

Early Childhood Educator Pay Equity Fund Workforce Impact Study

Final Report

September 2026

Owen Schochet and Katie Gonzalez

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Owen Schochet and Katie Gonzalez

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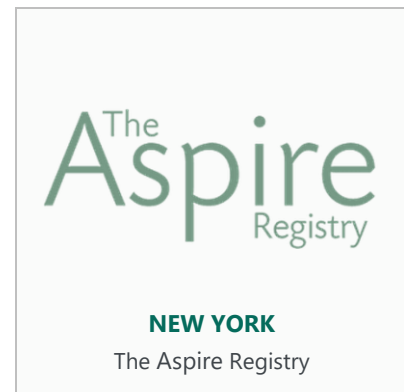
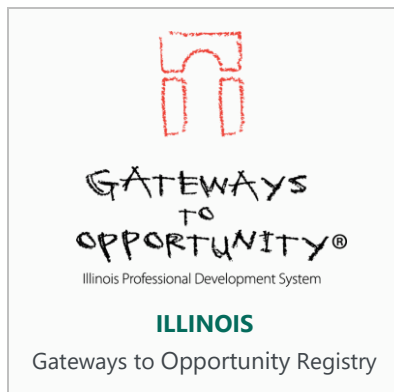
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Data and Research Infrastructure Partners

This study's data infrastructure was made possible through partnerships with the DC Office of the State Superintendent of Education, the National Workforce Registry Alliance, and six participating state workforce registries.



Participating state workforce registries



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This report is part of Mathematica's broader [Early Childhood Educator Pay Equity Fund Impact and Cost Effectiveness \(PEF Impact\) Study](#), which encompasses several research activities, products, and publications. Across this body of work, PEF Impact has received support from the Bezos Family Foundation, DC Action, the Esther A. & Joseph Klingenstein Fund, and the Early Care and Education Funders Collaborative, based at the Washington Area Women's Foundation.

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Abstract

Low compensation is a longstanding policy challenge in the child care and early education (CCEE) sector. Community-based facilities generally cannot finance meaningful educator wage increases by raising private tuition rates without making care less affordable for families, yet low wages contribute to high staff turnover, staffing shortages, and constraints on the number of children facilities can serve.

Washington, DC's Early Childhood Educator Pay Equity Fund (PEF) is the nation's first dedicated public funding stream designed to sustain large compensation increases across a local CCEE sector. Launched in late 2022, the PEF initially provided fixed payments directly to eligible educators before transitioning to a facility payment model in fiscal year (FY) 2024 that incorporated minimum required salaries into regular employer payrolls. In 2023, the program also began providing access to subsidized health insurance.

This report estimates how the PEF affected participating staff and the facilities that employed them during the first three program years. We linked population-level workforce registry records from Washington, DC, and six comparison states with PEF payment, licensing, child care subsidy, and quality-system administrative records. These records were assembled through partnerships with the DC Office of the State Superintendent of Education (OSSE), the National Workforce Registry Alliance (NWRA), and six participating state workforce registries. To our knowledge, this is the first impact evaluation of a CCEE program or policy to assemble population-level workforce registry records across multiple states and localities to construct an external comparison group.

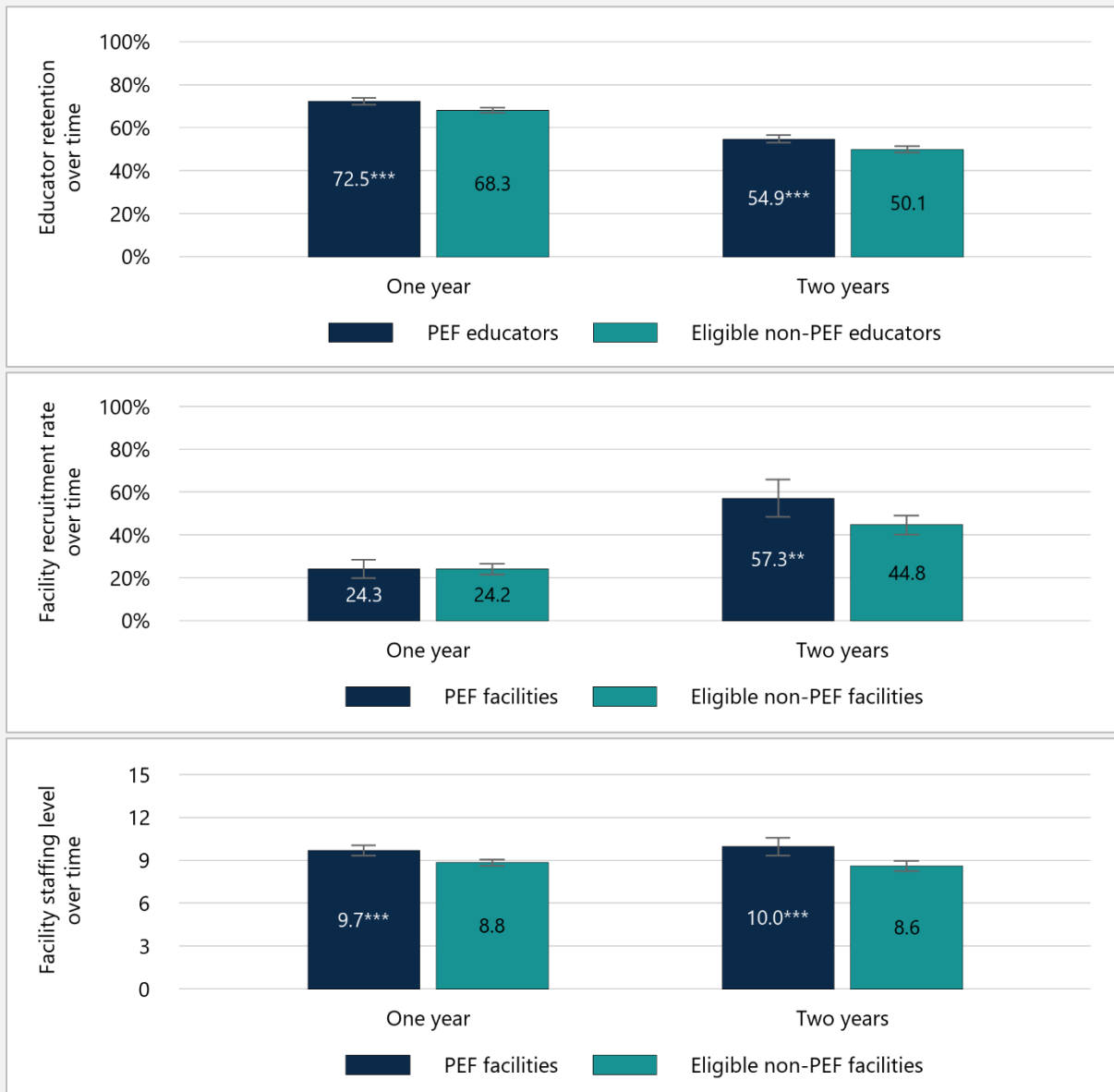
The study used a quasi-experimental difference-in-differences design. The comparison group included otherwise eligible staff and facilities that were not exposed to the PEF or a comparable compensation initiative. We developed weights to make the PEF and comparison groups more similar in facility operations and staff demographics and qualifications prior to the program. Impacts were then estimated as the differences in how outcomes changed over time between the two groups. The weighted comparison group represents what would likely have happened to PEF participants in the absence of the program. The analysis followed center-based educators, home-based providers, and center-based facilities from a baseline at the program's launch through follow-up points about one and two years later.

The findings show that the PEF produced effects across several stages of the study theory of change:

- **The PEF increased compensation in the amounts and patterns expected under the program's design.** After two years, hourly wages increased by \$7.85 among retained center-based educators and by \$4.88 among retained home-based providers. The center-based educator estimate implied an annual wage increase of roughly \$15,000 for a full-time worker. Wage effects were larger for lead than assistant teachers, increased across educator baseline qualification tiers, and were concentrated among educators whose facilities participated in the FY 2024 facility payment model.
- **The PEF strengthened staff attachment to their baseline facilities.** Among center-based educators, the program increased retention by 4.2 and 4.8 percentage points after one and two years, respectively; the one-year estimate represented a 13 percent reduction in expected attrition (Abstract Exhibit 1). The PEF also increased accumulated job experience among educators. Estimated effects on retention and job experience among home-based providers were larger but less precise. Retention gains were concentrated among educators with lower qualifications at study baseline.

- **Facility recruitment was an important pathway through which the PEF increased labor supply.** After two years, the PEF increased average facility recruitment rates by 12.5 percentage points, with recruitment gains emerging during the second follow-up year. This effect was equivalent to roughly 1.2 additional recruits for a facility that initially employed 10 educators. The combination of stronger retention and recruitment then translated into higher employment levels overall. The PEF increased average staffing by 0.9 educators after one year and 1.4 educators after two years (Abstract Exhibit 1). The two-year impact represented an increase of about 14 percent relative to the average center workforce size at baseline.
- **Facility staffing gains occurred primarily within existing licensed capacity and were concentrated in fewer operating centers.** The PEF did not significantly change licensed capacity after two years but did increase the number of teaching staff per licensed slot. This suggests that facilities used additional staff to strengthen operations within their existing licenses, such as by filling staffing vacancies or operating with more favorable staff-child ratios. At the same time, the PEF increased two-year facility closure by 6 percentage points. Exploratory findings show that the closure effect in the second year was concentrated among the smaller group of centers that did not participate in the facility payment model.
- **The PEF improved education and qualifications among staff and across facility workforces.** Center-based educators were more likely to increase their highest education level and obtain AA, BA, and field-specific degrees while remaining with their baseline facility. Home-based providers experienced similar gains, though their estimates were less precise. PEF facilities also employed larger shares of staff with AA and BA degrees after two years, with increases concentrated in the recruited portion of the follow-up workforce. DC policy changes to minimum staff credential requirements that took effect later in the study period also provide important context for interpreting these findings.
- **The PEF's effects on career advancement differed by educator position.** The overall impact on educator promotion was positive but not statistically significant, concealing offsetting effects for lead and assistant teachers. The PEF increased promotion from assistant to lead teacher by 3.4 percentage points, consistent with center staffing patterns and workforce flows. By contrast, suggestive evidence of a negative effect on promotion from lead teacher to director was consistent with wage compression between teaching and leadership positions as a possible unintended consequence of the program.
- **The PEF may also have increased facility engagement with public quality systems and the prevalence of high ratings.** The program increased participation in a quality rating and improvement system by 9 percentage points and participation with a high quality rating by 5.5 percentage points. These findings should be interpreted cautiously because the study had to align quality systems with different participation policies, rating structures, and criteria, and because pandemic-related disruptions affected the baseline rating information available in some jurisdictions.

Abstract Exhibit 1. Impact of the PEF on retention among center-based educators and recruitment rate and staffing among center-based facilities



Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Exhibit presents regression-adjusted means and 95 percent confidence intervals by research group for each study population and outcome. Estimates were based on 2,606 PEF educators, 46,086 eligible non-PEF educators, 297 PEF facilities, and 4,751 eligible non-PEF facilities. Facility recruitment rates measured as the share of recruited staff relative to the total number of staff employed at baseline. Facility staffing outcomes equal zero for facilities that were closed as of one or two years after baseline, as applicable. Data were drawn from Appendix Exhibits C.1, C.3, and C.6.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

Taken together, the findings extend earlier evidence that the PEF increased CCEE sector employment in the aggregate by identifying the workforce- and facility-level pathways through which those changes occurred. They provide evidence that large and sustained public investments in CCEE educator compensation can strengthen workforce retention, recruitment, staffing, and qualifications in a sector characterized by persistent low wages and staffing shortages. The findings also show that effects depend on program design and the broader policy context, including how compensation reaches workers, which staff and facilities participate in the program, and how salary requirements interact with staff qualifications and career pathways.

Beyond the impact findings, the study demonstrates that population-level workforce registry records from multiple jurisdictions can be combined and analyzed together to support a quasi-experimental evaluation of a CCEE policy or program. Aligning the linked records from DC and the six participating state registries made it possible to construct a plausible external comparison group for a broadly implemented program in one locality. The linked records also made it possible to follow the same staff and facilities over time, distinguish retention from recruitment, and connect individual employment changes with facility staffing, operations, and workforce composition. This approach provides a practical model for evaluating state or local CCEE initiatives when multiple jurisdictions maintain sufficiently complete and comparable records.

I. Introduction

Decades of research demonstrate the importance of child care and early education (CCEE) educators in supporting children’s learning and development during the formative early years (Hamre et al. 2014; Mashburn et al. 2008; Peisner-Feinberg et al. 2001; Phillips et al. 2016). Despite the importance of their work, CCEE educators—particularly those employed outside school-based settings—are among the lowest-paid workers in the United States. In May 2024, the median hourly wage for child care workers was \$15.41, more than 50 percent below the median wage for preschool teachers employed in schools and 39 percent below the median across all occupations (U.S. Bureau of Labor Statistics [BLS] 2025). Low compensation contributes to economic hardship and reliance on public assistance and is associated with poorer mental health and reduced personal well-being among CCEE educators (McLean et al. 2024; Gould 2015; Morrissey and Bowman 2024). It can also limit educators’ opportunities to remain in the field, accumulate experience, and invest in skills and qualifications that support professional growth.

The consequences of low educator wages extend beyond staff to the facilities where they work and the children and families those facilities serve. Estimates suggest that 25 to 40 percent of CCEE educators leave their employer within a year, more than double the turnover rate among K–12 teachers (Bryant et al. 2023; Caven et al. 2021; Doromal et al. 2022). When educators leave, facilities must devote scarce administrative and financial resources to recruiting, onboarding, and training replacements while losing institutional knowledge and established relationships with children, families, and colleagues (Doromal et al. 2022; Whitebook and Sakai 2003). Persistent vacancies can increase workloads for remaining staff, constrain facilities’ ability to staff classrooms and serve children up to licensed capacity, and limit families’ access to care (Grunewald et al. 2022; McLean et al. 2024). Turnover can also disrupt the stable, responsive educator–child relationships that support high-quality care and undermine facilities’ investments in professional development and continuous quality improvement (Hale-Jinks et al. 2006; Hall et al. 2024; Hamre et al. 2014; Markowitz 2024; Phillips et al. 2016).

Meaningful and sustained increases in CCEE educator compensation generally require additional public investment. Community-based CCEE operates largely through a market-based financing structure that relies heavily on tuition paid by families, while public investment remains substantially lower than in K–12 education (Davis and Sojourner 2021; Hawley et al. 2024; Showers et al. 2025). Facilities have limited ability to finance substantial wage increases from existing revenues. Strict child–staff ratios—particularly for infants and toddlers—limit the extent to which facilities can increase enrollment, while further increasing tuition rates risks making care unaffordable or reducing families’ demand for services (Child Care Aware of America 2019; Gould and Cooke 2015; Hotz and Wiswall 2019; Morrissey 2017).

Washington, DC’s Early Childhood Educator Pay Equity Fund (PEF) represents an innovative response to this challenge. It is the nation’s first dedicated public funding stream designed to sustain meaningful increases in CCEE educator compensation at scale and narrow the pay gap between educators in licensed CCEE facilities and public school teachers. The program is financed through a tax on DC residents with high incomes (DC Official Code § 1-325.431). Launched in late 2022, the PEF initially delivered wage supplements directly to eligible educators. In fiscal year (FY) 2024, it shifted to a facility payment model that incorporated minimum required salaries into employer payrolls. In 2023, the PEF also began providing access to subsidized health insurance through the HealthCare4ChildCare (HC4CC) initiative.

This report estimates the impacts of the PEF on participating staff and the facilities that employed them during the program's first three fiscal years. It is part of the [Early Childhood Educator Pay Equity Fund Impact and Cost Effectiveness \(PEF Impact\) Study](#) and was funded by the Bezos Family Foundation and the Esther A. & Joseph Klingenstein Fund.¹

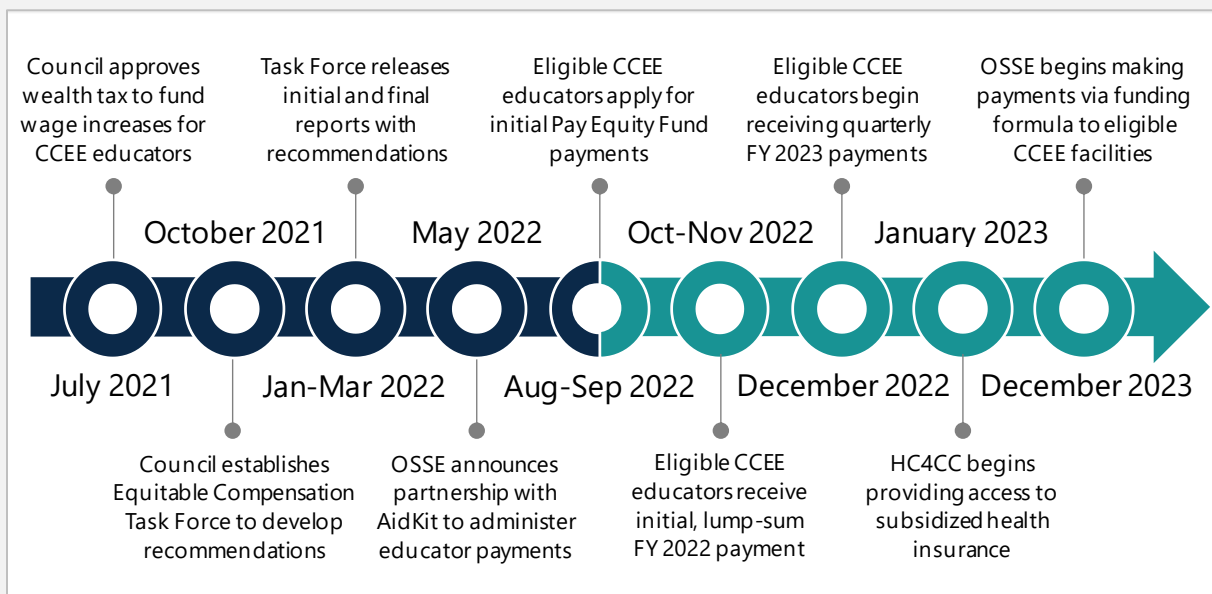
Using linked workforce registry, PEF payment, licensing, subsidy, and quality-system administrative records from Washington, DC, and six comparison states, the study applies a quasi-experimental difference-in-differences design to estimate impacts on workforce stability and professional development and facility operations, capacity, and quality-related outcomes. The report extends prior studies of the PEF's sector-wide labor market impacts and economic returns by following individual staff and facilities over time. To our knowledge, it is the first impact evaluation of a CCEE program or policy to assemble population-level workforce registry microdata across multiple states and localities. The analysis was made possible through partnerships with the DC Office of the State Superintendent of Education (OSSE), the National Workforce Registry Alliance (NWRA), and workforce registry staff representing state agencies in Illinois, Nevada, New York, Ohio, Pennsylvania, and Wisconsin.

A. The Early Childhood Educator Pay Equity Fund

The PEF emerged from a longer history of public CCEE investment in Washington, DC. The Pre-K Enhancement and Expansion Act of 2008 established a mixed-delivery universal pre-K system for 3- and 4-year-olds and OSSE's role in overseeing and administering the system. Preschool teachers employed by universal pre-K programs—primarily operating in DC Public Schools (DCPS)—are paid on the same salary scale as their K–12 colleagues (DC OSSE 2022a). The Birth-to-Three for All DC Act of 2018 further extended the District's CCEE policy focus to infants and toddlers and called for a competitive compensation scale for educators in licensed CCEE facilities, with the goal of achieving pay parity with DCPS educators. Together, these policies created the rationale and statutory basis for a compensation initiative focused on educators working in licensed community-based facilities operating outside of the District's universal pre-K system.

Several events translated the Birth-to-Three commitment into the PEF (Exhibit I.1). In July 2021, the DC Council increased taxes on residents with annual incomes above \$250,000 and dedicated a portion of the resulting revenue to CCEE educator compensation, allocating \$54 million in FY 2022. The Council subsequently established the Early Childhood Educator Equitable Compensation Task Force to recommend how the funds should be distributed. The Task Force's initial report, released in January 2022, recommended immediate lump-sum payments to eligible educators using FY 2022 funds (Early Childhood Educator Equitable Compensation Task Force 2022a). Its final report, released in March 2022, recommended quarterly payments in FY 2023 and established the foundation for a longer-term salary scale based on educator roles and qualifications in FY 2024 and beyond (Early Childhood Educator Equitable Compensation Task Force 2022b).

¹ Other activities conducted under the broader PEF Impact Study have also been supported by DC Action and the Early Care and Education Funders Collaborative based at the Washington Area Women's Foundation.

Exhibit I.1. Timeline of key events related to the Early Childhood Educator Pay Equity Fund

Source: *Toward Pay Equity: A Case Study of Washington, DC's Wage Boost for Early Childhood Educators* (Box 2 in Greenberg et al. 2023) and the Early Childhood Educator Pay Equity Fund (Timeline and History; DC OSSE n.d.[a]).

During FYs 2022 and 2023, the PEF provided wage supplements directly to eligible educators. Eligible staff included teachers and assistant teachers in center-based facilities licensed by OSSE and providers and assistant providers in licensed home-based facilities, with limited exceptions associated with the District's mixed-delivery universal pre-K system.² Center directors and other nonteaching staff were not eligible. Full-time teachers and primary home-based providers received \$14,000 annually, and full-time assistant teachers and assistant providers received \$10,000; part-time staff received half of the corresponding full-time amount (DC OSSE 2022b). FY 2022 payments were delivered as an initial lump sum beginning in late fall 2022 and were followed by quarterly payments in FY 2023. OSSE partnered with AidKit to administer applications and payments. More than 90 percent of staff identified as eligible applied for an initial payment (DC OSSE 2022c). The PEF distributed approximately \$38.4 million to 3,217 educators in FY 2022 and \$41.9 million to 4,085 educators in FY 2023 (DC OSSE 2023a, 2024). The application and initial payment period in late 2022 also corresponds to the study baseline used in this report.

In FY 2024, the PEF shifted from direct educator payments to a facility payment model intended to integrate higher compensation into regular employer payrolls. Facilities employing otherwise eligible educators could opt into the model by agreeing to meet established minimum salaries. The minimum required salaries were designed with reference to the DCPS salary scale at the time and varied not only by educator role but also by educator qualifications.

² Licensed home-based proprietors were eligible to participate as the primary caregiver in their facility, alongside associate caregivers employed in larger home-based facilities. Assistant teachers in community-based facilities participating in the Pre-K Enhancement and Expansion Program were also eligible, although lead teachers in those classrooms were not.

OSSE calculated facility awards using a payroll funding formula with three principal components. A base award represented the estimated gap between current average and minimum required salaries by educator role and qualification (DC OSSE n.d.[b]). An administrative enhancement covered costs associated with implementing the program, including increased payroll taxes. An additional adjustment provided more funding to facilities serving larger shares of children whose care was supported through child care subsidies (DC OSSE n.d.[c]). Facilities for which the formula and other revenues were insufficient to meet the minimum salaries could seek waivers. OSSE also provided a temporary supplement equal to 30 percent of the base award in FY 2024 to help facilities meet the salary requirements (DC OSSE 2025a).

In FY 2024, OSSE distributed approximately \$67.3 million in awards to 365 facilities, raising wages for more than 4,000 educators (DC OSSE 2025a). About three-quarters of operating facilities employing eligible educators received facility awards during the year (DC OSSE 2025a; Doromal, Jimenez Parra, et al. 2025). An estimated \$61.2 million of these awards was routed through employer payrolls to raise wages for 4,029 educators (Schochet and Gonzalez 2026b). This implied an average wage increase of approximately \$15,200 per participating educator, about 50 percent larger than the average FY 2023 supplement of \$10,260 under the direct educator payment model (Schochet and Gonzalez 2026b).³

The PEF also began supporting subsidized health insurance during its second year. In January 2023, HC4CC began providing free or lower-premium health insurance to CCEE staff and their families through the DC Health Benefit Exchange. Staff could obtain coverage through an eligible employer or, under specified circumstances, enroll directly. Eligibility extended beyond educators eligible for PEF wage payments to other staff employed by qualifying CCEE facilities. At the end of 2024, HC4CC covered 1,607 CCEE staff and 360 dependents (DC Health Benefit Exchange Authority 2025). Because HC4CC eligibility was broader than eligibility for the wage-payment component, estimates suggest that approximately one-third of educators who received PEF wage payments in FY 2024 also received subsidized health coverage (Schochet and Gonzalez 2026b). HC4CC operated alongside the wage-payment component throughout the remainder of the study period.

B. Theory of change for the PEF's impacts on educators and facilities

The PEF Workforce Impact Study theory of change draws on broader research to describe how sustained public investment in educator compensation is expected to produce immediate financial gains and, over time, improve outcomes for educators and facilities (Exhibit I.2). The framework presents the program's inputs and processes, outputs, mechanisms through which higher compensation may operate, and expected shorter- and longer-term outcomes. Inputs and processes include the dedicated revenue stream, recommendations of the Equitable Compensation Task Force, delivery of funds through the direct educator and facility payment models, and HC4CC enrollment. Program outputs measure educator compensation gains, including both direct income through wage payments disbursed under the educator and facility payment models and indirect income through subsidized health insurance coverage.

³ The remaining \$6.1 million represents the estimated share of facility awards used to cover facility administrative costs. Schochet and Gonzalez (2026b) applied OSSE's projected share of total facility award costs by funding formula component to actual reported FY 2024 program expenditures to estimate facility award allocations between educator salaries and facility administrative costs (OSSE 2023b).

Higher compensation is expected to operate through improvements in educators' financial and professional circumstances, which may lead first to greater workforce attachment and stability and then to changes in educator development, facility operations, capacity, and service quality. The theory of change also recognizes that impacts may depend on educator, facility, family, community, and policy characteristics, including educator role and qualifications, facility type and size, existing compensation and staffing, engagement with public funding systems, local labor-market conditions, and implementation of the facility payment model. This section draws on broader evidence about compensation, workforce attachment, professional development, facility operations, and service quality to inform the study framework. Section I.C then reviews prior empirical evidence on the PEF and the extent to which it was consistent with these expectations.

The primary program output examined in this study is increased wages for eligible educators. As previously described, under the direct payment model, public funds were transferred directly to eligible educators, whereas under the facility payment model, facility awards and minimum salary requirements increased regular payroll compensation. Direct educator payment amounts varied by teaching position, whereas the required salaries varied by position as well as educator qualifications; payments under both models were also adjusted by full-time status. The wage output was therefore expected to vary in ways that followed the program's payment rules, with larger increases for lead teachers than assistant teachers and, under the facility salary schedule, larger increases for educators with higher qualifications. For staff enrolled in HC4CC, subsidized health coverage provided an additional indirect compensation gain valued at the cost of the subsidy (Belfield and Schochet 2024).

Higher compensation is expected to improve educators' economic and professional well-being, the proximal mechanisms through which the PEF may influence employment and career decisions. Higher wages can reduce immediate financial hardship, food and housing insecurity, debt burdens, and the stress associated with meeting basic expenses. Greater compensation may also improve mental well-being, job satisfaction, morale, feelings of respect, and the perceived professional standing of CCEE work (Morrissey and Bowman 2024; O'Sullivan 2022; Pfeifer 2010). Health insurance coverage may also reinforce these mechanisms by lowering health expenditures and medical debt and improving access to care (Barker and Li 2020; Finkelstein et al. 2012; Office of the Assistant Secretary for Planning and Evaluation 2022).

At the staff level, expected shorter-term outcomes are stronger attachment to an employer and the CCEE field and accumulation of job experience. Higher compensation raises the relative attractiveness of remaining in a CCEE position rather than moving to another employer, leaving the field, or exiting employment. Remaining with the same facility also allows educators to accumulate employer-specific experience, deepen their knowledge of children and families, and preserve relationships with colleagues and administrators. Prior evidence supports the link from compensation to retention but is concentrated in a small number of initiatives that were less ambitious than the PEF and had different designs.⁴ In Virginia, a randomized \$1,500 incentive payment contingent on remaining at the same facility for eight months increased educator retention by 11 percentage points (Bassok et al. 2021). In Colorado, centers were randomly assigned to a teacher salary increase pilot that funded staff hourly wage increases ranging

⁴ See also Schochet and Gonzalez (2026a) for a review of the prior research on publicly funded CCEE educator compensation initiatives.

from \$3.00 to \$7.60 based on county cost of living and teacher role. The pilot increased one-year retention by an estimated 6.5 percentage points, although the estimate was not statistically significant (Maier et al. 2025).⁵ A structural analysis of smaller wage increases funded through child care subsidy reimbursement changes in Texas found limited effects on retention (Cunha and Lee 2023). These findings suggest that the size, duration, and conditions attached to a compensation increase may shape its influence on staff retention.

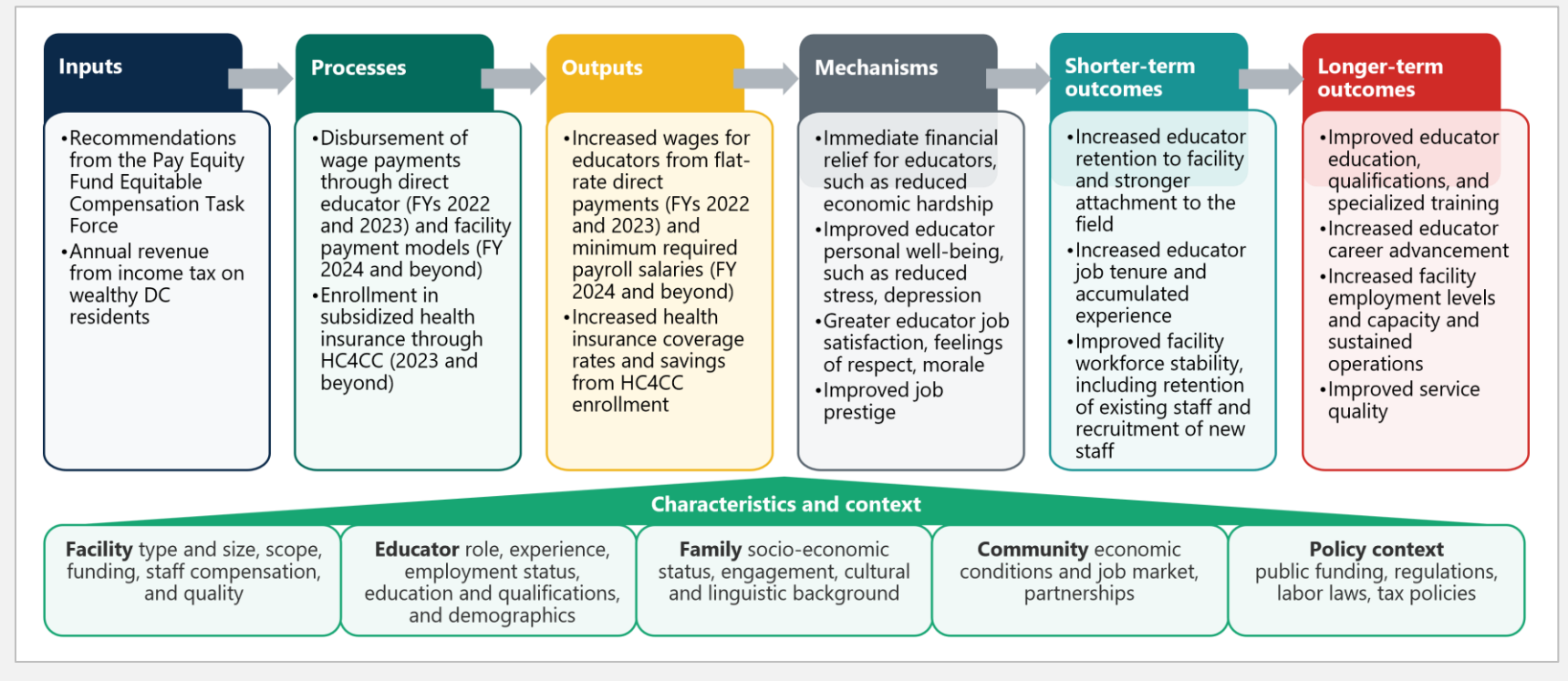
At the facility level, greater retention and more competitive wages are expected to strengthen workforce stability through both retention of existing staff and recruitment of new staff. Higher wages may reduce vacancies by lowering staff exits and making open positions more attractive to prospective employees. Lower staff turnover can reduce the administrative and financial resources devoted to repeated recruitment, onboarding, training, substitute coverage, and scheduling. Facilities may also retain institutional knowledge and preserve established relationships and devote more attention to supervision, professional development, and quality improvement rather than continually responding to staffing disruptions (Bryant et al. 2023; Caven et al. 2021; Doromal et al. 2022; McCormick et al. 2022; Whitebook and Sakai 2003).

Retention and recruitment are distinct but interrelated pathways that together shape facilities' longer-term staffing, operations, and service capacity. When facilities are fully staffed and serving children up to licensed capacity, increased retention mainly reduces the need to hire replacements, whereas when facilities have staffing vacancies that constrain enrollment, higher compensation may support both retention and recruitment, allowing facilities to employ more educators, staff more classrooms, and make fuller use of existing licensed capacity. Recruitment may also exceed replacement hiring needs when facilities seek to expand. Increased staffing may help facilities sustain operations and serve more children, while increased licensed capacity depends on physical space and licensing requirements and may be most distal as a result. Together, these changes may preserve or expand families' access to CCEE services.

