AEP Data Note Technical Appendix 2

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Preface

This technical appendix provides additional information about the sample, data, and estimation strategy used for a series of American Educator Panels (AEP) Data Notes published by the RAND Corporation in 2019. The Data Note series is intended to provide brief but incisive analyses of teacher and school leader survey results that may be of immediate interest to policymakers, practitioners, and researchers. The information in this technical appendix pertains to the second set of Data Notes that will be released approximately once per month, starting in August 2019. If you are interested in using AEP data for your own analysis or reading other AEP-related publications, please email aep@rand.org.

This study was undertaken by RAND Education and Labor, a division of the RAND Corporation that conducts research on early childhood through postsecondary education programs, workforce development, and programs and policies affecting workers, entrepreneurship, financial literacy, and decisionmaking. This study was sponsored by The Bill & Melinda Gates Foundation, which is dedicated to improving the quality of life for individuals around the world. For more information and research on these and other related topics, please visit gatesfoundation.org.

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AEP Data Note Technical Appendix

The RAND American Educator Panels (AEP) consist of the American Teacher Panel (ATP) and American School Leader Panel (ASLP). These panels are nationally representative samples of K–12 public school educators. The ATP includes more than 25,000 teachers, and the ASLP includes more than 12,000 school leaders. Both groups respond to numerous online survey requests each year. The AEP began in 2014 and expanded significantly during the 2016–2017 and 2017–2018 school years. See Table 1 for a summary of the recruitment response rates during the 2016–2017 and 2017–2018 school years, as well as a summary of the response rates for the May 2018 survey.

Table 1. Panel Recruitment and Survey Response Rates

	ATP	ASLP
2016–2017 Recruitment		
Contacted for 2016–2017 panel recruitment effort	63,299	40,430
Newly enrolled in panel in 2016–2017	19,546	9,925
Enrollment rate	31%	25%
2017–2018 Recruitment		
Contacted for 2017–2018 panel recruitment effort	21,406	8,600
Newly enrolled in panel in 2017–2018	7,369	2,104
Enrollment rate	25%	34%
Survey administration		
Total panel size for May 2018 survey	28,955[a]	12,954
Complete responses	15,719[b]	3,530
Survey response rate	54%	27%

[a] The total panel size as of May 2018 is somewhat larger than the number of newly enrolled panel members because some participants joined the panels during earlier recruitment efforts.
[b] A teacher respondent had to complete at least 10 percent of the core survey to be considered a complete response for the ATP survey; for principals, the threshold was 33 percent of the ASLP survey.

Starting in 2013, AEP members have been recruited using probabilistic sampling methods. The AEP samples are designed to be of sufficient size to facilitate national analyses as well as analyses of prevalent subgroups at the national level (e.g., elementary school teachers, high school mathematics teachers, teachers in urban schools). Similarly, the panels are designed to permit analyses of the following geographic areas: Alabama, Arkansas, California, Florida, Georgia, Illinois, Kentucky, Louisiana, Maryland, Massachusetts, Mississippi, Nebraska, New Mexico, New York (New York State as a whole and New York City), North Carolina,

Oklahoma, Rhode Island, South Carolina, Tennessee, Texas, Virginia, West Virginia, and Wisconsin. One also can examine subgroups within these geographic areas (although there is lower precision for smaller groups). The AEP sample is not designed to permit analyses within geographic areas not listed above or among subgroups not specified above. For the AEP Data Note series, all analyses focus on national-level estimates.

Calibration Weights and Replicate Weights

A total of 81 weighting variables ensures that estimates reflect the national population of teachers and school leaders. One main weight was created to ensure that the sample is nationally representative, and a series of 80 replicate weights were calculated to produce the margin of error associated with an estimate. The main weight is calculated by first modeling response probabilities of teachers (or principals) across a wide variety of teacher (or principal) characteristics. The main weight is then calibrated so that the weighted sample matches the known national teacher or school leader population across these characteristics. Characteristics that factor into this process include descriptors at the individual level (e.g., gender, professional experience) and school level (e.g., school size, level, urbanicity, socioeconomic status). Replicate weights are calculated by removing 1/80th of the sample and repeating the process used to determine main weights on the remaining set of respondents. Replicate weights are used in calculating jackknife standard errors in our estimates.

The May 2018 Measurement Learning and Improvement Survey

In May 2018, RAND researchers administered the Measurement Learning and Improvement (MLI) Survey to the full ATP and ASLP samples. The MLI Survey was developed by The Bill & Melinda Gates Foundation (BMGF) in consultation with staff at RAND. Researchers provided feedback on question wording, format, and sequencing, with BMGF maintaining final editorial control of the survey items. The survey was designed to generate representative data on teacher and principal perspectives regarding educator preparation and working conditions, curriculum use and adherence to state standards, data use, and interventions to support students. Most items were developed by program staff at BMGF, with the exception of a set of social and emotional learning (SEL) items that were adapted from Bridgeland, Bruce, and Hariharan's (2013) nationally representative survey of teachers on their attitudes toward SEL.

