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Understanding the Cost to Deliver High-Quality Publicly Funded Pre-Kindergarten Programs

In the 2018–2019 academic year, 44 states and the District of Columbia provided public funds to offer pre-kindergarten (pre-K) programs to some or all of their four-year-olds and, in some cases, three-year-olds as well (Friedman-Krauss et al., 2020). State funding for pre-K programs totaled about \$8.75 billion in that year, equivalent to an average spending of about \$5,374 per enrolled child. In states where pre-K funding is not universal, some jurisdictions—such as cities, counties, and school districts—operate their own pre-K systems, drawing on other sources of public funding (CityHealth and the National Institute for Early Education Research, 2019). Although spending on publicly funded pre-K programs is well documented, we know relatively less about the true cost to deliver those programs, especially considering varying quality standards and accounting for the resources used at both the provider and system levels.

Cost Concepts Used in This Report

We define the *cost* of a pre-K program as the value of the resources required to deliver the program on an annual basis. We differentiate between a narrow and broad cost concept. **Accounting cost**, the narrow cost concept, refers to the sum of cash expenditures for the pre-K program, including both personnel and non-personnel resources paid for during the annual accounting period. A more comprehensive measure of **economic cost** values all resources used to deliver the pre-K program, including those provided in-kind with no cash outlay (e.g., volunteer time, donated space).

Both cost concepts may be captured at the provider level, such as a school or community-based nonprofit or for-profit center. The two cost concepts can also be measured at the system level, capturing costs related to program administration and any services and supports provided by intermediaries in the system or at the highest administrative level of the system (e.g., a professional development system, data systems, or quality monitoring and assurance systems).

This knowledge gap reflects the fact that collecting pre-K cost information at the provider and system levels is time-consuming, complicated, and expensive, whether the goal is to capture narrow or broad cost concepts (see the text box). At the same time, having information on the full cost of pre-K is vital for determining the overall financing required to ensure that state pre-K systems deliver high-quality programs. Information on pre-K costs can also inform the mechanism for reimbursing providers of pre-K programs. Further estimation of the

KEY FINDINGS

- Prior research shows a range of \$12,500 to \$13,600 (in 2019 dollars using national-level prices, which adjust for regional price differences) for the per-child cost of a high-quality publicly funded pre-K program that operates for a full school day (e.g., 5.5 to 6.5 hours) and for an academic year.
- Cost data collected for the 2018–2019 academic year from 36 pre-K providers in the state-funded pre-K programs in Michigan, Oregon, and Tennessee reveal tremendous variation in cost per child within systems; in particular, per-child cost was as much as two times higher at the high end of the cost range than at the low end.
- Key sources of variation that drive differences in per-child expenditures include annual program hours, staffing structure, staff compensation, and facility costs.
- For three systems for which we obtained system-level cost information, there was also a wide range in estimated per-child cost, from a few hundred dollars per child to a few thousand dollars per child. Combined provider- and system-level costs for those three systems were estimated to be between about \$11,500 and \$13,600 per child at national-level prices (excluding the programs with comprehensive service models, such as Head Start).
- Model-based national estimates indicate that the per-child cost of high-quality pre-K at the provider level would be about \$12,700, with a range of about \$9,800 to \$15,400 (2019 dollars) across the seven pre-K systems we modeled; estimates at the state or local level would be lower or higher than this figure based on differences in regional prices (e.g., for salaries and non-wage cost and fringe benefits). Including system-level costs would increase these estimates.
- The cost per child of a set of high-quality pre-K elements examined in the cost model varied from as little as about \$300 per child (for employing a child-level developmental screener) to as much as about \$3,100 per child (for employing lead teachers who are more highly skilled and the associated increase in their compensation).
- The average reimbursement rates for several of the state-funded pre-K systems that we examined were below the estimated per-child cost for at least some of the providers that we sampled. Thus, providers would need to fill the gap with other sources of public or private funds to sustain their operations.
- Reimbursement rates could recognize key cost drivers to better align provider cost with the per-child funding that the provider receives. Alternatively, agencies could negotiate contracts with each provider to tailor reimbursement rates to match the provider’s cost structure.

incremental cost of high-quality investments (e.g., higher teacher qualifications or smaller group sizes) can be combined with evidence (when available) of the potential returns from that investment in terms of children’s developmental progress. In this way, it is possible to compare the relative cost-effectiveness of alternative strategies for quality improvement in pre-K programs.

As part of its Partnership for Pre-K Improvement (PPI) initiative, the Bill & Melinda Gates Foundation’s Early Learning team and its partners in three states—Oregon, Tennessee, and Washington—recognized the need for greater under-

standing of the cost to implement high-quality pre-K programs, and the foundation sponsored the RAND Corporation to study that topic.¹ With this report, our goal is to highlight findings from the analyses that have broader relevance for the early learning field. Specifically, this report addresses the following questions:

- What do we know about the cost of pre-K from prior cost studies?
- What is the estimated per-child cost of a pre-K program based on information obtained from sampled providers in the study states?

- What are key sources of cost variation across providers?
- What is the per-child cost of a pre-K program based on a cost model that assumes certain high-quality features? What is the estimated incremental cost associated with key quality elements?
- Does evidence of the effectiveness of different pre-K quality components indicate that spending on some quality elements is more cost-effective than spending on others?
- How do pre-K funding mechanisms vary, and is funding sufficient to cover the costs of high-quality programs?
- What are the challenges in collecting and analyzing information on pre-K program expenditures and full program costs?

Section One describes the study approach, and the research questions are addressed in sections describing results from a literature review (Section Two); the collection and analysis of 2018–2019 fiscal year cost data for nearly 40 providers across three states (and findings from a similar study on a fourth study state) (Section Three); and the use of a cost model to generate estimates of the total costs of high-quality pre-K, the incremental costs of key quality elements, and cost-effectiveness (Section Four). The two final sections address pre-K system funding mechanisms and challenges with understanding the true cost of a high-quality pre-K program, respectively.

SECTION ONE Study Approach

Before turning to the questions addressed in this report, we begin by describing the pre-K systems that are the focus of our analysis. We emphasize the differences between measuring system *spending* per child versus *cost* per child. We also highlight what can be learned through cost data collection versus cost modeling and which pre-K systems in our study are included in these two approaches.

Pre-K Systems Included in the Study and Their Features

In this study, we examined seven pre-K systems. For starters, we examined the four systems in the three Gates Foundation PPI states: Oregon Pre-Kindergarten (Oregon Pre-K), Oregon’s Preschool Promise, Tennessee’s Voluntary Pre-K (VPK), and Washington state’s Early Childhood Education and Assistance Program (ECEAP). Because several of the PPI systems had not yet achieved the highest quality standards recognized in the field (e.g., those promulgated by the National Institute for Early Education Research [NIEER]), we selected three more pre-K systems to include in the study that would meet or exceed key quality benchmarks that the PPI systems achieved, particularly the minimum education qualifications for the lead classroom teacher.² These additions allowed us to compare the cost of pre-K under a variety of quality standards.

Abbreviations

3s	three-year-olds
4s	four-year-olds
AA	associate’s degree
BA	bachelor’s degree
BEA	Bureau of Economic Analysis
Boston UPK	Universal Pre-K Boston
CDA	Child Development Associate credential
CPC	Child-Parent Center program
ECEAP	Early Childhood Education and Assistance Program
FPL	federal poverty level
GSRP	Great Start Readiness Program
HSD	high school diploma
NIEER	National Institute for Early Education Research
Oklahoma UPK	Oklahoma’s Early Childhood Four-Year-Old Program
Oregon Pre-K	Oregon Pre-Kindergarten
PPI	Partnership for Pre-K Improvement
pre-K	pre-kindergarten
QRIS	quality rating and improvement system
SD	standard deviation
VPK	Voluntary Pre-K

More specifically, the three other systems included in the study met the following criteria for the 2018–2019 academic year:

1. The system serves four-year-olds (and possibly three-year-olds too).
2. The delivery approach for pre-K programming is mixed; that is, both public schools and private community-based providers deliver the program. The private organizations may include private for-profit and not-for-profit centers, community colleges, and Head Start centers, among others.
3. Programs operate for an academic year and offer a *school-day* option (e.g., 5 to 6 hours per day or 900 or more hours per year); some may also offer a *part-day* option (e.g., 2.5 hours per day).
4. The system has requirements for high-quality features, including a maximum class size of 20, a maximum teacher-child ratio of 1:10, and lead classroom teachers with at least a four-year bachelor's degree (BA).
5. There is evidence from one or more rigorous evaluations showing that the system has favorable effects on school readiness.³

Geographic variation was also taken into account. The three additional systems that were included in the study are Universal Pre-K Boston (Boston UPK), Michigan's Great Start Readiness Program (GSRP), and Oklahoma's Early Childhood Four-Year-Old Program (Oklahoma UPK).

Table 1.1 summarizes key features of the seven pre-K systems included in the study as of the 2018–2019 academic year, including the features expected to affect per-child cost. The seven district- or state-funded pre-K systems were similar in serving at-risk four-year-olds (“4s” in tables in this report) and sometimes three-year-olds (“3s” in tables). Two of the systems (Boston UPK and Oklahoma UPK) were universal (i.e., there is no income cap or other eligibility criteria other than the age cutoff for pre-K entry). All of the systems used a mixed delivery approach of public and private providers, although the specific types of eligible providers vary.

Most relevant for program costs, the systems varied in the requirement for minimum hours, from

2.5 hours per day (Oklahoma UPK and Washington ECEAP, although both have school-day options too) to 6.5 hours per day (Boston UPK), equivalent to a range of 450 to 1,080 annual hours for a 180-day academic year. Oregon Pre-K had a smaller group size and teacher-to-child ratio requirement for serving three-year-olds than for serving four-year-olds, so we would expect the cost for serving three-year-olds to be higher. Finally, of the four PPI systems, only Tennessee VPK required at least a BA for the lead teacher—which typically commands higher compensation—compared with the required associate's degree (AA) or Child Development Associate credential (CDA) required for the position in other PPI systems. The other three non-PPI systems required a BA for the lead teacher and a CDA, AA, or high school diploma (HSD) for the assistant teacher. The PPI systems met between five and eight of the ten NIEER quality benchmarks as of the 2018–2019 academic year, while the other three included systems met between eight and all ten of the benchmarks (Friedman-Krauss et al., 2020).

Given these differences in program features, we do not expect the per-child cost to be the same across the focal pre-K systems, even after adjusting for differences in annual hours by estimating the cost per child-hour or controlling for price differences across the six geographic areas. Furthermore, there were other differences in program features that are not reflected in the table but that also have implications for cost, such as the more comprehensive set of services provided to children (and their families) enrolled in Oregon Pre-K, which follows the Head Start model (specifically, the Head Start Program Performance Standards).

Spending per Child Versus Cost per Child

Table 1.2 reveals that the reported spending per child for each pre-K system varied considerably, for the state-only contribution or all reported spending (Friedman-Krauss et al., 2020). Spending from all sources may include a local match, which is required for Tennessee VPK (25-percent match) and is de facto for Oklahoma UPK. Considering

TABLE 1.1

Features of the Seven Focal Pre-K Systems, 2018–2019 Academic Year

Pre-K System (Starting Year)	Level	Eligible Children and Enrollment for 2018–2019	Eligible Providers	Key Program Features		Number of NIEER Benchmarks Met
Boston UPK (1998)	District	<ul style="list-style-type: none"> Eligible: 4s in district, moving toward universal access Enrollment: ~3,200 	Mixed delivery: public schools, community-based providers	Min. hours:	6.5 per day	8 of 10
				Max. class size:	20 (4s)	
				Max. teacher-child ratio:	1:10 (4s)	
				Lead teacher degree:	At least a BA	
				Asst. teacher degree:	At least an AA	
Michigan GSRP (1985)	State	<ul style="list-style-type: none"> Eligible: 4s; 90% must have family income below 250% of FPL Enrollment: ~37,100 	Mixed delivery: public schools and contracted community-based providers with a QRIS star 3 or higher rating	Min. hours:	3.0 per day, 4 days per week	10 of 10
				Max. class size:	18 (4s)	
				Max. teacher-child ratio:	1:8 (4s)	
				Lead teacher degree:	At least a BA	
				Asst. teacher degree:	At least a CDA	
Oklahoma UPK (1980)	State	<ul style="list-style-type: none"> Eligible: 4s, universal access Enrollment: ~42,600 	Mixed delivery: public schools and community-based providers with a public school teacher placed in the classroom	Min. hours:	2.5 per day	9 of 10
				Max. class size:	20 (4s)	
				Max. teacher-child ratio:	1:10 (4s)	
				Lead teacher degree:	At least a BA	
				Asst. teacher degree:	At least an HSD	
Oregon Pre-K* (1987)	State	<ul style="list-style-type: none"> Eligible: 3s and 4s who meet Head Start eligibility Enrollment: ~7,800 	Mixed delivery: public and community-based providers that do not receive Head Start funding	Min. hours:	3.5 per day	8 of 10
				Max. class size:	17 (3s), 20 (4s)	
				Max. teacher-child ratio:	2:17 (3s), 1:10 (4s)	
				Lead teacher degree:	At least an AA	
				Asst. teacher degree:	At least a CDA	

Table 1.1—Continued

Pre-K System (Starting Year)	Level	Eligible Children and Enrollment for 2018–2019	Eligible Providers	Key Program Features		Number of NIEER Benchmarks Met
Oregon Preschool Promise* (2016)	State	<ul style="list-style-type: none"> • Eligible: 3s and 4s with income below 200% of FPL • Enrollment: ~1,500 	Mixed delivery: public and community-based providers with a QRIS star 4 or 5 rating or with a waiver while building capacity	Min. hours:	5 per day ^a	5 of 10
				Max. class size:	20 (3s and 4s)	
				Max. teacher-child ratio:	1:10 (3s and 4s)	
				Lead teacher degree:	At least a CDA	
				Asst. teacher degree:	Other	
Tennessee VPK* (2005)	State	<ul style="list-style-type: none"> • Eligible: mostly 4s, with priority to those with various risk factors • Enrollment: ~17,900 	Mixed delivery: public and community-based providers; funding is provided to local education agencies that may contract with other public or private providers	Min. hours:	5.5 per day	8 of 10
				Max. class size:	20 (4s)	
				Max. teacher-child ratio:	1:10 (4s)	
				Lead teacher degree:	At least a BA	
				Asst. teacher degree:	At least an HSD	
Washington ECEAP* (1985)	State	<ul style="list-style-type: none"> • Eligible: 3s and 4s with income below 110% of FPL or with an individualized education program (up to 10% enrollment of children with other risk factors) • Enrollment: ~13,500 	Mixed delivery: public and community-based providers with a QRIS star 4 or 5 rating	Min. hours:	2.5 per day	8 of 10
				Max. class size:	20 (3s and 4s)	
				Max. teacher-child ratio:	1:10 (3s and 4s)	
				Lead teacher degree:	At least an AA	
				Asst. teacher degree:	At least a CDA	

SOURCES: Friedman-Krauss et al., 2020; CityHealth and the National Institute for Early Education Research, 2019. To supplement those sources, we reviewed the websites of the pre-K systems.