Over a longer period, higher compensation and stronger workforce attachment may support educators' education, qualifications, and career advancement. Educators who remain employed longer have more opportunity to accumulate experience and complete education, credentials, and specialized training. The FY 2024 salary schedule may create an additional direct incentive by increasing the financial return to higher degrees and credentials. Together, these pathways could produce gains in educational attainment and CCEE-specific qualifications and support promotion from assistant teacher to lead teacher or director. The relationship between continued labor-force attachment, accumulated experience, and career-related returns is consistent with broader evidence on human capital (Guvenen et al. 2022), although direct evidence that compensation initiatives produce formal education and qualifications gains remains limited (Belfield and Schochet 2024).

⁵ Both studies tested compensation pilots among selected groups of centers already interacting with public CCEE funding and quality systems. In Virginia, sites in the study had already volunteered for a broader state quality-improvement initiative open to programs serving children whose care was supported by public funds (Bassok et al. 2021). In Colorado, the pilot was more selectively targeted to centers that served a substantial share of children receiving child care subsidies and held relatively high ratings in the state's QRIS. As a result, the Colorado evaluation may also have lacked sufficient power to detect a retention effect of the estimated size (Maier et al. 2025).

Exhibit I.2. PEF Workforce Impact Study Theory of Change



Higher staff qualifications and competencies also improve the professional composition of facility workforces. Facility workforce qualifications may improve both when retained educators earn additional degrees or credentials and when higher wages help facilities recruit staff with stronger qualifications or experience. Although direct evidence that higher compensation helps recruit highly qualified CCEE educators remains limited, evidence from K–12 teacher labor markets in the United States suggests that substantial or differentiated compensation can attract academically stronger or more effective teachers (Biasi 2021; Steele et al. 2010). A systematic review of causal and comparative studies similarly found that financial incentives had the strongest evidence of effectiveness among strategies for recruiting qualified teachers to hard-to-staff schools and areas (See et al. 2020).

A more stable, experienced, qualified, and adequately staffed workforce may in turn improve service quality. Higher educator qualifications and additional staffing can improve structural quality, including by allowing facilities to maintain more favorable staff–child ratios. Greater workforce continuity and accumulated experience may support responsive relationships with children and families and more consistent classroom practice, while lower turnover allows facilities to sustain professional development and continuous quality-improvement efforts rather than repeatedly orienting and training replacements (Hale-Jinks et al. 2006; Hall et al. 2024; Hamre et al. 2014; Markowitz 2024; Phillips et al. 2016). Quality improvements may be reflected over time in facility quality ratings. The facility payment model may also increase some facilities’ engagement with DC’s quality rating and improvement system (QRIS) because OSSE administers both initiatives and their participation requirements overlap (DC OSSE, personal communication, July 2026).

The theory of change provides the framework for organizing the study measures but does not imply that every mechanism can be separately identified or that all longer-term effects would be fully realized within three fiscal years. The study directly examines the principal wage output; shorter-term staff and facility outcomes related to retention, job experience, recruitment, and workforce stability; and selected longer-term outcomes related to educator development, facility operations and capacity, workforce composition, and quality-system engagement and ratings. The next section reviews what prior empirical research had already shown about these domains and pathways in the specific context of the PEF.

C. Prior empirical evidence on the PEF

A growing body of research provided evidence across several domains of the PEF theory of change, although the strength and interpretation of that evidence differed according to the study designs. A multiyear implementation and outcomes study used repeated surveys, focus groups, interviews, licensing records, and other administrative data to describe participant experiences and associations between program participation and outcomes within DC. Participatory qualitative methods were also used to study the policy’s development and implementation from the perspectives of educators, directors, advocates, and community members. These studies provided detailed evidence about how participants experienced the PEF and whether observed patterns were consistent with its intended design and outcomes, but they were not designed to estimate impacts relative to an untreated counterfactual. By contrast, prior PEF Impact study activities used quasi-experimental methods and external comparison jurisdictions to estimate sector-wide labor market impacts. Separate benefit-cost analyses combined direct evidence on the PEF with broader research and calibration assumptions to estimate the program’s economic value.

Implementation research documented participants' reports of improvements in their financial circumstances and other proximal mechanisms represented in the theory of change. During the direct payment phase, educators reported that PEF payments helped them meet basic expenses, pay debts, build savings, and address immediate financial needs. They also described reduced financial stress, improved emotional well-being, and stronger feelings that their work was valued and respected (Mefferd et al. 2024; Sandstrom et al. 2024). Educators described the PEF as both immediate financial relief and a source of greater longer-term stability, and some reported that reduced financial strain allowed them to focus more fully on their work with children.

FY 2024 survey findings similarly showed that educators whose employers participated in the facility payment model reported greater food security and financial well-being and lower levels of depression and anxiety than educators whose employers did not participate. Larger wage increases were also associated with stronger economic security and mental-health outcomes (Mefferd, Doromal, et al. 2025). These descriptive comparisons provided direct evidence on educator financial and subjective well-being—mechanisms that the current study cannot measure. Participants in qualitative research similarly described the PEF as increasing their financial stability and HC4CC as reducing health-insurance expenses and improving access to coverage (Harris et al. 2025).

Participant reports and descriptive outcome analyses also provided evidence consistent with stronger retention and recruitment. In surveys during the direct payment phase, nearly two in three educators reported that the PEF led them to expect to remain in DC child care longer than they otherwise would have. Directors similarly reported that the payments made it easier to retain their strongest educators and influenced both existing educators' decisions to stay and new educators' decisions to join their facilities (Doromal et al. 2024; Nikolopoulos et al. 2024; Sandstrom et al. 2024). FY 2024 surveys continued to show stronger intentions to stay and less job seeking among educators whose employers offered wage enhancements, while directors described participation as important for competing for staff and attracting qualified applicants (Nikolopoulos et al. 2025).

An analysis of staff records found that about two in three educators remained at the same licensed center between March 2023 and March 2024. Among those who left, about three in four exited the DC licensed child care workforce rather than moving to another center. The same analysis found lower turnover among centers that accepted child care subsidies and participated in the facility payment model and found that staff changing employers or entering the DC workforce were more likely to work at centers offering enhanced wages (Doromal, Lamb, et al. 2025). These descriptive comparisons were especially informative about workforce patterns but remained correlational because facilities selected into the FY 2024 model and could differ in other ways related to retention and recruitment.

The implementation study also addressed longer-term educator development, facility operations, and service quality through participant reports and descriptive comparisons. Educators and directors reported that the FY 2024 salary schedule increased incentives and opportunities to pursue education and training and helped facilities recruit and retain staff with stronger skills and qualifications (Doromal, Nikolopoulos, et al. 2025; Nikolopoulos et al. 2024). Facilities that opted into the FY 2024 model were also more likely than nonparticipating facilities to be enrolled in Capital Quality and to hold one of DC's two highest quality designations. Educators and directors also perceived improvements in educator–child interactions resulting from greater well-being, stability, education, and training.⁶

Director interviews described broader operational benefits, including improved morale, staffing stability, and flexibility to address compensation and other operating needs without relying entirely on tuition increases. The same interviews identified implementation challenges and possible unintended consequences, particularly administrative burdens for smaller centers, uncertainty about payment systems and classifications, and pay compression between teaching staff and facility directors who were ineligible for the program (Jimenez Parra et al. 2025). These findings helped explain how the PEF may have operated in practice and identified conditions that could strengthen or constrain its effects.

Prior causal evidence came from a series of quasi-experimental studies of the PEF's aggregate CCEE labor market impacts after one, two, and three program years. These studies used federal labor market data from the Quarterly Census of Employment and Wages and synthetic control methods to compare changes in DC with a weighted combination of counties that approximated the CCEE sector outcomes DC would have experienced without the PEF (Schochet 2023, 2024; Schochet and Gonzalez 2026a). Employer-reported wage impacts were close to zero while payments were delivered directly to educators outside payroll, as expected. After the transition to the facility payment model, impacts on average weekly payroll wages became positive and statistically significant, reaching approximately \$179 by the end of 2024; this impact represented an average annual wage increase of about \$15,500 per participant when adjusted for estimated program eligibility and participation rates.

Positive impacts on the size of the CCEE workforce emerged shortly after the program launched and grew over time. By the fourth quarter of 2024, the PEF had increased the number of CCEE educators by an estimated 341 workers, or approximately 11 percent relative to the baseline counterfactual (Schochet and Gonzalez 2026a). Using a conservative assumption that each additional educator served five children (Belfield and Schochet 2024), the estimated increase in the workforce implied capacity for roughly 1,700 additional children in the District. The study did not detect a statistically significant increase in the number of reporting CCEE establishments. Point estimates instead became increasingly negative, suggesting that workforce growth occurred principally through greater staffing within existing establishments rather than growth in the number of employers.

Taken together, the prior empirical evidence on the PEF supports several theorized domains and pathways but leaves important questions unresolved. The studies showed that the program delivered substantial compensation increases, improved participants' perceptions of their financial and professional circumstances, increased aggregate labor supply, and was experienced by educators and directors as supporting retention, recruitment, professional development, and quality. Drawing on this direct evidence along with outside research and assumptions, benefit-cost analyses further estimated that the PEF generated social benefits that exceeded its substantial public costs with one-year economic returns of 23 percent under the direct educator payment model and 21 percent under the facility payment model (Belfield and Schochet 2024; Schochet and Gonzalez 2026b).

⁶ Following their initial adoption in 2016 and several subsequent delays, OSSE also implemented new minimum staff credential requirements in FY 2024 (DC OSSE n.d.[d]). These changes are important context for interpreting relationships between the PEF and workforce education and qualifications.

Most notably, however, the existing impact evidence remained limited to aggregate sector outcomes. Because the labor market data used in those studies were aggregated by county, they could not determine whether workforce growth reflected retention, recruitment, or both; detect moves between facilities in the same geographic area; distinguish between centers and home-based establishments; or assess changes in individual qualifications and site-specific staffing, operations, capacity, and quality-related outcomes. The aggregate data also could not show whether impacts varied across policy-relevant educator subgroups or according to facilities' subsequent participation in the FY 2024 payment model. Answering these questions required records that identified individual staff, connected them to facilities, and followed both staff and facility circumstances over time, together with comparable records from jurisdictions not exposed to the PEF or a comparable compensation initiative that could provide a plausible counterfactual.

D. The PEF Workforce Impact Study

The PEF Workforce Impact Study addresses these evidence gaps by estimating impacts on staff and facilities along the study theory of change. The study examines four broad questions:

1. Did the PEF increase hourly wages for participating center-based educators and home-based providers?
2. Did the PEF strengthen staff attachment to their baseline facilities and improve retention and recruitment across center workforces?
3. Did the PEF affect longer-term educator professional development and facility operations, capacity, workforce composition, and quality-related outcomes?
4. Were selected impacts among center-based educators concentrated according to baseline teaching position or the education and credential groups used to determine PEF payment amounts and required salaries? Were educator- and facility-level impacts concentrated among baseline facilities that subsequently participated in the facility payment model?

The study focuses on outputs and outcomes during the program's first three fiscal years, with annual follow-up observations approximately one and two years after the study baseline established around the program's launch in late 2022.

To answer these questions, we used linked longitudinal administrative records from DC and six comparison states and a quasi-experimental design to estimate the outcomes that participating staff and facilities would have experienced without the PEF. Workforce registry data were necessary because measuring retention requires following the same person and employer over time; separating retention from recruitment requires reconstructing facility workforces at successive periods; and measuring professional development requires repeated staff-level education and credential records. Linking these records to PEF payment, licensing, subsidy, and QRIS system administrative data supplied additional information about program participation and facility operations, capacity, and quality ratings. We obtained the DC workforce and facility records through a partnership with OSSE and comparison group data were assembled through partnerships with the NWRA and state workforce registry agencies in Illinois, Nevada, New York, Ohio, Pennsylvania, and Wisconsin.

The difference-in-differences design compared changes over time among PEF participants with changes over the same period among otherwise eligible nonparticipants in selected metropolitan areas that were not exposed to the PEF or a comparable compensation initiative. This comparison helped distinguish impacts of the PEF from broader workforce, labor-market, and economic changes affecting both research groups. We combined difference-in-differences with propensity score weighting to improve balance between PEF participants and eligible nonparticipants on observed baseline and pre-treatment characteristics. The resulting estimates represent the impacts of the PEF on the center-based educators, home-based providers, and center-based facilities that participated in the program when it was launched.

The remainder of the report describes the study approach and findings. Chapter II describes the linked workforce registry data, analytic samples, measures, and methods used to estimate program impacts and assesses the propensity score approach. Chapter III presents the impact findings, including selected exploratory results. Chapter IV summarizes the findings and discusses their implications for CCEE compensation policy, workforce stability, and service delivery. Appendices A through D provide detailed methods, propensity score diagnostics, impact results, and exploratory analysis tables.

II. Methodology

The impact of the PEF is the difference between the outcomes participants experienced under the program and the outcomes they would have experienced without it. Because the latter cannot be observed, estimating the impact of the PEF requires us to represent this counterfactual. We used linked longitudinal administrative records drawn primarily from early childhood workforce registries to compare how outcomes changed for PEF participants in Washington, DC, with how they changed over the same period for eligible nonparticipants in selected comparison areas. The records span the period before the PEF launched through the end of calendar year 2024, covering the program's first three fiscal years and supporting outcome measurement approximately one and two years after the study baseline. We examined output and outcome measures along the study theory of change. We estimated workforce-level impacts for baseline participant cohorts as well as site-level impacts for facilities employing baseline participants to capture recruitment alongside retention. Formally, the analysis uses a difference-in-differences design supported by propensity score weighting and regression adjustment. This chapter describes the data sources and construction of the study records, the analytic samples, and the study measures, and describes and assesses the analytic approach.

A. Study data sources and construction

1. Early childhood workforce registries

Early childhood workforce registries are administrative data systems that maintain professional records for CCEE staff across settings and employers. They commonly assign individuals persistent identifiers and compile information on employment, roles, education, credentials, and professional development. Registries also support operational functions such as compliance with licensing rules and regulations, implementation of workforce career pathway, scholarship, or compensation programs, and workforce outreach and communication. Because workforce records are created and updated by staff and administrators, they can provide longitudinal information about who works in the CCEE sector, where they work, and how their employment and qualifications change over time (NWRA 2024).

Workforce registry records offer capabilities that other early childhood data sources generally do not. When participation is sufficiently comprehensive and identifiers remain stable over time, registry records can follow individual staff within and across facilities, identify changes in employment and qualifications, and reconstruct facility workforces at multiple points in time. Linking workforce registry records with public licensing, quality, and funding systems records at the facility level can provide additional information about staff members' employers, such as facility type, operating status, licensed capacity, and engagement with public programs. These capabilities made it possible to use workforce registry data to examine the outcomes in the study theory of change, including retention, recruitment, accumulated experience, qualification gains, staffing, service capacity and availability, and engagement with quality initiatives.

Workforce registries nevertheless vary substantially across jurisdictions. Participation may be required for all or most staff in licensed facilities, limited to staff associated with selected public programs or initiatives, or largely voluntary. Registries also differ in who enters and updates information, which records and data elements are independently verified, how frequently profiles must be renewed before they are classified

as inactive, whether they preserve historical records or primarily reflect current status, and the extent to which registry records are integrated with licensing, QRIS, and other facility- (for example, child care subsidy agency records) and staff-level (for example, public assistance agency records) administrative systems (NWRA 2023, 2024). These differences affect how completely registry data represent the workforce overall, particular workforce subpopulations, and staff rosters within individual facilities; how current the records are and the depth and continuity of historical information available; and which data elements are collected, verified, and consistently available over time.

For the purposes of this study, we use *workforce registry data* broadly to refer to the linked workforce and facility administrative records assembled from each jurisdiction's registry and associated licensing, subsidy, QRIS, and other systems. The following subsections describe how we obtained workforce registry data from DC and comparison states; how differences across registry systems informed the selection of comparison jurisdictions and the use of records from different periods and administrative sources; and how we combined and aligned those records to create comparable staff- and facility-level study data sources.

2. Study workforce registry data partnerships

Estimating the effects of the PEF required longitudinal records for program participants and their facilities in Washington, DC, and comparable records for eligible nonparticipants who were not exposed to the program. Mathematica obtained the DC workforce records directly from OSSE under a data-sharing agreement. To construct the comparison group, Mathematica partnered with the NWRA and six state workforce registry agencies. Together, these partnerships provided staff- and facility-level records spanning approximately two years before through two years after the launch of the PEF.

a. DC Office of the State Superintendent of Education

The primary source of DC workforce registry data was the Division of Early Learning Licensing Tool (DELLT), OSSE's administrative system for licensed facilities and staff. Facilities licensed by OSSE are required to maintain staff records in DELLT, including their employees' facility affiliations, roles, employment dates, wages, and documented qualifications. DELLT records also supported implementation of the PEF. They helped establish or verify participant eligibility under the direct educator payment model and, after the PEF transitioned to the facility payment model, helped determine quarterly facility awards based on the number, roles, and qualifications of eligible staff.

DELLT records were supplemented with PEF and facility-level administrative data maintained elsewhere by OSSE. AidKit application and payment records identified center-based educators and home-based providers who applied for and received one or more of the FY 2022 and FY 2023 direct payments and supplied selected baseline demographic and employment characteristics reported by applicants, many of which were not available in DELLT. These data also recorded the status and amount of each of the five direct educator payments disbursed by the program. As discussed below, crosswalks between AidKit and DELLT also helped identify multiple DELLT records belonging to the same staff member. Separate OSSE facility licensing records supplied information about licensing history, facility type, authorized capacity, ages served, subsidy participation, and QRIS designation. Finally, quarterly facility- and staff-level PEF payment records documented participation in the FY 2024 facility payment model.

b. National Workforce Registry Alliance

NWRA is a national nonprofit membership organization that supports state and regional workforce registries and establishes standards for registry systems and workforce data. Through its national workforce data initiative, participating registries that meet NWRA's quality standards can contribute administrative records for national workforce analyses. NWRA's reporting protocols establish common definitions, data elements, and coding conventions so that extracts from different registry systems can be examined across jurisdictions and over time. NWRA also works with participating registries to align their registry data with this standardized reporting structure.

From among the registries participating in the national workforce data initiative, those representing Illinois, Nevada, New York, Ohio, Pennsylvania, and Wisconsin were included in the study. These registries had records spanning the full study period, having contributed to both the 2021 and 2023 national workforce datasets and having prepared a 2025 extract under the same protocols.⁷ Each state also required registry participation throughout the study period for all staff in the facility populations included in the study, such that their registry data both represented staff employment histories and facility staffing. We also prioritized registries in states with a greater number of metro areas with labor markets and child care sectors large enough to provide plausible comparisons with DC, as further discussed in Section II.B.3. Each participating registry consented to the study-specific use of its records.

NWRA facilitated access to the data provided by the participating registries, provided common protocols and other documentation used to prepare the records, and coordinated communication with registry staff. Each state registry agency produced deidentified staff and facility records from its own administrative systems, including linking workforce records with licensing and, where available, subsidy and QRIS data before submission. NWRA also supported communication with the state registries on behalf of the Mathematica study team to address questions about local data structures and prepare the 2025 extracts needed for the study.

3. Workforce registry data and the study design

The study required records that established educators' and facilities' circumstances at the start of the PEF, captured available history before that study baseline, and followed the same individuals and facilities after the program began. As previously described, the PEF began in late 2022 with the first lump-sum FY 2022 payments, continued through quarterly direct payments in FY 2023, and transitioned to facility-administered payments and required salary scales in FY 2024. We therefore set the study baseline in late 2022 and measured outcomes approximately one and two years later, at the ends of 2023 and 2024, respectively. Exhibit II.1 summarizes the DC and comparison-state registry records used to represent each of these study periods.

⁷ Together, the 2021 and 2023 national workforce datasets and 2025 workforce data extracts cumulatively included staff and facilities active in each participating registry from 2019 through 2024. We discuss how the various registry data reporting periods relate to the study period and the implementation of the PEF in the next section.

Exhibit II.1. DC and comparison-state workforce registry records used for each study period

Study period	DC records	Comparison-state records
Selected pre-treatment history	- Selected DELLT workforce records from 2021 - Semiannual facility licensing records from 2019 through 2021 - Annual facility subsidy and QRIS data from FY 2019 through FY 2021	2021 national workforce dataset, covering registry activity during 2019–2020 and active status near the end of 2020
Study baseline: late 2022	- FY 2022 and Q1 FY 2023 AidKit application and payment records - DELLT workforce records reconciled across July 2022 and January 2023 - Corresponding facility licensing records and FY 2022 subsidy and QRIS data	2023 national workforce dataset, covering registry activity during 2021–2022 and employment status near the end of 2022 - Employment history and years in field from adjacent reporting rounds, where needed
One-year follow-up: end of 2023	- January 2024 DELLT workforce records - Facility operating status and closure date from corresponding licensing records	- Study-requested indicator of end-of-2023 employment for records in state-specific 2025 extracts - Employment history and years in field from adjacent reporting rounds, where needed - Facility operating status and closure date from state-specific 2025 extracts
Two-year follow-up: end of 2024	- January 2025 DELLT workforce records - Corresponding facility licensing records and FY 2024 QRIS data	State-specific 2025 extracts, covering registry activity during 2023–2024 and employment and facility status at the end of 2024

Note: DC workforce registry snapshots dated January 1 were treated as corresponding to comparison-state records representing status on or near December 31 of the preceding year. Semiannual DC snapshots surrounding the baseline and follow-up dates provided additional information for reconciling employment histories and facility status. DC facility subsidy and QRIS records were reported by fiscal year. NWRA national protocols organize registry participant records around two-year active windows. DC and comparison-state registry participants and facilities were assigned anonymous identifiers used to link records across data sources and over time.

In DC, OSSE provided DELLT extracts representing semiannual snapshots of the workforce from July 2022 through January 2026, as well as pre-treatment snapshots from January and September 2021. OSSE also provided facility administrative records spanning from 2019 through 2026; licensing records were provided semiannually over this period, whereas subsidy participation and QRIS data were reported by fiscal year. AidKit application and payment records identified the payment receipt patterns used to define the initial PEF participant cohort and supplied selected information reported when staff first applied for the program. We constructed the principal workforce observation at baseline using the AidKit application records—corresponding to the initial FY 2022 or first quarterly FY 2023 payment—linked to DELLT records that were reconciled across the July 2022 and January 2023 snapshots.⁸ The January 2024 and January 2025 extracts served as the one- and two-year endpoints, while surrounding semiannual snapshots provided additional evidence for reconciling employment histories and validating changes in facility status. We used FY 2022 records for corresponding baseline measures of facility subsidy and QRIS participation and FY 2024 records for two-year QRIS-related outcomes. Where available, records from 2019 to 2021 supplied earlier workforce and facility histories for selected baseline characteristics and consistency checks.

The comparison records were organized around two-year national workforce reporting windows rather than discrete registry snapshots. The 2023 national workforce dataset covered activity during 2021 and 2022 and represented employment status near the end of 2022. State-specific 2025 extracts prepared under NWRA's national workforce data protocol covered activity during 2023 and 2024 and represented status at the end of 2024. At Mathematica's request, the comparison registries supplemented the 2025 extracts with a separate indicator of whether each person was actively employed at the end of 2023. These records therefore supplied a late-2022 baseline and one- and two-year follow-ups aligned closely with the constructed DC observations. The 2021 national workforce dataset covered registry activity during 2019 and 2020 and active status at the end of 2020, supplying additional pre-treatment information.

4. Study data construction

We made two sets of adjustments to represent staff, jobs, and employment changes consistently across the DC and comparison-state data before constructing the study records used in the analysis. The first addressed DELLT records for staff who held concurrent jobs at multiple facilities. NWRA's reporting structure includes one staff record and, for each reporting window, one primary job—the job in which the participant worked the most hours, with employment duration used to resolve ties. DELLT instead assigns a separate staff–facility identifier to each job, so the same person can appear in multiple records under different identifiers in a given snapshot.⁹ We used AidKit application and payment records to crosswalk DELLT staff–facility identifiers belonging to the same person and used hours worked and job duration across snapshots to identify one primary facility record for each corresponding two-year reporting window.

The second set of adjustments established a consistent job status and facility for each person at each study endpoint. In DC, we used surrounding DELLT snapshots to distinguish true employment changes or exits from isolated missing records or inconsistent job start dates within an otherwise continuous spell at the same facility. In the comparison-state data, we used employer identifiers, employment start dates, employment-status indicators, years in the field, and facility closure information over time to reconcile the start dates of continuous job spells and to place job changes and exits that occurred between adjacent endpoint observations more precisely within the relevant two-year window. Across sources, we preserved job changes and exits when observed and treated employment as continuous only when supported by the available evidence. These adjustments helped ensure that the study's retention, recruitment, and job experience measures reflected actual workforce changes rather than differences in registry reporting structure or record maintenance.

⁸ PEF participants applied for the FY 2022 payment in August or September 2022. Eligibility for FY 2023 payments automatically carried over for FY 2022 payment recipients, whereas newly hired or newly eligible staff applied for the first quarterly FY 2023 payment in November 2022. As further described in Section II.B.1, we only used AidKit data from successful applications for the first quarterly FY 2023 payment to construct baseline observations for the small share of staff that, according to linked DELLT records, were eligible for the initial FY 2022 payment but did not apply.

⁹ One exception occurred when licensed facilities belonged to the same parent organization. In those cases, DELLT could retain the same staff identifier across separate records associated with different facilities, whether the staff member worked at the facilities concurrently or moved between them over time.

The study data were then organized into related staff- and facility-level longitudinal records. The staff-level records connected each center-based educator or home-based provider to a baseline facility and followed their employment, roles, wages, and qualifications through the follow-up periods. The facility-level records reconstructed the eligible teaching workforce at each baseline center over time, allowing us to identify staff who remained from baseline, staff who entered after baseline, and changes in total facility staffing and workforce composition. Baseline and pre-treatment facility characteristics and FY 2024 facility payment data from OSSE were linked to records at both levels. Sections II.B and II.C describe the specific analytic populations and measures constructed from these records.

We also linked baseline facilities to county-level demographic, economic, and child care labor market information using Federal Information Processing Standards (FIPS) codes. These measures came from the American Community Survey, National Center for Health Statistics Urban–Rural Classification Scheme, BLS unemployment data, and the Quarterly Census of Employment and Wages (National Center for Health Statistics 2024; U.S. BLS n.d.[a], n.d.[b]; U.S. Census Bureau n.d.). We used these data to characterize the areas in which facilities operated and to identify metropolitan comparison areas with sufficiently large populations, labor markets, and CCEE sectors. Section II.B.3 describes the resulting county restrictions.

B. Analytic samples

We constructed the analytic samples to include DC staff who participated in the PEF and staff in the comparison states who met the same observable eligibility conditions, along with the center-based facilities that employed them. We first defined a common eligible workforce across the DC and comparison-state records. We then limited the comparison pool to registry populations with sufficiently complete workforce coverage and to metropolitan counties whose population, labor market, and child care sector were large enough to provide plausible comparisons with DC. These steps produced separate samples of center-based educators, home-based providers, and center-based facilities.

1. Eligible workforce sample

We first limited the study workforce to staff employed in facilities covered by the PEF at baseline, which in DC includes any facility licensed by OSSE, as previously described. Although the DC workforce records were already limited to staff in facilities licensed by OSSE, the comparison-state records initially included staff in a wider range of facility types. We first excluded comparison-state staff employed at baseline in unregulated home-based and in-home care, settings serving only school-aged children, and other facility types not covered by the PEF, retaining only staff in licensed or otherwise regulated center-based facilities, group child care (GCC) homes, or family child care (FCC) homes.

Next, we sought to exclude public school-based pre-K settings from the comparison-state data. Unlike in DC, where these settings are not licensed or otherwise regulated by OSSE, they were often categorized with other PEF-eligible centers in the comparison-state data. However, because the records did not consistently identify sources of public funding other than child care subsidies, we could not reliably distinguish these settings from other eligible arrangements. Because public school-based pre-K programs generally do not serve infants or toddlers, we instead limited facilities in both research groups to those with evidence of serving either age group.¹⁰ This provided a consistent way to exclude such settings and was also aligned with the PEF's focus on the birth-to-three workforce.

Within eligible facilities, we then limited the study workforce to staff in PEF-eligible roles, defined as teachers and assistant teachers in center-based facilities and providers and assistant providers in home-based facilities. Before providing the workforce records to the study team, OSSE limited them to staff who appeared in an eligible role in one or more of the available DELLT snapshots, but not necessarily the snapshot where they first appeared. The comparison-state records included registry participants across the full range of reported positions, such as center directors and other administrators, aides, home visitors, coaches, and other non-direct care staff. We therefore retained staff in both research groups if they were in a PEF-eligible role at study baseline or when they first appeared after baseline. This applied a consistent criterion when staff entered the study sample and retained those whose roles later changed, most notably including center-based educators promoted to center director.

Additional staff-level sample conditions reflected OSSE's remaining eligibility rules for the initial FY 2022 PEF payments specifically. Staff in both research groups had to be actively employed at study baseline, have entered that job on or before May 16, 2022, and work at least 10 hours per week (DC OSSE 2022b). Because the study estimates the impacts of PEF participation rather than eligibility alone, DC staff also needed evidence in the AidKit payment records that they received an initial direct PEF payment in FY 2022 or the first quarter of FY 2023.¹¹ Eligible nonparticipants in the comparison states met the same observable employment, role, and facility conditions but were not exposed to the PEF. We then classified the resulting records as center-based educators or home-based providers according to the staff member's baseline facility type.

2. Center-based facility sample

The facility sample included centers that employed at least one educator in the corresponding staff-level sample at baseline. A DC center entered the sample if it employed at least one educator who received an initial PEF payment and met the remaining individual eligibility conditions; a comparison center entered if it employed at least one educator who met the corresponding observable conditions. Facility-level analyses were limited to centers. Outcomes for home-based providers were examined at the staff level.

¹⁰ We included licensed centers if they had evidence of serving infants or toddlers in one or more reporting periods. In DC, data on age groups served came from facility licensing records. In the comparison states, these data came from staff reports of the age(s) of children they served that we aggregated to the facility level. We also required comparison-state homes to serve infants or toddlers in one or more reporting periods; all home-based facilities in DC already met this condition.

Illinois was the only comparison state to report both licensed and license-exempt regulated centers. The latter category included public school-based pre-K settings along with some private and religious programs that otherwise would have met the PEF eligibility criteria (Illinois Department of Human Services 2017). We therefore applied a more stringent rule to ensure these public pre-K settings were excluded, retaining license-exempt centers only when at least 5 percent of baseline staff reported serving infants or toddlers.

¹¹ As previously described, applications for the first quarterly FY 2023 payment also occurred during the study baseline period, as did the earliest disbursements. As a result, for staff who met the same conditions used to define eligibility in FY 2022, we also treated receipt of that payment as evidence of staff PEF participation. This approach functionally retained otherwise eligible staff who did not apply for the initial FY 2022 payment but did then apply for the first quarterly FY 2023 payment one or two months later.

Within each sampled center, the facility workforce records included all observed staff who were employed in a PEF-eligible teaching role when they first appeared during the study period, not only educators in the staff-level analysis sample. The baseline roster therefore also included educators who started their jobs after May 16, 2022, worked fewer than 10 hours per week, or, in DC, did not receive an initial direct PEF payment. Staff who entered a sampled center after baseline were included under the same eligible role-at-entry rule. We did not reapply the remaining staff-level eligibility criteria at later periods because they did not provide a stable basis for defining the facility workforce over time.¹²

3. Comparison-state registry and community restrictions

Next, we restricted the sampled center-based educators, home-based providers, and center-based facilities in comparison states to account for state-specific registry participation rules. As described in Section II.A.2.b, one of the conditions for selecting study comparison states was that registry participation was required for all staff in facility populations included in the study. In most comparison states and DC, registry participation was required for all staff in eligible facilities (NWRRA 2023). In Pennsylvania, registry participation was required for all staff except for those in facilities that did not progress beyond the first rating level of the state's QRIS, representing facilities that were auto-enrolled with licensing (NWRRA n.d.[a]). In New York, registry participation was required of all staff and facilities in the five New York City boroughs but was otherwise only required for facilities participating in the state's QRIS (NWRRA n.d.[b]). We therefore excluded remaining subpopulations of Pennsylvania records corresponding to facilities at the first QRIS level and New York records corresponding to facilities operating outside of New York City and not enrolled in the state's QRIS.

Last, we used the information contributed by community-level data sources described in Section II.A.4 to restrict all remaining comparison-state study records to those located in counties with metropolitan labor markets and child care sectors large enough to provide plausible comparisons with DC. Specifically, we retained facilities in large central, large fringe, or medium metropolitan counties with at least 100,000 residents, 30,000 jobs across all industries, 250 child care workers, and 25 child care establishments. These criteria were intended as broad initial comparability screens; the propensity score methods described in Section II.D.2 further adjusted for differences within the remaining comparison pool.

4. Final analysis samples and missing data

After the substantive facility, staff, registry system, and community restrictions, the eligible staff and facility samples included:

- 2,654 PEF and 90,494 eligible non-PEF center-based educators;
- 192 PEF and 11,401 eligible non-PEF home-based providers; and
- 303 PEF centers and 9,829 eligible non-PEF centers.

