or 87 percent agreement). The project manager reiterated that any report for which too little information was provided in the abstract should be judged "do not know." Clearer judgments would be made on reviewing the full report. The 10,435 reports that were identified through EBSCO and ERIC searches (after excluding duplicates) were then divided equally among the review team members.

The literature review team began by screening the abstracts. First, they judged whether the abstract indicated that the report measured teacher supply or demand. For each abstract, they entered "yes," "no," or "do not know." Second, the team determined whether the abstract indicated that the report included measurements of any of the components of teacher supply and demand. Again, they entered "yes," "no," or "do not know." If the response was "yes," they also entered the component that appeared to be measured and whether the measurements were of past or present data and whether the report included forecasts. Citations for the 1,392 reports for which literature review team members indicated "yes" or "do not know" were sent to the project teams' reference librarian for retrieval of the full-text report.

Results of literature search

Once the full-text reports were obtained, the reports were screened again for relevance. Full reports for which literature review team members were still uncertain were passed to the project manager for final decision.

The reports judged relevant were examined to determine whether they included forecasts of teacher supply and demand components, whether forecast models had been applied in a consistent way three or more times, and whether forecasts could be linked with "actual" data gathered during the forecast horizon. None of the relevant reports uncovered through the search of EBSCO and ERIC met these criteria.[10] Nor were there multiple reports using the same model a sufficient number of times to meet these criteria. This research question was then dropped from the study.[11]

APPENDIX C
INTERVIEW QUESTIONS

1. Are you (or the state education agency) required, by state law or administrative code, to perform the supply and demand study? (If not, where does the impetus come from?)

2. How often are such studies performed?

3. Which of the following do you examine when assessing teacher supply and demand?

    a. PK–12 student enrollment (current) and projected student enrollment for next 2, 5, 10 years?

    b. Number of teacher retirements for the year and projected retirements for next 2, 5, 10 years?

        - Broken out by teaching field?
        - Broken out by geographic region or district?

    c. Rate of teacher attrition (current) and projected rate for the next 2, 5, 10 years?

        - Broken out by teaching field?
        - Broken out by geographic region or district?

    d. Estimates of new teachers graduating from traditional teacher preparation programs? Projected numbers of new teachers from traditional teacher preparation programs for the next 2, 5, 10 years?

        - Broken out by teaching field?
        - Broken out by geographic region or district?

    e. Estimates of new teachers who teach with alternative certification? Projected numbers of new teachers with alternative certification for the next 2, 5, 10 years?

        - Broken out by teaching field?
        - Broken out by geographic region or district?

4. Do you conduct projections of any of the components listed in 3a through 3e?

5. Are there any other activities or studies that you or the state education agency does that are related to teacher supply, demand, or shortage?

6. To the best of your knowledge have the methods used to create teacher supply and demand reports changed in the past 10 years? (If so, how have they changed?)

7. To the best of your knowledge have you or anyone else analyzed the accuracy of the teacher supply and demand estimates/projections (for example, average percentage errors)? If so, what were the findings?

8. Are your supply and demand reports distributed to external reviewers prior to publication?

9. How much does it cost per year to develop the educator supply and demand report?

10. These are the teacher supply and demand reports that we have attained through other sources [list reports]. Are there any other reports or research summaries that the state education agency might have that you might share with us?

APPENDIX D
DATA REPORTED IN MOST RECENT TEACHER SUPPLY AND DEMAND REPORTS, BY MIDWEST REGION STATE

TABLE D1

Data reported in State A's most recent teacher supply and demand report, 2008

Component	Type of data reported	Level of aggregation	Data collection method	Source of data	Timeframes for data collection	Date of data in 2008 report
Emergency licenses or conditional permits (synthesis)	Counts and percentage of total	Teaching areas and local education agencies	Mandatory reporting mechanism	Local education agencies	Continuous	Current at time of report

Note: This state does not publish the results of this analysis but shares information within the state education agency and sends list of shortage areas (those with the highest number of emergency licenses or conditional permits) to the U.S. Department of Education.

Source: State A, teacher demand and supply report, 2008.

