Supplemental Materials

Part of the series: Science and mathematics teacher retention in rural Illinois

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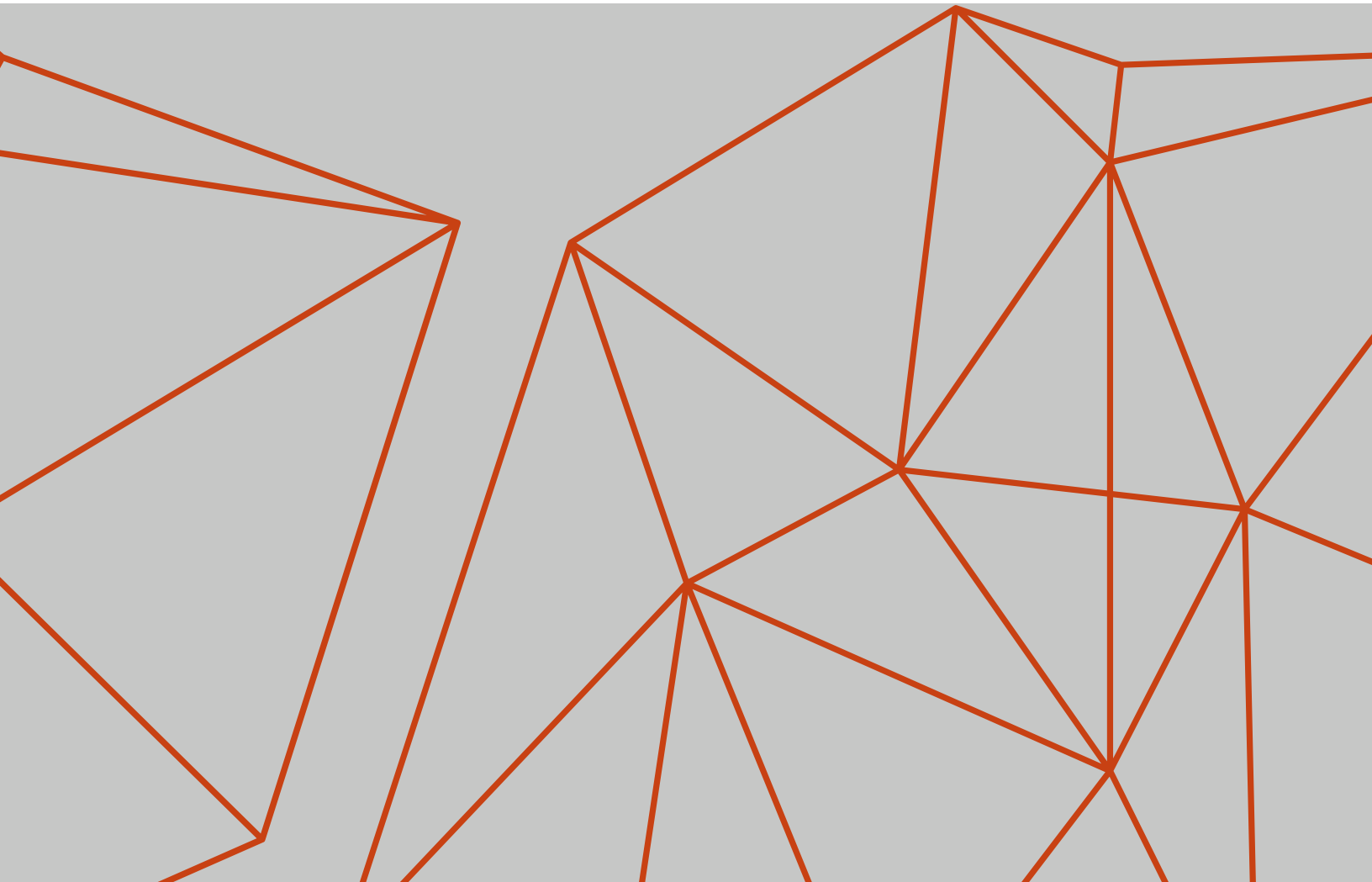
IWERC
Illinois Workforce & Education Research Collaborative



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Science and Mathematics Teacher Retention in Rural Illinois Series Information

A. District and Teacher Inclusion Criteria

Below are the rationale and rules that guided the establishment of key classifications in this series: (1) rural and high-need rural districts, (2) science and mathematics teachers, (3) one- and three-year retention rates, and (4) teacher licensure categories.

1. Rural and High-Need Rural Districts

Identifying Rural Districts

We referred to the Rural and Low-Income School Program, a grant issued by the U.S. Department of Education (n.d.), and adopted the criteria used to determine which local education agencies (LEAs), or public school districts, are considered rural. According to the Rural and Low-Income School Program, for a LEA "to be considered rural, all schools comprising the LEA must have a school locale code of 32, 33, 41, 42, or 43 (assigned by the National Center for Education Statistics, or NCES)." The NCES locale classifications are based on population size and proximity to populated areas, and classifications are as follows: 32 is town distant, 33 town remote, 41 rural fringe, 42 rural distant, and 43 rural remote. Of the 865 districts in Illinois statewide for the 2022-23 school year (see Illinois State Board of Education, or ISBE, 2024a), 426 districts (or 49.2% of districts statewide) met this rural criterion (NCES, 2023).[1]

Identifying High-Need Rural Districts

Next, within this set of rural districts, we referred to National Science Foundation (NSF) program specifications (NSF 21-578: Robert Noyce Teacher Scholarship Program) to identify which of the 426 rural districts are considered high need (NSF, 2023).

According to the NSF program solicitation, the term "high-need local educational agency (or high-need LEA)," as defined in section 201 of the Higher Education Act of 1965 (20 U.S.C. 1021), means a U.S. local educational agency (e.g., school district) that has at least one school that:

a. meets at least one of the following criteria (either i, ii, iii, or iv):

i. not less than 20% of the children served by the agency are from low income families;

[1] To categorize districts, and to identify rural and high-need rural districts, we used version 5.0 of ISBE's Illinois Report Card for SY23 (ISBE, 2024a). Version 5.0 contained 865 districts total, which differs from a later version (see, e.g., version 8.0), which contains 867 districts.

ii. serves at least 10,000 children from low-income families;

iii. is eligible for funding under the Small, Rural School Achievement Program under 20 U.S.C. 7345(b):

From Office of the Law Revision Counsel United States Code (n.d.a),

> "(A)(i)(I) the total number of students in average daily attendance at all of the schools served by the local educational agency is fewer than 600;[2] or
> (II) each county in which a school served by the local educational agency is located has a total population density of fewer than 10 persons per square mile; and
> (ii) all of the schools served by the local educational agency are designated with a locale code of 41, 42, or 43, as determined by the Secretary."

iv. is eligible for funding under the Rural and Low-Income School Program under 20 U.S.C. 7351(b);

From Office of the Law Revision Counsel United States Code (n.d.b),

> "(A)(i) 20 percent or more of the children ages 5 through 17 years served by the local educational agency are from families with incomes below the poverty line; and
> (ii) all of the schools served by the agency are designated with a locale code of 32, 33, 41, 42, or 43, as determined by the Secretary."

and

b. meets at least one of the following criteria:

i. has a high percentage of teachers not teaching in the academic subject areas or grade levels in which the teachers were trained to teach; or

ii. has a high teacher turnover rate or a high percentage of teachers with emergency, provisional, or temporary certification or licensure.

To satisfy Part A, we referred again to school-level NCES (2023) locale classifications as well as publicly available data on school and/or district characteristics from ISBE, depending on the criterion applied. In particular, we used a metric that provides the percentage of students in a school or district who are from low-income families. ISBE (2024c) defines this variable, low-income students, as students "who receive or

[2] We did not need to use the criterion of average daily attendance because all districts met other criteria listed under Part A.

live in households that receive Supplemental Nutrition Assistance Program or Temporary Assistance to Needy Families benefits; are classified as homeless, migrant, runaway, Head Start, or foster children; or live in a household where the household income meets the U.S. Department of Agriculture income guidelines to receive free or reduced-price meals."