¹² The other rules used to define the staff participant cohort were generally specific to the FY 2022 payments and did not apply to facility staff entering at later dates. Beginning in FY 2023, PEF payments only required staff to be employed when payment eligibility was determined and for no prior duration, and beginning in FY 2024, responsibility for PEF participation shifted from individual staff to facilities as previously described. Although the program continued to require eligible staff to work at least 10 hours per week, information on hours worked for DC staff came from AidKit data so was not maintained after study baseline.

As detailed in Section II.D.2, we estimated propensity scores for the remaining sample members in each study population. These scores represented the predicted probability of belonging to the PEF group conditional on study baseline and pre-treatment characteristics. To arrive at the final analysis samples, we identified sample members with estimated propensity scores in the area of common support, or the range of scores represented among both the PEF and comparison groups. This avoided estimating impacts for PEF participants for whom the comparison data contained no sufficiently similar observations. Most PEF participants with estimated propensity scores were retained in the common support area, while the restriction removed a larger share of the eligible comparison pool given very low predicted probabilities of being PEF participants. As presented in Appendix Exhibit A.1, the final analysis samples included:

- 2,606 PEF and 46,086 eligible non-PEF center-based educators;
- 175 PEF and 2,748 eligible non-PEF home-based providers; and
- 297 PEF centers and 4,751 eligible non-PEF centers.

Appendix Exhibit A.1 also presents the geographic distribution of eligible nonparticipants across the comparison states. Illinois contributed the largest share, with Cook County alone accounting for nearly one-third of both center-based educators and home-based providers after weighting. The five New York City boroughs contributed nearly one-quarter of center-based educators and one-fifth of home-based providers. The Cleveland, Cincinnati, and Columbus metropolitan areas together accounted for about 15 percent of each group; Philadelphia County accounted for about 10 percent of center-based educators and 6 percent of home-based providers; and the Milwaukee and Madison metropolitan areas together accounted for about 5 percent of both center- and home-based staff.

Final model samples were nearly identical across most outcomes because the linked registry records provided complete or nearly complete information at the study endpoints. Retention and recruitment outcomes were constructed from the baseline and follow-up facility rosters and therefore were observed for the full common-support samples. Outcomes measuring job experience, staffing, and operating status also retained nearly all cases. The main exception was hourly wage after two years, which was defined only for staff who had a valid, verified wage. Outcomes measuring changes in education or qualifications required valid information at both baseline and follow-up and therefore had modestly smaller samples. Appendix C reports sample size by research group and study population for each impact model outcome.

Missing data on baseline covariates did not further reduce the model samples. We used indicator-variable imputation, setting missing values to a constant and including a corresponding missingness indicator among the baseline covariates considered by the impact models. This approach retained records with observed outcomes while allowing the models to account for differences associated with missing baseline information. Missingness rates for most baseline variables were under one percent, and apart from wage measures, did not generally exceed five percent across measures and study populations (see Appendix Exhibits B.2 through B.4).

C. Study measures

We constructed measures at the staff and facility levels to represent the output and shorter- and longer-term outcomes in the study theory of change (Exhibit I.2). The PEF first increases educator compensation through wage gains and, for staff enrolled in HC4CC, savings on health insurance expenses; higher compensation is then expected to strengthen retention, job experience, and facility workforce stability and, over time, support educator qualifications, career advancement, and facility service availability, capacity, and quality. The workforce registry records do not include measures of HC4CC enrollment and health insurance expenses or educator subjective professional and financial well-being, but they do allow us to examine the outcomes expected to result from those outputs and mechanisms.

We also constructed baseline and pre-treatment characteristics describing staff, their jobs, their facilities, and facility workforces. These characteristics were used to estimate propensity scores, assess whether weighting produced comparable research groups, and provide candidate adjustment variables for the impact models. Most characteristics were observed repeatedly, and several were used to construct the follow-up measures directly. Retention and recruitment measures were constructed from changes in staff–facility relationships across periods, while education, qualification, and career-advancement measures directly compared quantities between baseline and follow-up.

1. Baseline and pre-treatment characteristics

The baseline characteristics were selected to capture observed differences that could influence both participation in the PEF and subsequent workforce or facility outcomes. Staff characteristics included demographics, qualifications, teaching position, full-time status, experience with the baseline facility, and hourly wage. We also linked each staff member to characteristics of the baseline facility, including facility type, age groups served, licensed capacity, number of teaching staff, subsidy and QRIS participation, quality rating, operating history, and average workforce experience and compensation. The center-based facility analysis used corresponding measures of facility operations and workforce size, demographic composition, qualifications, experience, and wages. Where reliable information was available, we also constructed selected measures from approximately two years before baseline to represent facilities' prior operating histories and conditions. Appendix Exhibit A.2 provides operational definitions, timing, and applicable study populations for the baseline and pre-treatment characteristics used in the analysis.

2. Output and outcome measures

We organized the output and outcome measures according to the sequence in which effects are expected to emerge in the theory of change. The principal study output measure was staff hourly wage. Shorter-term staff outcomes measured retention by the baseline facility and accumulated experience with that facility. Shorter-term facility outcomes measured retention and recruitment across the full teaching workforce. Longer-term staff outcomes measured education and qualification gains and career advancement, while longer-term facility outcomes measured staffing, operating status, licensed capacity, QRIS engagement and ratings, workforce qualifications, and staffing structure. Most shorter-term outcomes were measured after approximately one and two years. Wages, education and qualification gains, career advancement, licensed capacity, and service quality were measured after approximately two years. Exhibit II.2 summarizes the follow-up measures by study population, domain, and period.

Exhibit II.2. Output and outcome measures by study population, theory-of-change stage, and follow-up period

Study population	Domain	Follow-up measures	Follow-up period
Outputs			
Center-based educators and home-based providers	Compensation	Hourly wage	Two years
Shorter-term outcomes			
Center-based educators and home-based providers	Retention and job experience	Retained by baseline facility; years employed with baseline facility	One and two years
Center-based facilities	Workforce stability	Retention rate; recruitment rate within one or two years; recruitment rate during the second year	One and two years
Longer-term outcomes			
Center-based educators and home-based providers	Education and qualifications	Increased highest level of education; obtained an AA degree or above, BA degree or above, or graduate degree; had or obtained an AA degree or above in ECE	Two years
Center-based educators	Career advancement	Promoted from assistant teacher to lead teacher or director, or from lead teacher to director	Two years
Center-based facilities	Service availability and capacity	Program closure; number of educators; licensed capacity	One and two years, as applicable
Center-based facilities	Service quality	QRIS participation; high QRIS rating; shares of staff with an AA degree or above, BA degree or above, or AA degree or above in ECE; corresponding shares attributable to retained and recruited staff; teaching staff per slot	Two years

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: The study theory of change also identifies increased health insurance coverage and savings from HC4CC enrollment as a program output; these measures were not available in the linked study records. Appendix Exhibit A.3 provides complete operational definitions of study outputs and outcomes.

We defined outcomes for the full baseline staff and facility samples rather than restricting them to staff who remained with their baseline facility or facilities that remained open. Doing so preserved the impact study design by ensuring that the analysis was not conditioned on post-treatment quantities that the PEF could itself have influenced. Staff who were not retained by their baseline facility were assigned values of zero for endpoint measures of job experience, qualification gains, and career advancement. These measures were therefore interpreted as joint outcomes of remaining attached to the baseline facility and accumulating experience or achieving the specified gain. Applying the same principle, baseline facilities that later closed were assigned values of zero for measures of staffing, licensed capacity, workforce qualification shares, and selected quality indicators. We departed from this convention only for hourly wage. As a study output rather than outcome, impacts on staff wages were intended to provide a check that the data and study design captured the changes expected from PEF participation and the amount and structure of program payments. We therefore defined the measure only for staff retained by their baseline facility and with verified follow-up wages.

Facility workforce rates and shares used denominators that matched the question each measure was designed to answer. Retention and recruitment rates described workforce changes relative to a facility's baseline roster, placing staff exits and entries on a common scale fixed before the launch of the PEF. The retention rate was the share of baseline teaching staff still employed, whereas the recruitment rate was the number of new hires relative to the same baseline roster. Facility workforce qualification measures, however, were in terms of the number of teaching staff at the two-year follow-up because they were designed to describe the composition of the workforce employed at that study period. Using the baseline workforce to anchor these outcomes risked causing them to reflect changes in total staffing as well as changes in workforce qualifications. A facility whose workforce grew could appear to have larger qualification gains even if the proportion of qualified staff remained similar, while the opposite could be true for a facility with fewer staff at follow-up. We also constructed qualification share measures that separately focused each numerator on retained or recruited staff to explore whether potential improvements in workforce qualification shares primarily reflected qualification gains among retained baseline staff or the recruitment of new staff with relatively higher qualification levels. Facilities that had closed were assigned a value of zero across facility workforce qualification measures, as previously described.¹³

3. Exploratory subgroup measures

The exploratory analyses examined whether impacts among center-based educators varied across selected baseline characteristics used to determine PEF payment amounts or subsequent exposure to the facility payment model. The initial direct payment amounts varied according to whether educators were lead or assistant teachers, distinguished by baseline position. Under the facility payment model, minimum salary requirements also varied across three qualification tiers constructed by combining baseline position, education, and CDA or state certification status (DC OSSE n.d.[b]). The lower tier included educators below the middle-tier thresholds and lead teachers with a CDA but no college degree; the middle tier included assistant teachers with a CDA but no college degree and lead teachers with an AA degree; and the higher tier included assistant teachers with an AA degree or above and lead teachers with a BA degree or above.

We also measured actual exposure to the FY 2024 facility payment model among center-based educators and facilities using OSSE's quarterly facility payment records. Facilities were classified according to whether they received at least one quarterly payroll-formula payment during FY 2024, and educators were assigned the participation status of their baseline facility. The exploratory analyses used this measure to examine where the overall impacts of initial PEF participation were concentrated; it was not treated as a baseline characteristic or as a separate study treatment variable.

¹³ Although qualification shares for a baseline facility that closed prior to study endline were mathematically undefined because no facility workforce remained at follow-up, these measures were constructed to capture the fact that, analytically, that facility contributed no staff with relevant qualifications at follow-up.

D. Analytic strategy

Evaluating the impact of the PEF required estimating the outcomes that participating staff and facilities would have experienced had the program not been implemented. We combined three complementary methods to construct this counterfactual. First, a difference-in-differences design used changes over time among eligible nonparticipants to estimate how outcomes for PEF participants would have evolved in the absence of the program. Second, propensity score weighting gave greater influence to comparison observations that more closely resembled PEF participants before the program began. Third, regression adjustment accounted for baseline and pre-treatment characteristics associated with each outcome and improved the precision of the impact estimates. We applied these methods to estimate impacts separately among center-based educators, home-based providers, and center-based facilities.

1. Difference-in-differences design

The difference-in-differences design compared changes in outcomes for PEF participants with changes over the same period for eligible nonparticipants in the comparison states. The basic intuition is that a change experienced by both groups could reflect broader developments in the CCEE workforce or economy, whereas an additional change in DC after the PEF launched provides evidence of the program's impact. Conceptually, the impact at follow-up period t can be written as:

$$\tau_t = E(Y_{it} - Y_{i0} \mid D_i = 1) - E_w(Y_{it} - Y_{i0} \mid D_i = 0),$$

where Y_{it} is the outcome for staff member or facility i at follow-up, Y_{i0} is the corresponding baseline measure, D_i indicates participation in the PEF, and E_w denotes the average for the propensity-score-weighted comparison group. The first term represents the change among PEF participants, and the second represents the change that the weighted comparison group suggests PEF participants would have experienced without the program.

In practice, the study records were organized with information over time stored on a single record for each staff member or facility and we implemented the difference-in-differences logic through outcome-specific endpoint regressions that adjusted for available baseline and pre-treatment measures. A generic model can be expressed as:

$$(1) \quad g\{E(Y_{it} \mid D_i, Z_i)\} = \alpha_t + \theta_t D_i + Z_i' \beta_t,$$

where $g(\cdot)$ is the identity link for continuous outcomes and the logit link for binary outcomes, and Z_i includes baseline or pre-treatment measures of the outcome and other selected baseline characteristics. For continuous outcomes, the coefficient on D_i is the adjusted impact estimate. For binary outcomes, we converted the model coefficient into an average marginal effect, reported as a percentage-point impact.

For outcomes observed as levels at baseline and follow-up, such as wages, staffing, licensed capacity, QRIS participation, and workforce qualifications, adjusting for the baseline or pre-treatment level implements the same underlying comparison of changes while generally providing greater precision than directly modeling a change score. Other outcomes—such as retention, recruitment, degree attainment, and promotion—were themselves defined as transitions relative to baseline. For these measures, change was built directly into the outcome definition rather than represented by a separate baseline variable.

The design rests on two conditions. First, the comparison areas must provide an untreated counterfactual. We selected metropolitan counties outside the DC region, and eligible staff and facilities in those areas were not exposed to the PEF or a compensation initiative comparable in scale and design, reducing the likelihood of direct exposure or regional spillovers. Second, absent the PEF, outcomes for PEF participants and eligible nonparticipants would have followed similar trends. This parallel-trends condition cannot be verified directly and is especially important here because common eligibility and geographic restrictions and aligned observation periods did not, by themselves, ensure that eligible nonparticipants resembled PEF participants on factors that could shape workforce trends. Remaining differences may reflect local labor market conditions, employer practices, and career pathways that could shape wages, retention, recruitment, and qualifications (Schochet and Gonzalez 2026a). We therefore used propensity score methods to reweight eligible nonparticipants, so they more closely resembled PEF participants on observed baseline and pre-treatment characteristics.

2. Propensity score estimation and weighting

A propensity score represents the estimated probability that a staff member or facility participated in the PEF, conditional on observed baseline and pre-treatment characteristics:

$$p_i = P(D_i = 1 | X_i).$$

We estimated separate propensity scores for center-based educators, home-based providers, and center-based facilities. The candidate characteristics differed across the three populations but collectively described staff demographics, qualifications and employment; facility operations and service characteristics; facility workforce composition, experience, and compensation; and selected pre-treatment measures (see also Section II.C.1 and Appendix Exhibit A.2).

a. Generalized boosted models

We estimated the scores using generalized boosted models, or GBMs. GBMs are nonparametric machine-learning models that combine a sequence of regression trees. Unlike a conventional regression model, in which the researcher must specify each functional form and interaction, GBMs can identify nonlinear associations and interactions when they improve prediction of PEF participation. This flexibility was useful given the large number of staff-, workforce-, and facility-level characteristics and the possibility that combinations of those characteristics—not only their independent linear associations—distinguished PEF participants from eligible nonparticipants (Lee et al. 2010; Westreich et al. 2010).

We implemented the GBMs using the Toolkit for Weighting and Analysis of Nonequivalent Groups, or TWANG, in R through its Stata interface (Ridgeway et al. 2013; Cefalu et al. 2015). The models used shallow regression trees that allowed two-way interactions and iteratively added trees until further iterations no longer improved the selected balance criterion. We used TWANG's maximum Kolmogorov–Smirnov stopping rule, which selected the iteration that minimized the largest distributional imbalance across the included baseline characteristics. The number of trees allowed to reach that solution varied across the three study populations because of differences in sample size and model complexity.

We also calculated variable importance statistics to describe which baseline characteristics contributed most to distinguishing PEF participants from eligible nonparticipants in each GBM. The importance statistic reflects the relative contribution of a characteristic across all tree splits in which it was used, including contributions through nonlinear relationships, interactions, and the treatment of missing values. The statistics are expressed as percentages and sum to 100 within each model. They describe a variable's contribution to predicting PEF participation but do not communicate the direction of that relationship.¹⁴

b. Average treatment effect on the treated weights

We used the estimated propensity scores to restrict the analytic sample for each study population to the region of common support before constructing the propensity weights. Common support refers to the portion of the propensity score distribution for which the PEF and eligible non-PEF groups contained observations with sufficiently similar predicted probabilities of participation. Consistent with the average treatment effect on the treated (ATT) estimand, we excluded eligible nonparticipants with propensity scores below the minimum score among PEF participants and PEF participants with scores above the maximum score represented in the comparison group. This restriction retained the range over which the comparison group data could support inferences about the PEF population while avoiding extrapolation to participant profiles that the comparison data did not represent. Exhibit II.4 displays the propensity score distributions prior to the restriction; common-support sample sizes are reported in Section II.B.4.

We then used the estimated propensity scores to construct weights targeting the ATT. PEF participants received a weight (w_i) of 1. Eligible nonparticipants received a weight equal to the odds of their estimated propensity score ($\hat{p}_i$):

$$w_i = \begin{cases} 1, & D_i = 1, \\ \frac{\hat{p}_i}{1 - \hat{p}_i}, & D_i = 0. \end{cases}$$

Eligible nonparticipants with higher predicted probabilities of PEF participation therefore received more weight, whereas those whose observed characteristics made them less similar to PEF participants contributed less. The weighted comparison group is therefore intended to estimate the outcomes that the participating population might have experienced without the program. Consequently, the impact estimates represent average effects for the educators, providers, and centers participating in the PEF at study baseline, rather than effects for all potentially eligible staff and facilities.

c. Balance diagnostics

We assessed improvements in covariate balance from propensity score weighting using two statistics. Absolute standardized differences compare the PEF participant and weighted comparison-group means for each characteristic divided by the pooled standard deviation. Standardizing places characteristics measured in different units on a common scale. A value of zero indicates identical group means, and larger values indicate greater imbalance. We examined signed standardized differences for individual characteristics and absolute standardized differences when summarizing balance across characteristics. We used 0.25 standard deviations as a threshold for identifying residual imbalance (Stuart et al. 2013).

¹⁴ We discuss propensity score estimation and weighting diagnostics in Section II.E. Exhibit II.3 presents the most influential characteristics for each study population based on variable importance metrics in Appendix Exhibit B.1.

We also calculated Kolmogorov–Smirnov (KS) statistics, which measure the largest difference between the empirical cumulative distributions in the PEF and weighted comparison groups. KS statistics complement standardized mean differences as similar means may conceal differences elsewhere in the covariate distributions between research groups. The statistic ranges from zero, indicating identical distributions, to one, indicating completely nonoverlapping distributions. We calculated both balance diagnostics for each characteristic and summarized their mean and maximum values across the full covariate set.¹⁵

3. Estimating impacts

We estimated separate impact models for each output or outcome and each study population, restricting the reported analyses to the common-support samples and using the corresponding ATT weights. Continuous measures were estimated using weighted linear regression and binary measures were estimated using weighted logistic regression, from which we calculated regression-adjusted group percentages and average marginal effects of PEF participation. The estimated impact for each output or outcome and study population was therefore the adjusted difference between the mean or percentage for PEF participants and the corresponding weighted mean or percentage for eligible nonparticipants.

All models used doubly robust specifications that combined propensity score weighting with outcome regression. Weighting first adjusted the comparison group to resemble PEF participants across the full set of observed baseline characteristics. Regression adjustment then further incorporated an outcome-specific set of baseline and pre-treatment characteristics. Regression adjustment can increase precision by explaining residual outcome variation and may further reduce bias if some differences remain after weighting. Under standard assumptions, the impact estimate remains consistent if either the propensity score model or the outcome model is correctly specified (Hullsieck and Louis 2002).

For each outcome and study population, we used least absolute shrinkage and selection operator, or LASSO, methods to select a parsimonious adjustment set from the candidate baseline and pre-treatment characteristics. The PEF participation indicator was required to remain in every selection model, as was the baseline version of each outcome variable, where applicable. LASSO progressively shrinks the coefficients of weaker predictors toward zero and excludes those that add little explanatory value. As described in Section II.B.4, we used indicator-variable imputation for missing values among baseline and pre-treatment characteristics. Missingness indicators were eligible for LASSO selection but were only retained in the final adjustment set when the corresponding underlying characteristic was also selected.

For staff-level models, we calculated standard errors clustered by the staff member’s baseline facility. This adjustment accounts for the fact that educators working in the same facility experienced a shared implementation context and could have correlated outcomes. Facility-level models used heteroskedasticity-robust standard errors. All statistical tests were two-tailed. We identified impact estimates with $p < 0.10$ as suggestive or trend-level findings and used conventional thresholds of $p < 0.05$, $p < 0.01$, and $p < 0.001$ for statistical significance.

¹⁵ Exhibit II.5 presents summary diagnostics, and Appendix Exhibits B.2 through B.4 present means, distributions, and missingness rates for each characteristic before and after weighting.

In addition to impacts in their original units, we calculated standardized effect sizes to facilitate comparisons across outcome measures. For continuous measures, we reported Hedges' g , which divides the impact by the pooled outcome standard deviation and applies a small-sample correction. For binary measures, we reported the Cox index, which expresses the adjusted odds contrast on a standardized scale. Effect sizes were used to supplement the impact estimates in their original units and were not used to determine statistical significance. Appendix C presents the regression-adjusted group means or percentages, impact estimates, standard errors, p -values, and effect sizes for each output or outcome measure and study population.

4. Exploratory analyses

We conducted two sets of exploratory analyses to assess for whom and under what implementation conditions the impacts of PEF participation were concentrated. The first examined whether impacts among center-based educators varied across selected baseline characteristics used to determine PEF payment amounts or required salaries. The second examined whether center-based educator- and facility-level impacts varied according to whether the baseline facility subsequently participated in the FY 2024 facility payment model.¹⁶ The exploratory analyses were intended to identify possible differences in program effects and mechanisms. Appendix D presents these findings.

a. Baseline subgroup analyses

The subgroup analyses examined variation in the overall impacts of the PEF among center-based educators by baseline teaching position and qualification tier; we previously described these measures in Section II.C.3. We retained the common-support samples and overall ATT weights from the primary center-based educator analysis rather than estimating new propensity scores within each subgroup. This ensured that potential variation in the overall impact was driven by differences in estimated impacts between levels of the subgroup variables and not due to changes in the common target population or subgroup-specific reweighting.

For each outcome, we estimated one pooled model containing indicators for subgroup membership and interactions between PEF participation and the subgroup indicators. Only the PEF indicator was interacted with subgroup membership; the selected baseline adjustment variables entered additively. We used the same outcome-specific covariates selected for the corresponding overall impact model, unless they were also used to define the subgroup variable. Teaching position was therefore excluded from any model-specific covariate lists when impacts were estimated by baseline position, while position, education, and CDA or state certification measures were omitted from analyses by the qualification tier subgroup.

We calculated regression-adjusted PEF and eligible non-PEF group means and the marginal impact of PEF participation within each subgroup level. For the teacher position subgroup, we directly tested the difference between the two estimated impacts, captured by the estimated coefficient on the interaction term. For the three qualification tiers, we used an omnibus Wald test of whether the three subgroup-specific impacts were equal. Standard errors for the educator analyses were clustered by baseline facility.

¹⁶ We did not conduct exploratory analysis of impacts among home-based providers because the smaller PEF group sample size did not support further division into baseline subgroup or facility payment model participation levels.

b. Facility payment model participation analyses

The second exploratory analysis examined whether the impacts of initial PEF participation were concentrated among staff and facilities that subsequently participated in the FY 2024 facility payment model. We defined participation as receipt of at least one quarterly payroll-formula payment during FY 2024. Center-based educators were assigned the participation status of their baseline facility. Because this exposure began after the one-year follow-up period, the analysis focused on outcomes measured after approximately two years.

Facility payment model participation was observed only for PEF facilities and was not randomly determined. Facilities choosing to participate could differ systematically from those that did not, and no actual participation status existed for comparison-state facilities that were never offered the program. We therefore estimated an additional model among DC PEF facilities predicting participation in the facility payment model from baseline facility operations, workforce composition, experience, compensation, subsidy and QRIS participation, and selected interactions. We used LASSO logistic regression to select the prediction model and then applied the resulting coefficients to both PEF and comparison facilities. This produced, for each facility j , an estimated probability $\hat{q}_j$ that it would have participated in the facility payment model if offered.

PEF facilities were assigned to their observed participation group. Each eligible non-PEF facility was instead represented in both counterfactual participation groups. The copy assigned to the nonparticipation group received weight

$$w_{j0} = w_j^{ATT}(1 - \hat{q}_j),$$

and the copy assigned to the participation group received weight

$$w_{j1} = w_j^{ATT}\hat{q}_j,$$

where w_j^{ATT} is the facility's overall PEF propensity score weight. Thus, a comparison facility predicted to be highly likely to participate contributed primarily to the participation counterfactual, whereas one predicted to be unlikely to participate contributed primarily to the nonparticipation counterfactual. The two weights summed to the facility's original ATT weight, preserving its total contribution to the overall comparison group. We applied the same approach to educator records using the predicted participation probability of each educator's baseline facility.

We then estimated pooled models containing PEF participation, facility payment model participation group, and their interaction, together with the outcome-specific covariates selected for the corresponding overall impact model. These models produced separate estimates of the impact of initial PEF participation among facilities that did and did not subsequently participate in the facility payment model, along with a direct test of the difference between those impacts. Educator-level standard errors were clustered by baseline facility because the exposure was assigned at that level. Facility-level standard errors were clustered by the original facility record so that the two weighted comparison copies were not treated as independent observations.

These estimates describe how the impacts of the PEF were distributed according to subsequent facility payment model participation. Participation occurred after the initial PEF treatment began, and facilities may have selected into the model based on unobserved characteristics or earlier experiences with the program that the additional weighting would not capture.

E. Propensity score diagnostics

Section II.D.2 described how we estimated propensity scores for the three study populations, restricted the samples to the area of common support, and constructed weights targeting the ATT. This section assesses the performance of the analytic approach, examining how the eligible nonparticipant samples differed from PEF participants in terms of several characteristics, including baseline levels of key outcome measures, and how propensity score weighting substantially reduced those differences. Detailed propensity score estimation and weighting diagnostics are presented in Appendix B.

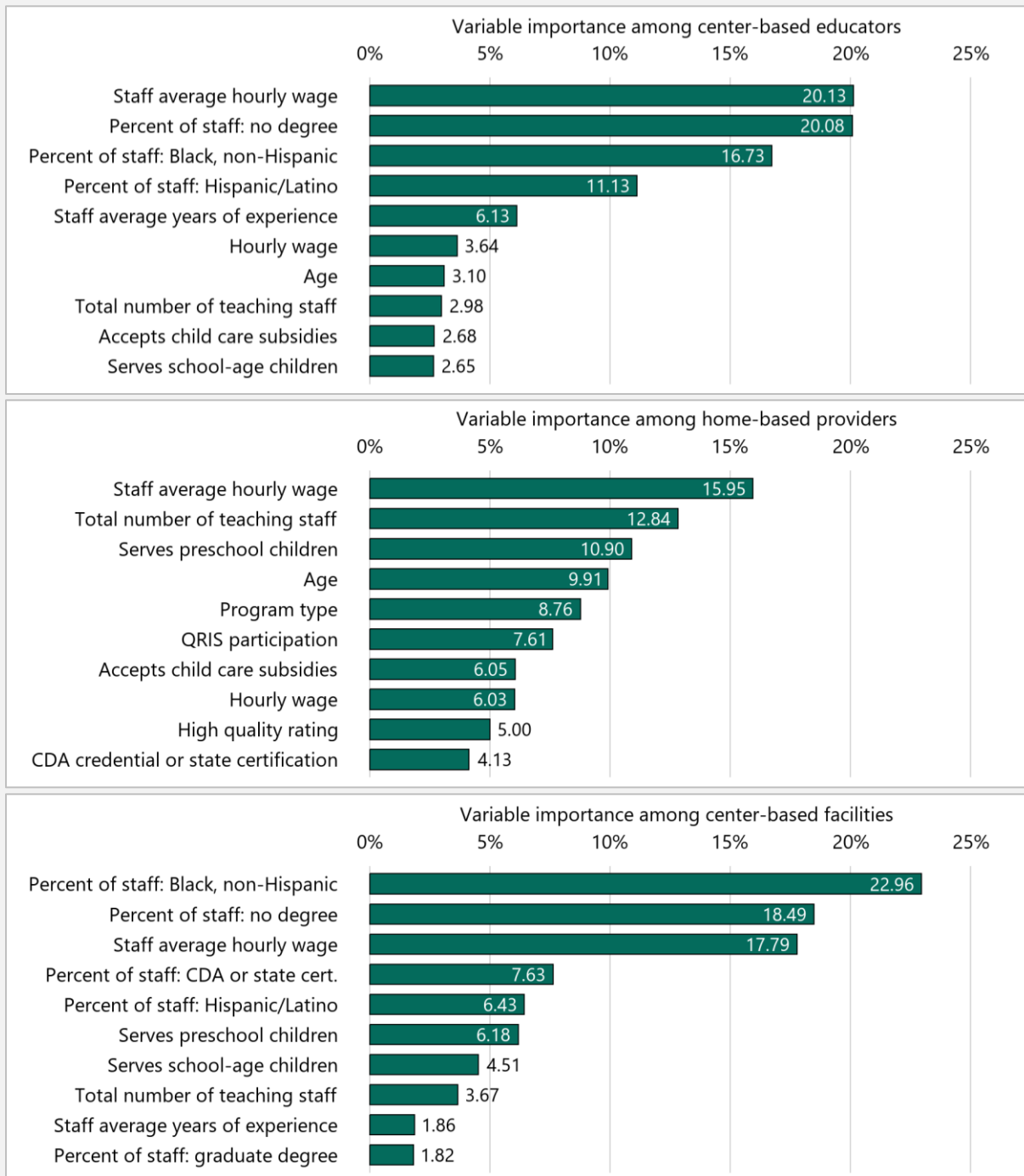
1. Baseline variable importance

As described in Section II.D.2.a, variable importance statistics indicate the relative contribution of each baseline or pre-treatment characteristic to predicting PEF participation under GBM methods. Values sum to 100 within each study population, with larger values indicating greater relative influence. They incorporate the different ways a characteristic contributed to the model, including missing values, non-linear terms, and interactions with other variables. Exhibit II.3 presents the 10 most influential characteristics for each study population; Appendix Exhibit B.1 presents results for all characteristics.

Across the three study populations, the most influential characteristics reflected substantive baseline differences between PEF participants and eligible nonparticipants in compensation, workforce composition, service model, and facility operations. Among center-based educators, the strongest predictors primarily described the workforce at their baseline facilities. Staff average hourly wage and the share of staff with no college degree each accounted for about 20 percent of total variable importance, followed by the shares of staff who were Black, non-Hispanic and Hispanic/Latino, at 17 and 11 percent, respectively. Staff average years of experience accounted for another 6 percent, and the educator's own hourly wage accounted for 4 percent. Educator age and facility workforce size, subsidy participation, and school-aged children served also distinguished PEF participants from nonparticipants.

Among home-based providers, staff average hourly wage was also the most influential characteristic, accounting for 16 percent of variable importance. The number of teaching staff accounted for 13 percent, preschool-aged children served accounted for 11 percent, and provider age accounted for 10 percent. Facility type accounted for 9 percent, followed by QRIS engagement at 8 percent, and subsidy participation and providers' own hourly wage at 6 percent each. High quality rating and CDA credential or state certification also contributed to the propensity score model.

Among facilities, the strongest predictors described workforce demographics, qualifications, and compensation. The share of staff who were Black accounted for 23 percent of variable importance, while the share with no college degree and staff average hourly wage each accounted for 18 percent. The share of staff with a CDA or state certification accounted for 8 percent, and the share who were Hispanic/Latino and preschool-aged children served each accounted for about 6 percent. School-aged children served, facility workforce size, and staff average experience also contributed to the estimated propensity score.

Exhibit II.3. Baseline and pre-treatment characteristics with the greatest influence on propensity score estimates by study population

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Exhibit presents variable importance values as percentages for center-based educators (top panel), home-based providers (middle panel), and center-based facilities (bottom panel). GBM-based importance metrics reflect the relative contributions of baseline characteristics to predicting PEF participation. Data were drawn from Appendix Exhibit B.1.

CDA = Child Development Associate.

Appendix Exhibits B.2 through B.4 show the direction of these relationships by comparing PEF participants with eligible nonparticipants before weighting.¹⁷ The largest differences again concerned baseline wages, staff qualifications, center workforce demographics, and home-based provider operations. Across study populations, PEF staff and facility workforces had higher baseline wages. They were also more likely to include staff with a CDA and no college degree, while fewer PEF participants held bachelor's degrees. Among centers, PEF educators were substantially more likely to be Black and less likely to be White. Among homes, PEF providers were far less likely to work in FCC settings and without other teaching staff and were more likely to work in GCC settings and with three or more teaching staff.

2. Propensity score distributions

Exhibit II.4 presents the distributions of estimated propensity scores by PEF participation status and study population before common-support restriction. Propensity scores for eligible nonparticipants were concentrated near the lower end of each distribution, indicating that many differed from PEF participants in their combinations of baseline and pre-treatment characteristics. Scores for PEF participants were more widely distributed, reflecting greater variation within the program population. This pattern is consistent with the PEF's broad eligibility and high initial take-up.

The distributions illustrate the basis for common-support restriction by showing the overlap in estimated propensity scores between PEF participants and eligible nonparticipants. The restriction removed observations with estimated scores outside the range common to both groups. Nearly all center-based PEF educators and facilities—98 percent—and most home-based providers—91 percent—were retained, preserving broad representation of the participant populations in the ATT estimates. Much larger shares of eligible nonparticipants—about one half of center-based educators and facilities and nearly three-quarters of home-based providers—were excluded because their propensity scores fell below the PEF-group minimum.¹⁸ Final analytic sample sizes were reported in Section II.B.4.