NOTES: FPL = federal poverty level; QRIS = quality rating and improvement system. All programs operate for 5 days per week for the academic year, unless otherwise indicated.

^a The requirement is for 900 hours per academic year, which is the equivalent of 5 hours per day for a 180-day academic year.

* Indicates PPI pre-K systems.

TABLE 1.2

Reported Spending per Child for the Seven Focal Pre-K Systems, 2018–2019 Academic Year

Pre-K System	Pre-K per-Child Spending (2018–2019 dollars)			Local Match Required?	All-Items Regional Price Index (2019)
	State (District) Spending	All Reported Spending			
Boston UPK	—	—		No	115.5
Michigan GSRP	6,586	6,586		No	92.3
Oklahoma UPK	4,264	9,096		No	87.2
Oregon Pre-K*	9,508	9,508		No	102.2
Oregon Preschool Promise*	11,418	11,418		No	102.2
Tennessee VPK*	4,841	6,266		Yes	89.7
Washington ECEAP*	8,969	8,969		No	108.4

SOURCES: Friedman-Krauss et al., 2020; Bureau of Economic Analysis, 2020.

NOTES: The Boston all-items regional price index is for the Boston-Cambridge-Newton metropolitan area; all other indexes are for the relevant state. The state and metropolitan regional price indexes are relative to the United States as a whole (i.e., U.S. average = 100).

* Indicates PPI pre-K systems.

— Indicates not reported.

all sources, Tennessee VPK reportedly spent about \$6,300 and Michigan GSRP spent about \$6,600 per child at the low end, compared with about \$11,400 per child for Oregon Preschool Promise. Washington ECEAP, Oklahoma UPK, and Oregon Pre-K spent about \$9,000, \$9,100, and \$9,500 per child, respectively. This relative spending pattern is mostly consistent with differences in the cost of living across these states, as measured by the Regional Price Parities index calculated by the Bureau of Economic Analysis (BEA) (in which the U.S. average is set to 100). According to data from the 2019 index, the cost of living in Oregon (index of 102.2) and Washington (108.4) was higher than the national average, whereas in Tennessee (89.7) and Michigan (92.3), the cost of living was lower than the national average (BEA, 2020). Oklahoma did not follow this pattern: Rather, Oklahoma had the lowest cost of living across the focal states (index of 87.2), but spending per child was similar to that in Oregon and Washington, which had the highest cost of living among our focal states.

Although these per-child spending figures are informative, they do not capture the true cost of providing pre-K programs in these systems. What states or districts spend on a pre-K program may

exceed the true cost if pre-K providers in centers and schools are being over-compensated (i.e., spending is higher than the true cost). Alternatively, providers may be being under-compensated. In the former instance, a provider would be operating with a surplus in the pre-K component of its program (revenue exceeding expenses); in the latter case, a provider would be operating at a loss unless it could make up for the missing state- or district-level revenue with other sources of support (e.g., private fundraising or family fees). A similar issue of over- or under-reimbursement may apply to system-level spending versus cost. The bottom line is that we cannot use the figures on spending per child in Table 1.2 as a measure of the true cost of pre-K or the cost of high-quality pre-K.

The Value of Cost Data Collection Versus Cost Modeling

With a goal of understanding the true cost of high-quality pre-K, we used two alternative but complementary methods: cost data collection and cost modeling. Table 1.3 provides a description of each of the two approaches and the questions they can answer.

TABLE 1.3

Contributions of the Cost Data Collection Versus Cost Modeling Methods

	Cost Data Collection	Cost Modeling
What the method does	<ul style="list-style-type: none"> Estimates per-child cost from providers and administrative agencies based on reported resources used, associated expenditures, and imputed values of in-kind resources. 	<ul style="list-style-type: none"> Estimates per-child cost using a model that has assumptions about resources required and associated prices and that sums the value of all resources under those assumptions.
Questions that the method can answer	<ul style="list-style-type: none"> What resources (“ingredients”; see later discussion) are used to deliver pre-K at the provider and system levels based on program requirements and features? What prices do providers and system administrators face for personnel and non-personnel resources? What resources are provided in-kind? Which are the major cost components? How much variation is there across providers in per-child cost? What accounts for differences in per-child costs (e.g., resources, prices, or both)? 	<ul style="list-style-type: none"> What is the cost per child under alternative assumptions about the resources (ingredients) used or the prices for those resources? What is the incremental (marginal) cost of varying one program feature, leaving other features constant? Which program features are the major cost drivers? How much variation in cost per child would be expected based on variation in resource quantities or prices? What is the estimated per-child cost at the national level?

Cost data collection requires obtaining information from providers and system-level agencies about the resources they use to deliver a pre-K program and the value of those resources. The narrow measure of *accounting cost* is usually based on annual expenditures, disaggregated into major expenditure components (e.g., classroom staff personnel, administrative or support personnel, rent and utilities). To capture full *economic cost*, any resources that are donated or otherwise provided without a cash outlay would also be included. The resources used and their values would be captured at all system levels, from those used by the service provider to those used by any public- or private-sector agencies involved in administering or supporting the pre-K program. Because both the number of children served and the annual hours of program time can vary across providers, the most comparable cost metric across providers is cost per child-hour (a *child-hour* is a unit of one hour’s time for one child).

As enumerated in Table 1.3, the resulting cost estimates can be used to examine aspects related to the resources used to deliver a pre-K program, the prices of those resources, and sources of variation across providers. The drawback of this approach is that cost information is challenging to collect from providers and system-level administrators for a variety of reasons, such as a lack of time for providers or

agencies to participate in the data collection, disorganized or incomplete provider financial records, and complex provider operational structures that make it difficult to parse out which resources are used for the pre-K services versus other program components (e.g., classrooms at the same site serving younger or older children). This means that cost information is typically collected for a sample, and those samples are often small because provider participation in the data collection is low.

The second method that we used was to employ a cost model to estimate the per-child cost for a pre-K program. The model makes assumptions about the resources required and their prices, and assumptions can be informed by what was observed in the real-world provider data. One advantage of the cost model approach is that the per-child cost can be estimated for the pre-K system of interest under alternative scenarios that differ from the current approach, such as with a different overall program scale or provider mix or with modifications to the required group size and teacher-child ratio, the education requirements and compensation of program staff, and so on. A cost model also allows for estimating the marginal change in cost per child as one program feature is varied at a time or when multiple components are varied simultaneously. The use of a cost model also supports an examination of key

cost drivers and the development of a national-level estimate of per-child cost (a national-level estimate adjusts for regional price differences). The main shortcoming of the model-based approach is that it produces a cost estimate for a given provider of how it is assumed to operate rather than how it may structure its program, the costs that it faces, and the variation in costs across providers.

Rather than using one approach or the other, we used both in this study because they are complementary and can be constructively used together. Table 1.4 summarizes which pre-K systems we included in each approach. For the cost data collection method, our goal was to obtain expenditure information for the 2018–2019 academic year for 20 providers in each of the six jurisdictions (states or districts) covered by the seven systems in our study. Our data collection period began in February 2020 and continued through mid-December 2020, so the effort was limited by the effects of the COVID-19 pandemic. Specifically, we did not collect data for two planned systems: Boston UPK and Oklahoma UPK. In a separate study using similar methods, ICF International (forthcoming) collected and analyzed

provider data for Washington ECEAP; those estimates are cited in this report alongside estimates that are based on data that we collected from providers in Michigan, Oregon (two systems), and Tennessee. In addition, we collected pre-K *system*-level information for the two systems in Oregon and the system in Washington. As shown in Table 1.4, all seven systems in the six jurisdictions were included in the cost modeling approach. We also produced national-level estimates based on the model.

In the analysis that follows, monetary values are presented in 2018–2019 dollars for numbers that are based on expenditure data collected for the 2018–2019 academic year or in 2019 dollars for model-based estimates. For purposes of comparison, dollar figures from earlier years are converted to 2019 dollars using the Personal Consumption Expenditures price index (BEA, 2021). When comparing across different states or districts, we also use the Regional Price Parities index (BEA, 2020) to convert dollar estimates to the national level. This should remove differences in the cost of living at a state or local level as a major source of differences in the pre-K cost estimates.⁴

TABLE 1.4
Pre-K Systems Included in Each Analysis Method

Pre-K System	Included in Cost Data Collection		Included in Cost Modeling
	From Providers	From System Level	
Boston UPK			✓
Michigan GSRP	✓		✓
Oklahoma UPK			✓
Oregon Pre-K*	✓	✓	✓
Oregon Preschool Promise*	✓	✓	✓
Tennessee VPK*	✓		✓
Washington ECEAP*	✓ ^a	✓	✓
National level	—	—	✓

* Indicates PPI pre-K systems.

— Indicates not applicable.

^a For Washington ECEAP, we use results from a similar analysis by ICF International, forthcoming.

SECTION TWO

Prior Estimates of Pre-K Costs

With the growth of pre-K programs funded at the state and local levels, cost estimates have been generated, based on cost data collection and cost modeling, for a handful of the pre-K systems that are implemented at the state or district level. In this section, we assess what prior pre-K cost studies indicate about actual or modeled cost. Using an earlier review of pre-K cost studies, Minervino assessed the evidence regarding the cost of a high-quality pre-K program; he concluded, “Given the previously discussed elements of quality required for early learning success, and given what federal, state and local governments are already spending on early learning, a cost-sustainability target averaging \$8,000–\$10,000 per-child, per-year [in 2012 dollars] is feasible” (Minervino, 2014, p. 17). That range in 2019 dollars equates to \$8,800–\$11,000. Minervino’s conclusion rested on model-based estimates by Gault et al. (2008) for a pre-K program with high-quality features, including a lead teacher with a BA and teacher-child ratios as low as 2:15 and as high as 2:20 (or 1:10). The per-child cost range estimated by Gault et al. (2008), however, did not account for system-level costs.

Table 2.1 summarizes per-child pre-K cost estimates from studies available at the time of Minervino’s 2014 report, as well as several more-recent estimates.⁵ The studies are grouped by their approach so that any differences in cost estimates based on the methodology are more apparent. The first panel of the table—panel A—features results for five publicly funded pre-K programs in operation for which cost estimates were available based on actual expenditures. Those programs are Boston UPK, Chicago’s Child-Parent Center program (CPC), Oklahoma UPK as implemented in Tulsa, New Jersey’s Abbott Preschool Program, and the Virginia Preschool Initiative Plus program. None of these estimates is based on expenditure information collected directly from providers; rather, the studies employed aggregate expenditures at the district level for all districts or a subset of districts. Panel B summarizes estimates from two model-based cost stud-

ies for state-specific programs: again New Jersey’s Abbott Preschool Program and South Carolina’s Child Early Reading Development and Education Program. The model-based approach is more dependent on assumptions and thus may deviate from estimates based on recorded expenditures. Three model-based national estimates are listed in panel C. These estimates would be expected to vary from those for state or district programs because of differences in prices at the national level versus the state or local level. We note that two of the pre-K systems in Table 2.1 are among our focal systems (Boston UPK and Oklahoma UPK).

A comparison of per-child cost across the pre-K programs in Table 2.1 would ideally standardize the cost estimates as much as possible. First, given that the original cost estimates are reported for different years and different geographies, we standardized all dollar values to 2019 dollars at the national level (i.e., adjusting for regional price differences), as shown in the next-to-last column. Second, we selected pre-K programs that have similar structural features that are important cost drivers, or we made adjustments.⁶ For example, with the exception of Chicago CPC, all cost estimates are for pre-K programs operating for a school day (about 6 hours per day) and for an academic year. Chicago CPC offered only a part-time option at the time that the cost estimate was derived. Oklahoma had both a part- and school-day option, and cost estimates were available for both. With the exception of the Abbott Preschool Program, the actual or assumed programs were similar in having a maximum group size of 20 children in a classroom, a teacher-child ratio of 1:10, and a BA (or higher) requirement for the lead teacher. The Abbott program had a smaller group size (15 per classroom) and thus a more favorable (and costly) ratio. A key remaining difference across the estimates is whether system-level costs were included. They were included for the two district-level programs that do not operate under a state-level infrastructure (Boston UPK and Chicago CPC), but they generally were not included for state-level systems whose cost estimates were based on cost data collection or cost modeling (because of the challenges of collecting such information or modeling the system-level components).