TABLE D2

Data reported in State B's most recent teacher supply and demand report, October 2008

Component	Type of data reported	Level of aggregation	Data collection method	Source of data	Timeframes for data collection	Date of data in 2008 report
Teacher shortage areas (synthesis)	Teacher shortage areas	Teaching areas	Mandatory reporting mechanisms	Local education agencies	Continuous	Current at time of report

Source: State B, teacher demand and supply report, 2008.

TABLE D3

Data reported in State C's most recent teacher supply and demand report, July 2008

Component	Type of data reported	Level of aggregation	Data collection method	Source of data	Timeframes for data collection	Date of data in 2008 report
Teacher shortage areas (synthesis)	Teacher shortage areas	Teaching areas	Mandatory reporting mechanisms	Local education agencies and teacher preparation institutions	Job openings and teacher licenses: continuously updated; program completers: updated annually	Current at time of report

Source: State C, teacher demand and supply report, 2008.

TABLE D4

Data reported in State D's most recent teacher supply and demand report, August 2007

Component	Type of data reported	Level of aggregation	Data collection method	Source of data	Timeframes for data collection	Date of data in 2007 report
Student enrollment (demand)	Counts, percentage increase	Local education agency setting and socioeconomic status	Mandatory reporting mechanism	Local education agencies	Each fall	Fall 2006
Teacher demand projections (synthesis)	Percentages, estimated counts	Local education agency setting and socioeconomic status	Mandatory reporting mechanism	Local education agencies	Each fall	Fall 2006
Teacher racial characteristics	Percentages	Local education agency setting and socioeconomic status	Mandatory reporting mechanism	Local education agencies	Each fall	Fall 2006
Teacher workforce (demand or supply)	Counts and percentages	Year to year, position category, gender, race/ethnicity, education level, age, and experience	Mandatory reporting mechanism	Local education agencies	Each fall	Fall 2006
Long-term attrition of 2001 teachers (demand or supply)	Counts and percentages	Subject areas	Mandatory reporting mechanism	Local education agencies	Each fall	Fall 2006
Mobility of 2001 teachers (demand or supply)	Counts and percentages	Subject areas, local education agency setting	Mandatory reporting mechanism	Local education agencies	Each fall	Fall 2006
Retention of 2001 teachers (demand or supply)	Counts and percentages	Subject areas, position category	Mandatory reporting mechanism	Local education agencies	Each fall	Fall 2006
Size of teaching workforce	Counts	Subject areas over time	Mandatory reporting mechanism	Local education agencies	Each fall	Fall 2006
Teacher retirements (demand or supply)	Counts and percentages	Age range, gender, and experience.	Mandatory reporting mechanism (teacher retirement database)	Retirees	Continuous	2006

Source: State D, teacher demand and supply report, 2007.

TABLE D5

Data reported in State E's most recent teacher supply and demand report, January 2009

Component	Type of data reported	Level of aggregation	Data collection method	Source of data	Timeframes for data collection	Date of data in 2008 report
Retention (supply)	Percentage, year to year	Educator type	Mandatory reporting mechanism	Local education agencies	Each fall	Fall 2008
Pipeline: newly certified teachers (supply)	Counts	Educator type (instruction by level)	Database information	Certificate applicants	Continuous	July 2007–June 2008
In-state migration: provisional certificates (supply)	Counts	Level	Database information	Certificate Applicants	Continuous	2008
Reentries (supply)	Counts and percentage of total workforce	Educator type	Mandatory reporting mechanism	Local education agencies	Each fall	Fall 2008
Pipeline: completers of teacher preparation programs (supply)	Counts	Educator type and alternative certification routes	Survey	Teacher education institutions	Annually	2007
Student enrollments (demand)	Counts, percentage change, four-year projections	Level (elementary and secondary)	Mandatory reporting mechanism	Local education agencies	Each fall	Fall 2008
Total workforce (demand)	Counts	Educator type and year and region for each educator type	Mandatory reporting mechanism	Local education agencies	Each fall	Fall 2008
Ratio of certificates issued to hires (synthesis)	Counts, ratios	Educator type (instruction by teaching area)	Database information and mandatory reporting mechanism	Certificate applicants and local education agencies	Continuous and each fall	Certificates issued during fiscal 2007 and fall 2008.
Unfilled positions (synthesis)	Counts	Educator type (instruction by teaching areas)	Mandatory reporting mechanism	Local education agencies	Each fall	Fall 2008
Administrator ratings of over-and undersupply (synthesis)	Ratings	Teaching area	Mandatory reporting mechanism	Local education agencies	Each fall	Fall 2008
Demand projections (demand)	Calculations based on average new hires over previous eight years	Teaching area	Mandatory reporting mechanism	Local education agencies	Each fall	