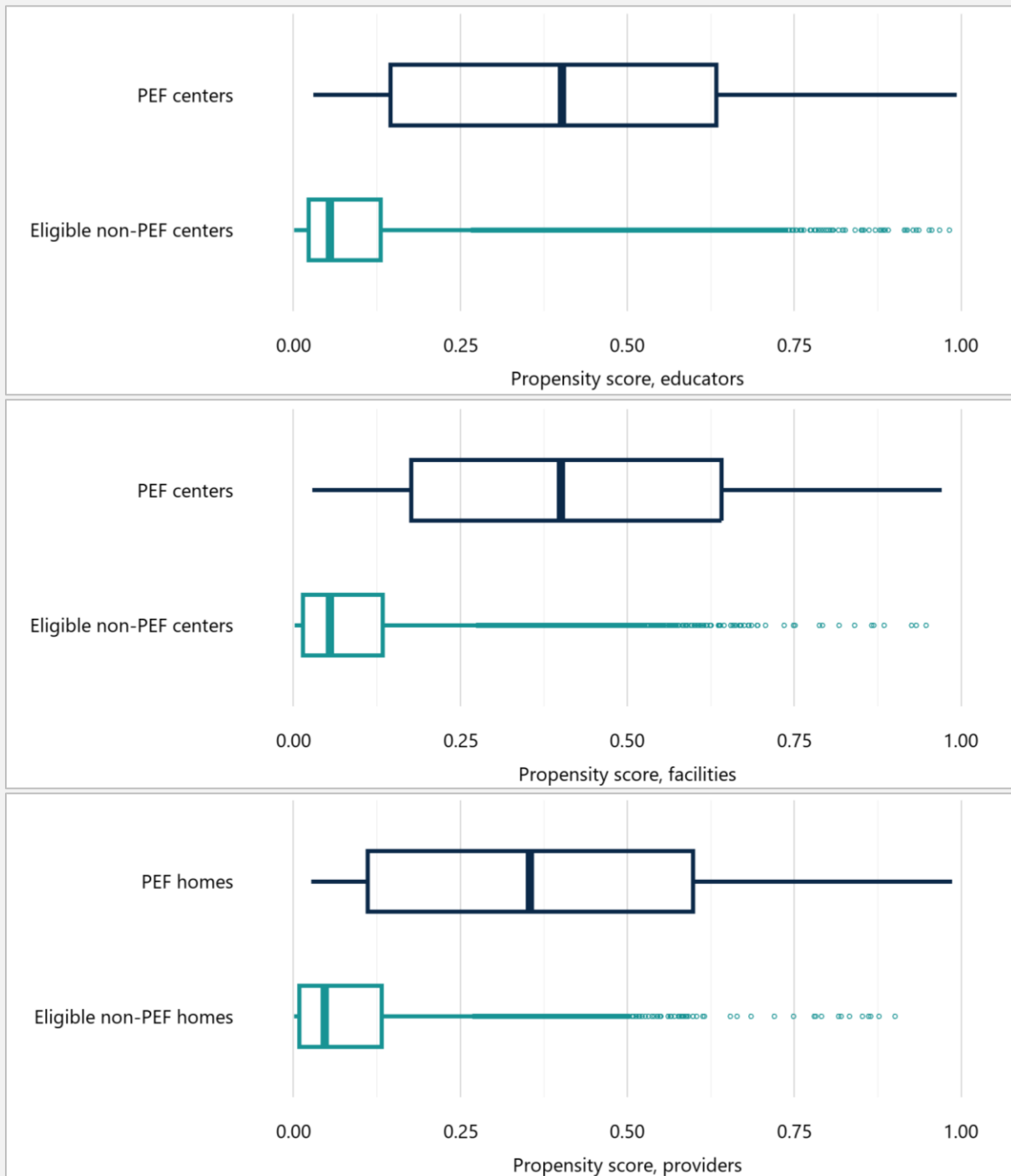
3. Assessment of propensity score weighting

As described in Section II.D.2.b, we used the estimated propensity scores for the analytic samples to construct weights targeting the ATT. Weighting was intended to increase the influence of eligible nonparticipants whose baseline characteristics more closely resembled those of PEF participants and to reduce the influence of less similar observations. We assessed how well the weighting procedure balanced the PEF and eligible non-PEF groups in terms of observed baseline and pre-treatment characteristics using the two diagnostics defined in Section II.D.2.c. ASDs measure differences in group means in pooled standard-deviation units, whereas KS statistics capture the largest difference between the full distributions of a characteristic. Exhibit II.5 summarizes the mean and maximum values of both statistics across characteristics, whereas Exhibit II.6 relates the ASD for each characteristic before and after weighting.

¹⁷ Variable importance statistics were based on estimated propensity score models using the full eligible samples, whereas variable means in Appendix Exhibits B.2 through B.4 were estimated using the common-support samples.

¹⁸ The relevant practical concern when excluding eligible nonparticipants outside the common-support area is whether enough comparison observations remain to precisely estimate the counterfactual. Because the national workforce registry data provided very large eligible comparison pools, the final analytic samples remained sufficiently large despite the considerable reductions due to violations of common support.

Exhibit II.4. Propensity score distributions for PEF participants and eligible nonparticipants by study population



Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Exhibit compares the distribution of estimated propensity scores by PEF participation status for center-based educators (top panel), center-based facilities (middle panel), and home-based providers (bottom panel) in the full eligible sample, including sampled staff and facilities with propensity scores outside the common support range.

Weighting substantially improved balance across all three study populations (Exhibit II.5). Mean ASDs declined from between 0.24 and 0.30 before adjustment to between 0.09 and 0.10 afterward, while mean KS statistics declined from between 0.10 and 0.12 to between 0.04 and 0.05. Maximum imbalances also fell sharply; maximum ASDs declined from between 0.89 and 1.49 to between 0.27 and 0.35, while maximum KS statistics declined from between 0.43 and 0.44 to between 0.11 and 0.15.

Exhibit II.5. Summary of balance measures before and after propensity score weighting by study population

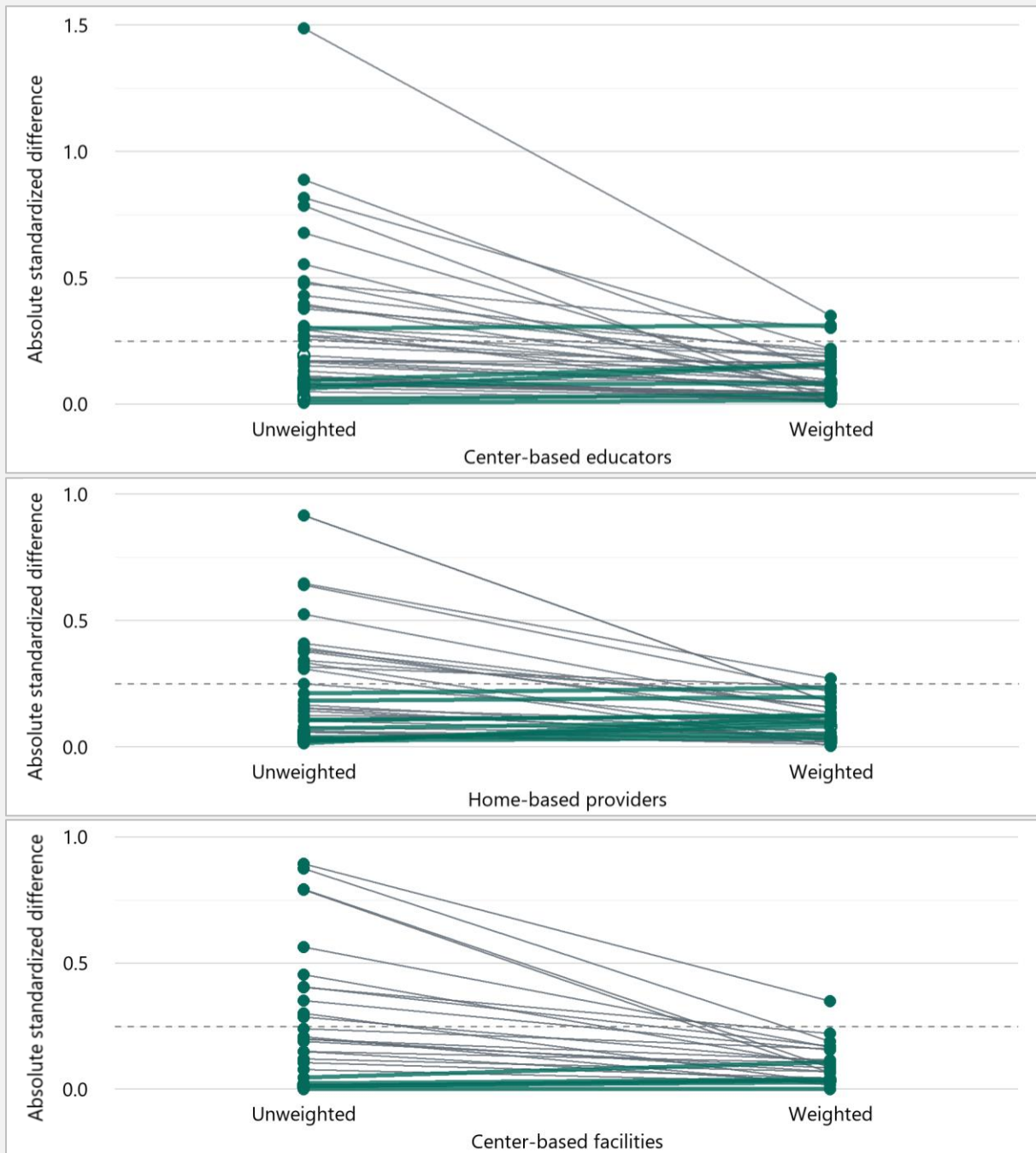
	Center-based educators	Home-based providers	Center-based facilities
Balance statistics			
Absolute standardized difference			
Mean across sample characteristics			
Unweighted	0.29	0.24	0.30
After propensity score weighting	0.10	0.09	0.10
Maximum across sample characteristics			
Unweighted	1.49	0.92	0.89
After propensity score weighting	0.35	0.27	0.35
Kolmogorov-Smirnov statistic			
Mean across sample characteristics			
Unweighted	0.11	0.10	0.12
After propensity score weighting	0.05	0.04	0.05
Maximum across sample characteristics			
Unweighted	0.43	0.44	0.44
After propensity score weighting	0.15	0.13	0.11
Sample sizes			
PEF participants	2,606	175	297
Eligible nonparticipants	46,086	2,748	4,751

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Table presents summary statistics for absolute standardized differences (ASDs) and Kolmogorov-Smirnov statistics across baseline characteristics used to generate each propensity score. Standardized effect sizes compare the difference in means by PEF participation status for each baseline characteristic, scaled by its pooled standard deviation, and ASDs reflect the absolute value of this difference. Values are expressed in standard-deviation units and larger values indicate greater imbalance between groups. The Kolmogorov-Smirnov statistic compares the full distributions of each sample characteristic between groups and is defined as the maximum absolute difference between the two cumulative distribution functions. Values range from 0 (indicating identical distributions) to 1 (indicating completely non-overlapping distributions).

Among center-based educators, 44 of the 46 characteristics used to estimate the propensity score—including applicable missingness indicators—fell below an ASD threshold of 0.25 after weighting (Exhibit II.6). The corresponding totals were 37 of 38 characteristics for home-based providers and 25 of 26 for center-based facilities. Across study populations, ASDs declined for nearly all characteristics after weighting, and the characteristics with the largest initial differences—discussed in Section II.E.1—generally showed the largest reductions; the few increases were modest (see also Appendix Exhibits B.2 to B.4).

Exhibit II.6. Effect of propensity score weighting on absolute standardized differences between PEF participants and eligible nonparticipants by study population



Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Exhibit presents ASDs for baseline and pre-treatment characteristics before and after propensity score weighting. ASDs reflect the absolute value of the difference in means between PEF participants and eligible nonparticipants for each characteristic scaled by its pooled standard deviation. Values are expressed in standard-deviation units and larger values indicate greater imbalance between groups. Dashed reference line indicates conservative ASD threshold of 0.25. Thin connecting lines indicate reductions in ASDs after weighting. Data were drawn from Appendix Exhibits B.2 to B.4.

III. Results

This chapter presents the estimated impacts of the PEF on center-based educators, home-based providers, and center-based facilities. Consistent with the theory of change presented in Exhibit I.2, we first report impacts on outputs and shorter-term outcomes and then turn to impacts on longer-term outcomes. The exhibits focus on findings central to the narrative and include related estimates needed to show patterns across study populations, outcomes, or follow-up periods. They present regression-adjusted means or percentages for the PEF and eligible non-PEF groups, with error bars representing 95 percent confidence intervals. Asterisks next to the PEF group estimate indicate the statistical significance of the estimated impact. Appendix C presents full data tables with the study impact estimates.

We integrate selected exploratory findings with the corresponding main impact findings. As described in Section II.D.4, these analyses examined whether impacts among center-based educators varied by baseline position and qualification tier and whether two-year impacts of initial PEF participation among center-based educators and facilities were concentrated among facilities that subsequently participated in the FY 2024 facility payment model. Appendix D presents the complete exploratory findings.

A. Impacts of the PEF on outputs and shorter-term outcomes

1. Impacts on hourly wages

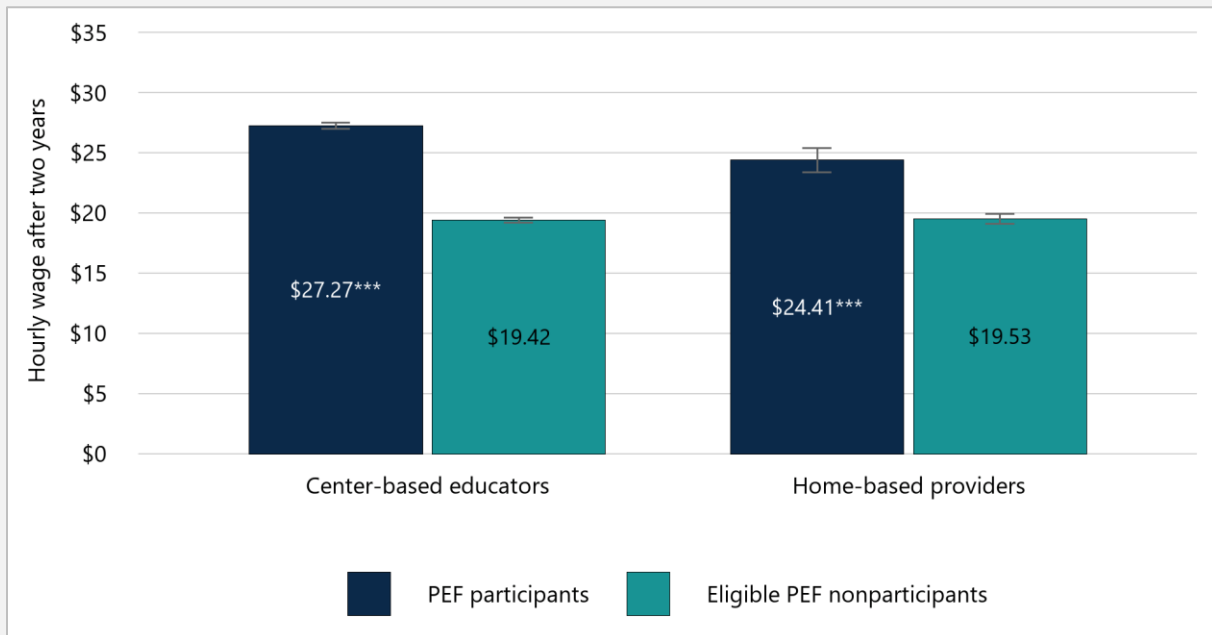
The most immediate expected result of the PEF was an increase in staff compensation. Among staff who remained with their baseline facilities and had verified follow-up wages, the PEF increased hourly wages after two years by \$7.85 for center-based educators, from \$19.42 to \$27.27 per hour, and by \$4.88 for home-based providers, from \$19.53 to \$24.41 per hour (Exhibit III.1). For context, the center-based educator estimate implied an annual wage increase of approximately \$15,300, consistent with prior labor market and benefit-cost findings (Schochet and Gonzalez 2026a, 2026b).¹⁹

Exploratory findings were consistent with the structure of the initial PEF payments and later facility salary scale (Exhibit III.2). Wage impacts were larger for lead teachers than assistant teachers—\$8.97 compared with \$6.30—and increased from \$6.77 among educators in the lower qualification tier to \$8.41 in the middle tier and \$10.85 in the higher tier. Wage impacts were also concentrated among educators whose baseline facilities participated in the facility payment model. The estimated impact was \$7.99 among educators at participating facilities and near zero among educators at facilities that did not participate.

2. Impacts on retention, job experience, and recruitment

The PEF increased center-based educators' attachment to their baseline facilities. After one year, 72.5 percent of PEF educators remained with their baseline facility, compared with 68.3 percent of eligible non-PEF educators, an impact of 4.2 percentage points (Exhibit III.3). After two years, the corresponding rates were 54.9 and 50.1 percent, an impact of 4.8 percentage points. Consistent with these retention effects, the PEF increased educators' accumulated experience with their baseline facilities by about one-third of a year at both follow-up points (Appendix Exhibit C.1).

¹⁹ The annual increase was calculated by multiplying the estimated \$7.85 hourly wage impact for center-based educators by an assumed full-time, year-round schedule of 37.5 hours per week for 52 weeks.

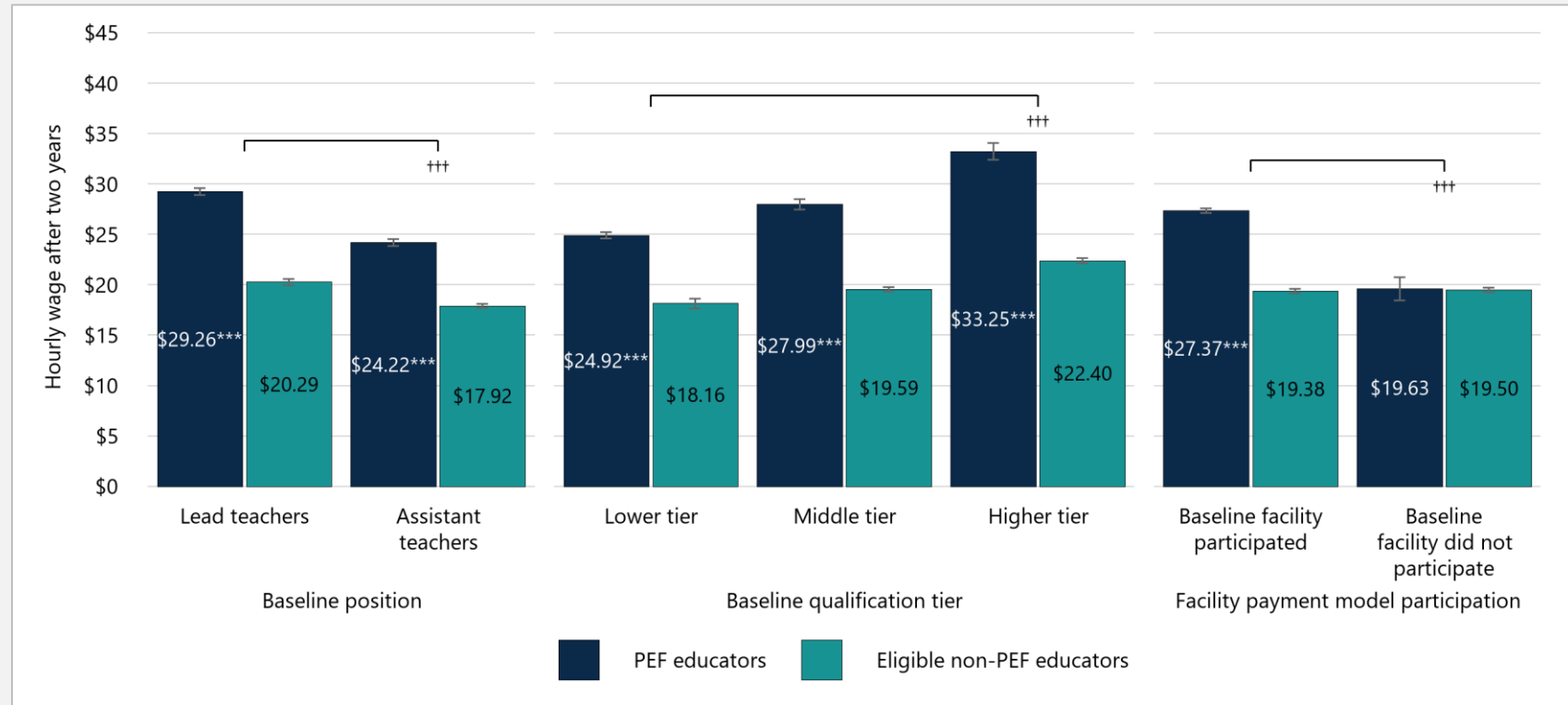
Exhibit III.1. Impact of the PEF on hourly wages among center-based educators and home-based providers

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Exhibit presents regression-adjusted means and 95 percent confidence intervals by research group for each study population. Estimates were based on 1,293 PEF educators, 14,621 eligible non-PEF educators, 79 PEF providers, and 933 eligible non-PEF providers. Hourly wage after two years is missing for staff who were not with their baseline facility after two years or did not report verified wage data. Data were drawn from Appendix Exhibits C.1 and C.2.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

Exhibit III.2. Impact of the PEF on hourly wages by baseline position, qualification tier, and facility payment model participation among center-based educators

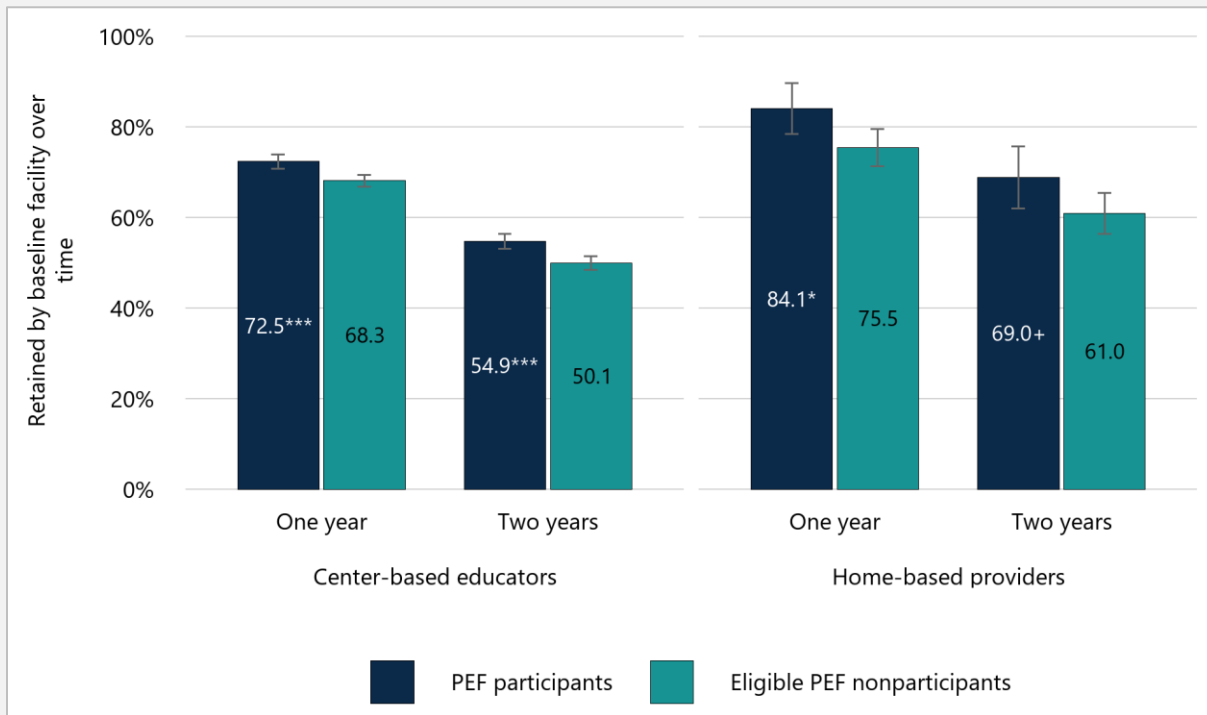


Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Exhibit presents regression-adjusted means and 95 percent confidence intervals by research group for each subgroup level or subpopulation. Estimates were based on 1,293 PEF educators and 14,621 eligible non-PEF educators across subgroup levels. Exhibit D.S1 presents detailed sample sizes from the exploratory analysis. Hourly wage after two years is missing for educators who were not with their baseline facility after two years or did not report verified wage data. Data were drawn from Appendix Exhibits D.1, D.2, and D.3.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^/+/++/+++ Estimated difference in impacts is statistically significant at the .10/.05/.01/.001 level (two-tailed).

Exhibit III.3. Impact of the PEF on retention to facility among center-based educators and home-based providers

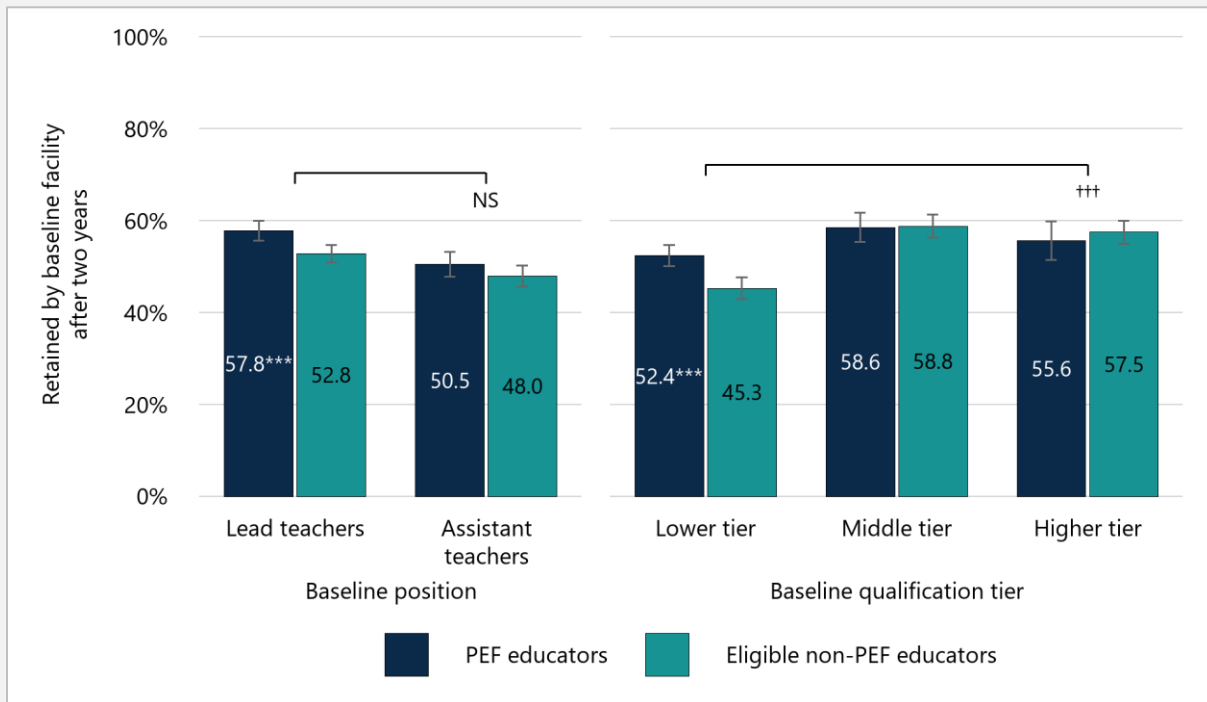
Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Exhibit presents regression-adjusted means and 95 percent confidence intervals by research group for each study population and outcome. Estimates were based on 2,606 PEF educators, 46,086 eligible non-PEF educators, 175 PEF providers, and 2,748 eligible non-PEF providers. Data were drawn from Appendix Exhibits C.1 and C.2.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

The PEF also increased retention among home-based providers, for whom remaining at a baseline facility often meant continuing to operate their child care business. After one year, 84.2 percent of PEF providers remained at their baseline facility, compared with 75.5 percent of eligible non-PEF providers, an impact of 8.6 percentage points (Exhibit III.3). The PEF also increased one-year job experience by 0.79 years (Appendix Exhibit C.2). After two years, the estimated impacts on retention and job experience remained similarly positive at 7.96 percentage points and 0.63 years, though were less precisely estimated; neither was statistically significant at the 5 percent level ($p = 0.06$ and 0.11 , respectively).

Exploratory findings indicated that, among center-based educators, retention effects extended across teaching positions but varied more clearly across qualification tiers (Exhibit III.4). The PEF increased two-year retention among lead teachers by 5.0 percentage points. The estimate for assistant teachers was also positive, at 2.5 percentage points, but was not statistically significant; this effect was also not significantly different from the lead teacher effect. By contrast, the two-year retention impact was concentrated among educators in the lower qualification tier, for whom the PEF increased the probability of remaining with the baseline facility by 7.1 percentage points. Impacts were near zero in the middle and higher tiers, and the differences in impacts across the three tiers were statistically significant.²⁰

Exhibit III.4. Impact of the PEF on retention to facility by baseline position and qualification tier among center-based educators

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

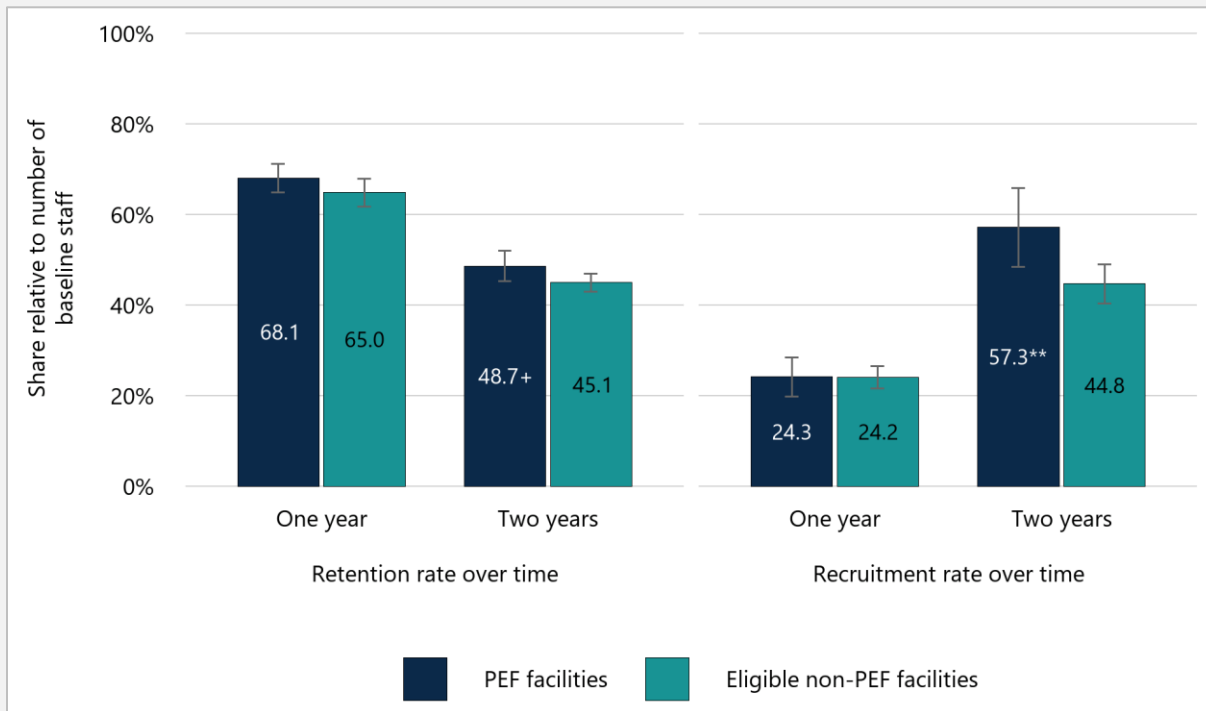
Note: Exhibit presents regression-adjusted means and 95 percent confidence intervals by research group for each subgroup level or subpopulation. Estimates were based on 2,606 PEF educators and 46,086 eligible non-PEF educators across subgroup levels. Exhibit D.S1 presents detailed sample sizes from the exploratory analysis. Data were drawn from Appendix Exhibits D.1 and D.2.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^/t/+/++/+++ Estimated difference in impacts is statistically significant at the .10/.05/.01/.001 level (two-tailed).

At the facility level, the estimated impact on the one-year retention rate of 3.1 percentage points was positive but not statistically significant (Exhibit III.5). After two years, PEF centers had retained 48.7 percent of their baseline teaching staff, compared with 45.1 percent among eligible non-PEF centers, an impact of approximately 4 percentage points that was statistically significant at the 10 percent level. As described in Section II.B.2, the facility-level retention measures were based on the full baseline workforce roster—including educators that did not receive or were otherwise ineligible for the initial payments—and were estimated from far fewer observations than the staff-level measures; retention estimates are therefore not directly comparable across levels of analysis, and the facility estimates are less precise.