TABLE 2.1

Estimated Cost per Child for Publicly Funded Pre-K Programs

Pre-K System or Estimate (Source)	Level	Eligible Children and Providers	Actual (Operating Programs) or Assumed (Modeled Programs) Key Features		Cost Estimation Method	Cost per Child (original dollars)	Cost per Child (2019 national-level dollars) ^a	Includes System-Level Costs?	
A. Estimates based on macro expenditures for operating programs: School district and state programs									
Boston UPK (Kabay, Weiland, and Yoshikawa, 2020)	School district (Boston)	<ul style="list-style-type: none"> Children: Universal 4s Providers: Public schools 	Min. daily hours:	6.5	Reported school district expenditures divided by enrollment	School day: \$15,240 (2018 dollars)	\$13,391	State: —	District: Yes
			Max. class size:	20					
			Max. teacher-child ratio:	1:10					
			Lead teacher degree:	BA					
			Asst. teacher degree:	AA					
Chicago CPC (Reynolds et al., 2011)	School district (Chicago)	<ul style="list-style-type: none"> Children: Targeted 3s and 4s Providers: Public schools 	Min. daily hours:	3	Reported school district expenditures divided by enrollment ^b	Part day: \$5,675 ^c (2007 dollars)	\$6,632	State: —	District: Yes
			Max. class size:	17					
			Max. teacher-child ratio:	2:17					
			Lead teacher degree:	BA					
			Asst. teacher degree:	NS					
Oklahoma UPK (Bartik, Gormley, and Adelstein, 2012)	School district (Tulsa)	<ul style="list-style-type: none"> Children: Universal 4s Providers: Public schools 	Min. daily hours:	2.5	Reported school district expenditures divided by enrollment	Part day: \$4,403	\$6,389	State: No	District: Yes
			Max. class size:	20			School day: \$8,806 (2005–2006 dollars)	\$12,779	
			Max. teacher-child ratio:	1:10					
			Lead teacher degree:	BA					
			Asst. teacher degree:	CDA					
New Jersey Abbott Preschool Program (Belfield and Schwartz, 2007)	Abbott school districts	<ul style="list-style-type: none"> Children: Targeted 3s and 4s Providers: Public schools and contracted private centers and Head Start centers 	Min. daily hours:	6	Reported school district expenditures divided by enrollment	School day: \$11,982 (2007–2008 dollars)	\$12,409	State: No	District: Yes
			Max. class size:	15					
			Max. teacher-child ratio:	2:15					
			Lead teacher degree:	BA					
			Asst. teacher degree:	CDA					

Table 2.1—Continued

Pre-K System or Estimate (Source)	Level	Eligible Children and Providers	Actual (Operating Programs) or Assumed (Modeled Programs) Key Features		Cost Estimation Method	Cost per Child (original dollars)	Cost per Child (2019 national-level dollars) ^a	Includes System-Level Costs?	
Virginia Preschool Initiative Plus (Kahn et al., 2019)	11 school districts	<ul style="list-style-type: none"> Children: Targeted 4s Providers: Public schools and contracted private centers 	Min. daily hours:	6	Reported school district expenditures divided by enrollment	School day: \$16,210 (2017 dollars)	\$16,586	State:	No
			Max. class size:	18				District:	Yes
			Max. teacher-child ratio:	1:9					
			Lead teacher degree:	BA					
			Asst. teacher degree:	Varies by district					
B. Estimates based on modeled expenditures for operating programs: State-specific estimates									
New Jersey Abbott Preschool Program (Belfield and Schwartz, 2007)	Abbott school districts	<ul style="list-style-type: none"> Children: Targeted 3s and 4s Providers: Public schools and contracted private centers and Head Start centers 	Min. daily hours:	6	Cost estimates of ensuring a well-planned, high-quality pre-school using a regression-based cost function	School day: \$12,736 (2007–2008 dollars)	\$13,247	State:	No
			Max. class size:	15				District:	Yes
			Max. teacher-child ratio:	2:15					
			Lead teacher degree:	BA					
			Asst. teacher degree:	CDA					
South Carolina Child Early Reading Development and Education Program (Karoly and Gomez, 2019)	State	<ul style="list-style-type: none"> Children: Targeted 4s Providers: Public schools and private centers 	Daily hours:	6.5	Cost model based on the ingredients method	School day: \$11,996 (2017–2018 dollars)	\$13,589	State:	No
			Max. class size:	20				District:	Yes
			Max. teacher-child ratio:	1:10					
			Lead teacher degree:	BA					
			Asst. teacher degree:	Other					
			Under-enrollment:	10%					
C. Estimates based on modeled expenditures for specified programs: National estimates									
Institute for Women's Policy Research cost of high-quality care estimate (Gault et al., 2008)	National	<ul style="list-style-type: none"> Children: Universal Providers: Public schools and private centers 	Daily hours:	6	Cost model based on the ingredients method	School day: \$7,454 (2007 dollars)	\$8,995	State:	No
			Max. class size:	20				District:	No
			Max. teacher-child ratio:	1:10					
			Lead teacher degree:	BA					
			Asst. teacher degree:	Other					

Table 2.1—Continued

Pre-K System or Estimate (Source)	Level	Eligible Children and Providers	Actual (Operating Programs) or Assumed (Modeled Programs) Key Features		Cost Estimation Method	Cost per Child (original dollars)	Cost per Child (2019 national-level dollars) ^a	Includes System-Level Costs?	
Cost of public pre-K program estimate (Kabay, Weiland, and Yoshikawa, 2020)	National	<ul style="list-style-type: none"> Children: Universal Providers: Public schools 	Min. daily hours:	6.5	Cost model based on the ingredients method ^d	School day: \$12,380 (2018 dollars)	\$12,564	State:	Yes ^e
			Max. class size:	20				District:	Yes
			Max. teacher-child ratio:	1:10					
			Lead teacher degree:	BA					
			Asst. teacher degree:	AA					
National Academies of Science, Engineering, and Medicine cost of high-quality care estimate (Allen and Backes, 2018)	National	<ul style="list-style-type: none"> Children: Universal Providers: Public schools and private centers 	Daily hours:	6.5 ^f	Cost model based on the ingredients method	School day: \$7,687 (2017–2018 dollars)	\$8,194	State:	Yes
			Max. class size:	20				District:	Yes
			Max. teacher-child ratio:	1:10					
			Lead teacher degree:	BA					
			Asst. teacher degree:	AA					
			Under-enrollment:	10%					

SOURCE: See the sources cited in the first column. For more on the ingredients method, see Levin and McEwan, 2001.

NOTES: NS = not specified. Part-day programs operate between 2.5 and 3 hours per day. School-day programs operate between 6 and 6.5 hours per day. All programs operate for 5 days a week and for an academic year.

— Indicates not applicable.

^a Cost estimates in this column were converted to 2019 national values using the Personal Consumption Expenditures price index (BEA, 2021) and the Regional Price Parities index (BEA, 2020) for states and metro areas.

^b The cost estimate includes the value of parents' time to participate in the parent engagement component of the program.

^c The original cost estimate was per child enrolled in the one- or two-year program. Children participated for 1.5 years on average. We converted the original estimate to an annualized cost estimate.

^d We report the “maintain” or steady-state cost per child reported by Kabay, Weiland, and Yoshikawa (2020). That study also reports an “initiate” estimate, which includes start-up costs. That estimate in 2019 dollars is about \$2,200 higher per child compared with the “maintain” cost.

^e The national estimate extrapolates the resources at the district level for Boston UPK but does not assume additional resources at a state level. However, some of the supports implemented at the district level would presumably be administered through a state-level agency under national implementation.

^f The original cost estimate was per child, assuming 40 hours of care per week for 52 weeks. The estimate here prorates the full-time year-round estimate (1,080 annual hours) to a school-day (6.5 hours) and a 180-day academic year (1,170 annual hours).

Several key points about the estimates in Table 2.1 merit mention:

- After we converted the original estimates to 2019 national-level prices, most of the per-child cost estimates for a school-day, academic-year program were in the range of about \$12,500 to \$13,600.⁷ With three exceptions (discussed next), this range holds for six studies in panels A to C with school-day programs (i.e., excluding Chicago CPC) and for estimates from both cost data (panel A) and cost models (panels B and C). Overall, this range is about \$1,500 to \$2,600 higher than the upper bound of \$11,000 (in 2019 dollars) suggested by Minervino (2014).
- One notable exception on the high end of this range is Virginia’s Preschool Initiative Plus, funded through a federal Preschool Expansion Grant. The program had an estimated national cost of \$16,600 per child. The grant funding, which supported expanded slots and increased quality, may have allowed districts to spend more per child during the grant years than what might otherwise be sustainable.
- Exceptions at the lower end of per-child costs were the two model-based estimates in panel C by Gault et al. (2008) and Allen and Backes (2018). These estimates, at national-level prices, were about \$9,000 and \$8,200, respectively, per child for a school-day, academic-year program. In contrast, the

Prior research suggests that the cost of high-quality pre-K programs would be expected to range from \$12,500 to \$13,600 per child at national-level prices.

national-level model-based estimate by Kabay, Weiland, and Yoshikawa (2020), based on the Boston UPK model, was about \$12,600, which is within the range noted earlier. Notably, the Gault et al. (2008) and Allen and Backes (2018) studies assumed a mixed delivery model, albeit with at least partial pay parity. The other estimates in Table 2.1 effectively assumed delivery through public schools with their associated compensation structure, typically with higher salaries and more-generous fringe benefits. Assumptions about compensation are a key cost driver in model-based estimates (Karoly and Gomez, 2019; Karoly and Walsh, 2020).

- Interestingly, even though the New Jersey Abbott Preschool Program had a smaller class size and teacher-child ratio compared with Boston UPK, the per-child cost estimates were nearly the same when measured in national-level prices, about \$13,300. This may reflect other differences in resource use beyond the key structural factors of group size and teacher-child ratio, or it may reflect the possibility that the regional price indexes do not fully adjust for differences in the cost of labor and other resources required to deliver a high-quality pre-K program.
- It is relatively rare for the per-child pre-K cost estimates presented in Table 2.1, especially when calculated for operating programs, to include system-level costs at all relevant levels, particularly the state level. Thus, in most cases, the estimates in Table 2.1 would not be expected to reflect the full cost of a state- or district-funded pre-K program. Likewise, the cost estimates for the operating programs in panel A do not consistently include *in-kind resources*—that is, expenditures at the school or district level that may not be reimbursed by the state (or district). Again, this would be expected to produce an underestimate of the true per-child cost.

The bottom line is that prior research suggests that the cost of high-quality pre-K programs would be expected to range from \$12,500 to \$13,600 per

child at national-level prices. The cost for a given state or local program would adjust upward or downward based on the difference between regional and national prices. Accounting for system-level cost would push that range even higher. And assumptions about the settings in which pre-K programming is delivered and the associated compensation packages are other key determinants of per-child cost.

SECTION THREE

Results Based on Cost Data Collection

We now turn to estimates of pre-K cost based on provider-level data that we collected for four systems in three jurisdictions—Michigan, Oregon, and Tennessee—and on estimates for Washington ECEAP in the ICF International (forthcoming) report. Detailed system-level cost information was collected for the two pre-K systems in Oregon and for Washington ECEAP. Before presenting findings, we first briefly describe our approach, followed by key details about the ECEAP study. Additional details about the methods for our cost data collection are available in Appendix A, and details about methods for data-based cost estimation and cost modeling are found in Appendix B. All appendixes are available separately online at www.rand.org/t/RRA252-1.

RAND's Cost Data Collection and Estimation

Costs are the product of a quantity of a given resource times the economic value of that resource, typically based on the market price. If we can account for all resources used and the value of those resources, we can measure the full economic cost of a pre-K program. Using relevant data, we can divide total cost by the number of children served or the number of child-hours of service to arrive at an estimate of a program's cost per child or cost per child-hour. To generate a comprehensive cost estimate, we include not only cash expenditures but also the value of resources provided in-kind (e.g., donated or subsidized space, volunteer labor). Where possible, we also include system-level cost.

As noted earlier, we collected program and cost information at the provider level for three of our focal states between February and December 2020 (see Table 1.4). The final sample of 36 providers consisted of 14 providers for Michigan GSRP, nine for Oregon (three for Oregon Pre-K and six for Oregon Preschool Promise), and 13 for Tennessee VPK.⁸ We implemented the provider-level data collection using a standardized expenditure collection tool for school- and community-based providers. A separate standardized expenditure collection tool was used for system-level expenditures in the three systems covered.

At the site level, we stratified providers into groups based on information known prior to random sampling. The goal was to obtain variation across provider types (e.g., centers versus school-based sites), geography (e.g., regions of the state), and other key program features (see Appendix A). The general approach began with an email to the selected providers inviting them to participate in the study, and we conducted email and telephone follow-ups for those who did not respond. For providers that agreed to participate in the study, we scheduled an initial phone interview to collect key program details and to explain how to use the fillable data instrument (in Adobe Acrobat or another PDF editor) or how to directly provide relevant financial summary information (e.g., a year-end financial statement) from which we would extract the needed information. Forms returned by providers were reviewed for completeness and consistency. In many cases, we followed up with providers by phone or by email to clarify responses or collect missing information.

Our approach used a modified version of the ingredients method (Levin and McEwan, 2001). For the most part, at both the provider and system levels, we recorded expenditures as the product of quantities and prices. For programs, we generally captured the staffing structure, such as the number and types of administrators and the number and types of teachers in a classroom. However, we did not always obtain salaries and benefits for each staff member but rather the aggregate wage bill at the classroom or program level. As much as possible, direct costs for the pre-K classrooms and shared administrative expenses were

At the system level, it is not always feasible to identify all of the resources, especially indirect spending by other government agencies, that are required to support a given pre-K site or the system as a whole.

recorded and distinguished from resources used to serve younger and older children at the same site.

The provider-level data collection tool recorded expenditures and other resources for the most recent completed fiscal year, which was 2018–2019, although the starting and ending months varied somewhat.⁹ Using the data collected, we estimated the pre-K cost per child on an annual and hourly basis for the 2018–2019 academic year. We report such cost estimates as the (unweighted) average across sites in each system, as well as the range across the sites (minimum and maximum). We first report accounting cost, which is based on actual expenditures. Not every provider paid full cost for the value of the space it used because either it owned its own building (mortgage-free) or space was partially or fully subsidized. Some providers also reported regular voluntary labor in the classroom. Thus, we also report an economic cost estimate in which these resources are valued and included with actual (accounting) cost.