The data generated from the survey are intended to be used by analysts at RAND, BMGF, and numerous state education agencies (SEAs), with SEAs being able to compare the responses of educators from their states with a nationally representative comparison group.

As shown in Table 1, the May 2018 MLI survey yielded 15,719 complete responses out of 28,955 invitations for teachers (54-percent response rate), and 3,530 out of 12,954 for school leaders (27-percent response rate). Table 2 provides weighted descriptive statistics for survey respondents.

Table 2. Weighted Descriptive Statistics

	ATP		ASLP	
	Mean	Standard Error	Mean	Standard Error
School characteristics				
Elementary school	0.492	0.003	0.587	0.004
Middle school	0.199	0.001	0.186	0.003
High school	0.272	0.003	0.182	0.003
Other types of schools	0.037	0.001	0.044	0.003
Total enrollment	840.095	7.086	563.586	7.176
Percentage Asian	4.861	0.122	3.927	0.261
Percentage Hispanic	24.321	0.251	22.692	0.430
Percentage black	15.236	0.198	14.327	0.464
Percentage white	50.433	0.155	53.625	0.521
Percentage other	5.139	0.108	5.438	0.342
Percentage free or reduced-price lunch	52.245	0.213	53.893	0.401
High poverty school (> 75% free or reduced-priced lunch)	0.247	0.003	0.265	0.008
Title I school	0.434	0.005	0.468	0.010
City school	0.287	0.002	0.257	0.006
Suburban school	0.396	0.002	0.326	0.003
Town school	0.114	0.002	0.133	0.002
Rural school	0.204	0.001	0.284	0.003
Educator characteristics				
Total years in role	14.045	0.106	6.827	0.109
Female	0.765	0.006	0.514	0.004
Asian[a]	0.027	0.004	0.017	0.004
Hispanic[a]	0.078	0.005	0.078	0.007
Black[a]	0.071	0.007	0.128	0.009
White[a]	0.831	0.005	0.801	0.010
Other race/ethnicity[a]	0.021	0.002	0.006	0.002

NOTE*:* The ATP sample contains 15,719 observations. The ASLP sample contains 3,530 observations. School background characteristics were obtained from the Common Core of Data and are from the 2015–2016 school year. Means and standard errors were calculated using survey weights, which are calibrated to match the national averages for teachers and school leaders. The definition for *high poverty school* (greater than 75 percent free or reduced-price lunch) follows the definition set forth by the National Center for Education Statistics (2017). Educator characteristics are self-reported by the respondent. The rate of missingness in educator characteristics is about 2 percent and 5 percent in the teacher and principal samples, respectively.

[a] Variables were not used in the calculation of sampling weights.

Data Analysis

Primary Estimation Strategy

Our primary estimation strategy consists of simple weighted averages of the relevant survey responses among the full sample of respondents and/or subgroups of interest. To obtain simple

national averages, we estimated the weighted means using the main weight described above. Replicate weights were used in calculating jackknife standard errors.[1] We also conducted analyses that contrasted survey responses across subgroups of interest.[2] In these analyses, to obtain point estimates and standard errors for each subgroup, the survey measure of interest was regressed on the indicator for the subgroup of interest as follows:

$$Y_{is} = \beta_0 + \beta_1 X_{is} + \varepsilon_{is} \quad (1)$$

Y_{is} represents the response of survey participant i in state s. X_{is} represents an indicator for whether the participant is a member of the subgroup of interest, X.[3] β_0 represents the average value of Y for respondents not in the subgroup of interest (the reference group). β_1 represents the differential response for members in the subgroup of interest. A test of the null hypothesis that $\beta_1 = 0$ will indicate whether the responses were statistically significantly different between the two groups. $\beta_0 + \beta_1$ provides the average response of participants in the subgroup of interest. ε_{is} is an individual stochastic error term. Survey weights and jackknife standard errors were used when reporting results from all regressions.

In some cases, the same questions were asked of teachers and principals, and the estimate of interest was the difference in responses between the two groups of educators. In these situations, the two data sets were combined, including each data set's overall weight and 80 replicate weights. Differences between groups were estimated using Equation 1, in which X_{is} represents an indicator for being a teacher and all 81 weights were included in the model. Some specification checks explored whether differences in response were affected by school characteristics, such as urbanicity, poverty level, grade level, or size. In these circumstances, the teacher indicator was interacted with the characteristic of interest. The magnitude and significance of the interaction term was used to judge whether the differences in responses were statistically significantly different among schools of a certain type.