²⁰ One-year retention findings followed the same pattern within and across educator baseline position and qualification tier subgroups, although the positive estimated impact among assistant teachers was statistically significant, unlike the two-year effect (Appendix Exhibits D.1 and D.2).

Exhibit III.5. Impact of the PEF on retention and recruitment rates among center-based facilities

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Exhibit presents regression-adjusted means and 95 percent confidence intervals by research group for each study outcome. Estimates were based on 297 PEF facilities and 4,751 eligible non-PEF facilities. Retention and recruitment rates measured as the share of staff in each group relative to the total number of staff employed at baseline. Data were drawn from Appendix Exhibit C.3.

+/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

The PEF's impact on facility recruitment was larger than its impact on retention and emerged at the two-year follow-up (Exhibit III.5). PEF facilities and eligible non-PEF facilities both had recruitment rates of about 24 percent after one year. After two years, however, the PEF increased facility recruitment by about 12.5 percentage points, from 44.8 to 57.3 percent—equivalent to roughly 0.12 additional hires per baseline teaching staff member. Virtually all of the two-year impact occurred during the second follow-up year (Appendix Exhibit C.3).

B. Impacts of the PEF on longer-term outcomes

1. Impacts on facility operations, staffing, and capacity

PEF and eligible non-PEF facilities had similar closure rates after one year, but after two years, 16.0 percent of PEF facilities had closed, compared with 10.0 percent of eligible non-PEF facilities, an estimated impact of 6.0 percentage points (Exhibit III.6). At the same time, the PEF increased the number of educators per facility by 0.9 after one year and by 1.4 after two years, when average staffing levels for PEF and eligible non-PEF facilities were 10.0 and 8.6 educators, respectively. Increased staffing reflects the combination of

higher retention rates and higher recruitment rates after two years. The estimated impact on licensed capacity after two years was also positive but not statistically significant. Consistent with increased staffing and little change in licensed capacity, the PEF increased the number of teaching staff per licensed slot by 0.02 educators (Appendix Exhibit C.7). Together, these findings indicate that the increase in staffing occurred primarily within facilities' existing licensed capacity.

Exploratory analysis by facility payment model participation helps clarify this combination of increased retention, recruitment, and overall staffing alongside no change in licensed capacity and higher closure rates. Most PEF centers in the analysis—86 percent—participated in the FY 2024 facility payment model (Appendix Exhibit D.S1). Among this subpopulation, the PEF increased two-year retention by 7.1 percentage points and recruitment by 16.7 percentage points, effects that were larger than the corresponding estimates for the full facility sample (Exhibit III.7). The corresponding estimates also showed increases in the number of educators while the estimated impact on program closure was small and not statistically significant. The estimated impact on licensed capacity remained positive and small.

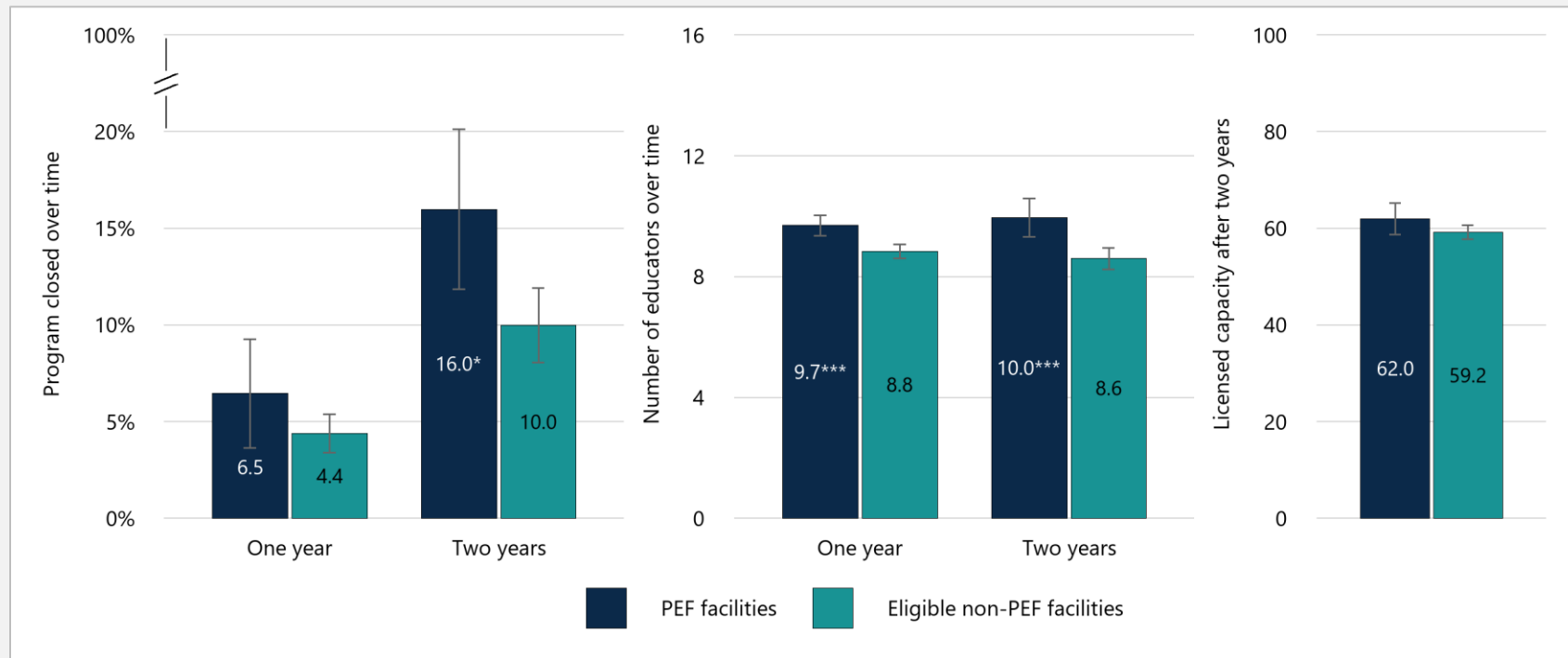
This pattern suggests that the increase in program closures estimated in the full facility sample was primarily concentrated among the group of PEF facilities that did not receive a quarterly facility payment in FY 2024. This group was small and closely intertwined with facility closure. Approximately half of the PEF facilities that did not participate in the facility payment model had closed by the two-year study follow-up (Appendix Exhibit D.7), two in three of which had already closed before the first facility payments were issued. The exploratory analysis therefore identifies where the overall closure effect was concentrated but cannot establish whether nonparticipation contributed to closure or instead reflected unobservable conditions that already placed these facilities at greater risk.

2. Impacts on education, qualifications, and career advancement

The PEF promoted substantial gains in education and qualifications among center-based educators. After two years, the program increased the probability that an educator remained with their facility and attained a higher level of education than they held at baseline by 8.5 percentage points (Exhibit III.8). The PEF also increased the probability of obtaining an AA degree or above by 6.2 percentage points, a BA degree or higher by 4.5 percentage points, and an AA degree or above specifically in CCEE or a related field by 3.2 percentage points. The overall estimated impact on promotion to a higher position was positive but not statistically significant (Appendix Exhibit C.4), although exploratory analyses by baseline position identified promotion gains for assistant teachers of 3.4 percentage points (Appendix Exhibit D.5); promotions from lead teacher to director were very rare.²¹

Home-based providers showed a similar pattern, although the smaller sample of PEF providers resulted in less precise estimates (Exhibit III.8). The PEF increased the probability of educational attainment by 7.9 percentage points. The estimated impacts on obtaining an AA degree or above and a BA degree or above were 5.3 and 4.5 percentage points, respectively, and statistically significant at the 10 percent level. The estimated impact on obtaining a CCEE-specific degree was also positive but not statistically significant.

²¹ Exploratory analyses by baseline position also found education and qualification gains among both lead and assistant teachers, with larger impacts for lead teachers on some outcomes (Appendix Exhibit D.5). We did not examine qualification gains by qualification tier because tier membership determined which gains were possible.

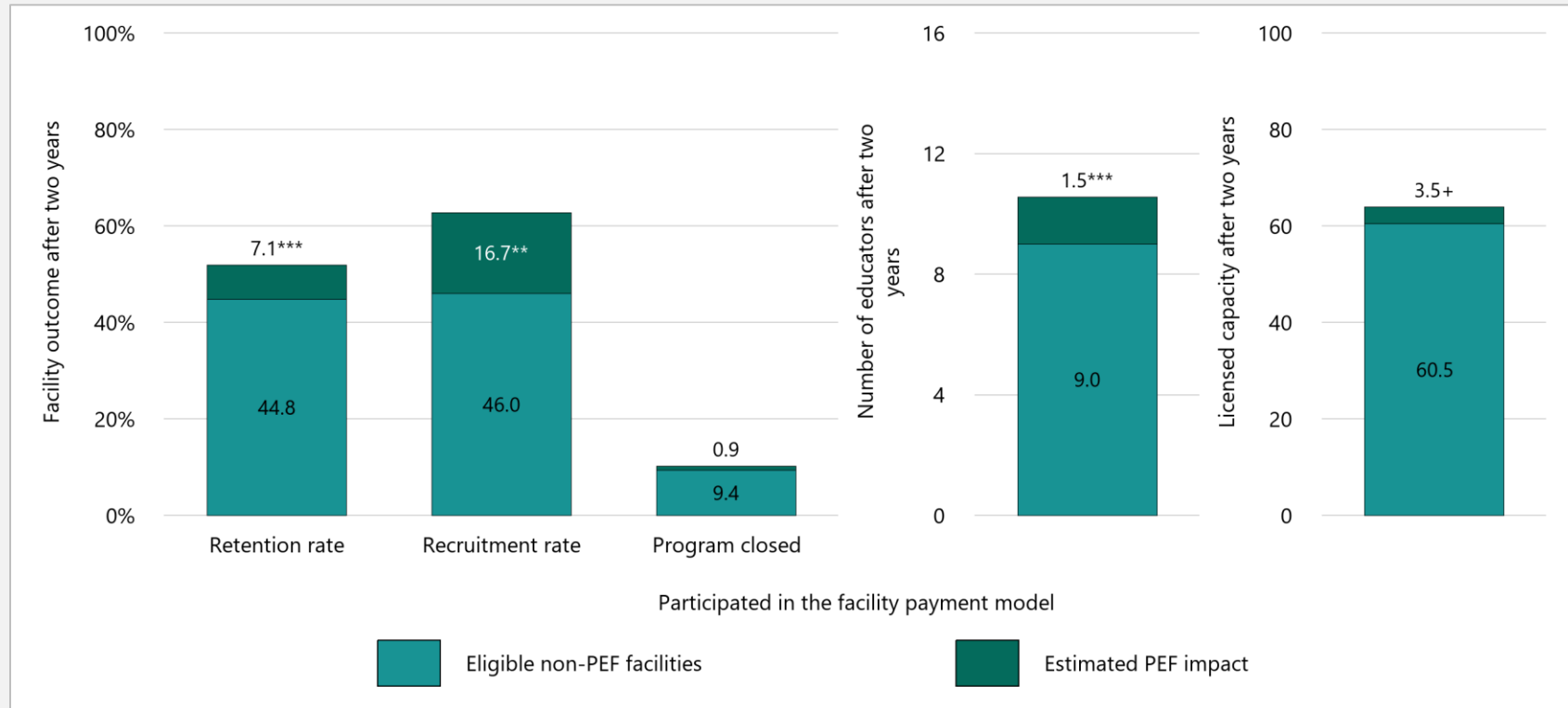
Exhibit III.6. Impact of the PEF on program closures, staffing, and licensed capacity among center-based facilities

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Exhibit presents regression-adjusted means and 95 percent confidence intervals by research group for each study outcome. Estimates were based on 297 PEF facilities and 4,751 eligible non-PEF facilities. Staffing and capacity outcomes equal zero for facilities that were closed as of one or two years after baseline, as applicable. Data were drawn from Appendix Exhibit C.6.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

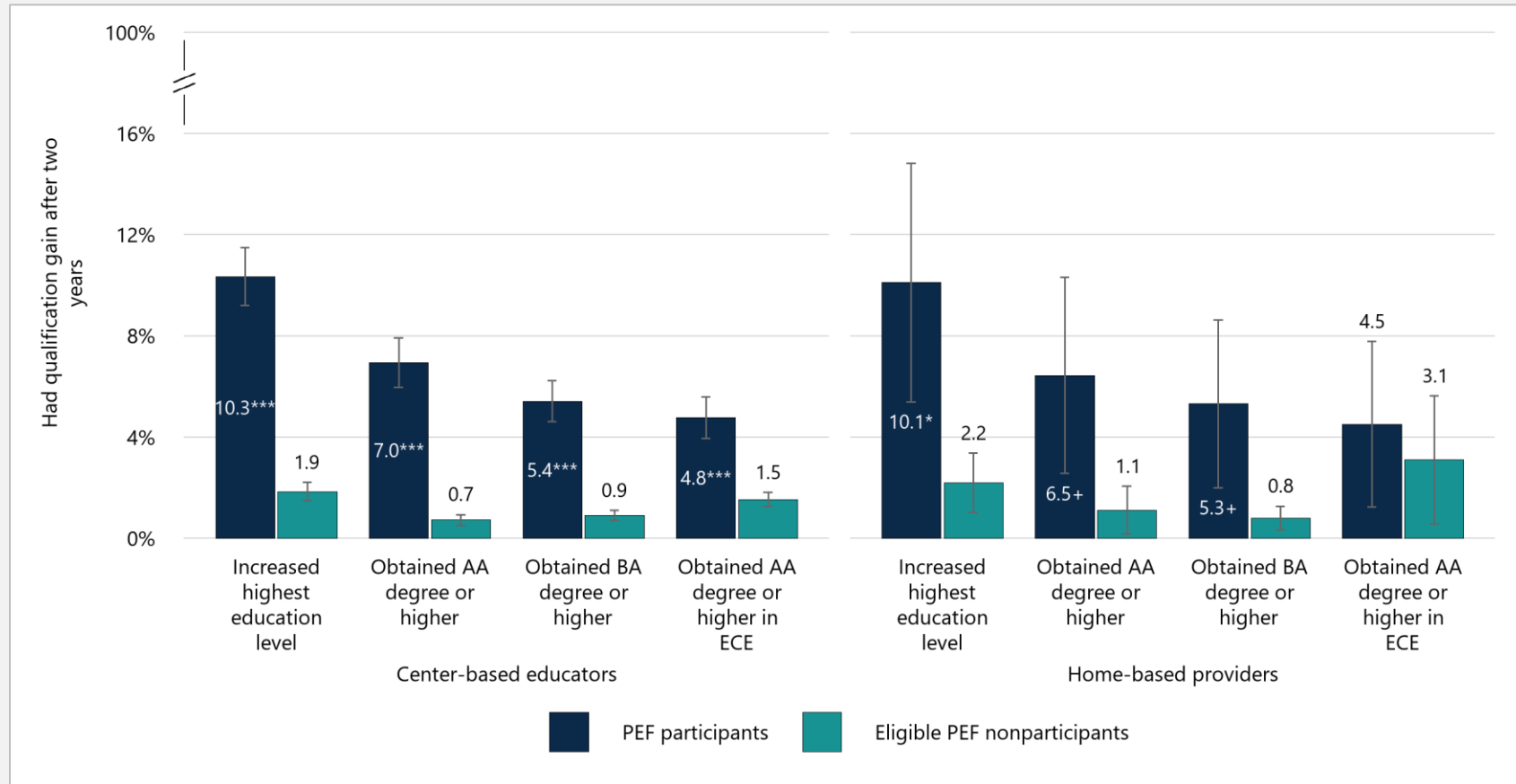
Exhibit III.7. Impact of the PEF on retention and recruitment rates, program closures, staffing, and licensed capacity among center-based facilities that participated in the facility payment model



Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Exhibit presents regression-adjusted means among eligible non-PEF facilities and the estimated PEF impact for each study outcome. Estimates were based on 256 PEF facilities that participated in the facility payment model and 4,751 eligible non-PEF facilities. Retention and recruitment rates measured as the share of staff in each group relative to the total number of staff employed at baseline. Staffing and capacity outcomes equal zero for facilities that were closed as of two years after baseline. Data were drawn from Appendix Exhibits D.4 and D.7.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

Exhibit III.8. Impact of the PEF on increased education and qualifications among center-based educators and home-based providers

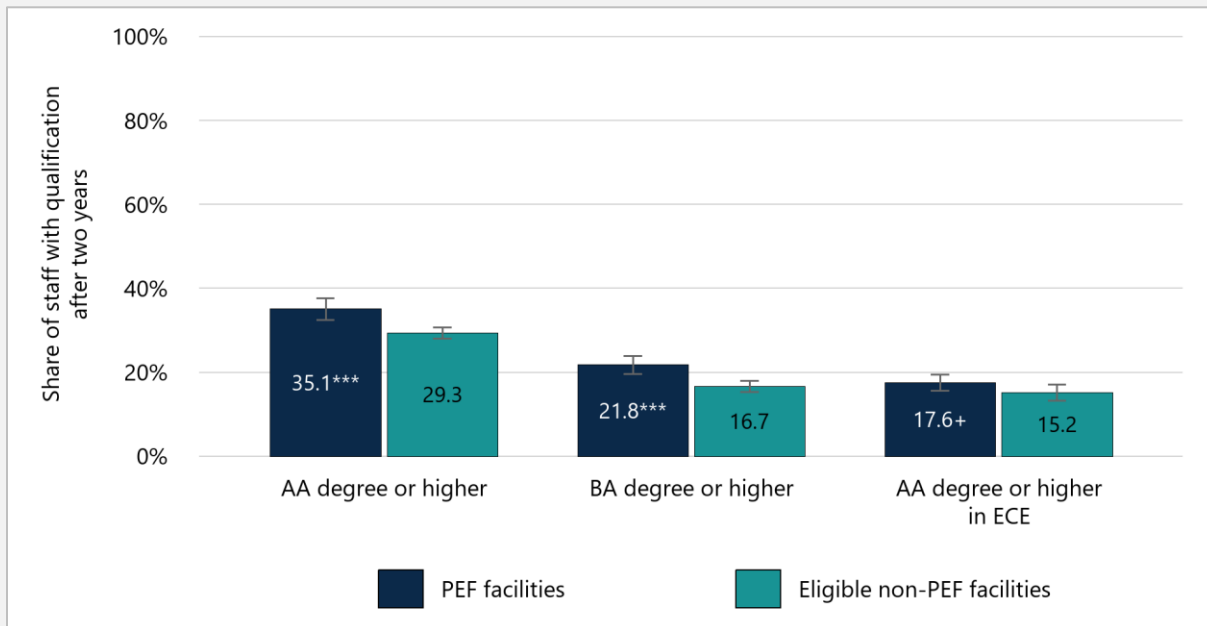
Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Exhibit presents regression-adjusted means and 95 percent confidence intervals by research group for each study population and outcome. Estimates were based on 2,604 PEF educators, 43,737 eligible non-PEF educators, 175 PEF providers, and 2,523 eligible non-PEF providers. All qualifications outcomes equal zero for staff who were not with their baseline facility after two years. Degree and qualification attainment outcomes equal zero for staff who had the relevant degree or qualification or higher at baseline. Data were drawn from Appendix Exhibits C.4 and C.5.

+/*/**/**** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

At the facility level, the PEF also improved the qualification profile of the teaching workforce employed after two years. The program increased the share of facility staff with an AA degree or above by 5.8 percentage points and the share with a BA degree or above by 5.1 percentage points (Exhibit III.9). It also increased the share of staff with a degree in CCEE or a related field by 2.4 percentage points, an impact that was statistically significant at the 10 percent level.

Exhibit III.9. Impact of the PEF on workforce education and qualifications among center-based facilities



Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

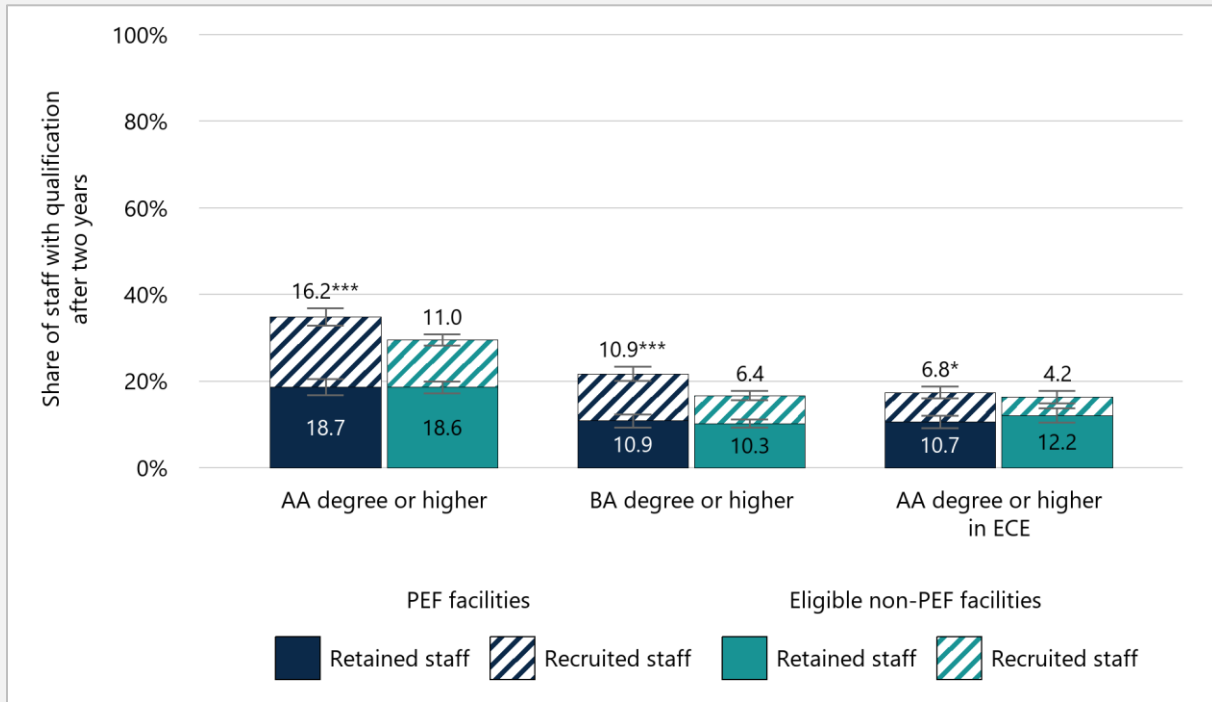
Note: Exhibit presents regression-adjusted means and 95 percent confidence intervals by research group for each study outcome. Estimates were based on 297 PEF facilities and 4,726 eligible non-PEF facilities. Workforce education and qualifications outcomes measured as the share of staff with each degree or qualification relative to the total number of staff after two years, and equal zero for facilities that were closed as of two years after baseline. Data were drawn from Appendix Exhibit C.7.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

Exhibit III.10 separates each workforce qualification share into the portions represented by retained and recruited staff. The findings suggest that higher qualification shares at PEF facilities were concentrated in the recruited portion of the follow-up workforce. The PEF increased the share of the follow-up workforce composed of newly recruited staff with an AA degree or above by 5.2 percentage points, with a BA degree or above by 4.5 percentage points, and with an AA degree or above in CCEE by 2.6 percentage points. By contrast, the retained components of the qualification shares did not differ significantly between PEF and eligible non-PEF facilities.²²

²² Because these measures use the full follow-up workforce as the denominator, they do not show the qualification profile of retained or recruited staff or qualification gains among retained staff. For example, although the estimated

Exhibit III.10. Impact of the PEF on workforce education and qualifications by staff recruitment status among center-based facilities



Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

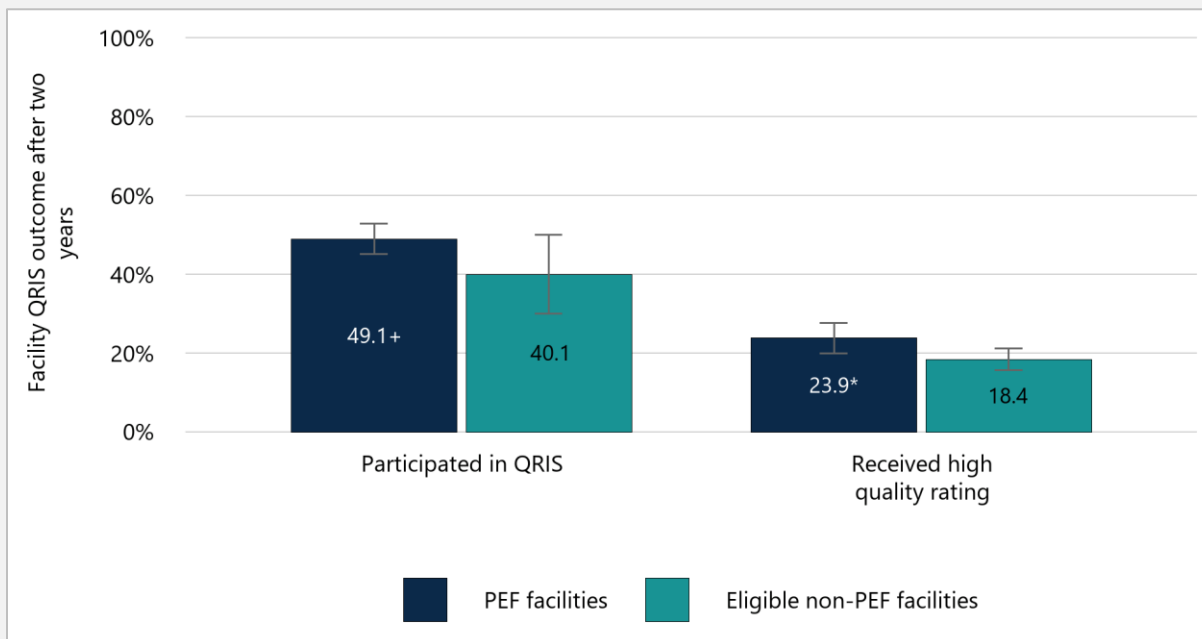
Note: Exhibit presents regression-adjusted means and 95 percent confidence intervals by research group for each study outcome. Estimates were based on 297 PEF facilities and 4,726 eligible non-PEF facilities. Workforce education and qualifications outcomes measured as the share of retained or recruited staff with each degree or qualification relative to the total number of staff after two years, and equal zero for facilities that were closed as of two years after baseline. Data were drawn from Appendix Exhibit C.7.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

3. Impacts on QRIS engagement and quality ratings

The PEF increased facility engagement with public quality-improvement systems. After two years, 49.1 percent of PEF facilities participated in QRIS, compared with 40.1 percent of eligible non-PEF facilities, an impact of 9.0 percentage points that was statistically significant at the 10 percent level (Exhibit III.11). As part of the FY 2024 facility payment model, OSSE began conducting classroom quality observations at participating facilities, including private-pay facilities not already observed through DC's QRIS. This brought some facilities into closer contact with the District's quality-improvement infrastructure and may have modestly encouraged QRIS participation (DC OSSE, personal communication, July 2026).

impact on the retained component for an AA degree or above was essentially zero, adjusted results suggest both that PEF facilities retained more staff with this qualification (1.9 compared with 1.6 staff) and that it was more common among the retained workforce (39 versus 35 percent). The recruited components similarly combine the amount of recruitment with the qualification profile of recruits and therefore do not distinguish whether the positive estimated impacts reflect more recruitment, a more qualified mix of recruits, or both.

Exhibit III.11. Impact of the PEF on QRIS participation and quality ratings among center-based facilities

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Exhibit presents regression-adjusted means and 95 percent confidence intervals by research group for each study outcome. Estimates were based on 297 PEF facilities and 2,887 eligible non-PEF facilities. In states with mandatory QRIS participation (IL and PA), the participation measure includes facilities with a rating above the level automatically assigned through licensing. High quality ratings include facilities at the highest rating level that participate in QRISs with three or four known quality rating levels (DC, IL, NV, PA, and WI) and facilities at the fourth or fifth levels that participate in QRISs with five known quality rating levels. Quality rating and engagement outcomes equal zero for facilities that were closed as of two years after baseline and were not available for facilities in NY and OH. Data were drawn from Appendix Exhibit C.7.

+/*/**/**** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

The PEF also increased participation in QRIS with a high quality rating by 5.5 percentage points, from 18.4 to 23.9 percent. This estimate should be interpreted more cautiously than the QRIS participation result, however. The outcome measure combines information from QRISs with different rating structures and policies, and baseline ratings used to model change over time were affected by pandemic-related disruptions to classroom observation and rating processes.²³

²³ For example, in DC, OSSE paused the classroom observations used to assign and update facility quality ratings during the pandemic. When the PEF launched, facilities therefore either had ratings based largely on pre-pandemic observations or remained at the preliminary level if they had not received an earlier rating.

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IV. Discussion

This study provides the first quasi-experimental evidence on how the Early Childhood Educator Pay Equity Fund affected the CCEE staff and facilities directly exposed to the program.²⁴ To our knowledge, it is also the first impact evaluation of an early childhood program or policy to assemble population-level workforce registry microdata across multiple states and localities. During its first three fiscal years, the PEF increased wages in the amounts and patterns expected under its payment rules, strengthened staff attachment to their baseline facilities, increased facility recruitment and staffing, and improved staff and facility workforce qualifications. These findings extend prior sector-level evidence by identifying the staff and facility pathways through which aggregate employment and wage gains occurred.

For some outcomes farther along the theory of change, the evidence was more differentiated. Career advancement gains were concentrated among assistant teachers, with weaker evidence of an opposing effect among lead teachers. Staffing growth occurred mainly within facilities' existing licensed capacity, which may be expected because licensed capacity depends on physical space and licensing requirements. The finding of higher closure rates among PEF facilities ran counter to the program's theorized effects. Estimates for QRIS engagement and ratings moved in the expected direction, although the rating estimate should be interpreted cautiously because QRIS systems differ in their rating structures and policies. Taken together, the findings support the central logic of the PEF while also showing that its effects varied across domains and developed on different timelines.

A. Summary of findings

The study used standardized, population-level workforce registry records from multiple jurisdictions to construct an observed counterfactual for a policy implemented in one local area. To estimate what would have happened without the PEF, the study needed a comparison group that resembled PEF participants before the program began. Even after applying common eligibility and geographic restrictions, eligible nonparticipants differed from PEF participants in baseline wages, qualifications, workforce demographics, and facility characteristics. Workforce registry records from several metropolitan areas across six states not only comprised a large comparison pool but also provided a broader range of staff and facilities across the baseline and pre-treatment measures.

The size and diversity of the comparison pool made it possible to retain nearly all PEF participants within the area of common support while identifying eligible nonparticipants who more closely resembled PEF participants in DC and who were consequently given greater weight in the analysis. Propensity score weighting substantially reduced the observed differences between the groups. While we cannot verify the parallel-trends assumption for all measures or rule out unobserved differences (see also Box IV.1), the propensity score results support the plausibility of the weighted comparison group as a counterfactual for estimating program impacts.

²⁴ PEF participants were identified based on receipt of an initial wage payment. HC4CC began after the study baseline but some participants enrolled during the follow-up period—roughly one in three based on FY24 estimates (Schochet and Gonzalez 2026b). The estimates therefore reflect the PEF as implemented, including any contribution of HC4CC among enrolled participants. The study data did not identify HC4CC enrollment or capture the compensation value of subsidized health insurance coverage or its other direct health and financial benefits that mediate study outcomes.

The PEF increased compensation in the amounts and patterns expected under the program’s design. After two years, the PEF increased hourly wages by \$7.85 among retained center-based educators and by \$4.88 among retained home-based providers. Among center-based educators, wage impacts were larger for lead teachers than assistant teachers, increased across qualification tiers, and were concentrated among educators whose baseline facilities participated in the FY 2024 facility payment model. These patterns provide an important check that the linked records and study design detected the expected program output.

The PEF strengthened staff attachment to their baseline facilities. Center-based educators were approximately 4 and 5 percentage points more likely to remain with their baseline facility after one and two years, respectively, and accumulated about one-third of a year more experience with that facility at each follow-up. The one-year estimate represents a 13 percent reduction in expected annual attrition. Home-based providers experienced larger retention gains, including an 8.6 percentage-point impact after one year, although these estimates were less precise because of the smaller participant sample. Among center-based educators, gains extended across teaching positions but were concentrated more clearly among educators in the lower qualification tier.

Facility recruitment was an important pathway through which the PEF increased labor supply. Facility workforce recruitment rates were nearly identical after one year, but after two years the PEF increased recruitment by 12.5 percentage points, with virtually all of that effect emerging during the second follow-up year. The combination of stronger retention and recruitment then translated into higher employment levels overall. The PEF increased average staffing by 0.9 educators after one year and 1.4 educators after two years. Among facilities still operating after two years, staffing increased by about 12 percent from baseline at PEF facilities, compared with an average decline of about 3 percent at eligible non-PEF facilities.

Facility staffing gains occurred primarily within existing licensed capacity and were concentrated in fewer operating centers. The PEF did not produce a statistically significant overall increase in licensed capacity after two years, but it increased the number of teaching staff per licensed slot. The findings are consistent with facilities first filling vacancies, staffing additional classrooms within their existing licenses, or operating at more favorable staffing levels before undertaking the more substantial changes in physical space and licensing needed to expand formal capacity. At the same time, the PEF increased two-year facility closure by 6 percentage points. Exploratory findings show that the closure effect in the second year was concentrated in the smaller group of centers that did not participate in the facility payment model.