At the system level, the goal was to capture the information for each of the systems that had provider data. Complete information was not available from Michigan and Tennessee during the study period, so

results pertain to Oregon and Washington. For each system, state-level program administrators identified spending in nine areas: curriculum and other pedagogy, student assessment, program or classroom quality, professional development, higher education systems, summative evaluation, data systems, general administration, and other system-level supports. This list was developed based on interviews with system-level staff regarding the types of supports they provide as part of delivering the pre-K program. Expenditure information was collected for the 2018–2019 academic year and captured direct personnel costs (e.g., agency personnel), other direct costs (e.g., travel and contracts for delivery of services, such as quality measurement), and indirect costs (e.g., overhead to support other functions, such as payroll and data systems). Expenditures were aggregated and divided by the number of full-time equivalent slots in the pre-K system.¹⁰

It is important to keep in mind that we did not intend for the providers analyzed to be a representative sample for any given pre-K system; rather, we intended to capture some of the diversity in the resources that programs use and the cost of those resources. Furthermore, the cost analysis relies on information reported by providers, which is expected to have some measurement error, especially for providers without robust financial accounting systems. Such measurement error may also affect system-level information. And, as discussed later, there are challenges involved in collecting information from providers and system-level supports to capture the full cost of high-quality pre-K. These challenges include accounting for both school-based and community-based sites, sites that serve younger and older children where the pre-K classrooms are located, and sites with blended funding for the preschool-age children. Likewise, at the system level, it is not always feasible to identify all of the resources, especially indirect spending by other government agencies, that are required to support a given pre-K site or the system as a whole. These circumstances may also affect the ability of providers and analysts to accurately attribute resources and their costs to the pre-K program of interest.

ICF International’s Cost Data Collection and Estimation

The ICF International (forthcoming) cost study for Washington ECEAP was sponsored by the Washington State Department of Children, Youth, and Families, which administers the program. The data collection was designed as a census of all ECEAP providers, with a goal of using the resulting cost information to set reimbursement rates and inform other policy decisions. The self-administered survey was fielded from May to September 2020, which was longer than expected because of the pandemic; the survey used an online instrument that was similar to RAND’s in the sections that pertained to cost data collection. Training webinars and one-on-one technical assistance aimed to ensure consistent data collection. Responses were obtained for 136 of the 386 providers invited to participate; 53 were community-based settings and 83 were school-based settings. However, about 73 percent of the nearly 400 ECEAP providers operated part-day programs in 2020; school-day sites would be most comparable to the other pre-K systems for which RAND collected data. The ICF researchers obtained usable responses for computing per-child cost from 15 community-based sites and three school-based sites with school-day programs, and the report provided results only for the former, given the small number of respondents for the latter. ICF also obtained and reported responses from part-day programs at 24 community-based sites and 41 school-based sites.

The ICF study approach to estimating cost using the collected data was similar to ours, and results were reported at the median values separately for community- and school-based providers and for part- and school-day programs.¹¹ The cost per child-hour was not reported, limiting the ability to pool across part- and school-day programs. Disaggregation of total cost by cost component was reported for personnel versus non-personnel cost and, within the latter, was disaggregated into several categories that align with our breakdown.

Characteristics of RAND’s Sampled Providers

In this section, we summarize key features of the sampled providers in our analysis, reporting the features separately for each of the four pre-K systems and focusing on factors that may produce variation in per-child cost (see Table 3.1).¹² Overall, the providers were in diverse locations, ranging from cities and suburbs to smaller towns and rural areas. Given that all systems in Table 3.1 used mixed delivery systems, we had a mixture of school-based programs and others delivered by not-for-profit or for-profit community-based organizations, including private child care centers, community colleges, and social services agencies. A subset of the sampled programs in each system were Head Start programs, which may lead to higher cost estimates, given the more comprehensive services provided by Head Start compared with non-Head Start pre-K programs. In Michigan, nearly all sites participated in the state’s QRIS; this was less common in the other state samples. Even rarer among the sampled providers in each system was being accredited by a national organization, such as the National Association for the Education of Young Children. Sites with these quality markers may operate with higher costs because of any additional requirements associated with their rating or accreditation status, although unrated programs or programs that are not accredited could operate with equally high standards.

Programs varied considerably in their size overall and in the size of their pre-K program, which may have implications for scale economies. In Michigan, for example, the school-based sites ranged from seven to 26 classrooms overall, and centers had one to ten classrooms. But in terms of the GSRP classrooms, eight of the 14 sites had just one or two classrooms, while three sites had seven or more classrooms (the maximum was 11 classrooms). One or two state-funded pre-K classrooms per site was the norm across all systems, despite a wide range in the number of total classrooms. All of the sites aimed for state-funded pre-K classrooms that had no more than 20 children, consistent with the program requirements. Annual hours, on the other hand, varied con-

TABLE 3.1
General Program Characteristics of Surveyed Providers, by Pre-K System

Program Characteristic	Michigan GSRP (14 providers)	Oregon Pre-K* (3 providers)	Oregon Preschool Promise* (6 providers)	Tennessee VPK* (13 providers)
Urban-rural status (number)				
City or suburban	7	2	3	3
Town or rural	7	1	3	10
Operator (number)				
School, charter school, or district	6	3	3	10
Community-based organization	8	0	3	3
Head Start program (number)	4	3	1	2
Has QRIS rating (number)	13	1	5	3
Accredited (number)	2	0	0	3
Total classrooms: Schools (range)	7 to 26	5 to 15	7 to 13	12 to 37
Total classrooms: Centers (range)	1 to 10	—	4 to 22	7 to 21
Number of state-funded pre-K classrooms (number)				
1	4	0	4	8
2	4	1	2	1
3 to 4	3	1	0	3
5 to 6	0	1	0	1
7 or more	3	0	0	0
Desired group size (number)	16 to 18	20	16 to 20	20
Annual hours (range)	816 to 1,538	1,108 to 1,176	864 to 1,260	990 to 1,425
Minimum lead teacher qualification in state-funded pre-K classrooms (number)				
Two-year AA	0	0	0	0
Four-year BA	9	1	5	6
Master's degree or higher	5	2	1	7
Has teachers covered by a collective bargaining agreement (number)	8	1	4	2
Bilingual program (number)	2	0	2	1
Additional services provided (number)				
Height and weight measurement	6	3	2	13
Vision screening	10	3	3	13
Hearing screening	10	3	2	11
Dental screening	8	3	4	5
Speech screening	13	3	4	12
Speech services	13	3	4	12
Developmental assessment	13	3	6	12
Meals	14	3	6	13
Counseling	7	3	2	8
Referrals	11	3	3	11
Transportation to and/or from the program	7	0	2	3

SOURCE: Information collected from 36 providers.

* Indicates PPI pre-K systems.

— Indicates not applicable.

siderably across sites, ranging from about 820 hours to more than 1,500 hours. This variation results from some systems allowing a four-day week (e.g., Michigan and Oregon), with variation in the length of the day (from 5.5 hours to 8 hours), and variation in the number of operating weeks per year. For this reason, we report estimated per-child cost on both an annual and hourly basis, the latter adjusting for the variation in annual hours.

As noted earlier, the pre-K systems varied in the minimum education requirement for the lead teacher in each classroom. Although Oregon allowed for a minimum of an AA or CDA, depending on the program (see Table 1.1), all Oregon sites in our sample operated with a lead classroom teacher who had at least a BA. In many sites, all teachers had a master's degree. Some systems had a greater proportion of sampled providers with a collective bargaining agreement, which we would expect to result in higher salaries and more-generous benefit packages.

Finally, across the pre-K programs, there were considerable differences in the types of services offered, such as bilingual programs, various types of screenings and assessments, and other family supports. All sites reported providing meals, as required by the system. Transportation services were less common than the other services. The three Oregon Pre-K sites all reported having the full set of additional services identified in Table 3.1 (with the exception of transportation), which is consistent with the system's comprehensive services model (equivalent to Head Start).

Results from RAND's Provider-Level Cost Data Collection

Tables 3.2 through 3.5 present the results of the analysis of cost data collected from the 14 providers that deliver Michigan's GSRP, the nine total providers for the two Oregon systems, and the 13 providers that deliver Tennessee's VPK. Tables 3.2 and 3.3 show the results for the two cost concepts defined earlier: accounting cost (panel A) and economic cost (panel B). Table 3.2 tabulates values as reported by providers (i.e., local prices). Table 3.3 converts these local cost measures to national measures using the Regional Price Parities index (BEA, 2020). In each

Within each system, there is considerable variation across providers in the estimated overall cost per child.

table, we report two unit cost measures: provider total cost per child over the academic year and provider cost per child-hour. For each cost concept and unit cost measure, the two tables summarize the results across providers by reporting the minimum value, the maximum value, and the (unweighted) average. The minimum and maximum demonstrate the variation across providers. Given the small number of providers in the sample, the average should not be viewed as a system-wide representative average but rather as a measure of central tendency for the included sites. Although the number of providers in Oregon is small, Table 3.4 presents suggestive evidence of strong differences in per-child cost across those two systems. Finally, Table 3.5 provides further disaggregation of the economic cost measure using national prices, first on a per-child basis and then for the percentage distribution. Again, the minimum, maximum, and average are recorded.¹³ For all four tables, the estimates are based on the information given by the providers and may contain errors.

Even though the number of providers analyzed was small, these estimates illustrate several important patterns. First, within each system, there is considerable variation across providers in the estimated overall cost per child, whether measured on an annual or hourly basis (Table 3.2). Even when focusing on the hourly cost indicator—which controls for the fact that there is wide variation across providers within and across systems in their annual hours—the variation across providers can be considerable. For example, considering the accounting cost measure (panel A), the cost per child-hour ranges from \$6.05

TABLE 3.2

Provider-Level Estimated per-Child Cost Based on Sampled Providers in Michigan, Oregon, and Tennessee:
Local Prices (2018–2019 dollars)

Cost Indicator	Michigan (14 providers)			Oregon* (9 providers)			Tennessee* (13 providers)		
	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average
A. Unit cost estimates: Accounting cost (\$)									
Cost per child	6,097	15,311	9,530	7,391	19,160	12,965	5,188	13,754	7,597
Cost per child-hour	6.05	12.30	8.43	7.90	17.09	11.91	2.81	11.76	6.18
B. Unit cost estimates: Economic cost (\$)									
Cost per child	7,724	15,845	10,711	9,003	19,748	13,959	6,618	14,072	8,498
Cost per child-hour	7.54	12.73	9.53	9.62	17.82	12.86	3.52	12.89	6.91

SOURCE: Information collected from 36 providers.

NOTE: Accounting cost estimates exclude the value of in-kind resources (e.g., voluntary labor and occupancy cost). Economic cost estimates impute volunteer time assuming a cost of \$15 per hour at the national level and impute total occupancy cost assuming a cost of \$29,018 per classroom at the national level.

* Indicates PPI pre-K systems.

TABLE 3.3

Provider-Level Estimated per-Child Cost Based on Sampled Providers in Michigan, Oregon, and Tennessee:
National Prices (2018–2019 dollars)

Cost Indicator	Michigan (14 providers)			Oregon* (9 providers)			Tennessee* (13 providers)		
	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average
A. Unit cost estimates: Accounting cost (\$)									
Cost per child	6,606	16,588	10,325	7,232	18,747	12,686	5,784	15,333	8,469
Cost per child-hour	6.55	13.32	9.13	7.73	16.72	11.65	3.13	13.11	6.89
B. Unit cost estimates: Economic cost (\$)									
Cost per child	8,369	17,167	11,604	8,810	19,323	13,658	7,378	15,688	9,474
Cost per child-hour	8.17	13.79	10.32	9.41	17.43	12.58	3.92	14.37	7.70

NOTE: Accounting cost estimates exclude the value of in-kind resources (e.g., voluntary labor and occupancy cost). Economic cost estimates impute volunteer time assuming a cost of \$15 per hour at the national level and impute total occupancy cost assuming a cost of \$29,018 per classroom at the national level. We adjusted state cost estimates to the national level based on the Regional Price Parities index for states (BEA, 2020).

* Indicates PPI pre-K systems.

to \$12.30 across just the 14 Michigan providers. The range is even wider for the nine Oregon providers, with a doubling from the lowest-cost provider in the sample (\$7.90 per child-hour) to the highest-cost provider (\$17.09 per child-hour). Across the 13 Tennessee providers, the cost level is lower but the range is equally wide, from \$2.81 to \$11.76 per child-hour. The average cost for the sampled providers across the systems ranges from about \$6 per child-hour in Tennessee to about \$12 per child-hour in Oregon. Michigan falls in between at about \$8 per child-hour.

Second, many of the school-based providers reported no rental or leasing costs, and some community-based providers reported a rental discount. When economic cost is considered (panel B of Table 3.2), the variation is somewhat muted because of the equalization in the treatment of occupancy cost estimates across providers. In Michigan, for example, cost per child increased on average about \$1,200 when occupancy costs and the value of voluntary labor are imputed—that is, when full economic cost instead of accounting cost is measured. This increase is about \$1,600 per child at the minimum cost estimate but just about \$500 per child at the maximum (compare panels A and B in Table 3.2). This same pattern holds for Oregon and Tennessee, where accounting for all resources used increases the estimated economic cost by about \$1,000 per child.

Third, adjusting for regional price differences in Table 3.3 allows comparisons across the three systems at approximately the same national price level. This adjustment effectively increases the unit cost estimates for Michigan and Tennessee because they

are lower-cost states (i.e., their Regional Price Parities index values are lower than the U.S. average), and the cost estimates fall just a little for Oregon, given that its index value (102.2) is slightly above the national average of 100. Viewed in national-level dollars and focusing on the average, the highest unit cost using the economic cost concept (panel B) is for Oregon’s two systems at about \$13,700 per academic year, followed by Michigan at \$11,600 and then Tennessee at about \$9,500.

Fourth, combining the two Oregon systems (because of the small number of Oregon Pre-K providers) masks distinct differences in cost for the three Oregon Pre-K providers versus the six Oregon Preschool Promise providers. Notably, when we base calculations on national prices and economic cost, the three most costly Oregon providers are those in Oregon Pre-K, which has a range of per-child cost of about \$17,300 to \$19,300 and an average of \$18,600 (see Table 3.4). In contrast, the range for the six Oregon Preschool Promise sites is just about \$8,800 to \$13,100, with an average cost of \$11,200. The estimated cost per child-hour follows the same pattern of a non-overlapping range of costs between Oregon Pre-K and Oregon Preschool Promise. Given the more comprehensive set of services and associated staffing patterns for Oregon Pre-K, it is not surprising that the system has a higher level of resource use per child compared with Oregon Preschool Promise.