Source: State E, teacher demand and supply report, 2008.

TABLE D6

Data reported in State F's most recent teacher supply and demand report, January 2009

Component	Type of data reported	Level of aggregation	Data collection method	Source of data	Timeframes for data collection	Date of data in 2008 report
Pipeline: completers of teacher preparation programs (supply)	Counts	Teacher shortage areas, over time	Data supplied from external source	Teacher education institutions	Annually	2007
Total teaching licenses (supply)	Counts and percentage change	Teacher shortage areas, over time	Database	License applicants	Continuous	Fall 2008
New teaching licenses granted (supply)	Counts	Teachers prepared in-state and out-of-state, by teacher shortage areas over time	Database	License applicants	Continuous	Fall 2008
Teacher retirements (supply or demand)	Counts and percentage of employed teachers	Over time	Mandatory reporting mechanism	Local education agencies	Every fall	Fall 2008
Teacher retirements and initial licenses granted (synthesis)	Counts and percentage change	By teacher shortage areas, over time	Mandatory reporting mechanism and database information	Local education agencies and license applicants	Every fall (retirements) and continuous (licenses)	Fall 2008
Retention (supply or demand)	Counts	Cohorts of new teachers since 2001, by time and region	Mandatory reporting mechanism	Local education agencies	Every fall	Fall 2008
Emergency licenses or permits	Counts and percentage change	Broad teaching filed and type of license or permit over time and by region	Mandatory reporting mechanisms	Local education agencies applications for licenses or permits	Continuous	Fall 2008
Areas of shortage and surplus	Impressions	Teaching area (including substitutes)	Survey of local education agency personnel	Local education agencies personnel	Fall, every even year	Fall 2008
Five-year projections of teacher retirements (supply or demand)	Counts based on impressions	Teaching area	Survey of local education agency personnel	Local education agencies personnel	Fall, every even year	Fall 2008

Note: State F also collects vacancy counts by teaching area from the survey of local education agency personnel. That information is not included in the report.

Source: State F, teacher demand and supply report, 2008.

TABLE D7

Data Reported in State G's Most Recent Teacher Supply and Demand Report, 2007

Component	Type of data reported	Level of aggregation	Data collection method	Source of data	Timeframes for data collection	Date of data in 2007 report
Pipeline: completers of teacher preparation programs (supply)	Counts	Teaching area by type of institution (public or private); institution and broad teacher categories over time	Mandatory reporting system	Teacher education institutions	September 2005– August 2006	August 31, 2006
Pipeline: completers of alternative certification programs (supply)	Counts	Teaching area and alternative certification program	Mandatory reporting system	Teacher education programs	September 2005–August 2006	August 31, 2006
Attrition rates, year to year (supply or demand)	Percentages	Year to year, by general education and special education	Mandatory reporting system	Local education agencies	1989–2006	Fall 2006
Attrition rates, long term (supply or demand)	Percentages	Cohorts of teachers	Mandatory reporting system	Local education agencies	1996–2006	Fall 2006
Ages of educators	Counts, percentages	Teaching area, age categories, and grade level	Mandatory reporting system	Local education agencies	2006/07 and 2002/03	Fall 2007
Vacancies	Counts	Teaching area	Survey of local education agencies	Local education agency administrators	2006/07	Winter 2007
Applicants	Counts	Teaching area	Survey of local education agencies	Local education agency administrators	2006/07	Winter 2007
Areas of shortage and surplus	Impressions	Teaching area (including substitutes)	Survey of local education agencies	local education agency personnel	Fall, every even year	Fall 2008

Source: State G, teacher demand and supply report, 2007.