The PEF improved education and qualifications among staff and across facility workforces. Center-based educators were more likely to increase their highest education level and obtain AA, BA, and field-specific degrees while remaining with their baseline facility. Home-based providers experienced similar gains, though their estimates were less precise. PEF facilities also employed larger shares of staff with AA and BA degrees after two years, with the increases concentrated in the recruited portion of the follow-up workforce. Anticipated policy changes to staff credential requirements in DC took effect later in the follow-up period and may have contributed to some qualification gains, although several estimated effects extended beyond the new minimum standards.

The PEF's effects on career advancement differed by educator position. The overall impact on promotion was positive but not statistically significant. Exploratory analysis, however, suggested a pattern of offsetting effects by educator position at baseline. The PEF increased promotion among assistant teachers by 3.4 percentage points, nearly always to lead teacher, while the estimated effect on promotion from lead teacher to director was negative at the 10 percent significance level. The latter finding is suggestive but consistent with wage compression between teaching and leadership positions, which were ineligible for PEF payments, as a possible unintended consequence of the program.

The PEF may also have increased facility engagement with public quality systems and the prevalence of high ratings. After two years, the program increased QRIS participation by 9 percentage points and participation with a high rating by 5.5 percentage points. The increase in QRIS participation may reflect a specific overlap between the facility payment model and DC's quality system. Private-pay centers not already participating in the QRIS were required to undergo the same classroom observations as a condition of receiving PEF facility payments, which may have increased their familiarity with the QRIS and encouraged enrollment (DC OSSE, personal communication, July 2026). The positive estimate for high quality ratings should be interpreted more cautiously because the study had to translate different state rating scales and policies into a common outcome measure. Pandemic-related disruptions also influenced the baseline ratings measure used to assess change over time.

Taken together, the impact findings support the theory of change but also show that impacts developed differently across domains and over time. Staff retention gains were evident after one year and persisted through the second year, whereas evidence of increased facility recruitment emerged during the second year. The program had begun to influence several longer-term outcomes after two years, including increased staffing and several measures of staff and workforce qualifications, while others—particularly licensed capacity—may require more time or different conditions. The remainder of the chapter interprets these findings in the sequence established by the study theory of change.

B. Interpreting impacts along the theory of change

We interpret the findings in the sequence established by the study theory of change, beginning with compensation and then moving through staff attachment, facility workforce stability and staffing, operations and service capacity, staff and workforce qualifications, career advancement, and service quality. The study workforce registry records did not measure the financial and professional well-being mechanisms through which the program was expected to affect these outcomes; instead, we draw selectively on findings from prior implementation research when they help interpret the estimated impacts. Box IV.1 summarizes this and other limitations of the study design, data, and measures.

1. The PEF increased compensation in the amounts and patterns expected under the program's design

Hourly wage was the study's only measured output, so the wage findings mainly serve as a check that the study's linked workforce registry records and quasi-experimental design captured the compensation changes produced by the program. The magnitude of the wage effects aligned closely with independent estimates derived from different data sources. Annualizing the hourly wage effect for center-based educators assuming full-time schedules of 35 to 40 hours per week yields impacts of \$14,300 to \$16,300.

This range includes comparable figures of \$15,200 and \$15,500 from cost analysis of FY 2024 program expenditures and estimated labor market impacts on employer-reported wages, respectively (Schochet and Gonzalez 2026a, 2026b). Although these estimates came from different data sources and research methods, their convergence across workforce registry records, program expenditure reports, and federal employer payroll data strengthens confidence that the study detected compensation gains of the expected size.

Variation in the wage estimates was also consistent with the program's payment rules. Impacts were larger for lead teachers than assistant teachers and increased across qualification tiers, matching the ordering of the initial direct payments and salary scale requirements. The proportional difference between within-subgroup effects also approximated the difference between the initial payments by educator position and the distribution of minimum required salaries across the salary scale. For instance, the estimated impact for lead teachers was approximately 42 percent larger than the impact for assistant teachers, whereas the direct payment rate for lead teachers was 40 percent larger than for assistant teachers. The two-year wage impacts were also concentrated among educators at facilities that participated in the facility payment model and were near zero among retained educators at facilities that did not. This pattern is consistent with the program design because, by the two-year study endpoint, the facility payment model was the only channel through which program funds reached educator wages.

2. The PEF strengthened staff attachment to their baseline facilities

The retention outcomes measured whether staff remained with the same licensed facility. Staff attrition could reflect a move to another licensed facility, including another site operated by the same organization; departure from the CCEE field or exit to unemployment; or closure of the baseline facility. The study measure therefore captures continuity in a facility's workforce and in educators' relationships with children, families, colleagues, and administrators at that site. It should not be interpreted as a direct estimate of staff retention to the CCEE field or labor supply.

Among center-based educators, the one-year impact represented a 13 percent reduction in expected attrition relative to the estimated counterfactual; this impact remained mostly similar after two years. The corresponding increase in accumulated experience indicates that the PEF increased the duration of educators' attachment to their baseline facilities as well as the probability that they were observed there at a particular follow-up endpoint. The estimates for home-based providers—a population rarely represented in rigorous studies of CCEE compensation—were larger, representing a one-year reduction in attrition by almost one-third, but also less precise. Site-specific retention also has a somewhat different interpretation in home-based care, particularly for primary providers who operate the business and for whom remaining with the baseline facility generally means continuing to operate the same licensed program. The outcome therefore combines elements of business continuity and employment stability. Nevertheless, the study estimates provide novel evidence that increased compensation can strengthen workforce continuity in both the licensed center-based and home-based sectors.

Among center-based educators, the study impacts on staff retention were in the range of estimated effects from Colorado's Child Care Assistance Program (CCCAP) Teacher Salary Increase Pilot, which, as described in Section I.B, reported a 6.5 percentage-point increase in retention to educators' baseline facility after approximately one year (Maier et al. 2025). The estimate was not statistically significant, but

the authors note that the study may have lacked sufficient power to detect an effect of that size; given available funding, just 30 percent of 74 applicant centers were assigned to receive the salary increases. Like the PEF, the CCCAP pilot supported large staff compensation increases that were not conditioned on future retention or other behaviors or outcomes. It nevertheless operated on a much smaller scale, was targeted to a selected subset of centers that were most engaged with public sector programs, and was a temporary pilot initiative designed to fund compensation increases for two years.

Both estimates were smaller than the 11-percentage-point impact of Virginia’s Teacher Recognition Program (TRP), which offered a \$1,500 payment contingent on remaining at the same facility for eight months (Bassok et al. 2021). The TRP directly changed the financial return to remaining with the same site through the end of the period because the payment was forfeited if an educator left. By contrast, the PEF sought to raise compensation broadly toward parity with public school teachers, improving the relative attractiveness of sector employment without making future payments contingent on remaining with the baseline facility. Retention-contingent incentives and sustained wage increases are therefore closely related but not interchangeable policy tools. The former may generate a larger immediate effect on site-specific retention whereas the latter can influence a wider set of employment decisions—including remaining with an employer, moving among eligible facilities, remaining in the field, or entering it—and can continue to affect staff and facilities after a short incentive period ends.²⁵ Against that background, a 13 percent reduction in annual attrition from a broadly available program operating across the sector represents a meaningful effect.

Exploratory findings suggest that the retention effects extended across teaching positions but were more varied by qualifications. The impacts were concentrated among the roughly half of educators in the lower qualification tier, for whom the PEF increased retention by 7.1 percentage points after two years, while estimated effects were near zero in the middle and higher tiers. This pattern may indicate that employment decisions among educators with lower qualifications and lower expected compensation without the PEF were more responsive to increased pay, even though their absolute wage gains were smaller than those of educators in the higher tiers. The analysis cannot identify whether the differences arose from relative wage changes, financial need, outside employment alternatives, baseline turnover risk, or other characteristics associated with educator qualification level.

Retention and experience gains were also concentrated among educators whose baseline facilities subsequently participated in the FY 2024 facility payment model—a group that included about nine in ten baseline participants. This pattern is consistent with the importance of sustaining higher compensation after the transition from direct educator payments to the facility payment model. However, facilities chose whether to participate, and some facilities that did not participate in the program had already closed before the first facility payments were issued. The exploratory estimates therefore cannot isolate the effect of sustained exposure to higher wages on staff retention and job experience outcomes, although they are consistent with that mechanism.

²⁵ The impacts of the TRP have not been reported beyond the initial eight-month follow-up. The program relied on temporary federal funding and did not continue after that funding expired (Virginia Department of Education n.d.).

3. The PEF strengthened facility workforce stability through retention and recruitment

The facility retention findings extend the staff-level analysis from the initial participant cohort to the full teaching workforces of sampled centers. The facility measure therefore better describes stability across the entire teaching workforce, whereas the staff-level measure more directly reflects the experience of initial participants. The modest positive effect after two years was consistent with the educator findings, though slightly smaller and less precisely estimated. Including baseline teaching staff who were not part of the initial participant cohort in the facility workforce rosters may have attenuated the estimate, and the smaller number of PEF observations reduced its precision.

The larger effect on facility workforce stability occurred through recruitment. PEF and eligible non-PEF facilities both recruited new hires equal to about one-quarter of their baseline workforces during the first year, but by the end of the second year, the PEF had increased the facility recruitment rate by 12.5 percentage points. This is equivalent to about 0.12 additional hires per baseline teaching staff member, or roughly 1.2 additional recruits for a facility that began with 10 educators. Virtually all of the cumulative impact was estimated to have emerged during the second follow-up year.²⁶

This finding helps explain the program's previously documented positive impact on labor supply in the aggregate (Schochet 2023, 2024; Schochet and Gonzalez 2026a). The three-year labor market impact study found that the program increased the DC CCEE workforce by an estimated 341 workers, or about 11 percent, by the end of 2024. The current study suggests that this growth reflected both stronger retention and more hiring within sampled facilities, with recruitment accounting for the larger difference by the end of the follow-up period. The PEF has often been understood as a policy for stabilizing the workforce through retention; these results show that making CCEE employment more attractive to prospective workers was also central to its influence on labor supply.

The current estimates provide novel evidence of the program's impact on workforce recruitment and are consistent with other descriptive evidence from DC and elsewhere. Center directors participating in the PEF reported that the more competitive wages supported by the program improved their ability to compete for staff and attract qualified applicants. Analysis of administrative records also found that DC educators entering the licensed workforce or changing employers were more likely to join centers participating in the facility payment model (Doromal, Lamb, et al. 2025; Nikolopoulos et al. 2025). More broadly, descriptive evidence links higher CCEE wages to fewer vacancies and staffing challenges and a greater ability to hire staff with the desired experience and qualifications (Hall et al. 2024).

Additional research is needed to understand why recruitment gains emerged later than retention gains and how this pattern related to program implementation. One plausible explanation is that hiring responses take longer to emerge than retention responses. Recruitment requires prospective workers to learn that compensation has changed, decide to enter or change jobs, identify vacancies, complete application or credentialing requirements, and be matched with an employer. These steps can take longer than decisions by existing staff about whether to remain in their current jobs.

²⁶ As previously described, DC workforce outcomes were observed in separate point-in-time registry snapshots at each follow-up endpoint, whereas comparison-state registry extracts summarized employment activity over the full two-year follow-up period and employment at each endpoint was determined using employment dates, histories and

The transition to the facility payment model may have also increased the visibility of the compensation change to applicants as these processes unfolded. The initial payments were delivered directly to educators already employed in eligible roles and did not necessarily appear in the wages advertised by employers. Under the facility payment model, PEF-supported wages became part of regular payroll, allowing participating facilities to advertise higher salaries as ongoing compensation. Recruitment gains emerged during the portion of the follow-up period roughly corresponding to the program year after the facility payment model was introduced. The analysis cannot distinguish the effect of this change from the effect of additional time since baseline because both occurred over the same period. The timing of recruitment gains could reflect the spread of information about higher pay, ordinary job search and employment transitions, the incorporation of PEF payments into advertised wages, or some combination.

4. The PEF increased facility staffing primarily within existing licensed capacity

Changes in facility staffing reflect the balance between educators who remain and new staff who are hired. When a facility is already fully staffed, stronger retention mainly reduces the need to hire replacements. When vacancies constrain operations or enrollment, or when a facility seeks to expand, retention and recruitment can both increase workforce size. The PEF findings are consistent with this second possibility; modest retention gains combined with larger recruitment gains to increase average staffing in the District by 0.9 educators after one year and 1.4 educators after two years.

The two-year staffing impact represented an increase of about 14 percent relative to the size of the average center workforce at baseline—approximately 10.1 educators. This is comparable to the earlier labor market impact study finding of an 11 percent increase in sector-wide employment over the same period.²⁷ Among PEF facilities that remained open, baseline staffing had increased by about 12 percent after two years, compared with a smaller average decline of about 3 percent among eligible non-PEF facilities that continued to operate. In the earlier labor market study, employment in the counterfactual also changed little over the same period, increasing by about 3 percent. Together, these findings suggest that the PEF supported growth in facility workforces and sector labor supply during a period when employment in the counterfactual remained below pre-pandemic levels and staffing shortages persisted across the sector (McLean et al. 2024; Schochet and Gonzalez 2026a).

Estimated staffing gains were not accompanied by changes in facility licensed capacity, although this result should not be interpreted as evidence that the PEF had no effect on the number of children served or on facility staffing conditions. Licensed capacity represents the maximum number of children a facility is authorized to serve based on building space, certificates of occupancy, and licensing requirements; it does not indicate actual enrollment and might not be expected to change over a relatively short period (DC OSSE, personal communication, July 2026). Many facilities operate below their licensed limit, either by design or because of low enrollment, staffing shortages, or both. Additional educators could allow

status indicators. This distinction is most relevant for interpreting how the cumulative two-year retention and recruitment effects were distributed between the first and second follow-up years.

²⁷ The estimates are not directly equivalent. The facility analysis follows staff who entered sampled centers in eligible teaching roles and assigns zero staff to facilities that close. The labor market analysis includes all payroll jobs reported by child care services establishments, including some nonteaching staff and home-based facilities with payroll employees, and reflects both establishment entry and exit.

facilities to fill vacancies, staff more classrooms, add shifts or coverage for absences, or operate with more favorable staffing ratios. Because the study did not observe enrollment, it cannot determine whether the additional staff also allowed facilities to serve more children within their existing licensed capacity.

The higher two-year closure rate among PEF facilities contrasted with the otherwise favorable effects estimated across most study outcomes. Closure rates were similar after one year, but by the two-year follow-up, the PEF had increased facility closure by 6 percentage points. Because many longer-term facility outcomes, including staffing and capacity, were assigned values of zero when baseline facilities closed, the closure effect reduced the estimated full-sample gains in these outcomes relative to the growth observed among facilities that remained open.

The facility closure finding is consistent with, and may help explain, findings from the earlier labor market study, which estimated increasingly negative, though not statistically significant, effects on the total number of reporting CCEE establishments over time (Schochet and Gonzalez 2026a). This study provides more specific evidence about the exit component of that aggregate measure by following whether centers operating at baseline subsequently closed.²⁸ A higher relative closure rate would contribute to the negative establishment gap unless it were offset by greater facility entry.²⁹ At a minimum, the two studies suggest that the PEF increased labor supply mainly by increasing staffing within existing facilities that continued to operate, rather than by increasing the total number of facilities in the sector, whether through fewer exits or more entrants.

The estimated closure effect arose as DC's center-based market was already shifting toward larger facilities during the pandemic recovery. Analysis of DC licensing records suggests that licensed slots grew faster than the number of facilities in the pre-treatment period (Willenborg et al. 2023). Centers that remained operational through the pandemic saw modest increases in licensed capacity, while centers that closed tended to be smaller on average. Researchers suggested that centers that remained open may have absorbed demand left by the closure of smaller centers and that fixed licensing and operating requirements may create economies of scale as enrollment grows. The launch of the PEF may therefore have interacted with an ongoing market shift, particularly if larger or more stable centers were better positioned to participate in the facility payment model.

Exploratory findings are consistent with this possibility but do not establish why facilities closed. Among centers that participated in the facility payment model, the two-year closure impact was small and not statistically significant, while licensed capacity increased modestly. The overall closure effect was concentrated among the smaller group of facilities that did not participate, which also tended to employ fewer staff and have smaller licensed capacities. About half of these facilities had closed by the two-year

²⁸ The labor market study findings on CCEE establishment counts should also not be strictly interpreted as direct evidence about the number of facilities despite being broadly comparable. In the earlier study, employers that operated multiple facilities appeared either as multiple establishments or a smaller number of consolidated establishments, depending on whether and how often they completed a reporting supplement that disaggregated employment and wages across facilities.

²⁹ The study was not designed to estimate impacts on facility entry. Descriptive analysis of the workforce registry records showed that among eligible facilities operating during the study period, about 9 percent of DC centers and 12 percent of large metro comparison-area centers opened during the follow-up period.

follow-up, and one in three had closed before the first facility payments were issued. Because facilities chose whether to participate during the follow-up period, the analysis cannot determine whether facility payment model participation helped facilities remain open or whether facilities that were already less likely to close opted into the program.

Taken together, the findings suggest that the PEF increased access to CCEE services mainly by increasing facilities' ability to use their existing licensed capacity, rather than by increasing the number of licensed slots or facilities. Staffing increased across the full sample of baseline facilities despite the higher estimated closure rate, likely allowing centers that continued operating to fill vacancies, staff more classrooms, and serve more children within their existing licenses. Enrollment data are needed to determine how much of the staffing increase translated into additional children served, and higher closure rates may still have reduced families' choice among facilities even if the added staffing increased the availability of services overall.

5. The PEF improved education and qualifications among staff and across facility workforces

The PEF increased the likelihood that staff remained with their baseline facility and advanced their education. Because the staff-level measures counted education and qualification gains only when staff remained with their baseline facility, the impacts combine stronger retention with greater attainment among retained staff. Center-based educators were more likely to progress to a higher education level and obtain AA, BA, and CCEE-specific degrees. Home-based providers showed a similar pattern, although estimates were less precise because of the smaller sample.

Two features of the PEF offer plausible explanations for these staff education and qualifications results. First, the large compensation increase may have made it easier for educators to pay for and complete coursework while remaining employed. Second, beginning in FY 2024, the salary schedule increased the financial return to additional education by tying minimum required salaries directly to educators' roles and qualifications. Educators and directors participating in the implementation study similarly reported that the prospect of higher salaries increased incentives and opportunities to pursue education and training (Doromal, Nikolopoulos, et al. 2025; Nikolopoulos et al. 2024). Although the PEF did not directly subsidize tuition, broader causal evidence shows that reducing financial barriers can increase persistence and degree completion (Bettinger et al. 2019; Dynarski 2008). To our knowledge, these findings provide the first quasi-experimental evidence that a CCEE compensation initiative increased formal education attainment.

At the facility level, the PEF also improved the qualification profiles of center workforces. These gains were concentrated in the portion of the follow-up workforce composed of newly recruited staff, consistent with the large recruitment effect discussed in the preceding section. Because the measures use the full follow-up workforce as their denominator, however, they combine the amount of recruitment with the qualifications of recruited staff. As a result, they cannot distinguish whether the PEF produced more recruitment, a more qualified mix of recruits, or both. The more limited conclusion is that qualified new hires accounted for most of the increase in facility workforce qualification shares. This finding complements the staff-level results, which separately show education and qualification gains among educators who remained with their baseline facilities.

This pattern is consistent with evidence that compensation can influence whom employers are able to recruit. As reviewed in Section I.B, research from K–12 teacher labor markets finds that substantial or differentiated financial incentives can attract academically stronger or more effective teachers, with especially strong evidence for recruitment into hard-to-staff schools and areas (Biasi 2021; See et al. 2020; Steele et al. 2010). DC center directors also reported that PEF-supported wages helped them attract applicants with stronger skills and qualifications (Nikolopoulos et al. 2025). In a sector with persistent vacancies and high turnover, higher wages may expand the applicant pool and improve facilities' ability to hire staff who meet their preferred qualifications. The current study did not observe applicants or estimate qualification rates specifically among recruited staff, so it cannot distinguish these changes from the broader increase in facility recruitment.

DC's implementation of minimum education requirements during the follow-up period is important context for interpreting both the staff- and facility-level qualification findings. OSSE adopted the requirements in 2016 and deferred the deadlines several times before they took effect for lead and assistant teachers and home-based providers in early FY 2024 (DC OSSE n.d.[d]). Emergency revisions adopted at that time broadened the available pathways for meeting the requirements, allowed teachers to remain employed while pursuing an associate degree, gave newly hired assistant teachers additional time to obtain a CDA, and created exemptions for some long-serving educators (DC OSSE 2023c); OSSE made these revisions permanent at the end of FY 2025, after the study period (DC OSSE 2025b). Several comparison jurisdictions already required college coursework or approved credentials for teaching staff, although the standards varied across states and roles (Bipartisan Policy Center 2024).

Exploratory findings by educator position help clarify where the licensing requirements may have mattered. The analysis estimated education and qualification gains among both lead and assistant teachers, with larger impacts for lead teachers on some outcomes. Assistant teachers could satisfy the new standard with a CDA, yet the PEF increased their attainment of college degrees, including CCEE-specific degrees, indicating gains beyond minimum compliance. For lead teachers, an AA degree or equivalent coursework generally met the standard, so the larger impacts for this group, as well as facilities' demand for teachers with these qualifications, may partly reflect the licensing requirements or their interaction with the PEF. Although the effects of the two policies cannot be fully separated, the findings suggest that the PEF helped educators and facilities respond to the new standards while also encouraging additional education and qualifications beyond the established minimums.

6. The PEF's effects on career advancement differed by educator position

Higher pay, increased retention and job experience, and gains in education and qualifications may also open pathways to career advancement. Because the study promotion measure was observed only for educators who remained with their baseline facility, it reflects advancement within the same center. As previously noted, formal advancement through defined staff roles is less applicable to home-based providers, who often own their programs or work in settings with few teaching staff. Across all center-based educators, the overall estimated impact on promotion was positive but not statistically significant. Exploratory findings by baseline position, however, identified offsetting patterns that were concealed by the overall effect. The PEF increased promotion among assistant teachers by 3.4 percentage points, while the estimated impact among lead teachers was negative and statistically significant at the trend level.

The concentration of promotion gains among assistant teachers is consistent with center staffing patterns and workforce flows. Assistants have a greater opportunity for career advancement within their facility because centers generally employ more lead teachers than directors, and turnover is likely higher among teaching staff than center administrators. The FY 2024 salary schedule may have further encouraged promotion from assistant to lead teacher by making the associated pay increase explicit. This may have been particularly true among assistant teachers with college degrees, for whom the promotion incentive was strongest.³⁰

Fewer opportunities for site-specific promotion help explain why advancement among lead teachers was rare, but not why the estimated PEF effect was negative. Instead, that result is consistent with concerns about wage compression between teaching and leadership positions as an unintended consequence of the PEF (Schochet and Gonzalez 2026a). As described in Section I.A, directors were ineligible for the direct PEF payments, and the facility payment model did not establish minimum salaries or require salary increases for staff in administrative roles. Raising lead teacher pay without guaranteeing a comparable increase for directors therefore reduced, and at some facilities may have eliminated, the financial return to moving from lead teacher to director. Prior implementation research found that nearly one-third of directors reported considering changing roles to become eligible for the direct payments, and after the salary schedule took effect, about one-quarter reported that most teachers at their facilities earned more than they did (Jimenez Parra et al. 2025; Nikolopoulos et al. 2024).³¹ Still, because the negative lead teacher estimate was significant only at the 10 percent level, it should be interpreted as suggestive. Taken together, the findings indicate that the PEF supported advancement from assistant to lead teacher while potentially weakening incentives to move from lead teaching into facility leadership.

7. The PEF may have increased facility engagement with public quality systems and the prevalence of high ratings

Several findings discussed above suggest favorable changes in the conditions that support service quality. The PEF increased staff retention and job experience, facility staffing, the number of teaching staff per licensed slot, and workforce qualifications. The QRIS findings extend this pattern to facility engagement with public quality systems and the prevalence of high ratings. After two years, the PEF increased QRIS participation by 9 percentage points and participation with a high quality rating by 5.5 percentage points. The effect on QRIS participation was statistically significant at the 10 percent level. These findings are consistent with the quality pathways in the theory of change, although the available measures do not identify the specific mechanisms through which the effects occurred.

The QRIS participation effect may partly reflect a specific overlap between the PEF facility payment model and the District's QRIS, Capital Quality. Capital Quality uses annual observations with evidence-based

³⁰ Among assistant teachers with a CDA or equivalent, promotion to lead teacher resulted in a 6 percent increase in FY 2024 minimum salary. Among assistant teachers with an AA degree and BA degree or higher, those figures were about 18 and 38 percent, respectively (DC OSSE n.d.[b]).

³¹ Because the staff sample was limited to PEF-eligible teaching roles at baseline and the facility workforce measures excluded recruited directors, the study could observe lead teachers who became directors but not directors who returned to teaching, moved to school-based settings or other sectors, or otherwise entered or left the workforce.

tools to inform facility ratings and provides participating facilities with technical assistance and continuous quality improvement supports (DC OSSE 2023d). As a condition of receiving PEF facility payments, private-pay centers not already participating in Capital Quality were required to undergo the same classroom observations used by the QRIS.³² This requirement brought additional centers into contact with OSSE staff who manage DC’s quality initiatives and the assessors who conduct Capital Quality observations, which may have increased their familiarity with the system and encouraged voluntary enrollment (DC OSSE, personal communication, July 2026). Prior descriptive analysis of administrative licensing records also found that facilities opting into the facility payment model were more likely to participate in Capital Quality (Doromal, Nikolopoulos, et al. 2025).

The positive estimate for high quality ratings is also consistent with the possibility that the PEF’s effects on workforce stability, staffing, and qualifications improved service quality. Educators and directors participating in the implementation study similarly reported improvements in educator–child interactions that they attributed to program-related gains in educator well-being, workforce stability, education, and training (Doromal, Nikolopoulos, et al. 2025; Nikolopoulos et al. 2024). Descriptive findings also suggested that facilities that opted into the facility payment model were more likely to hold one of DC’s two highest quality designations. OSSE also reported improvement in facility classroom observation scores over time and noted that ongoing investments in training, targeted supports, and coaching may have contributed, but did not identify a single system-level explanatory factor (DC OSSE, personal communication, July 2026). These efforts may have operated alongside the PEF and underscore that changes in quality ratings occur within broader QRISs that provide facilities with quality improvement supports.

Both QRIS outcomes required the study to align systems that differed in their structures, rating rules, and participation policies. Because licensing automatically placed facilities at the entry rating level in Illinois and Pennsylvania, the study counted facilities in those states as participating only if they demonstrated system engagement by advancing beyond that level. The study similarly defined high quality as the top rating category or categories according to the number of levels in each system. These rules improved comparability, but the underlying systems still differed in the criteria and observation tools used to determine ratings, how often facilities were observed or rerated, and the technical assistance and financial incentives associated with QRIS participation (The BUILD Initiative and Child Trends 2024).

The high-rating estimate should be interpreted cautiously. Because the outcome required both QRIS participation and a high rating, the impact could reflect more facilities entering QRIS and receiving high ratings or improvements among facilities already enrolled. Pandemic-related disruptions to QRIS rating processes, including canceled in-person observations, also affected the recency and consistency of baseline ratings in DC and some comparison systems. This made the baseline rating a less consistent basis for assessing change over time, adding to the challenges of comparing outcomes across different quality systems. Future research could supplement these findings with repeated classroom observation scores in DC and comparison areas with sufficiently comparable assessments and scoring. Such analyses could help distinguish changes in observed classroom practice from changes in QRIS participation or other components of facility ratings and provide more specific evidence about particular quality domains.

³² Facilities that participate in the DC Child Care Subsidy Program are required to participate in Capital Quality. Non-subsidy facilities may join voluntarily.

Box IV.1. Key limitations and considerations for interpreting the findings

- **The PEF and its policy context evolved during the follow-up period.** Participants were defined by receipt of an initial direct payment. During the follow-up period, however, some staff enrolled in HC4CC and most center-based facilities transitioned to the facility payment model. DC’s minimum education requirements also took effect. The study findings represent the impacts of initial PEF participation over a period in which the program and surrounding policy environment evolved.
- **The quasi-experimental design cannot rule out all alternative explanations.** The study used a large comparison pool, common eligibility and geographic restrictions, propensity score weighting, and regression adjustment to improve comparability on observed characteristics. Unobserved differences in levels or trends may, however, remain, and sufficient pre-treatment measures were unavailable to directly assess parallel trends for facility outcomes constructed from workforce rosters.
- **Workforce registry systems differed across jurisdictions.** The study selected comparison registries with required staff and facility participation, applied common reporting protocols, and reconciled employment records and definitions across data sources. Differences in collection windows, retrospective versus point-in-time reporting, record maintenance, and data verification may nevertheless affect the timing or measurement of some workforce changes.
- **Some outcomes provide only partial measures of broader concepts.** Same-facility retention does not fully distinguish moves between facilities from exits from the field; the facility analysis examined closures but not impacts on new market entry; licensed capacity does not measure actual enrollment; and the QRIS outcomes do not identify effects on underlying classroom quality domains. The two-year endpoint may also be too early to capture the full response of some longer-term outcomes, including licensed capacity and service quality.
- **Some outcomes combine multiple stages of the theory of change.** Assigning zero values to staff who left their baseline facilities and facilities that closed avoided conditioning the analysis on post-treatment quantities also influenced by the program, but it means that staff qualifications and promotion estimates also reflected retention, while facility staffing, capacity, workforce qualifications, and quality estimates also reflected continued operation. ▲

C. Conclusions

The PEF addresses a structural financing problem in the CCEE sector. Community-based facilities generally cannot raise educator pay to levels comparable with public schools through tuition alone without making care less affordable and reducing families’ demand for care. Yet keeping wages low constrains labor supply, leaving facilities with vacancies that limit their ability to staff classrooms and enroll children up to capacity. Both pressures threaten provider stability and restrict the supply of care. Sustained public financing offers one way to ease this tradeoff by raising compensation without passing the full cost to families. Most previous public compensation initiatives have been modest, temporary, or conditioned on specific behaviors, leaving little evidence about what such funding can accomplish at scale.

As the first dedicated public funding stream designed to sustain large compensation increases across a local CCEE sector, the PEF created a rare opportunity to examine that question (Schochet and Gonzalez 2026a). Building on prior evidence that the PEF increased sector employment and employer-reported wages, this study shows that those employment gains reflected both stronger retention and greater recruitment and translated into higher staffing at sampled centers. The program also improved education and qualifications among staff and facility workforces, increased promotion from assistant to lead teacher, and produced suggestive evidence of greater QRIS engagement and high ratings. Other findings were

more mixed. PEF facilities had higher closure rates, and the program may have decreased incentives for teaching staff to assume leadership positions.

The findings also show that the effects of public funding for subsidizing educator compensation depend on how those funds are delivered through the broader CCEE system; program impacts represented more than a simple transfer to individual workers. Under the facility payment model, incorporating PEF support into regular payroll made higher salaries more visible to applicants, while the salary schedule explicitly linked compensation to educator roles and qualifications. The findings also suggest that the program's reach and effectiveness were shaped by staff and facility participation, eligibility criteria and payment rules, and the interaction of the PEF with other workforce policies and preexisting CCEE market trends. Beyond the generosity of the compensation increase, the duration and reliability of support, how payments reach workers, which staff and facilities are eligible, how salary requirements are structured, and the administrative demands of participation can all shape effects on retention, recruitment, professional development, and facility operations.

Beyond its substantive findings, the study demonstrates that population-level workforce registry records from multiple jurisdictions can be standardized and analyzed together to support a quasi-experimental evaluation. Combining records from DC and six states made it possible to construct a plausible external comparison group for a broadly implemented policy in one locality. The linked records also made it possible to follow the same staff and facilities over time, distinguish retention from recruitment, and connect individual employment changes with facility staffing, operations, and workforce composition. This approach addresses measurement limitations of aggregate labor market data as well as design limitations of analyzing staff and facility administrative records from individual states or areas to evaluate universal sector programs or policies. It will not suit every policy or registry system, but it demonstrates a feasible approach for evaluating discrete state or local initiatives when multiple jurisdictions maintain sufficiently complete and comparable records. Continued development of state workforce registries—with attention to participation requirements, stable identifiers, preservation of historical records, data collection and verification, and links to other administrative data systems—would expand the range of policies and outcomes that can be evaluated in this way.

PEF Impact study evidence has informed the program as it has evolved. The DC Council cited earlier labor market and benefit-cost findings when it restored \$70 million in funding for FY 2025 (DC Council Committee of the Whole 2024). The FY 2027 Budget Support Emergency Act continues the program, allocates \$73.5 million in local funds, and extends the applicable minimum salary requirements through December 2027 (D.C. Act 26-416). The present study adds more specific evidence about the workforce and facility pathways behind the aggregate gains and identifies implementation features and possible unintended effects to consider as the program continues.