Fifth, after adjusting for regional price variation and focusing on economic cost, the remaining unit cost differences both within and across pre-K systems can be attributed to key cost components,

TABLE 3.4
Provider-Level Estimated per-Child Economic Cost Based on Sampled Providers in Oregon Pre-K and Oregon Preschool Promise: National Prices (2018–2019 dollars)

Cost Measure	Oregon Pre-K* (3 providers)			Oregon Preschool Promise* (6 providers)		
	Minimum	Maximum	Average	Minimum	Maximum	Average
Cost per child	17,341	19,323	18,589	8,810	13,104	11,193
Cost per child-hour	15.65	17.43	16.44	9.41	11.83	10.66

SOURCE: Information collected from 36 providers.

NOTE: Accounting cost estimates exclude the value of in-kind resources (e.g., voluntary labor and occupancy cost). Economic cost estimates impute volunteer time assuming a cost of \$15 per hour at the national level and impute total occupancy cost assuming a cost of \$29,018 per classroom at the national level. We adjusted state cost estimates to the national level based on the Regional Price Parities index for states (BEA, 2020).

* Indicates PPI pre-K systems.

TABLE 3.5

Provider-Level Estimated per-Child Economic Cost and per-Child Cost Components Based on Sampled Providers in Michigan, Oregon, and Tennessee: National Prices (2018–2019 dollars)

Cost Indicator	Michigan (14 providers)			Oregon* (9 providers)			Tennessee* (13 providers)		
	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average
A. Unit cost estimate (\$)									
Cost per child	8,369	17,167	11,604	8,810	19,323	13,658	7,378	15,688	9,474
B. Cost per child, by cost component (\$)									
Personnel	5,697 ^b	14,466	7,737 ^c	6,365 ^a	14,790	10,240 ^c	4,031	10,334	6,536
Classroom	4,354	11,820	6,117	4,914	12,057	7,879	1,646	8,351	5,026
Administrative	1,084 ^b	4,562	1,621 ^c	747 ^a	6,042	2,361 ^c	851	3,558	1,510
Staff professional development	0	339	84	0	372	115	0	128	39
Classroom materials and supplies	47	1,277	323	131	1,263	400	53	844	328
Meals	149 ^a	800	443 ^c	16	1,444	609	66 ^a	1,022	377 ^c
Transportation	0	508	61	0	407	65	0	248	37
Occupancy	1,747	2,620	1,965	1,291	1,775	1,547	1,618	1,797	1,631
Other operating costs	15	3,583	992	129	1,638	682	6	2,743	526
C. Percentage distribution, by cost component (%)									
Personnel	46.7 ^c	84.3	66.2 ^c	62.9	84.2	75.0	51.9	78.4	68.9
Classroom	35.2	71.5	52.8	37.5	75.1	59.0	20.5	69.8	52.6
Administrative	8.7 ^b	28.4	13.4 ^c	8.0 ^a	31.6	16.0	8.6	44.3	16.4
Staff professional development	0.0	3.3	0.7	0.0	2.5	0.7	0.0	1.4	0.4
Classroom materials and supplies	0.5	7.9	2.8	0.9	12.5	3.4	0.7	7.8	3.5
Meals	1.5 ^a	6.9	3.8 ^c	0.1	10.8	4.0	0.8 ^a	12.7	4.2
Transportation	0.0	5.2	0.6	0.0	2.1	0.4	0.0	2.8	0.4
Occupancy	10.9	23.5	17.6	8.2	17.9	12.1	11.5	21.9	17.9
Other operating costs	0.1	28.8	8.3	1.5	8.5	4.5	0.1	17.5	4.7

SOURCE: Information collected from 36 providers.

NOTES: We adjusted state cost estimates to the national level based on the Regional Price Parities index for states (BEA, 2020). Columns with average values may not sum exactly to the total because of rounding. Columns with minimums and maximums will not sum exactly to the total.

* Indicates PPI pre-K systems.

^a One case with a zero value was omitted when computing the minimum.

^b Two cases with zero values were omitted when computing the minimum.

^c This is likely to be an underestimate because of the zero values.

as seen in Table 3.5. Personnel costs are the largest cost component, representing 66 to 75 percent of per-child cost on average across the three states, and variation in these costs is substantial. Within a given system, based on the range, the amount of provider spending per child varied by as much as \$7,500 for classroom personnel and by as much as \$5,300 for administrative and support staff. Across the three states, even after adjusting for regional price differences, the Oregon providers in the sample spent about \$3,700 more per child on personnel cost on average compared with Tennessee providers on average. This degree of difference reflects variation in staffing structures, as well as compensation levels (salaries and fringe benefits). Prior to valuing facilities in a consistent way at their full cost (not shown), spending on occupancy cost (building rent or lease, utilities, maintenance, and repairs) was another category with substantial variation across providers, with differences in the thousands of dollars per child.

Sixth, other non-personnel aspects of program delivery with variation in the hundreds of dollars per child include classroom materials and supplies, meals, transportation, and occupancy (after estimating full economic value). For example, in the 2018–2019 academic year, most providers were not directly offering transportation services under the pre-K systems, but the few that did offer such services had costs of up to \$500 per child. In contrast, staff professional development costs were typically low on a per-child basis, especially for the sampled providers in Tennessee. As we will see in the system-level cost analysis, professional development supports may be provided at the system level and will therefore not show up in provider-level expenditures.

Finally, although the providers that we sampled did not explicitly indicate this notion, many providers appear to constrain their spending overall or in specific categories based on the system funding level. For example, spending on classroom materials might be reported as \$500 per classroom, the exact amount allowed under the funding mechanism. Thus, the observed cost structure and per-child costs may not always reflect the desired level of resources that the provider would deploy to deliver a high-quality pre-K program.

Results from ICF International’s Provider-Level Cost Data Collection

The ICF International (forthcoming) analysis produced estimates of cost per child for Washington ECEAP separately for part-day programs from school-based providers and for part- and school-day programs from community-based providers. These estimates are reported in Table 3.6, where we have converted the local cost figures to national estimates, again using the Regional Price Parities index (BEA, 2020). When we focus on the median provider-level cost using national-level prices specifically for community-based school-day programs (most comparable to our estimates), per-child costs were about \$12,500, within the range shown in Table 3.3.

ICF did not compute a median cost per child-hour. We approximate this cost measure by dividing median annual cost in each program type in Table 3.6 by median hours for that strata. The results show that the two part-day program types, with about 370 to 380 median annual hours, were as much as two times more costly compared with the one school-day program type, which had about 1,000 median annual hours. For example, community-based part-day programs had an estimated median cost per child-hour of nearly \$26, whereas that median cost for the community-based school-day programs was about \$12.50. The data further show how costs were distributed among major cost components. The table shows that, consistent with the providers in Oregon, Michigan, and Tennessee analyzed in Table 3.5, personnel costs (wages and benefits) ranged from about 60 to 70 percent of total costs.

Many providers appear to constrain their spending overall or in specific categories based on the system funding level.

TABLE 3.6

Provider-Level Estimated per-Child Cost and per-Child Cost Components Based on Sampled Providers in Washington (2018–2019 dollars)

Cost Component	Washington ECEAP Median Provider-Level Cost		
	School-Based Part-Day (41 providers)	Community-Based Part-Day (24 providers)	Community-Based School-Day (15 providers)
A. Unit cost estimates (\$)			
Cost per child	8,614	10,604	13,557
Cost per child, national prices	7,946	9,782	12,506
Cost per child-hour, national prices	21.36	25.68	12.41
B. Cost per child, by cost component, national prices (\$)			
Personnel	5,633	6,446	7,345
Wages	4,042	5,197	6,016
Benefits	1,590	1,249	1,329
Non-personnel costs	2,314	3,336	5,161
C. Percentage distribution, by cost component (%)			
Personnel	70.9	65.9	58.7
Wages	50.9	53.1	48.1
Benefits	20.0	12.8	10.6
Non-personnel costs	29.1	34.1	41.3

SOURCE: Authors' analysis of ICF International, forthcoming.

NOTES: Percentages may not sum exactly to 100 because of rounding. Median reported hours in the three columns are 372, 381, and 1,008, respectively.

Accounting for System-Level Costs

As noted earlier, few studies of pre-K costs have captured the system-level resources deployed to administer and support the system overall. As shown in Table 1.4, we were able to collect such information for three of the systems in our study: Oregon Pre-K, Oregon Preschool Promise, and Washington ECEAP. When collecting this information, it is important to recognize that system-level costs, just like provider-level costs, will not necessarily be the same across systems, either in the resources used or the associated prices. For example, some pre-K systems may support professional development for program leaders and classroom staff centrally rather than requiring each provider to deliver those supports. Curriculum materials or test assessments may be purchased centrally to take advantage of statewide licensing or bulk discounts, but other systems may require each provider to pay for those resources. For example, Oregon Pre-K

requires that grantees use a minimum of 2.5 percent of their grant funds to support professional learning and quality improvement. All curriculum and assessment materials are also purchased at the grantee level. Furthermore, the system-level supports may not be the same over time; they wax and wane depending on the state of the system and the underlying need. For instance, system-level expenditures may be higher in the early years of a system, as providers work to achieve high levels of quality that can then be sustained with a lower level of system supports.

Table 3.7 summarizes the types of supports offered at the system level for Oregon Pre-K, Oregon Preschool Promise, and Washington ECEAP, as reported by state system administrators for the 2018–2019 academic year. Both of the Oregon systems reported expenditures in all nine domains and subcategories of support. Washington ECEAP did not list any system-level supports related to higher education or impact evaluations.

TABLE 3.7

Categories of Pre-K System-Level Administration and Supports, 2018–2019 Academic Year

Cost Component	Oregon Pre-K*	Oregon Preschool Promise*	Washington ECEAP*
Curriculum and other pedagogy			
Curriculum selection and monitoring, training, and ongoing support	✓	✓	✓
Student assessments			
Child formative assessment tools selection and monitoring, training, and ongoing support	✓	✓	✓
Program or classroom quality			
Quality monitoring (e.g., inspections, audits)	✓	✓	✓
Quality assessment and rating	✓	✓	✓
Quality incentives	✓	✓	✓
Professional development			
Coaching and technical assistance for programs and classrooms	✓	✓	✓
Financial incentives for the workforce	✓	✓	✓
Higher education systems			
Improvements in 2- and 4-year teacher education (degree) programs	✓	✓	
Improvements in 2- and 4-year teacher education (certificate) programs	✓	✓	
Summative evaluation			
Child summative assessment tools selection and monitoring, training, and ongoing support	✓	✓	✓
Internal or external implementation or impact evaluations	✓	✓	
Data systems			
Data collection activities	✓	✓	✓
Database management and improvements	✓	✓	✓
General administration			
Policy and program management: agency leaders	✓	✓	✓
Policy and program management: other agency staff	✓	✓	✓
Other system-level supports			
Fiscal monitoring of contractors and subcontractors	✓	✓	✓
Marketing and outreach to families	✓	✓	✓

SOURCE: Information collected from state pre-K system administrators.

* Indicates PPI pre-K systems.

Table 3.8 presents the results of the system-level cost analysis. Panel A lists the total expenditures in aggregate at local prices and system enrollment. The per-child estimates are shown in panel B in local and national prices. The distribution of cost per child by the nine spending categories and the percent-

age distribution are reported in panels C and D. For Washington ECEAP, some expenditure components could not be estimated in full (see the table note), although the bulk of spending is likely captured. Even so, the aggregate spending amount for this system likely represents a lower-bound estimate.

TABLE 3.8
System-Level Estimated per-Child Cost and per-Child Cost Components
Based on Sampled Providers in Oregon and Washington (2018–2019 dollars)

Cost Component	Oregon Pre-K*	Oregon Preschool Promise*	Washington ECEAP*
A. Aggregate estimates			
Total system-level expenditures, local prices	977,070	3,034,517	3,733,284 ^a
System-level enrollment	7,913	1,300	8,249 ^b
B. Unit cost estimates (\$)			
Cost per child, local prices	123	2,334	453
Cost per child, national prices	121	2,284	418
C. Cost per child, by cost component, national prices (\$)			
Curriculum and other pedagogy	13	92	40
Student assessments	10	20	46
Program or classroom quality	30	504	54
Professional development	30	662	33
Higher education systems	14	86	0
Summative evaluation	4	5	5
Data systems	4	104	125
General administration	11	675	28
Other system-level supports	5	136	86
D. Percentage distribution, by cost component (%)			
Curriculum and other pedagogy	10.9	4.0	9.7
Student assessments	8.0	0.9	11.1
Program or classroom quality	24.9	22.1	13.0
Professional development	24.9	29.0	7.9
Higher education systems	11.4	3.8	0.0
Summative evaluation	3.1	0.2	1.2
Data systems	3.6	4.6	29.9
General administration	9.1	29.6	6.7
Other system-level supports	4.0	5.9	20.5

SOURCE: Information collected from state pre-K system administrators.

NOTES: State cost estimates are converted to national-level prices based on the Regional Price Parities index for states (BEA, 2020b). Columns may not sum exactly to totals because of rounding.

* Indicates PPI pre-K systems.

^a The total for Washington ECEAP does not include some expenditures related to professional development, data systems, fiscal monitoring of contracts, and marketing and outreach to families.

^b The enrollment count is reweighted to account for part-day enrollment. Absolute enrollment was 13,394.

Overall, spending levels varied per child at national prices, starting with a low of about \$120 for Oregon Pre-K, reaching about \$420 for Washington ECEAP, and finally topping out at about \$2,300 for Oregon Preschool Promise, a nearly 20-fold difference in the range. Viewed on a per-child basis, the major sources of difference across systems are the higher levels of spending by Oregon Preschool Promise on program or classroom quality, professional development, and general administration. Notably, for Oregon Preschool Promise, the Oregon Department of Education contracts with 16 early learning hubs (the intermediaries that administer the program), which, in turn, subcontract with local providers to deliver Preschool Promise programming. The funds granted to the hubs to support continuous quality improvement and professional learning are included in the system's total. It is worth noting that Oregon Preschool Promise is the newest of the three systems—it started in 2016, and the other two systems started in the mid-1980s—and it has the smallest enrollment of the three systems by as much as a factor of six. The higher per-child cost may thus reflect economies of scale for system-level supports and higher initial investments to support providers

in improving quality and to achieve other system objectives. Oregon Pre-K, in contrast, is a well-established program that serves nearly 8,000 children per year with many embedded supports, such as those for professional development, following the Head Start model.