Supplemental Analyses

To better understand whether the subgroup differences estimated in the primary model are confounded by characteristics of the schools or respondents, we also created a supplemental

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[1] Recent ATP and ASLP surveys are weighted so that a jackknife with 80 replication groups can be used. Each replication group is created by 1/80th of the sample (selected at random); the portion removed does not overlap across the groups. The weighting process that was used to create the main weights (wherein inverse probability weights were calibrated) is then applied to respondents within each replication group separately to create 80 sets of replication weights. A respondent who has been dropped from a specific replication group is given a weight of zero for weights corresponding to that group.

[2] Subgroup comparisons included comparing respondents by school level (elementary and secondary levels or elementary, middle, and high schools) and schools' poverty levels (low, middle-low, middle-high, and high levels of poverty).

[3] For illustration purposes, we use a comparison of two subgroups (e.g., teachers in urban schools versus teachers in nonurban schools). In cases involving more than two subgroups, the model would be adjusted to include additional X_{is} indicators of group membership, so that each group is being compared with an omitted referent.

model that includes additional covariates and a vector of state fixed effects. Although the conclusions presented in the Data Notes are based on the unadjusted results from the primary model described above, we include information about the supplemental analysis below.

This supplemental model takes the following form (bold text indicates a vector of variables):

$$Y_{is} = \gamma_0 + \gamma_1 X_{is} + \boldsymbol{L_{is}}\gamma_2 + \boldsymbol{W_{is}}\gamma_3 + \alpha_s + \omega_{is} \quad (2)$$

In this model, we add a vector of school characteristics, $\boldsymbol{L_{is}}$, and a vector of individual characteristics, $\boldsymbol{W_{is}}$. In some Data Notes, state fixed effects, α_s, were also employed. School characteristics include indicators for school level (elementary school, middle school, high school, or other type of school); student enrollment; percentage enrollment by race or ethnicity (percentage Asian, percentage Hispanic, percentage black, percentage white, percentage Hawaiian/Pacific Islander, and percentage two or more ethnicities); percentage special education students; percentage free and reduced-price lunch students; an indicator for Title I eligibility; and a categorical indicator of urbanicity, broken out by city, suburb, rural, and town. In models in which we explore response by high- and low-poverty schools, we replace the percentage free and reduced-price lunch enrollment with an indicator for being in a high-poverty school. We follow the National Center for Education Statistics' definition that a high-poverty school has 75 percent or more of students in a free or reduced-price lunch program (National Center for Education Statistics, 2017). In models in which we explore differences by urban and nonurban schools, we use only the indicator for urban schools. Respondent characteristics include the total number of years in the role (teacher or principal), an indicator for female, and indicators for race or ethnicity (Asian, Hispanic, black, white, Hawaiian/Pacific Islander, other). In some cases, state fixed effects are used to account for any state-level differences (i.e., factors that influence all educators in the same state) that are not observed in the available data.

We compare estimated β_1 from Equation 1 and estimated γ_1 from Equation 2 to understand the extent to which differences in responses by subgroup are confounded by school and individual characteristics. All reported relationships in the Data Notes were statistically significant in both specifications. In cases in which the two specifications yielded estimates that differ by more than 25 percent, we include both estimates in the appropriate Data Note. Any threshold used to report the two point estimates will be arbitrary. One challenge is that β_1 ranges from 10 percentage points to 40 percentage points. We believe that the threshold of 25 percent represents differences in estimates that are potentially meaningful to the reader, regardless of the possible values of β_1.

Twenty states were oversampled in the design of the survey. When estimating effects on the principal sample, some replications of the jackknife standard errors could not be estimated because of the small sample sizes in states that were not oversampled. In these instances, states that were not oversampled were aggregated into fixed effects by census region (Pacific, Mountain, West North Central, West South Central, East North Central, East South Central, New England, Middle Atlantic, and South Atlantic) to ensure the robustness of the standard errors. All

models include survey weights and jackknife standard errors. To ensure robustness to clustered standard errors, regressions were also estimated in which the jackknife standard errors were replaced by standard errors clustered at the state level.

Limitations

We acknowledge that all findings presented in the AEP Data Note series are based entirely on correlational analyses (results of which should not be interpreted as causal) and teacher and educator self-reports, which could be affected by social desirability bias and drive some responses to be more positive (e.g., teachers overreporting the extent to which they perform certain activities) or more negative (e.g., principals underreporting the resources or opportunities their districts provide for them as a way of explaining their own behavior). In addition, these biases can be correlated with the particular educator characteristic of interest in an analysis (i.e. the urbanicity of the school in which the educator works). Nonetheless, we believe that these findings represent a reasonable demonstration of educators' perceptions of their working conditions and perspectives on their students, peers, and educational contexts. Results can help guide future research to uncover underlying causes for the patterns seen in the Data Notes, including social desirability bias.

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