To satisfy Part B, we used publicly available, district-level recruitment and retention metrics from ISBE, specifically teacher retention, teachers with short-term or provisional licenses, out-of-field teachers, and vacancy rates (ISBE 2024a, 2024d), calculating measures of central tendency for all districts statewide and rural districts.[3] Because the metrics for rural districts were slightly lower compared to all districts statewide, we defined "high" as being above average on any of these metrics for rural districts (see Table SM1). Subsequently, 307 districts (or 35.4% of districts statewide) met at least one of the additional high-need criteria specified in Part B. Notably, recruitment and retention in high-need rural districts appear to be more difficult, on average and of varying degree, compared to rural and statewide districts.

Table SM1. District characteristics and teacher staffing metrics in Illinois, by type for school year 2022-23 (SY23).

	Statewide districts (865)			**Rural districts (426)**			**High-need rural (307)**		
	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range
Student enrollment	2,114	11,201	[29, 319,769]	642	624	[29, 6,240]	571	615	[29, 6,240]
Low-income students	45%	22	[1%, 100%]	46%	17	[3%, 100%]	48%	16	[7%, 100%]
Teacher retention (three-year rate)	89%	6	[29, 100]	88%	6	[53, 100]	87%	6	[54, 100]
Short-term/ provisional license	4%	5	[0, 60]	5%	6	[0, 60]	6%	6	[0, 60]
Vacancy rate	3%	5	[0, 40]	4%	6	[0, 40]	5%	6	[0, 40]
Out-of-field teachers	6%	7	[0, 60]	9%	9	[0, 60]	11%	9	[0, 60]

2. Science and Mathematics Teacher Workforce

To identify the science and mathematics teacher (SMT) workforce in Illinois in grades 6-12, we used confidential, individual-level administrative data from ISBE, as part of a master data share agreement

[3] Our analysis for Part B was conducted at the district level, and not school level, because the percentage of teachers on short-term/provisional license was only available at the district level. For consistency, we examined the additional teacher staffing metrics, which included teacher retention, out-of-field teachers, and vacancy rates, at the district level as well.

between IWERC and ISBE. These data spanned school years 2017-18 (SY18) to 2022-23 (SY23) and were inclusive of all teachers statewide. We received three datasets: employment, courses, and licensure. Details on each dataset are below.

First, to identify teachers, we referred to employment data, which included a teacher's employer district, position, race/ethnicity, and gender. We identified teachers as those individuals who held instructional positions. For a list of the applicable position codes, please see Table SM2. We also limited our analyses to teachers whose full-time equivalent (FTE) in an instructional position was 0.85 FTE or above upon the suggestion of our advisory committee. In deciding the range of FTEs to include in our analysis, we first examined the distribution of FTEs for SMTs in high-need rural districts. In SY23, for example, a preliminary analysis of SMTs in high-need districts indicated that appointments ranged from .05 to 1.0 and above, with nearly all SMTs (92% teachers) at appointments of 1.0 FTE or above in SY23. An additional 4% of SMTs held appointments between .85 to .99 FTEs, and so, we set the cutoff for inclusion as a full-time SMT at .85 FTE and above. Teachers with appointments less than 0.85 FTE, amounting to about 4% of SMTs, were excluded.

Table SM2. All science and mathematics teachers (SMTs) held at least one of the following instructor positions, according to classification in ISBE's Employment Information System (ISBE, 2024d).

Position code	Position
200	Teacher
201	Reading Teacher
202	Bilingual Education Teacher
203	English as a Second Language Teacher
204	Visiting International Teacher
207	Speech Language Pathology Teacher
208	Career and Technical Educator (CTE)
250	Special Education Teacher
251	Bilingual Special Education Teacher

Second, to identify teachers who taught science and mathematics courses in grades 6-12, we referred to course data, which included a teacher's assignment with subject and course title. For a list of the applicable grade 6 through 12 science and mathematics courses, please see Table SM3. To be considered a SMT, teachers needed to have taught at least one of these courses.

The course data indicates teachers of record for specific courses. As such, we created a metric that identified SMTs based on course data, regardless of teachers' licensure. When we merged employment and course data for SMTs with licensure data, SMTs held a variety of licenses (for license types, please see the section below, Teacher License Categories), though nearly all SMTs had a Professional Educator License.

Table SM3. Science and mathematics courses for grades 6 through 12. All science and mathematics teachers (SMTs) taught at least one of the following courses (see ISBE, 2026).

Course ID	Subject	Course title
02113A000	Mathematics	Abstract Algebra
52069A000	Mathematics	Algebra – Other
02052A000	Mathematics	Algebra I
52052A000	Mathematics	Algebra I
02053A000	Mathematics	Algebra I—Part 1
02054A000	Mathematics	Algebra I—Part 2
02056A000	Mathematics	Algebra II
02057A000	Mathematics	Algebra III
02069A000	Mathematics	Algebra—Other
02073A000	Mathematics	Analytic Geometry
52073A000	Mathematics	Analytic Geometry
02149A000	Mathematics	Analytic Mathematics—Other
02124A000	Mathematics	AP Calculus AB
02125A000	Mathematics	AP Calculus BC
02114A000	Mathematics	AP Precalculus
02203A000	Mathematics	AP Statistics
02154A001	Mathematics	Business Math
02154A000	Mathematics	Business Mathematics
02155A000	Mathematics	Business Mathematics with Algebra
02121A000	Mathematics	Calculus
02138A000	Mathematics	College Mathematics Preparation
52047A000	Mathematics	Comprehensive Math – Independent Study
52049A000	Mathematics	Comprehensive Math – Other
02156A000	Mathematics	Computer Mathematics with Algebra
52157A000	Mathematics	Consumer Math
02157A000	Mathematics	Consumer Mathematics
02123A000	Mathematics	Differential Calculus
02102A000	Mathematics	Discrete Mathematics
02109A000	Mathematics	Elementary Functions
02136A000	Mathematics	Finite Mathematics
02047A000	Mathematics	Foundation Mathematics—Independent Study
02049A000	Mathematics	Foundation Mathematics—Other
02151A000	Mathematics	General Applied Math
52002A000	Mathematics	General Math
02002A000	Mathematics	General Mathematics
02072A000	Mathematics	Geometry
52072A000	Mathematics	Geometry
52079A000	Mathematics	Geometry – Other

02079A000	Mathematics	Geometry—Other
02301A000	Mathematics	High School Math 1
02302A000	Mathematics	High School Math 2
02303A000	Mathematics	High School Math 3
02201A001	Mathematics	High School Transitional Math 4 – Quantitative Literacy and Statistics
02055A001	Mathematics	High School Transitional Math 4 – STEM
02153A001	Mathematics	High School Transitional Math 4 – Technical Math
02991A000	Mathematics	History of Math
52991A000	Mathematics	History of Math (prior-to-secondary)
02134A000	Mathematics	IB Further Mathematics
02131A000	Mathematics	IB Mathematical Studies
02132A000	Mathematics	IB Mathematics
02133A000	Mathematics	IB Mathematics and Computing—SL
02135A000	Mathematics	IB Mathematics, Middle Years Program
02140A000	Mathematics	IB MATHEMATICS: ANALYSIS AND APPROACHES
02139A000	Mathematics	IB MATHEMATICS: APPLICATIONS AND INTERPRETATION
02202A000	Mathematics	Inferential Probability and Statistics
02071A000	Mathematics	Informal Geometry
52071A000	Mathematics	Informal Geometry
02001A000	Mathematics	Informal Mathematics
52001A000	Mathematics	Informal Mathematics (prior-to-secondary)
02061A000	Mathematics	Integrated Math—multi-year equivalent
02062A000	Mathematics	Integrated Mathematics I
52061A000	Mathematics	Integrated Mathematics I (prior-to-secondary)
02063A000	Mathematics	Integrated Mathematics II
02064A000	Mathematics	Integrated Mathematics III
02065A000	Mathematics	Integrated Mathematics IV
02111A000	Mathematics	Linear Algebra
02112A000	Mathematics	Linear Programming
02104A000	Mathematics	Math Analysis
02108A000	Mathematics	Mathematic Analysis/Analytic Geometry
02137A000	Mathematics	Mathematical Modeling
52036A000	Mathematics	Mathematics (grade 6)
02036A000	Mathematics	Mathematics (grade 6)
02037A000	Mathematics	Mathematics (grade 7)
52037A000	Mathematics	Mathematics (grade 7)
52038A000	Mathematics	Mathematics (grade 8)
02038A000	Mathematics	Mathematics (grade 8)
52997A000	Mathematics	Mathematics – Independent Study
52999A000	Mathematics	Mathematics – Other
52993A000	Mathematics	Mathematics – Test Preparation
02994A000	Mathematics	Mathematics Proficiency Development
52994A000	Mathematics	Mathematics Proficiency Development (prior-to-secondary)
02995A000	Mathematics	Mathematics—Aide
02039A000	Mathematics	Mathematics—General
52039A000	Mathematics	Mathematics—General
02997A000	Mathematics	Mathematics—Independent Study
02999A000	Mathematics	Mathematics—Other