The Bottom Line

Bringing together the RAND and ICF estimates for provider-level cost and the RAND system-level estimates for Oregon and Washington, we can gain some perspective on the range of total per-child cost that might be expected for a high-quality pre-K system. Table 3.9 presents these results, and providers are ordered by the number of NIEER standards met out of ten total. Panel A shows the estimated provider-level per-child cost based on the ICF data for Washington ECEAP and the RAND estimates for the four other systems (based on data collected from providers). (Note that, despite the small sample sizes, we use the separate estimates for Oregon Pre-K and Oregon Preschool Promise.) Panel B lists the system-level per-child cost estimates for the systems in Oregon and Washington (based on data collected

TABLE 3.9

Estimates of the Full Cost of High-Quality Pre-K Based on Combined Results from Five Systems (2018–2019 national-level dollars)

Per-Child Cost Estimate	Oregon Preschool Promise* (5 of 10 standards)	Oregon Pre-K* (8 of 10 standards)	Tennessee VPK* (8 of 10 standards)	Washington ECEAP* (8 of 10 standards)	Michigan GSRP (10 of 10 standards)
A. Provider-level cost (Tables 3.3, 3.4, and 3.6)					
Data-based provider-level average (median)	11,193	18,589	9,474	13,557	11,604
B. System-level cost (Table 3.8 and author assumptions)					
Data-based system-level	2,284	121	—	418	—
Assume lower system-level amount	—	—	200	—	200
Assume higher system-level amount	—	—	2,000	—	2,000
C. Total cost (sum of panels A and B)					
Total, data-based	13,477	18,710	—	13,975	—
Total, lower system-level assumption	—	—	9,674	—	11,804
Total, higher system-level assumption	—	—	11,474	—	13,604

* Indicates PPI pre-K systems.

— Indicates not applicable.

from system administrators). For Tennessee VPK and Michigan GSRP, we assume a per-child system-level cost of \$200 as a lower amount and \$2,000 as a higher amount, consistent with the range observed for Oregon and Washington. Panel C sums the provider- and system-level estimates to produce a total per-child cost estimate that is based on data for the system-level costs (Oregon Preschool Promise, Oregon Pre-K, and Washington ECEAP) or that employs a lower or higher assumption (or range) for the per-child system-level costs (Tennessee VPK and Michigan GSRP). All estimates are in 2018–2019 dollars using national-level prices.

Using the data-based and lower assumption for system-level costs, the total cost of high-quality pre-K in the 2018–2019 academic year ranged from a low of about \$9,700 per child for Tennessee VPK to just more than \$18,700 per child for Oregon Pre-K. Using the data-based results and higher system-level assumption, the lowest cost was about \$11,500, and \$18,700 was still the maximum. These estimates, albeit based on small samples, do not demonstrate a strong relationship between the number of quality indicators met and the per-child cost. For instance, Oregon Preschool Promise met just five standards, but the estimated cost per child was lower for Tennessee, which met eight standards. Michigan GSRP met all ten standards but falls on the lower end of the range of per-child cost. Even the provider-level per-child cost estimates in panel A do not increase in a stair-step pattern in moving from five to eight to ten standards being met. On the other hand, Oregon Pre-K and Washington ECEAP included a more comprehensive set of services that would be expected to increase cost for any given level of the NIEER standards. If we focus on the other three systems, the per-child total cost was in a range of about \$11,500 to \$13,600, which falls within the bounds of the estimates from prior research (Table 2.1). Ultimately, these differences demonstrate that providers are combining resources in varied ways and facing different prices, both within a system and across systems, and these varied ways do not always imply that higher-quality standards (in this case, those measured by NIEER) will be associated with higher cost.

SECTION FOUR

Results Based on Cost Modeling

The full cost of pre-K programs can also be based on estimates from cost models (Allen and Backes, 2018). For example, Karoly and Gomez (2019) developed a tailored comprehensive cost model for South Carolina’s pre-K program by modifying such existing models as the Office of Child Care’s Provider Cost of Quality Calculator (Office of Child Care, undated) and using cost data collected from providers in the state. As described in the next section, and more fully in Appendix B, we take a similar approach for this study. In applying a cost model, our goal is to estimate the per-child cost of a pre-K program that has a set of high-quality features, using national-level prices and prices specific to our focal pre-K systems. These cost estimates will differ from those observed in the previous section to the extent that programs operate with different combinations of quantities and prices. Furthermore, variation in the estimated cost across systems will be solely a result of price differences across jurisdictions; all quantities are held constant. We also use the model to examine how per-child cost affects changes in the quantities or prices of key ingredients in a pre-K program, such as the teacher-child ratio or the compensation of program staff, holding all other program features constant. We use these estimates to examine the potential differences in the cost-effectiveness of different pre-K quality elements. Our estimates should be viewed as subject to considerable uncertainty because the research evidence on the impacts of specific pre-K program features is very limited.

Cost Modeling Approach and Sources of Data

The cost model specifies all relevant “ingredients” at the provider level to deliver a state or district pre-K program. For each ingredient, the model accounts for the quantities based on assumptions about the overall enrollment and pre-K enrollment of four-year-olds, the size of each classroom and classroom staffing patterns, the management-level staffing, and staffing for other supports (e.g., food preparation, jani-

torial services, transportation), plus all other non-personnel resources required. The prices associated with each ingredient are specified as well.

The cost model results are based on our assumptions about a set of common high-quality features for the national-level estimate and the focal pre-K systems (see the baseline assumptions in Table 4.1). The program features are modeled on those of Boston UPK and others with high-quality features and exceed those from some of the focal systems—for example, in the assumption of a 6.5-hour day and a BA-level lead teacher. For labor costs, we draw on national-, state-, and metro-level occupational wage and salary data from the Bureau of Labor Statistics, which cover pre-K teachers and other program staff (Bureau of Labor Statistics, undated). We assume that compensation—salaries and benefits—is consistent with public school pay and is the same whether a program is delivered by a school district or by a community-based provider (i.e., pay parity). And we assume that all providers pay the full market value of the space that they utilize and that transportation is

provided to and from the child’s home to the pre-K program. The key structural features, such as a group size of 20 and a teacher-child ratio of 1:10, are consistent with meeting the NIEER standards for high-quality pre-K.

Other assumptions about the staffing model, salaries by staff position, and other unit costs are documented in Appendix B.

Estimated Cost per Child at the Provider Level

The estimates in Table 4.2 are specific to the direct cost of the provider-based component of a high-quality pre-K program with a common set of quality features, using the assumptions in the relevant column of Table 4.1 (see also Appendix B). All estimates are in 2019 dollars; we provide national-level estimates in one column and local-level estimates for a generic system in each jurisdiction. These estimates lead us to several key results.

TABLE 4.1
Baseline Assumptions for Estimating the Cost of a Pre-K Program with High-Quality Features

Features	Baseline Assumption for a High-Quality Program	Meets NIEER High-Quality Standards?	Requirement for Focal Systems
Setting	District school or center	—	District school or center
Days per year	180	—	180
Hours per day	6.5	—	2.5 to 6.5
Group size	20	Yes	20
Teachers per classroom	2	Yes	2
Lead teacher qualifications	BA in early childhood education	Yes	AA to BA
Compensation	Public school salaries and benefits	—	—
Salaries	50th percentile of occupational salary distribution	—	—
Fringe benefit rate	45 percent	—	—
Total district pre-K enrollment	150	—	—
Total school or center enrollment	450 (school), 120 (center)	—	—
Total pre-K rooms per site	2	—	—
Facility rent	Included	—	—
Transportation	Included	—	—

— Indicates not applicable; there are no requirements for these features.

TABLE 4.2

Provider-Level Model-Based Estimated Unit Cost and Cost Components: National Level and Focal Jurisdictions
(2019 dollars)

Cost Component	National	Boston	Michigan	Oklahoma	Oregon	Tennessee	Washington
A. Unit cost estimates (\$)							
Cost per child	12,665	15,395	12,472	9,799	14,752	11,086	14,550
Cost per child-hour	10.82	13.16	10.66	8.37	12.61	9.48	12.44
B. Cost per child, by cost component (\$)							
Personnel	9,398	11,620	9,455	6,947	11,413	8,155	11,008
Classroom	6,652	8,462	6,752	4,766	8,413	5,715	7,704
Administrative	2,746	3,158	2,703	2,181	3,000	2,441	3,305
Staff professional development	25	28	23	21	25	22	27
Classroom materials and supplies	152	176	141	133	156	137	165
Meals	1,066	1,231	984	929	1,089	956	1,155
Transportation	406	469	375	354	415	364	440
Occupancy	1,301	1,504	1,203	1,137	1,330	1,167	1,410
Other operating costs	318	367	294	277	325	285	345
C. Percentage distribution, by cost component (%)							
Personnel	74.2	75.5	75.8	70.9	77.4	73.6	75.7
Classroom	52.5	55.0	54.1	48.6	57.0	51.5	52.9
Administrative	21.7	20.5	21.7	22.3	20.3	22.0	22.7
Staff professional development	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Classroom materials and supplies	1.2	1.1	1.1	1.4	1.1	1.2	1.1
Meals	8.4	8.0	7.9	9.5	7.4	8.6	7.9
Transportation	3.2	3.0	3.0	3.6	2.8	3.3	3.0
Occupancy	10.3	9.8	9.6	11.6	9.0	10.5	9.7
Other operating costs	2.5	2.4	2.4	2.8	2.2	2.6	2.4

NOTES: In this table, we have made assumptions about the use of resources and their prices that may differ from what many of the focal pre-K systems operate under; thus, each column represents the estimated per-child cost for a generic high-quality pre-K program (rather than the focal system) in each jurisdiction. Columns may not sum exactly to the total because of rounding.

First, the national-level per-child cost estimate of a high-quality pre-K program at the provider level is about \$12,700, which is at the lower end of the range of other pre-K cost studies (Table 2.1) and at the upper end of the range of provider-level estimates from cost data for the focal systems that did not offer comprehensive services in 2018–2019 (i.e., Michigan GSRP, Oregon Preschool Promise, and Tennessee VPK; see Tables 3.3 and Table 3.4). This estimate would be higher if comprehensive services were provided, akin to the Head Start program. The estimate would be lower if the quality features were lessened (e.g., a higher group size or higher teacher-child ratio).

Second, for the local jurisdictions, the per-child cost estimates range from about \$9,800 for Oklahoma to \$15,400 for Boston. If we ranked the per-child cost estimates across these focal jurisdictions in order from highest to lowest, that ranked order (as well as the national estimate) would be consistent with the pattern of occupational salaries and the regional price index across the geographic areas (see Table B.2 in Appendix B).¹⁴ In particular, Boston, Oregon, and Washington are consistently ranked highest for salary levels and in the regional price index; thus, the systems in those jurisdictions have the highest per-child estimates. This is because the program features are otherwise assumed to be the same for all six jurisdictions.

Third, for the systems for which we also collected cost data, we would not necessarily expect the estimates in Table 4.2 to be comparable with the provider-based real-world estimates (Table 3.2), given differences in the assumptions about the program features used to generate the model-based estimates versus the features of programs in operation. (It is because of these differences in assumptions that Table 4.2 represents a generic high-quality program, rather than the focal system, in each jurisdiction.) For example, the model-based cost estimate for a Tennessee program of about \$11,100 per child is at the high end of the range for the observed providers in Tennessee (see the economic cost estimate in Table 3.2). The model assumes pay parity between school- and center-based programs, which is not the case for programs operating in 2018–2019. The same pattern holds for Oregon Preschool Promise

For the local jurisdictions, the [model-based] per-child cost estimates range from about \$9,800 for Oklahoma to \$15,400 for Boston.

(Table 3.4), which does not require pay parity and where the lead teacher has a lower degree requirement than that assumed for the model-based estimates. However, the model-based estimates suggest how much higher per-child cost would be if the assumed features in the model were adopted. In contrast, the observed Oregon Pre-K providers (Table 3.4), which follow Head Start standards with more-comprehensive services, have observed costs that tend to exceed the model-based estimate for a generic Oregon program, which does not assume that such services are offered.

Estimated Cost per Child at the System Level

As noted earlier, the estimates in Table 4.2 capture the provider-based component of a high-quality pre-K program assuming a common set of program features across the six jurisdictions. The model does include administrative support at the district level for school-based programs, but it does not include other system-level elements—such as professional development, data systems, and quality improvement—that could be delivered at an intermediate level (e.g., a region) or at the state level. Other estimates of system-level cost (not documented here) suggest that the total cost per child would increase between 8 and 10 percent, depending on assumptions (Allen and Backes, 2018). By that estimation, the per-child cost estimates in Table 4.2 would

increase by about \$1,000 to \$1,250 per child when the full set of system supports required for a high-quality system are included. Based on the reported system-level expenditures for the two Oregon systems and Washington ECEAP, the per-child system-level costs could be as low as a few hundred dollars per child and as high as a few thousand dollars per child, depending on the nature of the system supports provided and the scale of the system.

Estimated Cost per Child for Key Quality Components

The cost model can also be used to estimate the incremental cost associated with changes in assumptions about quality components that are tied to specific changes in resource use or the prices of a resource. For example, changing the assumed group size or the teacher-child ratio implies a more- or less-intensive use of the quantity of classroom teacher human capital per child in the group. Changing the assumed salary and fringe benefit rate for classroom lead teachers is a change in the price associated with that resource. Taking these two examples, Table 4.3 shows the incremental increase or decrease in per-child annual pre-K program cost relative to the

Table 4.2 national base case, when we assume alternative group sizes and teacher-child ratios and alternative assumptions about lead teacher compensation (as a proxy for degree status).