Related efforts have emerged elsewhere, and several have drawn explicitly on DC's experience or earlier evidence. These include wage pilots in Contra Costa County and King County (Mefferd, Doromal, Miles, et al. 2025; Powell et al. 2024), a staged compensation agenda in Connecticut that cited DC's early labor supply findings (Connecticut Blue Ribbon Panel on Child Care 2023; Connecticut Office of Early Childhood 2025), and broader public financing strategies in Vermont and New Mexico that support educator compensation, provider capacity, or both (New Mexico Early Childhood Education and Care Department

n.d.; Richards et al. 2025). These approaches differ in scale, funding, and delivery, and the prior and current study results do not imply that the same design will produce the same effects elsewhere. They do provide a stronger basis for assessing whether and how sustained public compensation funding can strengthen the CCEE workforce and the facilities in which educators work. The next questions are whether the gains persist, how they translate into enrollment and service quality over longer periods, and which design features are most important when similar investments are adapted to other settings.

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Appendix A

Supplemental methods exhibits

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Exhibit A.1. Study sample sizes for PEF participants and eligible nonparticipants and geographic distribution of eligible nonparticipants across comparison states by study population

	Center-based educators		Home-based providers		Center-based facilities	
	N	%	N	%	N	%
PEF participants						
Washington, DC	2,606	—	175	—	297	—
Eligible nonparticipants						
Unweighted						
Comparison states (total)	46,086		2,748		4,751	
Illinois	—	37	—	55.7	—	29.7
Nevada	—	1.6	—	1.5	—	1.8
New York	—	16.5	—	12.2	—	20.5
Ohio	—	17.9	—	14.4	—	24.8
Pennsylvania	—	18.6	—	7.2	—	14.3
Wisconsin	—	8.4	—	9	—	8.8
Propensity score weights						
Comparison states (total)	2,589		168		291	
Illinois		40		48.4		35.4
Nevada		0.7		1		0.8
New York		22.7		20.3		21.8
Ohio		19.9		17.9		21.2
Pennsylvania		12.4		7.9		10.7
Wisconsin		4.4		4.6		10.1

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Table presents sample sizes and percentages. Weighted total sample counts across comparison states are from sums of ATT propensity score weights and therefore are weighted pseudo-counts rather than actual number of records. Percentages are calculated separately within each study population and panel across the six comparison states.

Exhibit A.2. Operational definitions of study baseline and pre-treatment characteristics

Measure	Operational definition
Staff characteristics	
Staff demographics and qualifications	
Age	Age at study baseline, rounded to the nearest year (continuous)
Gender: female	Female relative to all other reported gender identities (binary)
Race and ethnicity	Hispanic/Latino; Black, non-Hispanic/Latino; White, non-Hispanic/Latino; other, non-Hispanic/Latino (categorical)
Non-English primary language	Primary or home language other than English (binary)
Highest level of education	No completed college degree; associate's degree; bachelor's degree; graduate degree (categorical)
Degree in ECE or related field	AA degree or above in early childhood education (ECE) or a related field (binary)
CDA credential or state certification	Child Development Associate (CDA) credential or another state-recognized early childhood certification (binary)
Staff employment characteristics	
Teaching position	Lead teacher or home-based provider relative to assistant teacher or assistant provider (binary)
Full-time/part-time status ^a	Reported or derived full-time employment status in the baseline job (binary)
Years of experience at program	Years elapsed between the baseline job start date and study baseline (continuous)
Hourly wage ^b	Verified or employer-reported hourly wage at baseline (continuous)
Facility characteristics	
Program operations	
Program type	Center; family child care (FCC) home; group child care (GCC) home (categorical)
Age groups served	Facility served infants; toddlers; preschoolers; school-age children at baseline, two years before baseline (binaries)
Licensed capacity	Authorized number of slots at baseline, two years before baseline (continuous)
Total number of teaching staff	Number of staff employed in eligible teaching roles at baseline (continuous)
QRIS participation ^c	Facility participated or engaged in the applicable quality rating and improvement system (QRIS) at baseline, two years before baseline (binaries)
High quality rating ^d	Facility participated in the QRIS and held a high quality rating at baseline, two years before baseline (binaries)
Accepted child care subsidies	Facility received subsidy funding at baseline, two years before baseline (binaries)
Operated for at least two years	Facility licensed to operate approximately two years before baseline (binary)
Facility workforce demographics and qualifications	
Percent of staff by race and ethnicity	Percentage of baseline teaching staff who were Hispanic/Latino; Black, non-Hispanic/Latino; White, non-Hispanic/Latino; other, non-Hispanic/Latino (continuous)
Percent of staff with non-English primary language	Percentage of baseline teaching staff whose primary or home language was not English (continuous)

Measure	Operational definition
Percent of staff by highest level of education	Percentage of baseline teaching staff with no completed college degree; associate's degree; bachelor's degree; graduate degree (continuous)
Percent of staff with degree in ECE or related field	Percentage of baseline teaching staff with an AA degree or above in ECE or a related field (continuous)
Percent of staff with CDA or state certification	Percentage of baseline teaching staff with a CDA credential or state-recognized early childhood certification (continuous)
Facility workforce employment characteristics	
Staff average years of experience	Average years employed with the baseline facility across teaching staff (continuous)
Percent of staff by program tenure	Percentage of baseline teaching staff employed for under two years; two to three years; four years or more (continuous)
Staff average hourly wage ^b	Average baseline hourly wage among teaching staff with observed wages (continuous)

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Unless otherwise noted, characteristics were measured at study baseline. Staff characteristics applied to the center-based educator and home-based provider analyses. Facility and facility-workforce characteristics were linked to staff records and used directly in the center-based facility analysis, as applicable. Facility-workforce aggregates were calculated across all observed staff who entered the study records in eligible teaching roles.

AA = associate's degree; QRIS = Quality Rating and Improvement System.

^a Consistent with OSSE's definition, full-time staff were employees who worked an average of 30 or more hours per week. Staff who worked fewer than 10 hours per week were ineligible for the PEF and excluded from the staff-level analysis.

^b Because DC did not have a wage observation at the exact study baseline, baseline hourly wages were back-cast from the closest verified wage records collected in June 2023, during the period when PEF payments were delivered directly to educators outside of employer payrolls. Comparison-state wages came from the 2023 national workforce dataset.

^c In states with mandatory QRIS participation (IL and PA), includes facilities with a rating above the level automatically assigned through licensing. Includes facilities in DC and NV with a preliminary rating that had not yet received an official rating.

^d Includes facilities that participated in the QRIS and had high quality ratings. For jurisdictions with three or four known quality rating levels (DC, IL, NV, PA, and WI), indicates facilities at the highest rating level. For states with five known quality rating levels (OH and NY), indicates facilities at the fourth or fifth levels. This outcome equals zero for facilities that had lower known rating levels, did not participate or engage in the QRIS, or had a preliminary rating in DC and NV.

Exhibit A.3. Operational definitions of study outputs and outcomes

Measure	Operational definition
Outputs	
Compensation	
Hourly wage ^a	Verified hourly wage two years after baseline among staff retained by their baseline facility (center-based educators and home-based providers; continuous)
Shorter-term outcomes	
Retention to facility	
Retained by baseline facility	Staff remained employed by the baseline facility after [one year, two years] (center-based educators and home-based providers; binaries)
Job experience	
Years with baseline facility	Years employed with the baseline facility after [one year, two years]; zero if not retained (center-based educators and home-based providers; continuous)
Workforce stability	
Retention rate	Number of baseline teaching staff who remained employed by the facility after [one year, two years] divided by the number of baseline teaching staff (center-based facilities; continuous)
Recruitment rate	Number of teaching staff hired after baseline and employed at [one year, two years] divided by the number of baseline teaching staff; number of teaching staff hired in the second year divided by the number of baseline teaching staff (center-based facilities; continuous)
Longer-term outcomes	
Education and qualifications	
Increased highest level of education	Staff moved to a higher education category between baseline and two years (categories: no completed college degree; associate's; bachelor's; master's; doctoral degree); zero if not retained (center-based educators and home-based providers; binary)
Obtained a higher degree ^b	Staff attained the specified degree level or a higher level between baseline and two years (associate's; bachelor's; graduate degree); zero if not retained (center-based educators and home-based providers; binaries)
Had an AA degree or above in ECE	Staff held an AA degree or above in early childhood education (ECE) or a related field at the two-year endpoint; zero if not retained (center-based educators and home-based providers; binary)
Obtained an AA degree or above in ECE	Staff did not hold an AA degree or above in ECE or a related field at baseline and held one at the two-year endpoint; zero if not retained (center-based educators and home-based providers; binary)
Career advancement	
Promoted to new role ^c	Assistant teacher at baseline became a lead teacher or director, or lead teacher at baseline became a director, by the two-year endpoint; zero if not retained (center-based educators; binary)
Service availability and capacity	
Program closed	Facility had no observed teaching staff at [one year, two years], corroborated by licensing records (center-based facilities; binaries)
Number of educators	Number of teaching staff employed by the facility at [one year, two years], including retained staff and staff recruited after baseline; zero if closed (center-based facilities; continuous)

Measure	Operational definition
Licensed capacity	Authorized number of child care slots at the two-year endpoint; zero if closed (center-based facilities; continuous)
Service quality	
Participated in QRIS ^d	Facility participated or engaged in the applicable QRIS at the two-year endpoint; zero if closed (center-based facilities; binary)
High QRIS rating ^e	Facility participated in the QRIS and held a high quality rating at the two-year endpoint; zero if closed (center-based facilities; binary)
Share of staff with qualification after two years	Number of teaching staff with the specified qualification (associate's degree or above; bachelor's degree or above; associate's degree or above in ECE or a related field) divided by the number of teaching staff employed at the two-year endpoint; zero if closed (center-based facilities; continuous)
Share of retained staff with qualification	Number of baseline teaching staff with the specified qualification who remained employed at the two-year endpoint divided by the number of teaching staff employed at that endpoint; zero if closed (center-based facilities; continuous)
Share of recruited staff with qualification	Number of teaching staff with the specified qualification hired after baseline and employed at the two-year endpoint divided by the number of teaching staff employed at that endpoint; zero if closed (center-based facilities; continuous)
Teaching staff per licensed slot	Number of teaching staff employed at the two-year endpoint divided by authorized licensed capacity at that endpoint (center-based facilities; continuous)

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Shorter-term outcomes were measured after approximately one and two years. Longer-term outcomes were measured after approximately two years, except program closure and number of educators, which were measured at both endpoints. Staff who were not retained by their baseline facility were assigned zero for job experience, qualification, and career advancement outcomes. Facilities that had closed were assigned zero for staffing, licensed capacity, workforce qualification shares, staffing structure, and QRIS outcomes. Hourly wage was defined only for retained staff with verified follow-up wages. QRIS outcomes were not available for facilities in NY and OH.

AA = associate's degree; BA = bachelor's degree; ECE = early childhood education; QRIS = quality rating and improvement system.

^a Because DC did not have a wage observation at the exact study endline, the hourly wage output measure was back-cast from the closest verified wage records, which were collected in June 2025. Comparison-state wages came from the 2025 registry extracts. The wage output measure was conditioned on retention to provide an interpretable check on compensation changes associated with PEF participation and expected program payment amounts.

^b The graduate-degree measure includes staff that obtained a master's or doctoral degree within two years, including movement from a master's to a doctoral degree.

^c Promotion was defined only for center-based educators because comparable advancement pathways were not defined for home-based providers.

^d In states with mandatory QRIS participation (IL and PA), includes facilities with a rating above the level automatically assigned through licensing. Includes facilities in DC and NV with a preliminary rating that had not yet received an official rating.

^e For jurisdictions with three or four known quality rating levels (DC, IL, NV, PA, and WI), indicates facilities at the highest rating level. For states with five known quality rating levels (OH and NY), indicates facilities at the fourth or fifth levels. This outcome equals zero for facilities that had lower known rating levels, did not participate or engage in the QRIS, or had a preliminary rating in DC and NV.

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Appendix B

Propensity score estimation and weighting diagnostics

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Exhibit B.1. Relative influence of baseline characteristics on propensity score estimates by study population

	Variable importance (%)		
	Center-based educators	Home-based providers	Center-based facilities
Staff characteristics			
Staff demographics and qualifications			
Age	3.10	9.91	n.a.
Gender	0.00	0.12	n.a.
Race and ethnicity ^a	1.47	2.67	n.a.
Non-English primary language	0.00	0.00	n.a.
Highest level of education	1.09	0.16	n.a.
Degree in CCEE or related field	0.38	0.00	n.a.
CDA credential or state certification	0.54	4.13	n.a.
Staff employment characteristics			
Teaching position	0.00	0.69	n.a.
Full-time/part-time status	0.00	0.23	n.a.
Years of experience at program	0.00	3.79	n.a.
Hourly wage	3.64	6.03	n.a.
Facility characteristics			
Program operations			
Program type ^b	n.a.	8.76	n.a.
Age groups served			
Infants	0.00	2.00	0.00
Toddlers	0.00	0.05	0.27
Preschool children	1.83	10.90	6.18
School-age children	2.65	n.a.	4.51
Licensed capacity	0.99	n.a.	1.42
Total number of teaching staff	2.98	12.84	3.67
QRIS participation ^c	0.06	7.61	0.99
High quality rating ^d	0.27	5.00	0.25
Accepts child care subsidies	2.68	6.05	0.45
Operating for at least two years	0.02	0.12	0.07
Facility workforce demographics and qualifications			
Percent of staff by race/ethnicity:			
Hispanic/Latino	11.13	n.a.	6.43
Black, non-Hispanic/Latino	16.73	n.a.	22.96
Percent of staff with non-English primary language	1.25	n.a.	0.96
Percent of staff by highest level of education:			
No college degree	20.08	2.81	18.49
Associate's degree	n.a.	n.a.	1.65

	Variable importance (%)		
	Center-based educators	Home-based providers	Center-based facilities
Bachelor's degree	n.a.	n.a.	1.28
Graduate degree	n.a.	n.a.	1.82
Percent of staff with degree in CCEE or related field	1.91	0.17	0.86
Percent of staff with CDA or state certification	n.a.	n.a.	7.63
Facility workforce employment characteristics			
Staff average years of experience	6.13	n.a.	1.86
Percent of staff by program tenure:			
Under two years	0.00	n.a.	0.00
Two to three years	0.29	n.a.	0.10
Four years or more	0.65	n.a.	0.34
Staff average hourly wage	20.13	15.95	17.79

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Table presents variable importance values for 93,148 center-based educators, 11,593 home-based providers, and 10,132 center-based facilities operating in Washington, DC and selected metro counties in IL, NV, NY, OH, PA, and WI. The importance metric reflects the relative contribution of each baseline characteristic to distinguishing educators and their facilities that participated in the PEF from educators and their facilities that would have been eligible for the program were they employed in Washington, DC, when estimating propensity scores using GBMs. Values are expressed as percentages and sum to 100 across characteristics, with higher values indicating greater relative influence when variables are used in the boosted trees. All contributions of a variable (including those from splits due to missing values) are incorporated into a single importance score.

n.a. = not applicable; CDA = Child Development Associate; QRIS = Quality Rating and Improvement System.

^a Categorical variables are shown with a single importance value across levels.

^b Indicates whether home-based providers operated as family child care (FCC) or group child care (GCC) programs.

^c In states with mandatory participation (IL and PA), includes facilities with a rating above the level automatically assigned through licensing. Includes facilities in DC and NV with a preliminary rating that had not yet received an official rating.

^d Includes facilities that participated in the QRIS and had high quality ratings. For jurisdictions with three or four known quality rating levels (DC, IL, NV, PA, and WI), indicates facilities at the highest rating level. For states with five known quality rating levels (OH and NY), indicates facilities at the fourth or fifth levels. This outcome equals zero for facilities that had lower known rating levels, did not participate or engage in the QRIS, or had a preliminary rating in DC and NV.

Exhibit B.2. Baseline characteristics by PEF participation status among center-based educators before and after propensity score weighting

	PEF educators		Eligible non-PEF educators (unweighted)				Eligible non-PEF educators (weighted)			
	Mean/%	SD	Mean/%	SD	ES	KS	Mean/%	SD	ES	KS
Staff characteristics										
Staff demographics and qualifications										
Age	42.55	13.81	37.19	14.01	0.39	0.20	40.20	14.14	0.17	0.09
Gender: female	96.30	18.80	96.20	19.10	0.01	0.00	96.00	19.60	0.02	0.00
Race and ethnicity										
Hispanic/Latino	28.70	45.30	17.10	37.60	0.26	0.12	22.50	41.70	0.14	0.06
Black, non-Hispanic	55.40	49.70	21.60	41.20	0.68	0.34	52.10	50.00	0.07	0.03
White, non-Hispanic	8.10	27.30	48.90	50.00	-1.49	0.41	17.70	38.20	-0.35	0.10
Other, non-Hispanic	6.30	24.20	8.60	28.00	-0.10	0.02	5.20	22.20	0.04	0.01
Race and ethnicity: NA	1.50	12.20	3.80	19.20	-0.19	0.02	2.60	16.00	-0.09	0.01
Non-English primary language	11.00	31.30	9.40	29.20	0.05	0.02	10.40	30.50	0.02	0.01
Highest level of education										
No college degree	68.70	46.40	65.00	47.70	0.08	0.04	67.10	47.00	0.04	0.02
Associate's degree	17.20	37.70	10.70	30.90	0.17	0.06	11.90	32.30	0.14	0.05
Bachelor's degree	11.80	32.30	17.40	37.90	-0.17	0.06	14.10	34.80	-0.07	0.02
Graduate degree	1.50	12.30	5.30	22.30	-0.30	0.04	5.40	22.60	-0.31	0.04
Highest level of education: NA	0.80	8.60	1.60	12.60	-0.10	0.01	1.60	12.40	-0.09	0.01
Degree in CCEE or related field	17.90	38.30	14.10	34.80	0.10	0.04	16.40	37.00	0.04	0.01
Degree in CCEE or related field: NA	0.90	9.30	0.10	3.80	0.08	0.01	0.10	3.00	0.08	0.01
CDA credential or state certification	43.10	49.50	40.00	49.00	0.06	0.03	50.90	50.00	-0.16	0.08
CDA credential or state certification: NA	7.10	25.70	6.40	24.40	0.03	0.01	6.40	24.60	0.03	0.01
Staff employment characteristics										
Position: lead teacher ^a	59.80	49.00	51.30	50.00	0.17	0.09	51.50	50.00	0.17	0.08
Full-time status	94.60	22.60	86.10	34.60	0.38	0.09	89.70	30.40	0.22	0.05
Years of experience at program	5.65	6.64	4.78	5.70	0.13	0.08	5.55	6.24	0.01	0.05

	PEF educators		Eligible non-PEF educators (unweighted)				Eligible non-PEF educators (weighted)			
	Mean/%	SD	Mean/%	SD	ES	KS	Mean/%	SD	ES	KS
Hourly wage	19.14	4.47	16.67	4.82	0.55	0.38	18.98	6.10	0.04	0.12
Hourly wage: NA	29.70	45.70	32.80	46.90	-0.07	0.03	30.90	46.20	-0.03	0.01
Facility characteristics										
Program operations										
Age groups served										
Infants	82.20	38.30	85.20	35.50	-0.08	0.03	80.70	39.50	0.04	0.01
Toddlers	98.90	10.60	97.90	14.40	0.09	0.01	97.20	16.60	0.16	0.02
Preschool children	90.50	29.40	98.40	12.50	-0.27	0.08	92.80	25.80	-0.08	0.02
School-age children	22.00	41.40	55.80	49.70	-0.82	0.34	31.10	46.30	-0.22	0.09
Licensed capacity	98.85	71.77	127.42	78.73	-0.40	0.21	103.58	76.61	-0.07	0.05
Total number of teaching staff	16.98	11.11	22.40	16.17	-0.49	0.18	16.12	14.21	0.08	0.12
QRIS participation ^b	49.90	50.00	58.30	49.30	-0.17	0.08	47.10	49.90	0.06	0.03
High quality rating ^c	29.20	45.50	34.40	47.50	-0.11	0.05	28.50	45.20	0.01	0.01
Accepts child care subsidies	51.30	50.00	72.80	44.50	-0.43	0.21	61.30	48.70	-0.20	0.10
Operating for at least two years	87.70	32.80	95.30	21.20	-0.23	0.08	92.80	25.90	-0.15	0.05
Facility workforce demographics and qualifications										
Percent of staff by race/ethnicity:										
Hispanic/Latino	29.10	35.60	18.10	23.20	0.31	0.16	22.30	31.50	0.19	0.12
Black, non-Hispanic/Latino	56.40	38.00	22.60	30.60	0.89	0.43	51.70	39.20	0.12	0.07
Percent of staff with non-English primary language	11.10	23.50	9.20	16.60	0.08	0.18	9.90	19.90	0.05	0.07
Percent of staff with no college degree	68.90	23.70	57.60	25.50	0.48	0.26	61.80	27.10	0.30	0.15
Percent of staff with degree in CCEE or related field	17.90	16.20	16.10	16.40	0.11	0.10	18.10	19.90	-0.01	0.11
Facility workforce employment characteristics										
Staff average years of experience	5.24	3.44	4.18	2.78	0.31	0.21	4.91	3.34	0.10	0.08
Percent of staff by program tenure:										
Under two years	44.70	27.10	48.90	24.10	-0.15	0.14	42.70	28.70	0.08	0.09
Two to three years	15.70	14.30	19.60	15.00	-0.27	0.17	18.40	17.70	-0.19	0.09

	PEF educators		Eligible non-PEF educators (unweighted)				Eligible non-PEF educators (weighted)			
	Mean/%	SD	Mean/%	SD	ES	KS	Mean/%	SD	ES	KS
Four years or more	39.40	27.10	31.40	23.10	0.30	0.17	38.90	28.90	0.02	0.07
Staff average hourly wage	19.02	2.83	16.80	3.80	0.79	0.42	18.99	4.18	0.01	0.09
Staff average hourly wage: NA	3.20	17.50	2.80	16.50	0.02	0.00	3.80	19.20	-0.04	0.01

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Table presents means for continuous characteristics, percentages for binary characteristics, standard deviations, standardized effect sizes and Kolmogorov-Smirnov statistics. Standardized effect sizes compare the difference in means between center-based PEF educators and eligible non-PEF educators for each baseline characteristic, scaled by its pooled standard deviation. Values are expressed in standard-deviation units and larger values indicate greater imbalance between groups. The Kolmogorov-Smirnov statistic compares the full distributions of each sample characteristic between groups and is defined as the maximum absolute difference between the two cumulative distribution functions. Values range from 0 (indicating identical distributions) to 1 (indicating completely non-overlapping distributions). Missingness rates for each characteristic, if relevant, are indicated by NA.

NA = not available; SD = standard deviation; ES = standardized effect size; KS = Kolmogorov-Smirnov statistic.

^a Indicates whether educators were lead teachers or assistant teachers.

^b In states with mandatory QRIS participation (IL and PA), includes facilities with a rating above the level automatically assigned through licensing. Includes facilities in DC and NV with a preliminary rating that had not yet received an official rating.

^c Includes facilities that participated in the QRIS and had high quality ratings. For jurisdictions with three or four known quality rating levels (DC, IL, NV, PA, and WI), indicates facilities at the highest rating level. For states with five known quality rating levels (OH and NY), indicates facilities at the fourth or fifth levels. This outcome equals zero for facilities that had lower known rating levels, did not participate or engage in the QRIS, or had a preliminary rating in DC and NV.

Exhibit B.3. Baseline characteristics by PEF participation status among home-based providers before and after propensity score weighting

	PEF providers		Eligible non-PEF providers (unweighted)				Eligible non-PEF providers (weighted)			
	Mean/%	SD	Mean/%	SD	ES	KS	Mean/%	SD	ES	KS
Staff characteristics										
Staff demographics and qualifications										
Age	48.44	14.35	46.23	14.66	0.15	0.10	47.97	14.89	0.03	0.05
Gender: female	94.80	22.30	89.20	31.00	0.25	0.06	92.60	26.20	0.10	0.02
Race and ethnicity										
Hispanic/Latino	38.10	48.70	27.70	44.80	0.21	0.10	26.60	44.20	0.23	0.11
Black, non-Hispanic	57.10	49.60	50.00	50.00	0.14	0.07	59.20	49.10	-0.04	0.02
Race and ethnicity: NA	1.60	12.40	2.10	14.20	-0.04	0.00	1.80	13.40	-0.02	0.00
Non-English primary language	25.50	43.70	20.80	40.60	0.11	0.05	20.10	40.10	0.12	0.05
Highest level of education										
No college degree	72.90	44.40	73.60	44.10	-0.02	0.01	78.50	41.10	-0.12	0.06
Associate's degree	10.40	30.50	11.60	32.00	-0.04	0.01	8.80	28.30	0.05	0.02
Bachelor's degree	13.50	34.20	9.90	29.90	0.10	0.04	9.20	29.00	0.13	0.04
Graduate degree	3.10	17.40	4.20	20.00	-0.06	0.01	3.30	17.90	-0.01	0.00
Degree in CCEE or related field	12.50	33.20	10.10	30.10	0.07	0.02	9.10	28.80	0.10	0.03
CDA credential or state certification	44.60	49.80	38.40	48.60	0.12	0.06	50.10	50.00	-0.11	0.06
CDA credential or state certification: NA	3.10	17.40	2.10	14.30	0.06	0.01	2.60	15.80	0.03	0.01
Staff employment characteristics										
Position: lead teacher ^a	47.40	50.10	64.60	47.80	-0.34	0.17	57.00	49.50	-0.19	0.10
Full-time status	92.20	26.90	81.10	39.10	0.41	0.11	87.90	32.60	0.16	0.04
Years of experience at program	6.89	6.74	9.49	8.03	-0.39	0.18	7.95	7.46	-0.16	0.09
Hourly wage	18.81	5.47	17.80	8.12	0.18	0.33	19.89	8.28	-0.20	0.13
Hourly wage: NA	45.30	49.80	46.80	49.90	-0.03	0.01	49.40	50.00	-0.08	0.04
Facility characteristics										
Program operations										

	PEF providers		Eligible non-PEF providers (unweighted)				Eligible non-PEF providers (weighted)			
	Mean/%	SD	Mean/%	SD	ES	KS	Mean/%	SD	ES	KS
Program type: FCC setting ^b	35.40	47.80	79.20	40.60	-0.92	0.44	43.80	49.60	-0.18	0.08
Age groups served										
Infants	97.40	16.00	92.30	26.60	0.32	0.05	93.60	24.60	0.24	0.04
Toddlers	96.90	17.40	98.70	11.20	-0.11	0.02	97.70	14.90	-0.05	0.01
Preschool children	71.40	45.30	95.20	21.40	-0.53	0.24	77.50	41.80	-0.14	0.06
Total number of teaching staff										
One	12.50	33.20	33.80	47.30	-0.64	0.21	19.70	41.20	-0.22	0.07
Two	27.10	44.60	30.50	46.10	-0.08	0.03	29.30	45.50	-0.05	0.02
Three	34.90	47.80	16.80	37.40	0.38	0.18	29.20	45.00	0.12	0.06
Four or more	25.50	43.70	18.80	39.10	0.15	0.07	21.70	40.50	0.09	0.04
QRIS participation ^c	46.40	50.00	29.70	45.70	0.33	0.17	45.40	49.80	0.02	0.01
High quality rating ^d	21.40	41.10	5.20	22.20	0.39	0.16	25.20	43.40	-0.09	0.04
Accepts child care subsidies	45.30	49.90	74.90	43.40	-0.59	0.29	56.10	49.60	-0.27	0.13
Operating for at least two years	87.50	33.20	89.60	30.60	-0.06	0.02	86.30	34.40	0.04	0.01
Facility workforce demographics and qualifications										
Percent of staff with no college degree	73.70	29.50	68.80	39.80	0.17	0.14	72.00	35.60	0.06	0.10
Percent of staff with degree in CCEE or related field	11.70	19.10	11.30	26.00	0.02	0.11	9.90	21.10	0.10	0.08
Facility workforce employment characteristics										
Staff average hourly wage	18.70	4.33	17.36	6.96	0.31	0.32	18.68	5.71	0.00	0.12
Staff average hourly wage: NA	34.40	47.50	33.10	47.10	0.03	0.01	36.10	48.00	-0.04	0.02

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Table presents means for continuous characteristics, percentages for binary characteristics, standard deviations, standardized effect sizes and Kolmogorov-Smirnov statistics. Standardized effect sizes compare the difference in means between home-based PEF providers and eligible non-PEF providers for each baseline characteristic, scaled by its pooled standard deviation. Values are expressed in standard-deviation units and larger values indicate greater imbalance between groups. The Kolmogorov-Smirnov statistic compares the full distributions of each sample characteristic between groups and is defined as the maximum absolute difference between the two cumulative distribution functions. Values range from 0 (indicating identical distributions) to 1 (indicating completely non-overlapping distributions). Missingness rates for each characteristic, if relevant, are indicated by NA.

NA = not available; SD = standard deviation; ES = standardized effect size; KS = Kolmogorov-Smirnov statistic.

- ^a Indicates whether home-based providers were owners/lead teachers or home-based assistants.
- ^b Indicates whether home-based providers operated as family child care (FCC) or group child care (GCC) programs.
- ^c In states with mandatory QRIS participation (IL and PA), includes facilities with a rating above the level automatically assigned through licensing. Includes facilities in DC and NV with a preliminary rating that had not yet received an official rating.
- ^d Includes facilities that participated in the QRIS and had high quality ratings. For jurisdictions with three or four known quality rating levels (DC, IL, NV, PA, and WI), indicates facilities at the highest rating level. For states with five known quality rating levels (OH and NY), indicates facilities at the fourth or fifth levels. This outcome equals zero for facilities that had lower known rating levels, did not participate or engage in the QRIS, or had a preliminary rating in DC and NV.

Exhibit B.4. Baseline characteristics by PEF participation status among center-based facilities before and after propensity score weighting

	PEF facilities		Eligible non-PEF facilities (unweighted)				Eligible non-PEF facilities (weighted)			
	Mean/%	SD	Mean/%	SD	ES	KS	Mean/%	SD	ES	KS
Facility characteristics										
Program operations										
Age groups served										
Infants	77.60	41.80	72.50	44.70	0.12	0.05	74.60	43.50	0.07	0.03
Toddlers	97.70	15.00	91.60	27.70	0.40	0.06	94.30	23.10	0.22	0.03
Preschool children	83.20	37.50	94.40	22.90	-0.30	0.11	84.30	36.40	-0.03	0.01
School-age children	18.80	39.10	53.10	49.90	-0.88	0.34	26.30	44.00	-0.19	0.08
Licensed capacity	66.56	51.52	89.99	65.42	-0.46	0.19	71.38	57.05	-0.09	0.05
Total number of teaching staff	10.47	8.16	11.70	11.09	-0.15	0.08	9.61	9.33	0.10	0.11
QRIS participation ^a	48.80	50.10	51.20	50.00	-0.05	0.02	43.40	49.60	0.11	0.05
High quality rating ^b	24.10	42.80	25.20	43.40	-0.03	0.01	22.40	41.70	0.04	0.02
Accepts child care subsidies	51.80	50.00	66.20	47.30	-0.29	0.14	57.40	49.50	-0.11	0.06
Operating for at least two years	84.50	36.30	89.90	30.10	-0.15	0.06	85.50	35.20	-0.03	0.01
Facility workforce demographics and qualifications										
Percent of staff by race/ethnicity:										
Hispanic/Latino	25.40	35.20	17.00	26.00	0.24	0.11	19.80	31.30	0.16	0.10
Black, non-Hispanic/Latino	61.80	39.00	30.80	37.70	0.79	0.37	58.30	40.30	0.09	0.06
Percent of staff with non-English primary language	9.30	22.60	9.60	19.80	-0.01	0.11	8.70	19.50	0.03	0.04
Percent of staff by highest level of education:										
No college degree	70.90	26.20	60.20	31.50	0.41	0.19	66.40	29.20	0.17	0.10
Associate's degree	15.80	17.50	12.10	17.50	0.21	0.15	15.50	18.10	0.02	0.07
Bachelor's degree	11.50	15.80	20.40	23.60	-0.56	0.22	14.20	19.80	-0.17	0.09
Graduate degree	1.80	6.00	7.20	15.80	-0.89	0.18	3.90	10.90	-0.35	0.08
Percent of staff with degree in CCEE or related field	16.60	18.50	15.10	20.60	0.08	0.10	16.00	21.20	0.03	0.07
Percent of staff with CDA or state certification	40.50	26.40	35.20	34.20	0.20	0.23	38.60	31.00	0.07	0.11

	PEF facilities		Eligible non-PEF facilities (unweighted)				Eligible non-PEF facilities (weighted)			
	Mean/%	SD	Mean/%	SD	ES	KS	Mean/%	SD	ES	KS
Facility workforce employment characteristics										
Staff average years of experience	5.00	4.00	4.21	3.37	0.20	0.14	4.54	3.66	0.12	0.07
Percent of staff by program tenure:										
Under two years	47.20	31.20	47.20	30.50	0.00	0.04	47.20	32.60	-0.00	0.04
Two to three years	14.30	16.40	20.10	21.50	-0.35	0.13	16.80	19.50	-0.16	0.08
Four years or more	38.40	30.50	32.60	29.50	0.19	0.10	35.80	31.20	0.09	0.07
Staff average hourly wage	18.85	2.71	16.71	4.40	0.79	0.44	18.67	3.80	0.07	0.11
Staff average hourly wage: NA	7.30	25.90	7.60	26.50	-0.01	0.00	8.20	27.40	-0.04	0.01
Percent of staff missing hourly wage	34.80	31.20	31.40	32.60	0.11	0.14	33.40	31.80	0.05	0.08

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Table presents means for continuous characteristics, percentages for binary characteristics, standard deviations, standardized effect sizes and Kolmogorov-Smirnov statistics. Standardized effect sizes compare the difference in means between center-based PEF facilities and eligible non-PEF facilities for each baseline characteristic, scaled by its pooled standard deviation. Values are expressed in standard-deviation units and larger values indicate greater imbalance between groups. The Kolmogorov-Smirnov statistic compares the full distributions of each sample characteristic between groups and is defined as the maximum absolute difference between the two cumulative distribution functions. Values range from 0 (indicating identical distributions) to 1 (indicating completely non-overlapping distributions). Missingness rates for each characteristic, if relevant, are indicated by NA.