02996A000	Mathematics	Mathematics—Supplemental
52996A000	Mathematics	Mathematics—Supplemental
02993A000	Mathematics	Mathematics—Test Preparation
02998A000	Mathematics	Mathematics—Workplace Experience
02122A000	Mathematics	Multivariate Calculus
02101A000	Mathematics	Number Theory
02152A000	Mathematics	Occupationally Applied Math
02058A000	Mathematics	Particular Topics in Algebra
02141A000	Mathematics	Particular Topics in Analytic Mathematics
02126A000	Mathematics	Particular Topics in Calculus
02003A000	Mathematics	Particular Topics in Foundation Mathematics
52003A000	Mathematics	Particular Topics in Foundational Mathematics
02075A000	Mathematics	Particular Topics in Geometry
52075A000	Mathematics	Particular Topics in Geometry
02204A000	Mathematics	Particular Topics in Probability and Statistics
02051A000	Mathematics	Pre-Algebra
52051A000	Mathematics	Pre-Algebra (prior-to-secondary)
02052A001	Mathematics	Pre-AP Algebra 1
02056A001	Mathematics	Pre-AP Algebra 2
02079A001	Mathematics	Pre-AP Geometry with Statistics
02110A000	Mathematics	Pre-Calculus
02074A000	Mathematics	Principles of Algebra and Geometry
52074A000	Mathematics	Principles of Algebra and Geometry
02201A000	Mathematics	Probability and Statistics
02207A000	Mathematics	Probability and Statistics—Independent Study
02209A000	Mathematics	Probability and Statistics—Other
02158A000	Mathematics	QUANTITATIVE REASONING
02205A000	Mathematics	Statistics
02153A000	Mathematics	Technical Mathematics
02055A000	Mathematics	Transition Algebra
02103A000	Mathematics	Trigonometry
02106A000	Mathematics	Trigonometry/Algebra
02107A000	Mathematics	Trigonometry/Analytic Geometry
02105A000	Mathematics	Trigonometry/Mathematic Analysis
03064A001	Life and Physical Sciences	Advanced Biological Science Applications in Agriculture
03064A002	Life and Physical Sciences	Advanced Biological Science Applications in Agriculture (BSAA) - Animals
03064A003	Life and Physical Sciences	Advanced Biological Science Applications in Agriculture (BSAA) - Plants
03209A000	Life and Physical Sciences	Aerospace
03054A000	Life and Physical Sciences	Anatomy
03053A001	Life and Physical Sciences	Anatomy & Physiology for Health Sciences
03053A000	Life and Physical Sciences	Anatomy and Physiology
03056A000	Life and Physical Sciences	AP Biology
03106A000	Life and Physical Sciences	AP Chemistry
03207A000	Life and Physical Sciences	AP Environmental Science
03165A000	Life and Physical Sciences	AP Physics 1
03166A000	Life and Physical Sciences	AP Physics 2
03155A000	Life and Physical Sciences	AP Physics B
03156A000	Life and Physical Sciences	AP Physics C

03163A000	Life and Physical Sciences	AP Physics C: Electricity and Magnetism
03164A000	Life and Physical Sciences	AP Physics C: Mechanics
03203A000	Life and Physical Sciences	Applied Biology/Chemistry
03004A000	Life and Physical Sciences	Astronomy
03051A000	Life and Physical Sciences	Biology
53051A000	Life and Physical Sciences	Biology (prior-to-secondary)
53097A000	Life and Physical Sciences	Biology – Independent Study
53099A000	Life and Physical Sciences	Biology – Other
03052A000	Life and Physical Sciences	Biology—Advanced Studies
03097A000	Life and Physical Sciences	Biology—Independent Study
03099A000	Life and Physical Sciences	Biology—Other
03098A000	Life and Physical Sciences	Biology—Workplace Experience
03058A000	Life and Physical Sciences	Botany
03101A000	Life and Physical Sciences	Chemistry
53101A000	Life and Physical Sciences	Chemistry (prior-to-secondary)
53147A000	Life and Physical Sciences	Chemistry – Independent Study
53149A000	Life and Physical Sciences	Chemistry – Other
03102A000	Life and Physical Sciences	Chemistry—Advanced Studies
03147A000	Life and Physical Sciences	Chemistry—Independent Study
03149A000	Life and Physical Sciences	Chemistry—Other
03148A000	Life and Physical Sciences	Chemistry—Workplace Experience
03062A000	Life and Physical Sciences	Conceptual Biology
03105A000	Life and Physical Sciences	Conceptual Chemistry
03161A000	Life and Physical Sciences	Conceptual Physics
03008A000	Life and Physical Sciences	Earth and Space Science
03001A000	Life and Physical Sciences	Earth Science
53047A000	Life and Physical Sciences	Earth Science – Independent Study
53049A000	Life and Physical Sciences	Earth Science – Other
03047A000	Life and Physical Sciences	Earth Science—Independent Study
03049A000	Life and Physical Sciences	Earth Science—Other
03048A000	Life and Physical Sciences	Earth Science—Workplace Experience
53008A000	Life and Physical Sciences	Earth/Space Science (prior-to-secondary)
03010A000	Life and Physical Sciences	Earth/Space Science (prior-to-secondary)
71004A001	Life and Physical Sciences	Energy and the Environment
03012A000	Life and Physical Sciences	Energy and the Environment
03003A000	Life and Physical Sciences	Environmental Science
03214A000	Life and Physical Sciences	Forensic Laboratory Science
03059A000	Life and Physical Sciences	Genetics
03002A000	Life and Physical Sciences	Geology
03057A000	Life and Physical Sciences	IB Biology
03107A000	Life and Physical Sciences	IB Chemistry
03206A000	Life and Physical Sciences	IB Design Technology
03208A000	Life and Physical Sciences	IB Environmental Systems and Societies
03160A000	Life and Physical Sciences	IB Physical Science
03157A000	Life and Physical Sciences	IB Physics
03213A000	Life and Physical Sciences	IB Sciences, Middle Years Program
03065A000	Life and Physical Sciences	IB Sports, Exercise, and Health Science
03201A000	Life and Physical Sciences	Integrated Science
53201A000	Life and Physical Sciences	Integrated Science (prior-to-secondary)
53997A000	Life and Physical Sciences	Life and Physical Sciences – Independent Study