Panel A shows the base case per-child pre-K cost estimate at national average prices (i.e., \$12,665); for this estimate, the model assumes 20 pre-K children per classroom with a lead teacher and assistant teacher (or a 1:10 teacher-child ratio). In the first panel, allowing the group size to reach 22 with a 1:11 teacher-child ratio lowers cost by about \$740 per child (or about 6 percent). Alternatively, that per-child estimate increases by \$900 (or 7 percent) when the ratio is assumed to fall to 1:9 and the group size to 18. In the second panel, a similar exercise for changing teacher qualifications (proxied by a decrease in the average lead teacher salary and benefits based on public school salary rates) shows that a less qualified teacher, relative to the base case, lowers per-child cost by about \$2,600 (or 20 percent), while a more qualified lead teacher increases per-child cost by about \$3,200 (or 25 percent). These per-child cost changes could be larger or smaller depending on the base case and the new lower (or higher) salary and fringe benefit rate.

TABLE 4.3
Per-Child Annual Cost Estimates for Changes in the Group Size and Teacher-Child Ratio and Changes in Lead Teacher Compensation: National-Level Estimates

Indicator	Per-Child Annual Cost (2019 dollars)	Absolute Difference from Base Case (2019 dollars)	Percentage Difference from Base Case (%)
A. Alternative group size and teacher-child ratio			
Base case: 20 children and 1:10 teacher-child ratio	12,665	—	—
Lower-cost case: 22 children and 1:11 teacher-child ratio	11,929	-736	-5.8
Higher-cost case: 18 children and 1:9 teacher-child ratio	13,565	900	7.1
B. Alternative lead teacher compensation			
Base case: 50th percentile of public school salaries and 45% fringe rate	12,665	—	—
Lower-cost case: 25th percentile of public school salaries and 15% fringe rate	10,081	-2,584	-20.4
Higher-cost case: 75th percentile of public school salaries and 75% fringe rate	15,889	3,224	25.4

— Indicates not applicable.

Appendix C describes a further analysis to estimate per-child cost for five other quality elements: (1) a quality (research-based) curriculum with appropriate training and ongoing supports, (2) an annual child-level screener, (3) a child-level formative assessment (conducted three times per year under the base-case assumptions), (4) an independent child-level assessment of development (conducted in the fall and spring each year) to support summative evaluation, and (5) an independent assessment of classroom-level quality (conducted two times per year under the base-case assumptions). Each of these quality features has implications for cost at the provider and system levels, although the exact resources required to add these features are not well specified in the literature (see the discussion in Appendix C). Hence, we consider a range of assumptions about the resources required at the provider and system levels.

Table 4.4 summarizes the results of those analyses in terms of total cost per child and cost per child differentiated between four components: (1) provider-level costs for the curriculum and associated training or for the relevant assessment tools, (2) provider-level value of staff time, (3) system-level value of staff time, and (in one case) (4) system-level cost for the evaluation tool(s). The staff time at the provider level represents per-child costs that may already be included in the estimates in Table 4.2, because these are costs for administrators and classroom staff already accounted for in the provider-level estimates. At the same time, the per-child cost for provider-level staff represents the opportunity cost of staff time at the provider level for training, implementation, ongoing professional development, and administration of the quality element—time that could be used for other activities. Alternatively, the added staff time could be covered through additional compensation (e.g., for training or professional development). The costs for the curriculum or the assessment tools are not part of the Table 4.2 estimates, and neither are the system-level costs.

These cost estimates show that the quality component that was most resource-intensive among those listed in Table 4.4, given our assumptions, was the addition of a research-based quality curriculum, which cost nearly \$1,500 per child. The component that was second-most expensive was a child-level for-

The quality component that was most resource-intensive among those listed in Table 4.4 was the addition of a research-based quality curriculum, which cost nearly \$1,500 per child.

mative assessment, at about \$680 per child, followed by a classroom assessment, at about \$550 per child. The least-costly quality elements were an annual child-level screener (about \$280 per child) and a child-level summative assessment (about \$260 per child). The estimated direct provider-level per-child outlay for the curriculum materials or the assessment tool(s) and the associated training was considerably smaller because much of the costs represent provider-level administrative and classroom staff time. The system-level costs were relatively small as well, given that such costs are spread over the entire system enrollment.

Presenting the cost estimates on a per-child basis masks the aggregate cost of these quality elements, as well as potential considerations regarding the feasibility of the required data collection effort. For example, as discussed further in Appendix C, the child-level summative assessments assume that all children in the publicly funded pre-K program at a state or district level are assessed two times per year in the base case. We assume that parental consent is required and that it is granted for 50 percent of participating children in the base case. In a system with 25,000 enrolled children (a size between the enrollment in Tennessee of about 18,000 children and Michigan with 37,000 chil-

TABLE 4.4

Per-Child Annual Cost Estimates for Five Additional Quality Pre-K Components: National-Level Estimates for the Base Case and Alternative Assumptions (2019 dollars)

Indicator	Base-Case Assumptions	Lower-Cost Assumptions	Higher-Cost Assumptions
A. Per-child cost for a quality curriculum			
Provider: Curriculum and training fees	269	149	459
Provider: Value of staff time	1,014	546	1,867
System: Value of staff time	197	120	293
Total	1,480	815	2,619
B. Per-child cost for a child-level screener			
Provider: Curriculum and training fees	22	6	65
Provider: Value of staff time	257	130	581
System: Value of staff time	< 1	< 1	< 1
Total	278	136	646
C. Per-child cost for a child-level formative assessment^a			
Provider: Curriculum and training fees	24	12	46
Provider: Value of staff time	619	354	1,068
System: Value of staff time	39	24	59
Total	682	390	1,173
D. Per-child cost for a child-level summative assessment			
Provider: Curriculum and training fees	0	0	0
Provider: Value of staff time	156	88	289
System: Value of staff time	88	63	126
System: Cost of evaluation tool(s)	18	9	45
Total	262	159	460
E. Per-child cost for classroom assessment^b			
Provider: Curriculum and training fees	11	5	25
Provider: Value of staff time	428	205	836
System: Value of staff time	107	58	170
Total	546	267	1,031

NOTES: The value of staff time at the provider and system levels for these quality components may not require additional expenditures if the activities can be undertaken by existing staff, displacing time that they would have spent in another activity. In some cases, additional staff time, such as for training or professional development, could be compensated beyond regular job duties. In that case, additional expenditures would be required. See Appendix C for more discussion of the particular assumptions involved in generating these estimates.

^a Formative assessments are assumed to be conducted four times per year in the base case, three times per year in the lower-cost case, and five times per year in the higher-cost case.

^b Classroom assessments are assumed to be conducted two times per year in the base case, one time per year in the lower-cost case, and three times per year in the higher-cost case.

dren), this would require conducting assessments for 12,500 children in a short interval in the fall and again in the spring. Staffing the number of independent assessors required to mount such an effort across the jurisdiction may be a challenge, especially if this is a temporary workforce hired for this short-term measurement effort. This is one reason why child assessments for summative evaluation are typically performed for a sample of participating children rather than for the universe. Likewise, the task of independently assessing every pre-K classroom in a system two times per year may be a logistical challenge in some jurisdictions.

As noted at the outset, there is uncertainty in the staff time and other resources required to implement these quality elements. Therefore, Table 4.4 shows estimates based on lower-cost assumptions and higher-cost assumptions. These lower- and upper-bound estimates provide a gauge of the uncertainty of the estimates under the base case. Clearly, there is considerable variability in the potential per-child cost, and that should be kept in mind when interpreting these estimates. See Appendix C for more discussion of the particular assumptions involved in generating the Table 4.4 estimates.

Estimates of Cost-Effectiveness

Tables 4.3 and 4.4 indicate that the per-child cost for pre-K quality improvements varies depending on the quality element. Across the quality components, increasing the lead teacher’s qualifications is the most costly to implement, according to our estimates. However, without knowing whether there are differences in the impacts of improving quality through these different components, it is not possible to ascertain which strategies are the most cost-effective—that is, which produce the biggest “bang for the buck.” Ultimately, a cost-effectiveness analysis of pre-K quality improvement options is hindered by the paucity of causal estimates of how the array of pre-K quality improvements represented in Tables 4.3 and 4.4 affect child development.

Even with limited information, we proceed with generating back-of-the-envelope (i.e., rough) estimates to see whether there are any clear patterns in cost-effectiveness across quality elements. In par-

A cost-effectiveness analysis of pre-K quality improvement options is hindered by the paucity of causal estimates of how quality improvements affect child development.

ticular, we rely on available estimates in the literature of the association between child developmental outcomes (e.g., school readiness) and three of the pre-K quality improvement strategies: a group size reduction from 22 to 20 children (with a corresponding reduction in the teacher-child ratio from 1:11 to 1:10); an increase in the lead teacher qualifications and compensation; and use of a published, research-based curriculum. (There are no such ready estimates of associations between child development and the other quality improvement approaches covered in Table 4.4.) Estimates provided by Hong et al. (2019) that are focused on multiple quality elements, as well as estimates from Jenkins et al. (2018, 2019) that are specifically for using a high-quality curriculum, show a range of potential effect sizes for the three quality components, as summarized in Table 4.5.¹⁵ Together, these studies provide estimates of the association between each quality component and children’s development in early literacy, mathematics, and a composite measure of academic skills.¹⁶ For the most part, the effect sizes are small (up to 0.15 standard deviation [SD] units), and many are not statistically significant. Nevertheless, we use the estimated range for our back-of-the-envelope estimates of comparative cost-effectiveness.

The final column of Table 4.5 reports the estimated range of the cost for each of the three quality components to achieve a 0.01 SD change in an aca-

TABLE 4.5

Cost per 0.01 Standard Deviation Change in Child Development for Quality Components: National Estimates

Quality Component	Base Case per-Child Cost Estimate for Quality Increase (2019 dollars)	Range of Effect Sizes for Quality Increase (SD units)	Range of per-Child Cost to Achieve a 0.01 SD Change (2019 dollars)
Group size reduction from 22 to 20 (ratio from 1:11 to 1:10)	736	0.02 to 0.04	184 to 368
Increase in lead teacher qualifications (higher credential or degree) and compensation ^a	2,584	0.02 to 0.13	199 to 1,292
Use of a published, research-based curriculum ^b	1,480 (range of 815 to 2,619)	0.02 to 0.15	54 to 1,309

SOURCES: Cost estimates are author calculations, as reported in Tables 4.3 and 4.4. Effect size ranges are based on Hong et al., 2019; and Jenkins et al., 2018, 2019.

NOTE: The estimated range is the lowest to the highest estimate based on all relevant combinations of the per-child cost of the quality element and the effect size range.

^a This component assumes an increase in salary from \$44,310 to \$55,470 and from a 25-percent fringe rate to a 45-percent fringe rate.

^b The effect size is relative to either no published curriculum or a locally developed curriculum.

demically oriented measure of child development. The lowest estimate of \$54 per 0.01 SD unit change applies for implementing a quality curriculum, when the effect size is assumed to be 0.15 and the cost is estimated to be \$803 per child. However, the cost to achieve that change could be as high as nearly \$1,300 per child if the per-child cost for the curriculum is at the estimated upper limit (almost \$2,600 per child, as reported in Table 4.4) and the curriculum has little effect on child development (an effect size of 0.02). The lowest cost estimate per impact for the other two quality components is about \$180 to \$195.

Although interesting to consider, these estimates have a great deal of uncertainty and thus should be interpreted with caution. For example, these estimates are not sufficiently robust to use as a guide on which investment in pre-K quality is most efficient. Nevertheless, this exercise does suggest that, as researchers refine estimates of cost for pre-K quality improvement strategies and produce more-rigorous estimates of the impact of key quality improvement approaches on child outcomes, it will be possible to identify which pre-K policy levers are most cost-effective for improving program impact.

SECTION FIVE Cost Versus Funding

Another focus of our analysis is to compare the per-child pre-K program reimbursement at the state level for the focal pre-K systems. Information on funding at the provider level is not routinely reported or compiled, so we assembled this information through program websites and other documents for our six state-based focal systems (i.e., Boston UPK is excluded). For each pre-K system, Table 5.1 shows the nature of the funding mechanism; what factors are accounted for in determining provider reimbursement rates; the average reimbursement for a school-day, academic-year program; and other key reimbursement details, such as reimbursements for programs with different hours or services (e.g., transportation).

Using Michigan as an example, in the 2018–2019 academic year, average funding for a school-day GSRP provider equaled \$7,250 per child, with no variation in the reimbursement amount to account for regional cost differences or other factors that may affect provider costs. Part-day programs received half that reimbursement.¹⁷ Recall that the per-child accounting cost for the 14 GSRP providers in our sample ranged from about \$6,100 to \$15,300 (Table 3.2), implying that the reimbursement rate is

TABLE 5.1

Reimbursement Features of Focal State-Funded Pre-K Systems, 2018–2019 Academic Year

Pre-K System	State Reimbursement Mechanism	Factors Tied to Reimbursement	Average per-Child Reimbursement for a Standard Academic-Year School-Day Program ^a	Other Reimbursements (Annual)
Michigan GSRP	Per-child formula grant	<ul style="list-style-type: none"> Length of service day 	\$7,250	<ul style="list-style-type: none"> Part-day option, \$3,625 per child
Oklahoma UPK	Per-child weighted formula grant	<ul style="list-style-type: none"> Factors in school funding formula 	— ^b	—
Oregon Pre-K*	Grant-based funding from federal Head Start and state general fund	—	—	—
Oregon Preschool Promise*	Providers contract with fiscal hub; cost-reimbursable contract subject to allowable expenses	<ul style="list-style-type: none"> Public versus private provider Staff qualifications Fringe benefits Whether transportation is provided 	—	—
Tennessee VPK*	Per-child formula grant; required local match based on school funding formula	<ul style="list-style-type: none"> Factors in school funding formula 	\$5,874 ^c	—
Washington ECEAP*	Per-child contracted reimbursement based on Working Connections rates and QRIS tiered supplement	<ul style="list-style-type: none"> Region (regional market rates from Working Connections) QRIS tiered supplement Length of service day 	\$10,916	<ul style="list-style-type: none"> Part-day option, \$8,018 per child Extended-day option, \$16,904 per child

SOURCES: Friedman-Krauss et al., 2020, Appendix A; Barnett and Kasmin, 2016. To supplement those sources, we reviewed the websites of the pre-K systems.