NA = not available; SD = standard deviation; ES = standardized effect size; KS = Kolmogorov-Smirnov statistic.

^a In states with mandatory QRIS participation (IL and PA), includes facilities with a rating above the level automatically assigned through licensing. Includes facilities in DC and NV with a preliminary rating that had not yet received an official rating.

^b Includes facilities that participated in the QRIS and had high quality ratings. For jurisdictions with three or four known quality rating levels (DC, IL, NV, PA, and WI), indicates facilities at the highest rating level. For states with five known quality rating levels (OH and NY), indicates facilities at the fourth or fifth levels. This outcome equals zero for facilities that had lower known rating levels, did not participate or engage in the QRIS, or had a preliminary rating in DC and NV.

Appendix C

Full results from the impact analysis

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Exhibit C.1. Impact of the PEF on outputs and shorter-term outcomes among center-based educators

Outcome domain	PEF educators			Eligible non-PEF educators			Estimated impact			
	N	Mean/%	SE	N	Mean/%	SE	b	SE	p	ES
Outputs										
Wages										
Hourly wage after two years	1,293	27.27	0.13	14,621	19.42	0.12	7.85***	0.17	0.00	1.20
Shorter-term outcomes										
Retention to facility										
Retained by baseline facility after one year	2,606	72.46	0.82	46,086	68.25	0.67	4.20***	1.05	0.00	0.12
Retained by baseline facility after two years	2,606	54.87	0.85	46,086	50.07	0.77	4.80***	1.15	0.00	0.11
Job experience										
Years with baseline facility after one year	2,606	5.28	0.07	46,076	4.94	0.07	0.34***	0.10	0.00	0.05
Years with baseline facility after two years	2,606	4.85	0.08	46,081	4.52	0.08	0.33**	0.11	0.01	0.05

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Table presents unweighted sample sizes, regression-adjusted means and standard errors for continuous measures, regression-adjusted percentages and standard errors for binary measures, and regression-adjusted differences in means or percentages by research group and their standard errors, *p*-values, and effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for binary outcomes. Hourly wage after two years is missing for educators who were not with their baseline facility after two years, as well as educators that did not report verified wage data.

SE = standard error; b = estimated impact; ES = effect size.

+/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

Exhibit C.2. Impact of the PEF on outputs and shorter-term outcomes among home-based providers

Outcome domain	PEF providers			Eligible non-PEF providers			Estimated impact			
	N	Mean/%	SE	N	Mean/%	SE	b	SE	p	ES
Outputs										
Wages										
Hourly wage after two years	79	24.41	0.51	933	19.53	0.21	4.88***	0.54	0.00	0.56
Shorter-term outcomes										
Retention to facility										
Retained by baseline facility after one year	175	84.15	2.87	2,748	75.54	2.11	8.61*	3.39	0.01	0.34
Retained by baseline facility after two years	175	68.98	3.50	2,748	61.02	2.30	7.96+	4.18	0.06	0.27
Job experience										
Years with baseline facility after one year	175	7.61	0.21	2,748	6.82	0.15	0.79**	0.26	0.00	0.10
Years with baseline facility after two years	175	7.34	0.32	2,748	6.71	0.20	0.63	0.39	0.11	0.08

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Table presents unweighted sample sizes, regression-adjusted means and standard errors for continuous measures, regression-adjusted percentages and standard errors for binary measures, and regression-adjusted differences in means or percentages by research group and their standard errors, *p*-values, and effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for binary outcomes. Hourly wage after two years is missing for providers who were not with their baseline facility after two years, as well as providers that did not report verified wage data.

SE = standard error; b = estimated impact; ES = effect size.

+/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

Exhibit C.3. Impact of the PEF on shorter-term outcomes among center-based facilities

Outcome domain	PEF facilities			Eligible non-PEF facilities			Estimated impact			
	N	Mean/%	SE	N	Mean/%	SE	b	SE	p	ES
Shorter-term outcomes										
Retention rate ^a										
Retention rate after one year	297	0.68	0.02	4,751	0.65	0.02	0.03	0.02	0.16	0.12
Retention rate after two years	297	0.49	0.02	4,751	0.45	0.01	0.04+	0.02	0.07	0.13
Recruitment rate										
Recruitment rate after one year ^b	297	0.24	0.02	4,751	0.24	0.01	0.00	0.03	0.98	0.00
Recruitment rate after two years ^b	297	0.57	0.04	4,751	0.45	0.02	0.12**	0.05	0.01	0.19
Recruitment rate in the second year ^c	297	0.33	0.03	4,751	0.21	0.01	0.12***	0.03	0.00	0.39

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Table presents unweighted sample sizes, regression-adjusted means and standard errors for continuous measures, regression-adjusted percentages and standard errors for binary measures, and regression-adjusted differences in means or percentages by research group and their standard errors, *p*-values, and effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for binary outcomes.

SE = standard error; b = estimated impact; ES = effect size.

+/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^a Includes the percent of educators who were employed in the facility at baseline and who were still employed in the facility after one or two years.

^b Includes the number of educators who were hired within one or two years of baseline divided by the number of educators employed at baseline.

^c Includes the number of educators who were hired in the second year after baseline divided by the number of educators employed at baseline.

Exhibit C.4. Impact of the PEF on longer-term outcomes among center-based educators

Outcome domain	PEF educators			Eligible non-PEF educators			Estimated impact			
	N	Mean/%	SE	N	Mean/%	SE	b	SE	p	ES
Longer-term outcomes										
Education and Qualifications										
Increased highest level of education after two years ^a	2,596	10.35	0.58	43,737	1.85	0.19	8.50***	1.01	0.00	1.10
Obtained a degree after two years: ^b										
AA degree or above	2,604	6.95	0.50	43,737	0.73	0.11	6.22***	1.03	0.00	1.41
BA degree or above	2,603	5.43	0.42	43,737	0.91	0.10	4.52***	0.74	0.00	1.11
Graduate degree	2,603	1.08	0.20	43,737	0.55	0.11	0.52*	0.28	0.04	0.40
Had an AA degree or above in ECE after two years	2,605	14.13	0.56	45,425	12.11	0.35	2.02**	0.67	0.00	0.11
Obtained AA degree or above in ECE after two years	2,603	4.78	0.42	45,425	1.54	0.14	3.24***	0.60	0.00	0.71
Career advancement										
Promoted to new role after two years ^c	2,606	4.56	0.40	46,064	3.77	0.52	0.80	0.66	0.22	0.12

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Table presents unweighted sample sizes, regression-adjusted means and standard errors for continuous measures, regression-adjusted percentages and standard errors for binary measures, and regression-adjusted differences in means or percentages by research group and their standard errors, *p*-values, and effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for binary outcomes. All education, qualifications, and career advancement outcomes equal zero for educators who were not with their baseline facility after two years.

SE = standard error; b = estimated impact; ES = effect size.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^a Includes educators who were still with their baseline employer after two years and had obtained an AA, BA, MA, or doctoral degree since baseline.

^b Includes educators who were still with their baseline employer after two years, did not have the relevant degree at baseline, and had obtained the relevant degree or a higher degree within two years. The graduate degree measure also includes movement from a master's to a doctoral degree.

^c Includes educators who were employed as lead teachers at baseline and directors after two years, and educators who were employed as assistant teachers at baseline and lead teachers or directors after two years.

Exhibit C.5. Impact of the PEF on longer-term outcomes among home-based providers

Outcome domain	PEF providers			Eligible non-PEF providers			Estimated impact			
	N	Mean/%	SE	N	Mean/%	SE	b	SE	p	ES
Longer-term outcomes										
Education and qualifications										
Increased highest level of education after two years ^a	175	10.12	2.41	2,523	2.21	0.60	7.92*	3.61	0.03	0.91
Obtained a degree after two years: ^b										
AA degree or above	175	6.45	1.97	2,523	1.12	0.48	5.33+	3.13	0.09	0.79
BA degree or above	175	5.33	1.69	2,523	0.81	0.24	4.52+	2.66	0.09	0.77
Graduate degree	175	1.29	0.91	2,523	0.68	0.38	0.49	1.14	0.65	0.29
Had an AA degree or above in ECE after two years	175	12.39	1.71	2,709	10.68	1.23	1.72	2.24	0.43	0.10
Obtained AA degree or above in ECE after two years	175	4.52	1.67	2,709	3.11	1.29	1.41	2.33	0.53	0.24

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Table presents unweighted sample sizes, regression-adjusted means and standard errors for continuous measures, regression-adjusted percentages and standard errors for binary measures, and regression-adjusted differences in means or percentages by research group and their standard errors, *p*-values, and effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for binary outcomes. All education and qualifications outcomes equal zero for providers who were not with their baseline facility after two years.

SE = standard error; b = estimated impact; ES = effect size.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^a Includes providers who were still with their baseline employer after two years and had obtained an AA, BA, MA, or doctoral degree since baseline.

^b Includes providers who were still with their baseline employer after two years, did not have the relevant degree at baseline, and had obtained the relevant degree or a higher degree within two years. The graduate degree measure also includes movement from a master's to a doctoral degree.

Exhibit C.6. Impact of the PEF on longer-term service availability and capacity outcomes among center-based facilities

Outcome domain	PEF facilities			Eligible non-PEF facilities			Estimated impact			
	N	Mean/%	SE	N	Mean/%	SE	b	SE	p	ES
Longer-term outcomes										
Operating status										
Program closed after one year	297	6.46	1.43	4,751	4.39	0.51	2.07	1.57	0.18	0.25
Program closed after two years	295	15.99	2.12	4,751	9.99	0.98	6.00*	2.49	0.01	0.33
Employment levels ^a										
Number of educators after one year	297	9.69	0.18	4,751	8.84	0.12	0.86***	0.21	0.00	0.11
Number of educators after two years	297	9.97	0.32	4,751	8.61	0.18	1.36***	0.37	0.00	0.15
Service capacity										
Licensed capacity after two years	297	62.05	1.66	4,643	59.23	0.76	2.82	1.92	0.14	0.05

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Table presents unweighted sample sizes, regression-adjusted means and standard errors for continuous measures, regression-adjusted percentages and standard errors for binary measures, and regression-adjusted differences in means or percentages by research group and their standard errors, *p*-values, and effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for binary outcomes. All service availability and capacity outcomes equal zero for facilities that were closed as of one or two years after baseline, as applicable.

SE = standard error; b = estimated impact; ES = effect size.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^a Includes the number of educators employed as of one or two years after baseline, including educators that were retained and recruited since baseline.

Exhibit C.7. Impact of the PEF on longer-term service quality outcomes among center-based facilities

Outcome domain	PEF facilities			Eligible non-PEF facilities			Estimated impact			
	N	Mean/%	SE	N	Mean/%	SE	b	SE	p	ES
Longer-term outcomes										
Quality rating and engagement										
Participated in QRIS after two years ^a	297	49.07	1.97	2,887	40.09	5.10	8.98+	5.04	0.08	0.22
High QRIS rating after two years ^b	297	23.91	1.96	2,887	18.44	1.41	5.47*	2.50	0.03	0.20
Workforce education and qualifications										
Share of staff with qualification after two years: ^c										
AA degree or above	297	0.35	0.01	4,652	0.29	0.01	0.06***	0.02	0.00	0.20
BA degree or above	297	0.21	0.01	4,652	0.17	0.01	0.05***	0.01	0.00	0.22
AA degree or above in ECE	297	0.18	0.01	4,726	0.15	0.01	0.02+	0.01	0.08	0.11
Share of staff retained with qualification after two years: ^d										
AA degree or above	297	0.19	0.01	4,652	0.19	0.01	0.00	0.01	0.95	0.00
BA degree or above	297	0.11	0.01	4,652	0.10	0.00	0.01	0.01	0.51	0.03
AA degree or above in ECE	297	0.11	0.01	4,652	0.12	0.01	-0.01	0.01	0.17	-0.04
Share of staff recruited with qualification after two years: ^e										
AA degree or above	297	0.16	0.01	4,652	0.11	0.01	0.05***	0.01	0.00	0.31
BA degree or above	297	0.11	0.01	4,652	0.06	0.01	0.04***	0.01	0.00	0.31
AA degree or above in ECE	297	0.07	0.01	4,652	0.04	0.01	0.03*	0.01	0.01	0.26
Staffing structure										
Teaching staff per licensed slot	297	0.16	0.01	4,568	0.14	0.00	0.02***	0.01	0.00	0.19

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Table presents unweighted sample sizes, regression-adjusted means and standard errors for continuous measures, regression-adjusted percentages and standard errors for binary measures, and regression-adjusted differences in means or percentages by research group and their standard errors, *p*-values, and effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for binary outcomes. Unless otherwise noted, service quality outcomes equal zero for facilities that were closed as of two years after baseline. QRIS outcomes were not available for facilities in NY and OH.

QRIS = quality rating and improvement system; SE = standard error; b = estimated impact; ES = effect size.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

- ^a In states with mandatory QRIS participation (IL and PA), includes facilities with a rating above the level automatically assigned through licensing. Includes facilities in DC and NV with a preliminary rating that had not yet received an official rating.
- ^b Includes facilities that participated in the QRIS and had high quality ratings. For jurisdictions with three or four known quality rating levels (DC, IL, NV, PA, and WI), indicates facilities at the highest rating level. For states with five known quality rating levels (OH and NY), indicates facilities at the fourth or fifth levels. This outcome equals zero for facilities that had lower known rating levels, did not participate or engage in the QRIS, or had a preliminary rating in DC and NV.
- ^c These outcomes equal the number of staff employed in the facility with a particular qualification divided by the number of staff two years after baseline.
- ^d These outcomes equal the number of retained staff (staff who were employed in the facility at baseline and who were still employed after two years) with a particular qualification, divided by the number of staff two years after baseline.

Appendix D

Full results from the exploratory analysis

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Exhibit D.1. Impact of the PEF on outputs and shorter-term outcomes by baseline position among center-based educators

Outcome domain	Lead teachers				Assistant teachers				p-value for difference in impacts
	PEF educators	Non-PEF educators	Estimated impact		PEF educators	Non-PEF educators	Estimated impact		
	Mean/%	Mean/%	b	ES	Mean/%	Mean/%	b	ES	
Outputs									
Wages									
Hourly wage after two years	29.26	20.29	8.97***	1.27	24.22	17.92	6.30***	1.23	0.00+++
Shorter-term outcomes									
Retention to facility									
Retained by baseline facility after one year	75.55	70.77	4.78***	0.15	68.36	64.84	3.52*	0.10	0.56
Retained by baseline facility after two years	57.83	52.85	4.98***	0.12	50.55	48.00	2.54	0.06	0.29
Job experience									
Years with baseline facility after one year	5.94	5.54	0.40**	0.06	4.40	4.14	0.26*	0.04	0.45
Years with baseline facility after two years	5.51	5.09	0.41**	0.06	3.99	3.81	0.18	0.03	0.30

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: For each subgroup level, the table presents regression-adjusted means for continuous measures, regression-adjusted percentages for binary measures, and regression-adjusted differences in means or percentages by research group and their effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for binary outcomes. The *p*-value in the final column tests whether the two impact estimates differ. Exhibit D.S1 presents sample sizes for subgroup analyses. Hourly wage after two years is missing for educators who were not with their baseline facility after two years or did not report verified wage data.

b = estimated impact; ES = effect size.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^/+/++/+++ Estimated difference in impacts is statistically significant at the .10/.05/.01/.001 level (two-tailed).

Exhibit D.2. Impact of the PEF on outputs and shorter-term outcomes by baseline qualification tier among center-based educators

Outcome domain	Lower qualification tier				Middle qualification tier				Higher qualification tier				p-value for difference in impacts
	PEF group	Non-PEF group	Estimated impact		PEF group	Non-PEF group	Estimated impact		PEF group	Non-PEF group	Estimated impact		
	Mean/%	Mean/%	b	ES	Mean/%	Mean/%	b	ES	Mean/%	Mean/%	b	ES	
Outputs													
Wages													
Hourly wage after two years	24.92	18.16	6.77***	1.38	27.99	19.59	8.41***	1.52	33.25	22.40	10.85***	1.26	0.00+++
Shorter-term outcomes													
Retention to facility													
Retained by baseline facility after one year	71.35	62.24	9.11***	0.25	74.37	75.11	-0.74	-0.02	72.38	74.99	-2.61	-0.06	0.00+++
Retained by baseline facility after two years	52.40	45.33	7.07***	0.17	58.57	58.85	-0.27	-0.01	55.64	57.54	-1.90	-0.04	0.00+++
Job experience													
Years with baseline facility after one year	4.42	3.88	0.54***	0.10	6.43	6.56	-0.13	-0.02	5.93	5.75	0.18	0.03	0.03+
Years with baseline facility after two years	4.03	3.59	0.44**	0.08	6.09	5.98	0.10	0.01	5.33	5.37	-0.04	-0.01	0.24

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: For each subgroup level, the table presents regression-adjusted means for continuous measures, regression-adjusted percentages for binary measures, and regression-adjusted differences in means or percentages by research group and their effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for binary outcomes. The *p*-value in the final column is from a joint test of whether impacts differ across the three qualification tiers. Exhibit D.S1 presents sample sizes for subgroup analyses. Hourly wage after two years is missing for educators who were not with their baseline facility after two years or did not report verified wage data.

b = estimated impact; ES = effect size.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^/+/++/+++ Differences in impacts across qualification tiers are statistically significant at the .10/.05/.01/.001 level (two-tailed).

Exhibit D.3. Impact of the PEF on outputs and shorter-term outcomes by facility payment model participation among center-based educators

Outcome domain	Facility payment model participation				No facility payment model participation				<i>p</i> -value for difference in impacts
	PEF educators	Non-PEF educators	Estimated impact		PEF educators	Non-PEF educators	Estimated impact		
	Mean/%	Mean/%	b	ES	Mean/%	Mean/%	b	ES	
Outputs									
Wages									
Hourly wage after two years	27.37	19.38	7.99***	1.23	19.63	19.50	0.13	0.01	0.00+++
Shorter-term outcomes									
Retention to facility									
Retained by baseline facility after two years	56.53	50.74	5.79***	0.14	33.80	50.05	-16.25***	-0.41	0.00+++
Job experience									
Years with baseline facility after two years	4.91	4.46	0.45***	0.07	4.09	5.23	-1.14*	-0.15	0.00+++

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: For each subpopulation, the table presents regression-adjusted means for continuous measures, regression-adjusted percentages for binary measures, and regression-adjusted differences in means or percentages by research group and their effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for binary outcomes. Non-PEF educators are reweighted using baseline characteristics to represent their facilities that would have been more or less likely to participate in the facility payment model if offered. The *p*-value in the final column tests whether the two impact estimates differ. Exhibit D.S1 presents sample sizes for subgroup analyses. Hourly wage after two years is missing for educators who were not with their baseline facility after two years or did not report verified wage data. One-year outcomes are excluded because they were measured before the PEF transitioned to the facility payment model.

b = estimated impact; ES = effect size.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^/+/+/+++ Estimated difference in impacts is statistically significant at the .10/.05/.01/.001 level (two-tailed).

Exhibit D.4. Impact of the PEF on shorter-term outcomes by facility payment model participation among center-based facilities

Outcome domain	Facility payment model participation				No facility payment model participation				p-value for difference in impacts
	PEF facilities	Non-PEF facilities	Estimated impact		PEF facilities	Non-PEF facilities	Estimated impact		
	Mean/%	Mean/%	b	ES	Mean/%	Mean/%	b	ES	
Shorter-term outcomes									
Retention rate ^a									
Retention rate after two years	0.52	0.45	0.07***	0.26	0.29	0.46	-0.17**	-0.54	0.00+++
Recruitment rate									
Recruitment rate after two years ^b	0.63	0.46	0.17**	0.26	0.21	0.36	-0.15*	-0.22	0.00+++
Recruitment rate in the second year ^c	0.36	0.22	0.15***	0.48	0.10	0.21	-0.11*	-0.20	0.00+++

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: For each subpopulation, the table presents regression-adjusted means for continuous measures, regression-adjusted percentages for binary measures, and regression-adjusted differences in means or percentages by research group and their effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for binary outcomes. Non-PEF facilities are reweighted using baseline characteristics to represent those that would have been more or less likely to participate in the facility payment model if offered. The *p*-value in the final column tests whether the two impact estimates differ. Exhibit D.S1 presents sample sizes for subgroup analyses. One-year outcomes are excluded because they were measured before the PEF transitioned to the facility payment model.

b = estimated impact; ES = effect size.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^/+/++/+++ Estimated difference in impacts is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^a Includes the percent of educators who were employed in the facility at baseline and who were still employed in the facility after one or two years.

^b Includes the number of educators who were hired within one or two years of baseline divided by the number of educators employed at baseline.

^c Includes the number of educators who were hired in the second year after baseline divided by the number of educators employed at baseline.

Exhibit D.5. Impact of the PEF on longer-term outcomes by baseline position among center-based educators

Outcome domain	Lead teachers				Assistant teachers				p-value for difference in impacts
	PEF educators	Non-PEF educators	Estimated impact		PEF educators	Non-PEF educators	Estimated impact		
	Mean/%	Mean/%	b	ES	Mean/%	Mean/%	b	ES	
Longer-term outcomes									
Education and qualifications									
Increased highest level of education after two years ^a	12.78	2.78	10.00***	0.99	7.20	0.77	6.43***	1.39	0.00++
Obtained a degree after two years: ^b									
AA degree or above	7.67	0.96	6.71***	1.30	5.91	0.48	5.43***	1.56	0.21
BA degree or above	7.44	1.07	6.37***	1.21	3.64	0.43	3.21***	1.31	0.00+++
Graduate degree	1.48	1.00	0.47	0.24	0.48	0.07	0.41+	1.18	0.95
Had an AA degree or above in ECE after two years	21.28	17.93	3.35**	0.13	4.76	4.41	0.35	0.05	0.02+
Obtained AA degree or above in ECE after two years	6.21	2.03	4.18***	0.70	2.68	0.98	1.70**	0.62	0.00++
Career advancement									
Promoted to new role after two years ^c	0.91	2.14	-1.23+	-0.53	9.34	5.99	3.35**	0.29	0.00+++

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: For each subgroup level, the table presents regression-adjusted means for continuous measures, regression-adjusted percentages for binary measures, and regression-adjusted differences in means or percentages by research group and their effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for binary outcomes. The *p*-value in the final column tests whether the two impact estimates differ. Exhibit D.S1 presents sample sizes for subgroup analyses. All education, qualifications, and career advancement outcomes equal zero for educators who were not with their baseline facility after two years.

b = estimated impact; ES = effect size.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^/+/++/+++ Estimated difference in impacts is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^a Includes educators who were still with their baseline employer after two years and had obtained an AA, BA, MA, or doctoral degree since baseline.

^b Includes educators who were still with their baseline employer after two years, did not have the relevant degree at baseline, and had obtained the relevant degree or a higher degree within two years. The graduate degree measure also includes movement from a master's to a doctoral degree.

^c Includes educators who were employed as lead teachers at baseline and directors after two years, and educators who were employed as assistant teachers at baseline and lead teachers or directors after two years.

Exhibit D.6. Impact of the PEF on longer-term outcomes by facility payment model participation among center-based educators

Outcome domain	Facility payment model participation				No facility payment model participation				p-value for difference in impacts
	PEF educators	Non-PEF educators	Estimated impact		PEF educators	Non-PEF educators	Estimated impact		
	Mean/%	Mean/%	b	ES	Mean/%	Mean/%	b	ES	
Longer-term outcomes									
Education and qualifications									
Increased highest level of education after two years ^a	10.83	1.85	8.99***	1.13	4.24	1.91	2.33	0.50	0.00+++
Obtained a degree after two years: ^b									
AA degree or above	7.20	0.72	6.48***	1.43	3.93	0.75	3.18*	1.02	0.03+
BA degree or above	6.26	0.79	5.48***	1.29	1.54	0.69	0.86	0.50	0.00+++
Graduate degree	1.12	0.52	0.60**	0.47	0.51	0.80	-0.30	-0.28	0.16
Had an AA degree or above in ECE after two years	14.66	12.16	2.51***	0.13	7.98	11.96	-3.98*	-0.27	0.00+++
Obtained AA degree or above in ECE after two years	4.93	1.55	3.38***	0.72	2.93	1.39	1.55	0.46	0.18
Career advancement									
Promoted to new role after two years ^c	4.67	3.92	0.75	0.11	3.40	2.56	0.84	0.18	0.95

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: For each subpopulation, the table presents regression-adjusted means for continuous measures, regression-adjusted percentages for binary measures, and regression-adjusted differences in means or percentages by research group and their effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for binary outcomes. Non-PEF educators are reweighted using baseline characteristics to represent their facilities that would have been more or less likely to participate in the facility payment model if offered. The *p*-value in the final column tests whether the two impact estimates differ. Exhibit D.S1 presents sample sizes for subgroup analyses. All education, qualifications, and career advancement outcomes equal zero for educators who were not with their baseline facility after two years.

b = estimated impact; ES = effect size.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^/†/††/††† Estimated difference in impacts is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^a Includes educators who were still with their baseline employer after two years and had obtained an AA, BA, MA, or doctoral degree since baseline.

^b Includes educators who were still with their baseline employer after two years, did not have the relevant degree at baseline, and had obtained the relevant degree or a higher degree within two years. The graduate degree measure also includes movement from a master's to a doctoral degree.

^c Includes educators who were employed as lead teachers at baseline and directors after two years, and educators who were employed as assistant teachers at baseline and lead teachers or directors after two years.

Exhibit D.7. Impact of the PEF on longer-term service availability and capacity outcomes by facility payment model participation among center-based facilities

Outcome domain	Facility payment model participation				No facility payment model participation				p-value for difference in impacts
	PEF facilities	Non-PEF facilities	Estimated impact		PEF facilities	Non-PEF facilities	Estimated impact		
	Mean/%	Mean/%	b	ES	Mean/%	Mean/%	b	ES	
Longer-term outcomes									
Operating status									
Program closed after two years	10.26	9.40	0.86	0.06	50.08	15.45	34.63***	1.08	0.00+++
Employment levels ^a									
Number of educators after two years	10.56	9.01	1.55***	0.18	2.88	4.91	-2.02**	-0.39	0.00+++
Service capacity									
Licensed capacity after two years	64.01	60.52	3.49+	0.16	25.27	45.02	-19.74***	-0.43	0.00+++

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: For each subpopulation, the table presents regression-adjusted means for continuous measures, regression-adjusted percentages for binary measures, and regression-adjusted differences in means or percentages by research group and their effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for binary outcomes. Non-PEF facilities are reweighted using baseline characteristics to represent those that would have been more or less likely to participate in the facility payment model if offered. The *p*-value in the final column tests whether the two impact estimates differ. Exhibit D.S1 presents sample sizes for subgroup analyses. All service availability and capacity outcomes equal zero for facilities that were closed as of one or two years after baseline, as applicable. One-year outcomes are excluded because they were measured before the PEF transitioned to the facility payment model.

b = estimated impact; ES = effect size.

+/*/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^/+/++/+++ Estimated difference in impacts is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^a Includes the number of educators employed as of one or two years after baseline, including educators that were retained and recruited since baseline.

Exhibit D.8. Impact of the PEF on longer-term service quality outcomes by facility payment model participation among center-based facilities

Outcome domain	Facility payment model participation				No facility payment model participation				p-value for difference in impacts
	PEF facilities	Non-PEF facilities	Estimated impact		PEF facilities	Non-PEF facilities	Estimated impact		
	Mean/%	Mean/%	b	ES	Mean/%	Mean/%	b	ES	
Longer-term outcomes									
Quality rating and engagement									
Participated in QRIS after two years ^a	53.57	42.22	11.35+	0.28	19.63	28.62	-8.99	-0.30	0.00++
High QRIS rating after two years ^b	26.78	19.46	7.33**	0.25	5.04	12.97	-7.93*	-0.63	0.00+++
Workforce education and qualifications									
Share of staff with qualification after two years: ^c									
AA degree or above	0.37	0.29	0.08***	0.27	0.24	0.29	-0.05	-0.16	0.00++
BA degree or above	0.23	0.16	0.07***	0.29	0.15	0.18	-0.04	-0.14	0.00++
AA degree or above in ECE	0.18	0.15	0.03*	0.14	0.14	0.16	-0.01	-0.05	0.28
Share of staff retained with qualification after two years: ^d									
AA degree or above	0.20	0.18	0.01	0.05	0.13	0.20	-0.07*	-0.25	0.01++
BA degree or above	0.11	0.10	0.02	0.08	0.07	0.12	-0.05**	-0.23	0.00+++
AA degree or above in ECE	0.11	0.12	-0.01	-0.05	0.09	0.13	-0.04	-0.19	0.24
Share of staff recruited with qualification after two years: ^e									
AA degree or above	0.17	0.11	0.06***	0.36	0.11	0.10	0.01	0.05	0.17
BA degree or above	0.11	0.06	0.05***	0.35	0.08	0.06	0.02	0.09	0.24
AA degree or above in ECE	0.07	0.04	0.03*	0.27	0.06	0.03	0.02	0.21	0.88
Staffing structure									
Teaching staff per licensed slot after two years	0.16	0.13	0.02***	0.24	0.07	0.08	-0.01	-0.16	0.01+

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: For each subpopulation, the table presents regression-adjusted means for continuous measures, regression-adjusted percentages for binary measures, and regression-adjusted differences in means or percentages by research group and their effect sizes. Effect sizes calculated as Hedges' *g* for continuous outcomes and the Cox Index for

binary outcomes. Non-PEF facilities are reweighted using baseline characteristics to represent those that would have been more or less likely to participate in the facility payment model if offered. The p -value in the final column tests whether the two impact estimates differ. Exhibit D.S1 presents sample sizes for subgroup analyses. Unless otherwise noted, service quality outcomes equal zero for facilities that were closed as of two years after baseline. QRIS outcomes were not available for facilities in NY and OH.

QRIS = quality rating and improvement system; b = estimated impact; ES = effect size.

+/**/*** Estimated impact is statistically significant at the .10/.05/.01/.001 level (two-tailed).

^/+/++/+++ Estimated difference in impacts is statistically significant at the .10/.05/.01/.001 level (two-tailed).

- ^a In states with mandatory QRIS participation (IL and PA), includes facilities with a rating above the level automatically assigned through licensing. Includes facilities in DC and NV with a preliminary rating that had not yet received an official rating.
- ^b Includes facilities that participated in the QRIS and had high quality ratings. For jurisdictions with three or four known quality rating levels (DC, IL, NV, PA, and WI), indicates facilities at the highest rating level. For states with five known quality rating levels (OH and NY), indicates facilities at the fourth or fifth levels. This outcome equals zero for facilities that had lower known rating levels, did not participate or engage in the QRIS, or had a preliminary rating in DC and NV.
- ^c These outcomes equal the number of staff employed in the facility with a particular qualification divided by the number of staff two years after baseline.
- ^d These outcomes equal the number of retained staff (staff who were employed in the facility at baseline and who were still employed after two years) with a particular qualification, divided by the number of staff two years after baseline.
- ^e These outcomes equal the number of recruited staff (staff who were not employed at baseline and hired within two years after baseline) with a particular qualification, divided by the number of staff two years after baseline.

Exhibit D.S1. Exploratory analysis sample sizes by study population

	PEF group	Eligible non-PEF group
	N	N
Center-based educators		
Baseline position		
Lead teachers	1,561	24,282
Assistant teachers	1,045	21,804
Baseline qualification tier		
Lower qualification tier	1,452	21,051
Middle qualification tier	694	9,465
Higher qualification tier	406	12,765
Facility payment model participation		
Baseline facility participated in FY 2024	2,408	n.a.
Baseline facility did not participate in FY 2024	198	n.a.
Center-based facilities		
Facility payment model participation		
Participated in FY 2024	256	n.a.
Did not participate in FY 2024	41	n.a.

Source: Data obtained by Mathematica research team through data sharing agreements with OSSE and NWRA. Data for Washington, DC, from DELLT, AidKit data, and OSSE administrative licensing data and PEF facility payment records. Comparison-group data from NWRA national workforce datasets and participating state workforce registry extracts.

Note: Table presents unweighted sample sizes by research group among center-based educators and facilities. For exploratory analyses by facility payment model participation, non-PEF group sample sizes are not shown because the analysis separately reweights the full underlying comparison group analytic sample to represent facilities that would have been more or less likely to participate in the facility payment model if offered. Educator sample sizes use the two-year retention outcome; facility sample sizes use the number of educators after two years.

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