53999A000	Life and Physical Sciences	Life and Physical Sciences – Other
53994A000	Life and Physical Sciences	Life and Physical Sciences – Proficiency Development
03995A000	Life and Physical Sciences	Life and Physical Sciences—Aide
03997A000	Life and Physical Sciences	Life and Physical Sciences—Independent Study
03999A000	Life and Physical Sciences	Life and Physical Sciences—Other
03994A000	Life and Physical Sciences	Life and Physical Sciences—Proficiency Development
03996A000	Life and Physical Sciences	Life and Physical Sciences—Supplemental
53996A000	Life and Physical Sciences	Life and Physical Sciences—Supplemental (prior-to-secondary)
03998A000	Life and Physical Sciences	Life and Physical Sciences—Workplace Experience
03158A000	Life and Physical Sciences	Life Science
53158A000	Life and Physical Sciences	Life Science (prior-to-secondary)
03005A000	Life and Physical Sciences	Marine Science
03068A001	Life and Physical Sciences	Medical Interventions
03006A000	Life and Physical Sciences	Meteorology
03060A000	Life and Physical Sciences	Microbiology
03069A000	Life and Physical Sciences	Nutrition Science
03103A000	Life and Physical Sciences	Organic Chemistry
03205A000	Life and Physical Sciences	Origins of Science
03063A000	Life and Physical Sciences	Particular Topics in Biology
53063A000	Life and Physical Sciences	Particular Topics in Biology (prior-to-secondary)
03108A000	Life and Physical Sciences	Particular Topics in Chemistry
53108A000	Life and Physical Sciences	Particular Topics in Chemistry (prior-to-secondary)
03009A000	Life and Physical Sciences	Particular Topics in Earth Science
53009A000	Life and Physical Sciences	Particular Topics in Earth Science
03162A000	Life and Physical Sciences	Particular Topics in Physics
53162A000	Life and Physical Sciences	Particular Topics in Physics (prior-to-secondary)
03104A000	Life and Physical Sciences	Physical Chemistry
03007A000	Life and Physical Sciences	Physical Geography
03159A000	Life and Physical Sciences	Physical Science
03011A000	Life and Physical Sciences	Physical Science (prior-to-secondary)
53159A000	Life and Physical Sciences	Physical Science (prior-to-secondary)
03151A000	Life and Physical Sciences	Physics
53151A000	Life and Physical Sciences	Physics (prior-to-secondary)
53197A000	Life and Physical Sciences	Physics – Independent Study
53199A000	Life and Physical Sciences	Physics – Other
03152A000	Life and Physical Sciences	Physics—Advanced Studies
03197A000	Life and Physical Sciences	Physics—Independent Study
03199A000	Life and Physical Sciences	Physics—Other
03198A000	Life and Physical Sciences	Physics—Workplace Experience
03055A000	Life and Physical Sciences	Physiology
03070A000	Life and Physical Sciences	PLTW Biomedical Innovation
03067A000	Life and Physical Sciences	PLTW Human Body Systems
03068A000	Life and Physical Sciences	PLTW Medical Interventions
03066A000	Life and Physical Sciences	PLTW Principles of Biomedical Science
03056A001	Life and Physical Sciences	Pre-AP Biology
03106A001	Life and Physical Sciences	Pre-AP Chemistry
03153A000	Life and Physical Sciences	Principles of Technology
53153A000	Life and Physical Sciences	Principles of Technology (prior-to-secondary)

03064A000	Life and Physical Sciences	Regional Biology
03236A000	Life and Physical Sciences	Science (grade 6)
53236A000	Life and Physical Sciences	Science (grade 6)
53237A000	Life and Physical Sciences	Science (grade 7)
03237A000	Life and Physical Sciences	Science (grade 7)
03238A000	Life and Physical Sciences	Science (grade 8)
53238A000	Life and Physical Sciences	Science (grade 8)
03210A000	Life and Physical Sciences	Science, Technology and Society
53239A000	Life and Physical Sciences	Science—General
03239A000	Life and Physical Sciences	Science—General
03212A000	Life and Physical Sciences	Scientific Research and Design
03211A000	Life and Physical Sciences	Technical Science
03204A000	Life and Physical Sciences	Technological Inquiry
03001A001	Life and Physical Sciences	Technology and Society (EbD)
03202A000	Life and Physical Sciences	Unified Science
53202A000	Life and Physical Sciences	Unified Science (prior-to-secondary)
03061A000	Life and Physical Sciences	Zoology

3. One- and Three-Year Retention Rates

To calculate SMT retention, we present two metrics: a one-year calculation and a three-year calculation. To generate the three-year retention rate for SMTs, we consulted ISBE's retention metric, which was one of the recruitment and retention metrics used to identify high-need rural districts (see Table SM1). ISBE calculates retention as "the total number of full-time teachers staying in the same district in the past three years, divided by the total number of full-time teachers from the past three years" (ISBE 2024b, p. 25). For this project, we broadened ISBE's definition of full-time as being 1.0 FTE to include SMTs with a .85 FTE and higher to be more inclusive of teachers (see Section 2 above for more information). We also added one stipulation: SMT retention refers specifically to retention of SMTs *as SMTs* in a district, rather than retention of teachers overall.

A one-year retention rate allows us to account for variation across years. A three-year retention rate allows us to more readily compare the retention of all teachers (from publicly available ISBE data) to the retention of SMTs (from confidential teacher-level data).[4]

The equation below was used to calculate a ***three-year SMT retention rate***, with head count referring to the total number of SMTs in a district:

[4] Both the one-year and three-year retention rates have trade-offs. While a one-year retention rate can reveal year-to-year changes, it can also be more sensitive to yearly fluctuations in staffing changes, especially in districts with smaller staff sizes. A three-year retention rate, on the other hand, levels out year-to-year fluctuations, but can also obscure them.

$$SY23\ three\text{-}year\ retention\ (\%) = (Head\ count\ of\ SMT\ stayers\ in\ SY23\ from\ SY22 + head\ count\ of\ SMT\ stayers\ in\ SY22\ from\ SY21 + head\ count\ of\ SMT\ stayers\ in\ SY21\ from\ SY20)/(Head\ count\ of\ SMTs\ in\ SY22 + head\ count\ of\ SMTs\ in\ SY21 + head\ count\ of\ SMTs\ in\ SY20) \times 100$$

We also calculated a ***one-year SMT retention rate*** using the following equation:

$$SY23\ one\text{-}year\ retention\ (\%) = Head\ count\ of\ SMT\ stayers\ in\ SY23\ from\ SY22\ /\ Head\ count\ of\ SMTs\ in\ SY22 \times 100$$

4. Teacher Licensure Categories

In addition to employment and course data, we received confidential licensure data for all teachers across the state from SY15 to SY25. We consulted with ISBE to create the following three categories by licensure types:

i. **Qualified teachers (i.e., educators who hold full renewable credentials)**
   a. Professional Educator License (PEL)
   b. Career and Technical Educator (CTE) Endorsement

ii. **Provisional (i.e., educators who hold non-renewable credentials) teachers**
   a. CTE
      i. Provisional Career and Technical Educator Endorsement
      ii. Part-Time Provisional Career and Technical Educator Endorsement
   b. Other (i.e., licenses for people who can serve as a teacher of record)
      i. Alternative Provisional Educator Endorsement
      ii. Provisional In-State Educator
      iii. Transitional Bilingual Educator Endorsement
      iv. Visiting International Educator Endorsement

iii. **Paraprofessionals (i.e., educators who cannot serve as a teacher of record)**
   a. Paraprofessional Educator Endorsement

Please note that while the licensure data contained information on provisional licenses, it did not contain information on short-term approvals. In other words, these categories do not completely align with one of the publicly available recruitment and retention metrics used to identify high-need rural districts, which is

the percentage of teachers on short-term or provisional licenses. Also, teacher endorsements were not in the project scope but are an area worthy of future research.

B. Glossary

Table SM4. Glossary of terms included in the Series. Unless noted, terms are taken from ISBE's SY23 Report Card Glossary of Terms (ISBE, 2024c). Definitions with an asterisk are specific to this project.