NOTES

The authors wish to acknowledge Robert Reichardt, who provided guidance for this study.

1. Local education agencies, commonly used as a synonym for school districts, are defined here as organizations that operate local primary or secondary schools. Indiana refers to local education agencies as school corporations.

2. A fourth research question—how well do the methodologies used by Midwest Region states compare with the most rigorous and accurate supply and demand forecast models identified in the literature—was also posed but subsequently dropped. *Rigorous and accurate models* were defined as forecast models that had been applied consistently in a non-national setting three or more times and that, when compared with actual counts taken during the forecast horizon, resulted in low percentage errors, average percentage errors, or mean absolute percentage errors. A systematic search of literature in EBSCO and ERIC revealed 10,435 nonduplicated reports, 245 of them empirical examinations of teacher supply and demand. No single forecast model used in these reports that could be linked with actual data was applied consistently on three or more occasions. See appendix B for details of the literature search.

3. Reichardt (2003) provides some guidance to states seeking to design a comprehensive study of teacher supply and demand.

4. Respondents in States A, B, C, and F provided cost estimates in number of hours required to perform the analyses, using existing state data or data collected as part of the state's approach. Hours were then converted to dollars using salary information from state salary databases developed in 2007 by news media outlets through Freedom of Information Act requests to states. Costs include benefit costs, based on information from states' human resources offices. Cost estimates were sent to respondents for review. All but one respondent replied and made adjustments to the estimates. The respondent who did not reply (State A) was no longer employed at the state education agency at the time of the request.

5. All three states that conduct surveys as part of their teacher supply and demand report (States E, F, and G) provide response rates and some caveats regarding potential reporting bias when response rates are low. However, they do not provide any norms for judging the quality of the data, such as those offered by Mangione and Van Ness (2009) and others (see section below on cautions about relying on surveys and impression data). Nor do these state reports analyze characteristics of nonresponse.

6. The data from the survey of teacher education program completers are especially suspect. Mangione and Van Ness (2009) classify a response rate of less than 50 percent as "not scientifically acceptable." The authors of State G's report provide possible reasons for lack of response, but report no analysis of characteristics of nonresponders. Data from this program completer survey are still summarized in the report.

7. Both the Office of Management and Budget (OMB) and the American Association of Public Opinion Research have developed standard formulas for calculating response rates (Office of Management and Budge 2006; American Association of Public Opinion Research 2008). OMB and the National Center for Education Statistics (NCES) also provide guidelines requiring analyses of nonresponse when unit response rates or item response rates fall below certain levels. These standards and guidelines are widely accepted. There is much less consensus, however, on the relationship between response rates and survey quality, and the criteria for acceptably high or low response rates are not clearcut. Historical

response rates from surveys conducted with best practices by NCES are in the 70–90 percent range, depending on the type of surveys and stage of data collection (U.S. Department of Education 2002). Numerous reference books provide more comprehensive guidance on how to construct and administer high-quality surveys. Examples include Fowler (2009) and Mangione and Van Ness (2009). The Mangione and Van Ness guidelines are cited here to provide a well recognized set of criteria for assessing response rates in practice. They are not intended as rigid or authoritative standards.

8. The year 1983 was chosen because it represents the publication date for *A Nation at Risk*.

9. Most of the reports involving data from one or more administrations of the National Center for Education Statistics (NCES) Schools and Staffing Survey refer to NCES technical reports, which provide details on the relevant questionnaires and methodology.

10. In several instances a string of three or more reports including forecasts were uncovered, but the literature review team could not be certain based on the review that the researchers conducting the forecasts had consistently used the same forecast models.

11. The research team considered including in the report a catalog of research methodologies found during the research review. However, it was decided that such a catalog, although useful, was only tangentially related to the purpose of this report. Those interested in viewing the catalog can contact the first author of this report.

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