Term	Definition
Attendance rate	A weighted measure of the number of days a student is present relative to the total number of potential attendance days.
English Learners (ELs)	Students who have been identified through a screening process as eligible for bilingual education and/or English as a second language services, and who have not yet reached English proficiency, as measured by ACCESS for ELLs.
Evidence-based funding (EBF) tier	Evidence-Based Funding (EBF) for Student Success Act became law on August 31, 2017. Five previous grant programs are combined into a single grant program and distributed as EBF. Those grant programs are General State Aid, Special Education – Personnel, Special Education – Funding for Children Requiring Special Education Services, Special Education – Summer School, and English Learner Education. Districts receive the same amounts from these grant programs as they did in fiscal year 2017, the year prior to implementation of EBF. That hold harmless provision is known as the Base Funding Minimum. In addition, when there are sufficient appropriations, districts receive funding based on their assignment to one of four tiers. The tiers represent a ranking of district resources compared to individual district education costs. There are four tiers numbered 1 through 4. The Tier 1 threshold is set annually. Tier 2 districts have a Percent of Adequacy greater than or equal to the Tier 1 target ratio and less than 90 percent. Tier 3 districts have a Percent of Adequacy greater than or equal to 90 percent and less than 100 percent. Tier 4 districts have a Percent of Adequacy greater than or equal to 100 percent. In other words, Tier 1 districts are farthest away from adequacy and are highest-need whereas Tier 4 are closest to adequacy and are lowest in need for state funding.
Graduation rate (4-year)	Calculation based on ESSA High School Graduation Rate guidance found here. Students are reported at their home school. The cohort is based on the number of students who enter Grade 9 for the first time, adjusted by adding into the cohort any student who transfers in later during Grade 9 or during the next three years and subtracting any student from the cohort who transfers out, emigrates to another country, transfers to a prison or juvenile facility, or dies during that same period. It is the proportion of graduates from a specific cohort to the total number of students in that cohort.
Gender	The gender of a student or teacher that the district reports to ISBE. Gender will be either male, female, or non-binary.

High-need rural districts*	Districts that met the rural and high-need specifications as outlined in the NSF 21-578: Robert Noyce Teacher Scholarship Program solicitation (NSF, 2023). Inclusion criteria were two part. First, districts needed to meet requirements for the students they serve (e.g., percentage of students from low-income families and/or requirements from two federal programs, the Small, Rural School Achievement Program and the Rural and Low-Income School Program). Second, districts needed to meet teacher-staffing requirements (e.g., teacher retention, teachers with short-term or provisional licenses, out-of-field teachers, and vacancy rates). For a full definition, see the Supplemental Materials section on Inclusion Criteria.
Homeless students	Children/youth who lack a fixed, regular, and adequate nighttime residence. They include: • Students who are sharing the housing of other persons due to loss of housing, economic hardship, or a 10 similar reason; are living in motels, hotels, trailer parks, or camping grounds due to the lack of alternative adequate accommodations; are living in emergency or transitional shelters; are abandoned in hospitals; • Students who have a primary nighttime residence that is a public or private place not designed for or ordinarily used as a regular sleeping accommodation for human beings; • Students who are living in cars, parks, public spaces, abandoned buildings, substandard housing, bus or train stations, or similar settings; and • Migrant students who qualify as being homeless for the purposes of this subtitle because they are living in circumstances described above. See here for more details on homelessness and associated programming.
Individualized Education Program (IEP) students	Students who are identified as having a disability through formal evaluations and met specific criteria as stated under IDEA. They are eligible for special education and related services provided by a team of individuals who developed an IEP for them. Students are identified as of December 1. Students who have been found to be eligible to receive special education services. The 14 special education categories are 1) intellectual disability, 2) hearing impairments, 3) speech or language impairments, 4) visual impairments, 5) emotional disability, 6) orthopedic impairments, 7) other health impairments, 8) specific learning disabilities, 9) deaf-blindness, 10) multiple disabilities, 11) autism, 12) traumatic brain injury, 13) developmental delay, and 14) deafness.
Low-income students	Students who receive or live in households that receive Supplemental Nutrition Assistance Program or Temporary Assistance to Needy Families benefits; are classified as homeless, migrant, runaway, Head Start, or foster children; or live in a household where the household income meets the U.S. Department of Agriculture income guidelines to receive free or reduced-price meals.
Principal turnover	The number of different principals at the same school in the last six years; it is reported as a count. For district and state statistics, it is sum of the different principals from each school in the last six years, divided by the total number of schools; it is reported as an average.
Race/ethnicity (students and teachers)	The race or ethnicity of a student that the district reports to ISBE. For students, race will be one of seven values: White, Black, Hispanic, Asian, Hawaiian/Pacific Islander, American Indian, or Two or More Races. For teachers, an eighth value is included: Unknown.
Rural districts*	The NCES locale classifications of 32 (town distant), 33 (town remote), 41 (rural fringe), 42 (rural distant), and 43 (rural remote), which are based on population size and proximity to populated areas, are considered rural in this project.

Science and mathematics teachers (SMTs)*	Teachers with an full-time equivalent (FTE) in an instructor position of 0.85 or above who teach at least one science or mathematics course in grades 6-12. For a list of the applicable grade 6 through 12 science and mathematics courses refer to Appendix A, Table A3. For a list of the applicable instruction positions refer to Appendix A, Table A2.
Science and mathematics teacher (SMT) retention*	Retention of SMTs as SMTs in a district, rather than retention of teachers overall.
Short-term or provisional license rate	The percentage of teacher FTE with an active provisional license or approved emergency approval within the Educator Licensure Information System (ELIS).
Student with disabilities	Students with disabilities is defined as both students who were identified as having a disability through formal evaluations and met specific criteria as stated under the Individuals with Disabilities Education Act (IDEA) to be eligible for special education and related services by a team of individuals who developed an Individualized Education Program (IEP) It also includes students with a 504 Plan who are identified as students with a disability who have met specific criteria as stated under the Section 504 of the Rehabilitation Act of 1973 and are eligible to receive accommodations and related services in a general education setting.
Teacher experience (average)	The sum of the years of teaching experience for all full-time equivalent classroom teachers in the district, divided by the total number of full-time equivalent classroom teachers.
Teacher full-time equivalent (FTE)	The measure of the number of teachers weighted for full-time/part-time status and the length of time of the year they were employed. For example, a 1.0 FTE is a teacher who was full time and employed for the entire school year. A 0.5 FTE is a teacher who EITHER was full time for half the year or part time for the entire year, or any combination in between.
Teaching license*	The type of credentials teachers earned. For teachers with multiple licenses, their highest license was analyzed. Three categories of teaching license were created: *Qualified teachers* Teachers who hold the following full and renewable credentials: Professional Educator License (PEL) or Career and Technical Educator (CTE) Endorsement. *Provisional teachers* Teachers who hold the following non-renewable credentials: Provisional Career and Technical Educator Endorsement, Part-Time Provisional Career and Technical Educator Endorsement, Alternative Provisional Educator Endorsement, Provisional In-State Educator, Transitional Bilingual Educator Endorsement, Visiting International Educator Endorsement. *Paraprofessional teachers* Teachers who hold a paraprofessional endorsement. Paraprofessionals cannot serve as a teacher of record. In our data, there is a very small percentage of paraprofessionals who are listed as a SMT of record. It is possible that their licensure data may not have reflected their most recent credentials.
Teacher out of field	A teacher teaching in a grade or content area for which he or she does not hold the appropriate state-issued license, endorsement, approvals, or previous qualifications. A teacher is considered out-of-field on a course level basis. For example, a teacher can be out-of-field for one course and in-field for a different course. A school/district/state levels, a teacher will be considered out-of-field if they are out-of-field for at least one of their course assignments.

Teacher retention rate (ISBE)	The three-year average percentage of full-time teachers returning to the same entity from year to year, which comes from the Employment Information System. • Teacher retention rate at the school level is the total number of full-time teachers retained in the same school in past three years, divided by the total number of full-time teachers from the past three years. • Teacher retention rate at the district level is the total number of full-time teachers staying in the same district in past three years, divided by the total number of full-time teachers from the past three years. • Teacher retention rate at the state level is the total number of full-time teachers staying in the same district in past three years, divided by the total number of full-time teachers from the past three years.
Teacher salary (average)	The sum of the total teachers work location base salary, divided by the teacher full-time equivalent.
Teacher vacancy rate	The number of unfilled full-time equivalent teaching positions divided by the estimated total number of filled and unfilled full-time equivalent teaching positions (i.e., SY25 unfilled positions divided by SY24 filled plus SY25 unfilled positions; ISBE et al., 2025).

Note: Asterisks denote definitions specific to this project.

Report 1: Characteristics of Rural Districts and Their Science and Mathematics Teacher Workforce Supplemental Tables and Information

1. Addressing Missing Data

The teacher-level data we received from ISBE came in three separate datasets: employment, course assignments, and licensure. When applicable, districts with missing data in either employment, course assignments, or licensure from SY18 to SY23 were excluded (for further detail, see the Appendix). In particular, due to the structure of the course assignment data, districts with at least one SMT across the six years of data were included in this study. Districts with no SMTs in at least one year were excluded from the descriptive analyses of teachers because we could not reliably infer whether these data were missing or whether districts truly had zero SMTs of record: 60 districts statewide (7.0%), 35 rural districts (8.2%), and 28 high-need rural districts (9.2%) did not have a SMT of record for one or more years between SY18 to SY23.

2. Percentage Change and Percentage Difference

When relevant, we highlight differences between district types when those differences were separated by at least 5 percentage points, a 25% change, or a 25% difference. Percentage change was used to compare values across years to measure how much change occurred relative to a baseline (e.g., comparing the size of the SMT workforce in SY18 to SY23), whereas percentage difference was used to compare two independent values within a single year and where order did not matter (e.g., comparing the representation of women SMTs for all districts statewide to rural and high-need rural districts in SY23). In the results, percentage change is denoted by "% increase" or "% decrease," and percentage difference by "% difference."

Percentage change calculation

$$Percentage\ change = \frac{(x_{SY23} - x_{SY18})}{x_{SY18}} \times 100$$

where *x* is a given variable.

Percentage difference calculation

$$Percentage\ difference = \frac{(x_1 - x_2)}{[\frac{(x_1 + x_2)}{2}]} \times 100$$

where *x* is a given variable.

3. Supplemental Tables

Table SM5. District averages for student, teacher, and district characteristics in SY23 for all statewide, rural, and high-need rural districts (ISBE, 2024a).

	Statewide districts (N = 865)	Rural districts (N = 426)	High-need rural districts (N = 307)
Student identifiers			
AIAN	<1%	<1%	<1%
Asian	7%	2%	2%
Black/African American	16%	6%	8%
Hispanic/Latino	18%	10%	10%
NHPI	<1%	2%	2%
Two or more races	5%	5%	5%
White	70%	87%	88%
English Learners	13%	7%	8%
Homeless	4%	6%	7%
Low-income	45%	46%	48%
Students with disabilities	18%	18%	18%
Students with IEPs	15%	16%	17%
Student behavior and outcomes			
Attendance rate	93%	93%	93%
High school graduation rate (4-year)	87%	87%	86%
Teacher identifiers			
Female	79%	79%	79%
Male	22%	22%	22%
AIAN	1%	4%	6%
Asian	2%	2%	3%
Black/African American	9%	4%	5%
Hispanic/Latino	5%	3%	3%
NHPI	<1%	2%	2%
Two or more races	2%	3%	4%
White	91%	96%	95%
Unknown	6%	7%	7%
Novice teachers	8%	10%	11%
Working conditions			
Average teacher salary	$62,087	$52,970	$51,426
Average teacher experience	14 years	14 years	13 years
Principal turnover	2	2	2
EBF Tier			
Tier 1	39%	37%	37%
Tier 2	31%	37%	38%
Tier 3	8%	8%	8%
Tier 4	22%	18%	17%
Avg. Student enrollment	2,114	642	571

Note: Sixteen districts do not have EBF Tier assignments.

Table SM6. Percentage change of select science and mathematics teacher (SMT) characteristics from SY18 to SY23 for all statewide, rural, and high-need rural districts.

	Statewide districts (N = 802)	Rural districts (N = 390)	High-need rural districts (N = 277)
Total headcount	3.6%	0.5%	-0.5%
Subject area			
SMT only	10.1%	1.4%	-3.6%
Mathematics only	14.6%	6.2%	-0.3%
Science only	4.1%	-1.8%	-7.0%
Both science and mathematics	13.0%	-20.8%	-9.0%
SMT + other subjects	-3.2%	-0.3%	1.9%
Mathematics + other subjects	-1.7%	1.7%	2.4%
Science + other subjects	2.4%	-2.3%	5.2%
Both science and mathematics + other subjects	-10.4%	-1.5%	-2.0%
Gender			
Female	2.9%	3.2%	1.2%
Male	5.1%	-6.4%	-5.1%
Race/ethnicity			
White	2.5%	0.3%	-0.9%
Licensure			
PEL/CTE	3.0%	-0.1%	-1.2%

Table SM7. In SY22, representation of science and mathematics teachers (SMTs) by subjects taught, gender, race/ethnicity, and licensure for all districts statewide, rural districts, and high-need rural districts.

	Statewide districts (N = 802)	Rural districts (N = 390)	High-need rural districts (N = 277)
Subject area			
SMT only	54%	46%	44%
Mathematics only	30%	25%	24%
Science only	22%	19%	18%
Both science and mathematics	2%	2%	2%
SMT + other subjects	46%	54%	56%
Mathematics + other subjects	20%	25%	25%
Science + other subjects	13%	14%	14%
Both science and mathematics + other subjects	13%	16%	16%
Gender			
Female	69%	73%	73%
Male	31%	27%	27%
Race/ethnicity			
AIAN	≤1%	≤1%	≤1%
Asian	3%	≤1%	≤1%
Black/African American	6%	≤1%	≤1%
Hispanic/Latino	5%	≤1%	≤1%
NHPI	≤1%	≤1%	≤1%
Two or more races	≤1%	≤1%	≤1%
White	84%	97%	97%
Unknown	1%	2%	2%
Licensure			
PEL/CTE	≥99%	≥99%	≥99%
Provisional	≤1%	≤1%	≤1%
Paraprofessional	≤1%	≤1%	≤1%

Note: In the main report, we include a similar table (see Table 3) for SY23. In the Supplemental Materials we include data from SY18 to SY22 for comparison. Percentages are calculated out of the total number of SMTs employed in each district type.

Table SM8. In SY21, representation of science and mathematics teachers (SMTs) by subjects taught, gender, race/ethnicity, and licensure for all districts statewide, rural districts, and high-need rural districts.

	Statewide districts (N = 802)	Rural districts (N = 390)	High-need rural districts (N = 277)
Subject area			
SMT only	52%	47%	45%
Mathematics only	29%	25%	24%
Science only	21%	19%	18%
Both science and mathematics	2%	2%	2%
SMT + other subjects	48%	53%	55%
Mathematics + other subjects	20%	23%	23%
Science + other subjects	13%	13%	13%
Both science and mathematics + other subjects	14%	18%	19%
Gender			
Female	70%	73%	74%
Male	30%	27%	26%
Race/ethnicity			
AIAN	≤1%	≤1%	≤1%
Asian	2%	≤1%	≤1%
Black/African American	6%	≤1%	≤1%
Hispanic/Latino	5%	≤1%	≤1%
NHPI	≤1%	≤1%	≤1%
Two or more races	≤1%	≤1%	≤1%
White	85%	97%	96%
Unknown	1%	2%	1%
Licensure			
PEL/CTE	≥99%	≥99%	≥99%
Provisional	≤1%	≤1%	≤1%
Paraprofessional	≤1%	≤1%	≤1%

Note: Percentages are calculated out of the total number of SMTs employed in each district type.

Table SM9. In SY20, representation of science and mathematics teachers (SMTs) by subjects taught, gender, race/ethnicity, and licensure for all districts statewide, rural districts, and high-need rural districts.

	Statewide districts (N = 802)	Rural districts (N = 390)	High-need rural districts (N = 277)
Subject area			
SMT only	52%	45%	44%
Mathematics only	28%	24%	23%
Science only	22%	19%	18%
Both science and mathematics	2%	3%	3%
SMT + other subjects	48%	55%	56%
Mathematics + other subjects	21%	26%	26%
Science + other subjects	14%	14%	14%
Both science and mathematics + other subjects	14%	15%	16%
Gender			
Female	69%	72%	73%
Male	31%	28%	27%
Race/ethnicity			
AIAN	≤1%	≤1%	≤1%
Asian	2%	≤1%	≤1%
Black/African American	6%	≤1%	≤1%
Hispanic/Latino	5%	≤1%	≤1%
NHPI	≤1%	≤1%	≤1%
Two or more races	≤1%	≤1%	≤1%
White	85%	96%	96%
Unknown	2%	2%	2%
Licensure			
PEL/CTE	≥99%	≥99%	≥99%
Provisional	≤1%	≤1%	≤1%
Paraprofessional	≤1%	≤1%	≤1%

Note: Percentages are calculated out of the total number of SMTs employed in each district type.

Table SM10. In SY19, representation of science and mathematics teachers (SMTs) by subjects taught, gender, race/ethnicity, and licensure for all districts statewide, rural districts, and high-need rural districts.

	Statewide districts (N = 802)	Rural districts (N = 390)	High-need rural districts (N = 277)
Subject area			
SMT only	49%	46%	44%
Mathematics only	26%	24%	23%
Science only	21%	19%	18%
Both science and mathematics	2%	3%	3%
SMT + other subjects	51%	54%	56%
Mathematics + other subjects	22%	25%	26%
Science + other subjects	14%	15%	15%
Both science and mathematics + other subjects	15%	15%	15%
Gender			
Female	70%	72%	73%
Male	30%	28%	27%
Race/ethnicity			
AIAN	≤1%	≤1%	≤1%
Asian	2%	≤1%	≤1%
Black/African American	6%	≤1%	≤1%
Hispanic/Latino	5%	≤1%	≤1%
NHPI	≤1%	≤1%	≤1%
Two or more races	≤1%	≤1%	≤1%
White	84%	97%	97%
Unknown	2%	2%	2%
Licensure			
PEL/CTE	≥99%	≥99%	≥99%
Provisional	≤1%	≤1%	≤1%
Paraprofessional	≤1%	≤1%	≤1%

Note: Percentages are calculated out of the total number of SMTs employed in each district type.

Table SM11. In SY18, representation of science and mathematics teachers (SMTs) by subjects taught, gender, race/ethnicity, and licensure for all districts statewide, rural districts, and high-need rural districts.

	Statewide districts (N = 802)	Rural districts (N = 390)	High-need rural districts (N = 277)
Subject area			
SMT only	51%	45%	44%
Mathematics only	27%	24%	23%
Science only	22%	19%	18%
Both science and mathematics	2%	3%	2%
SMT + other subjects	49%	55%	56%
Mathematics + other subjects	21%	25%	26%
Science + other subjects	13%	15%	15%
Both science and mathematics + other subjects	15%	16%	16%
Gender			
Female	69%	71%	72%
Male	31%	29%	28%
Race/ethnicity			
AIAN	≤1%	≤1%	≤1%
Asian	2%	≤1%	≤1%
Black/African American	6%	≤1%	≤1%
Hispanic/Latino	4%	≤1%	≤1%
NHPI	≤1%	≤1%	≤1%
Two or more races	≤1%	≤1%	≤1%
White	85%	97%	96%
Unknown	2%	2%	2%
Licensure			
PEL/CTE	≥99%	≥99%	≥99%
Provisional	≤1%	≤1%	≤1%
Paraprofessional	≤1%	≤1%	≤1%

Note: Percentages are calculated out of the total number of SMTs employed in each district type.

Figure SM1. Map of Illinois showing high-need rural, rural that are not high-need, and non-rural elementary school and unit districts (left) and one-year retention rates for science and mathematics teachers (SMTs) in SY23 (right).

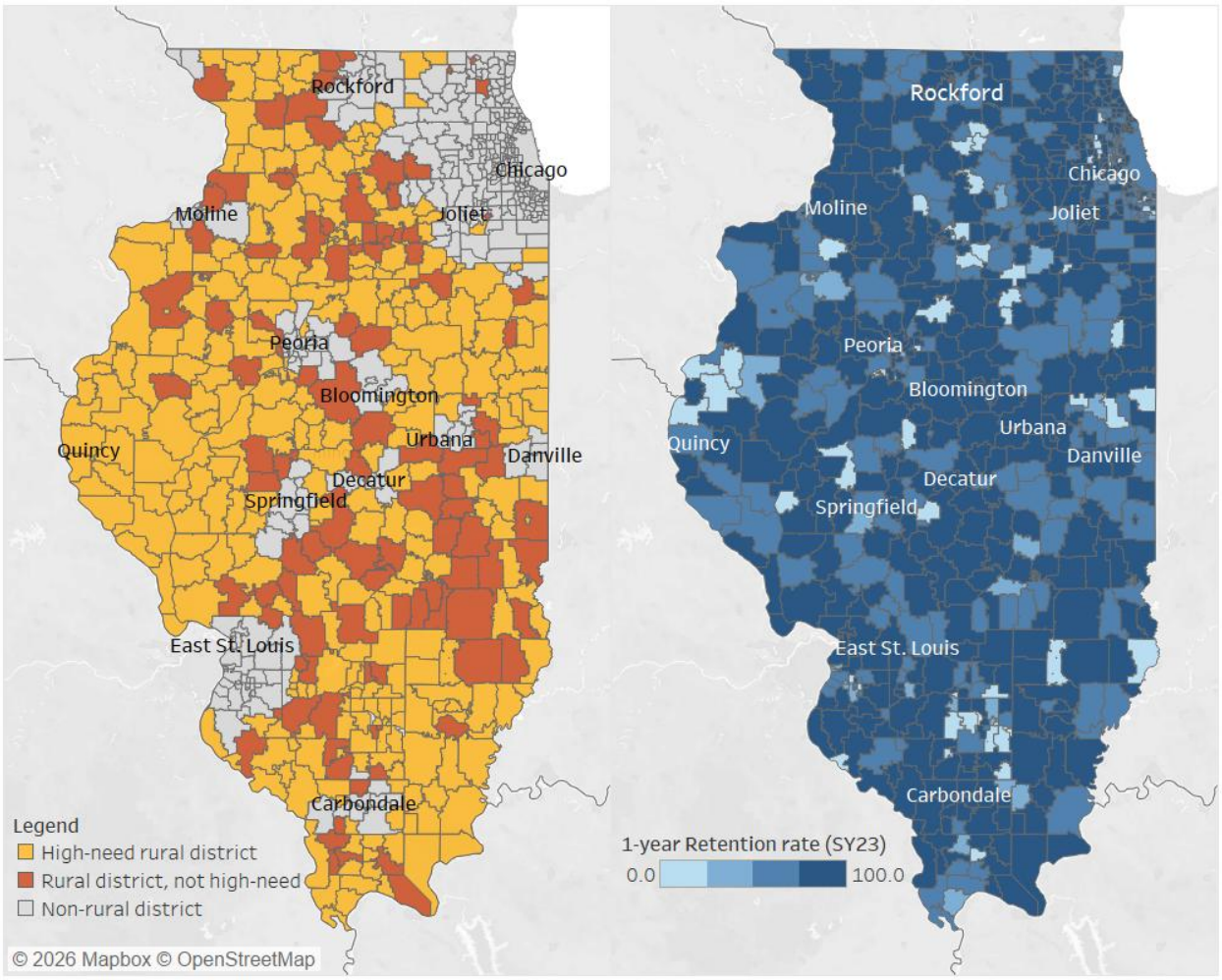

Table SM12. District averages for one-year retention rates of science and mathematics teachers (SMTs) by subjects taught, gender, race/ethnicity, and licensure among statewide, rural, and high-need rural districts from SY19 to SY22.

	Statewide districts				Rural districts				High-need rural districts			
	SY19	**SY20**	**SY21**	**SY22**	**SY19**	**SY20**	**SY21**	**SY22**	**SY19**	**SY20**	**SY21**	**SY22**
Overall	79%	80%	80%	79%	77%	79%	80%	79%	76%	78%	78%	76%
Subject area												
SMT only	75%	78%	75%	74%	72%	77%	73%	70%	68%	76%	70%	65%
Mathematics only	75%	77%	76%	74%	73%	76%	74%	70%	70%	75%	72%	65%
Science only	75%	79%	74%	74%	71%	79%	72%	70%	67%	78%	70%	65%
Both science and mathematics	50%	52%	49%	48%	58%	61%	56%	46%	58%	61%	51%	42%
SMT + other subjects	65%	65%	66%	66%	66%	67%	68%	70%	65%	65%	67%	68%
Mathematics + other subjects	56%	56%	54%	56%	58%	58%	54%	59%	58%	56%	52%	57%
Science + other subjects	59%	58%	55%	56%	63%	62%	60%	64%	64%	60%	60%	60%
Both science and mathematics + other subjects	54%	55%	57%	54%	49%	56%	61%	56%	48%	55%	60%	55%
Gender												
Female	79%	79%	80%	79%	78%	78%	80%	79%	76%	77%	79%	77%
Male	80%	83%	82%	82%	78%	84%	80%	80%	77%	82%	77%	76%
Race/ethnicity												
AIAN	79%	60%	79%	81%	--	--	--	--	--	--	--	--
Asian	80%	82%	88%	78%	83%	52%	94%	75%	75%	73%	93%	72%
Black/African American	72%	72%	74%	74%	77%	77%	76%	67%	81%	64%	83%	56%
Hispanic/Latino	77%	78%	75%	75%	78%	79%	74%	79%	80%	92%	71%	70%
NHPI	100%	78%	88%	73%	--	--	--	--	--	--	--	--
Two or more races	68%	69%	76%	70%	83%	68%	--	75%	88%	65%	--	--
White	79%	80%	80%	79%	78%	79%	79%	78%	77%	78%	78%	76%
Unknown	56%	59%	58%	69%	61%	64%	65%	72%	57%	66%	62%	74%
Licensure												
PEL/CTE	79%	80%	80%	79%	78%	79%	80%	79%	76%	78%	78%	76%
Provisional	19%	34%	41%	36%	--	0%	25%	29%	--	0%	25%	29%
Paraprofessional	0%	47%	0%	--	0%	50%	0%	--	0%	50%	0%	--

Note: The sample sizes for statewide, rural, and high-need rural districts differ for subgroups. Cells with dashes did not meet the criterion that districts have at least one SMT across the six years of data included in this study.

Table SM13. District sample sizes for one-year retention rates of subgroups from SY19 to SY22.

	Statewide districts					Rural districts					High-need rural districts				
	SY19	**SY20**	**SY21**	**SY22**	**SY23**	**SY19**	**SY20**	**SY21**	**SY22**	**SY23**	**SY19**	**SY20**	**SY21**	**SY22**	**SY23**
SMT only	726	732	737	733	727	336	338	343	338	334	233	234	240	237	234
Mathematics only	691	695	703	700	696	314	312	319	319	316	217	213	220	221	218
Science only	650	634	640	652	643	294	282	285	287	279	204	193	193	197	190
Both science and mathematics	236	234	238	229	240	93	91	86	81	82	62	66	63	58	56
SMT + other subjects	775	772	778	777	780	380	371	380	376	380	271	267	269	269	270
Mathematics + other subjects	678	683	694	678	676	328	330	340	325	323	233	239	244	231	227
Science + other subjects	575	573	576	567	574	273	267	265	264	275	187	187	184	182	187
Both science and mathematics + other subjects	542	551	563	572	567	252	242	255	261	262	178	169	180	189	182
Female	797	797	797	800	799	387	386	386	389	388	275	274	273	276	275
Male	724	707	707	710	712	337	322	325	328	327	234	226	229	230	229
AIAN	21	21	18	17	20	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Asian	121	128	131	139	140	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Black/African American	127	146	143	143	148	11	11	12	12	11	<10	<10	<10	<10	<10
Hispanic/Latino	137	155	156	164	173	13	16	17	23	25	<10	10	12	16	15
NHPI	<10	12	14	15	12	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Two or more races	67	65	71	80	81	12	14	12	16	14	<10	10	<10	10	<10
White	799	798	796	799	799	389	389	389	388	388	276	276	276	275	275
Unknown	147	148	145	113	122	50	50	51	42	48	36	36	35	28	35
PEL/CTE	802	802	802	801	802	390	390	390	389	390	277	277	277	276	277
Provisional	15	18	25	30	49	<10	<10	<10	<10	10	<10	<10	<10	<10	<10

Paraprofessional	<10	<10	12	<10	18	<10	<10	<10	<10	10	<10	<10	<10	<10	<10

Table SM14. Percentage change of one-year retention rates by select science and mathematics teacher (SMT) characteristics from SY19 to SY23 for statewide, rural, and high-need rural districts.

	Statewide districts (N = 802)	Rural districts (N = 390)	High-need rural districts (N = 277)
Overall retention	-1.3%	0.2%	-0.5%
Subject area			
SMT only	-0.2%	3.9%	5.2%
Mathematics only	-1.5%	0.4%	0.4%
Science only	1.1%	6.4%	7.4%
Both science and mathematics	-2.5%	-5.3%	-4.2%
SMT + other subjects	-2.3%	-0.1%	0.5%
Mathematics + other subjects	-4.3%	-4.2%	-4.6%
Science + other subjects	-3.5%	-0.5%	1.5%
Both science and mathematics + other subjects	-3.0%	9.4%	7.8%
Gender			
Female	-1.7%	-0.1%	-0.4%
Male	-0.6%	1.0%	0.7%
Race/ethnicity			
White	-1.6%	0.5%	-0.3%
Licensure			
PEL/CTE	-1.1%	0.3%	-0.4%

Table SM15. District averages for three-year retention rates of science and mathematics teachers (SMTs) by subjects taught, gender, race/ethnicity, and licensure among statewide, rural, and high-need rural districts from SY19 to SY22.

	Statewide districts		Rural districts		High-need rural districts	
	SY21	SY22	SY21	SY22	SY21	SY22
Overall	79%	79%	78%	78%	77%	77%
Subject area						
SMT only	71%	71%	67%	68%	64%	65%
Mathematics only	67%	67%	61%	63%	57%	58%
Science only	66%	65%	61%	59%	58%	55%
Both science and mathematics	25%	24%	23%	20%	19%	17%
SMT + other subjects	73%	74%	71%	72%	71%	71%
Mathematics + other subjects	59%	58%	54%	54%	53%	53%
Science + other subjects	51%	51%	46%	48%	45%	46%
Both science and mathematics + other subjects	48%	51%	42%	46%	39%	42%
Gender						
Female	78%	78%	77%	77%	75%	75%
Male	71%	71%	67%	67%	64%	64%
Race/ethnicity						
AIAN	32%	28%	45%	43%	45%	43%
Asian	48%	51%	29%	26%	31%	28%
Black/African American	48%	50%	34%	34%	32%	25%
Hispanic/Latino	44%	46%	22%	24%	23%	23%
NHPI	--	--	--	--	--	--
Two or more races	38%	40%	0%	0%	0%	0%
White	30%	29%	35%	34%	36%	41%
Unknown	79%	79%	78%	78%	77%	76%
Licensure						
PEL/CTE	79%	79%	78%	78%	77%	76%
Provisional	8%	5%	0%	0%	0%	0%
Paraprofessional	0%	0%	0%	0%	0%	0%

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