* Indicates PPI pre-K systems.

— Indicates not applicable.

^a The standard program is 5 to 6.5 hours per day for 180 days.

^b Oklahoma funds all students from pre-K to grade 12 using the same weighted funding formula applied to districts and schools. Thus, per-child funding varies and is not reported on a per-child basis. For 2018–2019, average expenditure per child was \$8,778.

^c This figure is based on the funding benchmark of \$117,490 per classroom and dividing by 20 children per room. Other adjustments are based on the school funding formula. The required local match will add to this amount.

sufficient to cover costs for some but not all providers. A similar result holds for Tennessee, where the estimated funding per child was almost \$5,900, with some variation in that amount associated with the weighted school funding formula. Tennessee VPK has an explicit expectation of a local match but does not report the combined funding amount for an individual provider. Average spending per child from all reported sources in 2018–2019 was about \$6,300 (Table 1.2). If this approximates per-child funding on average, it falls on the low end of the per-child accounting cost estimates for the 13 Tennessee VPK providers in our sample (a range of \$5,200 to \$13,800; see Table 3.2). ICF International (forthcoming) also

found that Washington ECEAP reimbursement rates did not fully cover the median per-child expenditures for the sampled providers, especially for community-based programs.

Table 5.1 does not list a per-child funding amount for the two Oregon pre-K systems. Oregon Pre-K follows the Head Start approach of grant-based funding established for each grantee. Oregon Preschool Promise is one of the few states where cost modeling informed the reimbursement approach. In 2018–2019, Oregon Preschool Promise relied on cost-reimbursable contracts subject to allowable expenses. Contracts were negotiated between the early learning hubs and each provider. The funded

The relatively low reimbursement rates mean that there is a difference between school districts' or private providers' actual costs and what they are reimbursed by the state.

amount accounts for provider type (schools versus community-based providers), staff education and fringe benefits available, whether transportation services are provided, and other locally determined factors. These tailored approaches to reimbursing providers have the potential to cover a more consistent share of a providers' accounting cost by recognizing important cost drivers that are otherwise not reflected in flat per-child reimbursement rates. On the other hand, such approaches are likely to be more costly to administer.

Karoly and Gomez (2019) compiled information on reimbursement policies for several other states, concentrated in the southeastern United States (see Table 5.2). Collectively, these states had a similar pattern of not covering the full cost of a high-quality pre-K program, given our estimates of the cost of such programs. Several of these state systems recognize cost differences associated with key factors—such as provider type, staff qualification, and geographic location—and adjust the reimbursement accordingly. But such adjustments may still not fully capture the incremental change in program costs associated with each feature. The relatively low reimbursement rates mean that there is a difference

between school districts' or private providers' actual costs and what they are reimbursed by the state, so they are effectively required to make up for the difference through parent fees, other sources of private revenue (e.g., donations or fundraising), and other public funding (e.g., the federal Child and Adult Care Food Program or local public school budgets). Alternatively, providers may look for ways that they can reduce their expenditures while still meeting program standards, such as by paying lower salaries or limiting fringe benefits (where there are no required salary schedules or required benefits) or by locating in a site with lower occupancy costs (if that is feasible). In the absence of other reliable sources of funding to fill the gap between state funding levels and provider costs, providers may not be able to sustain delivery of the pre-K program, especially at the highest levels of quality.

SECTION SIX

Challenges in Understanding Full Pre-K Program Costs and Implications for Policymakers and Future Research

Understanding the cost of high-quality pre-K is important for policymakers seeking to expand investments in high-quality publicly funded programs. An estimate of the per-child cost for a high-quality program with a given set of features, either currently being implemented or planned for future implementation, can be used to determine the total funding required, how the funding could be supported with different sources of funds, and how much providers need to be reimbursed to cover their costs and sustain their operations. Our analyses demonstrate that there is no single estimate of the cost of a high-quality pre-K program. Based on a cost model and an assumed set of features for the pre-K program—such as the staffing model, salary levels and benefits, the required classroom materials, and the type and cost of facilities—it is possible to produce a single per-child cost estimate. In our case, our model-based national-level estimate of

TABLE 5.2

Reimbursement Features of State-Funded Pre-K Systems in Selected Other States

State System (Academic Year)	State Reimbursement Mechanism	Factors Tied to Reimbursement	Average per-Child Reimbursement for a Standard Academic-Year School-Day Program ^a	Other Reimbursements (Annual)
Alabama (2018–2019)	Per-child discretionary grant; expectation of local contribution to achieve quality	—	\$4,860	<ul style="list-style-type: none"> • Supplement for classrooms with other funding, up to \$2,250 per child • New classroom, up to \$2,640 per child
Florida (2014–2015)	Per-child discretionary grant	<ul style="list-style-type: none"> • District cost differential 	\$2,508	<ul style="list-style-type: none"> • Summer option
Georgia (2018–2019)	Per-child discretionary grant	<ul style="list-style-type: none"> • Lead teacher education • Metro versus non-metro area • Public versus private provider • Class size • Number of days offering services 	\$3,087 ^b \$3,229 ^c \$3,529 ^d	<ul style="list-style-type: none"> • Transportation, ~\$150 per child • New classroom • Sparsity allowance
Kentucky (2018–2019)	Per-child school funding formula	<ul style="list-style-type: none"> • Child disability status 	\$4,491	<ul style="list-style-type: none"> • Supplement for severe or multiple disabilities, \$2,143 per child
Mississippi (2017–2018)	Per-child discretionary grant; require 1:1 local match	—	\$2,150	<ul style="list-style-type: none"> • Part-day option, \$1,075 per child • Extended-day option
North Carolina (2017–2018)	Per-child discretionary grant; based on state contract with provider	<ul style="list-style-type: none"> • Lead teacher education or credential • Public versus private provider 	\$4,257 ^e \$5,850 ^f	<ul style="list-style-type: none"> • Administration (~4%) • New classroom • Quality funds
South Carolina (2018–2019)	Per-child formula grant	—	\$4,510	<ul style="list-style-type: none"> • Transportation, \$574 per child (private only) • New classroom, up to \$500 per child • Extended-day and summer options
Virginia (2016–2017)	Per-child discretionary grant shared by state and local match (50% maximum) based on index of ability to pay	—	\$6,125	—
West Virginia (2015–2016)	Per-child school funding formula	<ul style="list-style-type: none"> • Educator salaries 	\$5,007 (est.)	<ul style="list-style-type: none"> • Administration and other cost factors • Transportation • Quality improvements

SOURCES: Friedman-Krauss et al., 2020, Appendix A; Barnett and Kasmin, 2016. To supplement those sources, we reviewed the websites of the pre-K systems.

NOTE: This table reports results from the most recent academic year available, as indicated in the first column.

— Indicates not applicable.

^a The standard program is 5 to 6.5 hours per day for 180 days.

^b Approximate rate for a public school program with a lead teacher with a BA and full enrollment.

^c Approximate rate for a private program in a non-metro area with a lead teacher with a BA and full enrollment.

^d Approximate rate for a private program regardless of teacher qualification.

^e Approximate rate for a public school program with a lead teacher with a BA; monthly rate times 9 months.

^f Approximate rate for a private program with a lead teacher with a BA and a birth-through-kindergarten license; monthly rate times 9 months.

the provider-level cost of a pre-K program for the 2018–2019 academic year is about \$12,700 per child. If accounting for a range of system-level costs from \$300 to \$2,000, the total cost would range from \$13,000 to \$14,700 per child. Because this estimate is based on national-level prices, we would expect it to vary across geographies based on differences in the cost of the “ingredients” that are deployed to deliver the high-quality pre-K program. In addition, a pre-K program with more-comprehensive services, such as those offered by Head Start, would further add to this cost estimate.

But even if we assume that all program requirements are met across providers in a given system, we can generally expect the cost for any given provider to deviate from the expected cost. The potential magnitude of the variation that would exist is evident in the data collected for this study in four pre-K systems. Keeping in mind that our small sample of providers in each system was selected to capture potential sources of variation in cost across provider types in mixed delivery systems and across different

Our model-based national-level estimate of the provider-level cost of a pre-K program for the 2018–2019 academic year is about \$12,700 per child. A pre-K program with more-comprehensive services would further add to this cost estimate.

geographic areas, it is striking that the estimated per-child cost at the provider level typically differed by a factor of two or more from the lowest- to the highest-cost provider in each pre-K system sample (with the exception of Oregon Pre-K). That range would almost certainly increase in collecting expenditure data for a larger, more representative sample of providers, unless we happened to sample the lowest- and highest-cost providers in the system for our study. This variation reflects provider-level differences across many factors, such as the way providers combine resources to meet the program standards, the prices they pay for each resource (notably, staff compensation and facilities), and whether they choose to just meet or instead exceed the program standards (e.g., employing BA-level lead teachers when an AA-level lead teacher is required).

In recognition of the value of having a better understanding of pre-K program costs, policy-makers and pre-K system administrators are seeking to conduct cost studies or develop cost models. As noted earlier, both approaches can provide valuable information and can actually be complementary, as exemplified by this analysis. Of the two approaches, collecting cost information from providers is arguably the more resource-intensive. Furthermore, there are several complexities involved in collecting and analyzing data on the cost to deliver state-funded pre-K programs. We conclude by highlighting these issues and their implications for policymakers and for future research that seeks to advance our understanding of pre-K program costs.

First, the four systems in this study for which we collected data (Michigan GSRP, Oregon Pre-K, Oregon Preschool Promise, and Tennessee VPK) used a mixed delivery approach, which means we needed to collect comparable information on resources used from both private providers and public schools. Although our data collection tool was designed to collect comparable information from both provider types, a common challenge is reporting on the value of resources provided in-kind or with a partial subsidy in order to capture full economic cost. This issue is most salient when measuring the cost of the space used by pre-K programs, because differences in occupancy costs can be a key source of cost variation between and within provid-

ers in the public and private sectors. For programs operated by schools or districts and housed in school buildings, the building is often owned by the education agency, with no associated rent or mortgage. In such cases, school-based providers were able to report on other components of facility costs, such as expenditures for utilities, cleaning, or maintenance. When square footage could be estimated, rent could be imputed based on an assumed market price for that space. A full or partial subsidy for rent or other facility costs is not uncommon for private providers as well. Understanding how access to subsidized resources affects the bottom-line estimate of pre-K program costs is important for reimbursement policy. For example, should the reimbursement rate account for what providers actually pay for facilities and other resources rather than assuming that all providers incur such costs? Alternatively, if all providers are assumed to pay market rates for their facilities, providers with lower occupancy costs may be able to direct any excess funding toward other resources, such as staff compensation.

Second, many sites blend state pre-K funding with pre-K funding from other sources, such as Head Start or subsidized child care. Our data collection tool was designed to focus on classrooms with at least one enrolled child and that received funding from the focal pre-K system we were examining. Some features in a classroom may thus be associated with more-stringent or more-extensive requirements tied to the other funding source compared with the focal pre-K system. For example, Head Start programs are required to provide a broader set of services in accordance with the Head Start Performance Standards. As a result, programs employ additional staff, such as home visitors, family service workers, and staff focused on coordinating supports for child and family health or children with disabilities. Our cost estimation approach with the sampled providers assumed that these resources were available to children and funded through the focal pre-K system, apportioning a share of the cost of these extended services based on the share of overall program enrollment. An alternative approach would be to exclude such expenditures from the estimate of the focal pre-K system costs, assuming no coverage of these supports for the children who were not supported by

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Head Start funding. The reality is probably somewhere in between these two extremes. Additional research would be required to understand which children and families have access to extended services in programs with mixed funding.

Third, both the center- and school-based programs we sampled typically also serve younger children (e.g., infants and toddlers in the case of a child care center) or older children (e.g., children in kindergarten and older grades in the case of a school). Expenditures on resources shared across classrooms with younger or older children were allocated to the pre-K program classrooms based on the share of enrollment at the site (e.g., for administrative staff) or the share of rooms (e.g., for building rent and utilities), as appropriate. These are reasonable assumptions, although further research may suggest that simple allocation rules are not consistent with how resources are actually used, particularly if some staff are assigned to work exclusively with some age groups or with children according to the funding stream that covers a given child's slot.

Fourth, some providers track expenditures up to the allowable amount based on funding and the expenditures that will be reimbursed rather than on actual expenditures required for program implementation. We aimed to capture actual expenditures

whenever possible, but some providers participating in our data collection were clearly providing figures based on what they were being reimbursed for. Another challenge with tracking and reporting expenditures occurs when resources are paid for at different levels of the system. For example, it was common for school-based pre-K programs to budget for and track expenses associated with their own pre-K classrooms, but other expenditures were paid for and monitored at the school or district level. This was common for food services, facilities, and school or district administration. This required the pre-K providers to track down expenditures documented in financial records at higher levels in the system.

Fifth, each pre-K system varied in terms of where system-level costs were incurred. The simplest structure is when the state provides administration and supports to providers, which deliver the pre-K program. In more-complex systems, school districts or intermediaries (e.g., intermediary school districts or some other administrative center below the state level) also provide supports. In capturing system-level costs, further work is needed to understand how each pre-K system is structured in terms of the number of levels of administration and the supports provided at each level.

In sum, based on the data collected for the four state pre-K systems, there is great variability in how publicly funded pre-K programs are organized and

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delivered. Some of the approaches observed include the following:

- a public school district with pre-K programming funded through the focal pre-K system and for which services were located in classrooms at multiple school sites, as well as a dedicated pre-K building
- a public school-administered pre-K classroom housed within a social service agency building
- a Head Start provider that had the pre-K programming for a subset of children in pre-K classrooms funded through the focal pre-K system
- a pre-K system in which some intermediary school districts passed funding through to individual providers while other intermediary districts operated one or more sites directly
- a pre-K system with some private administrative centers that served as intermediaries between the state and providers, some that passed funding through to individual providers, and some that provided direct supports.

In effect, almost every provider in our sample had unique aspects in its structure that introduced complexities for cost data collection and cost estimation, particularly how to apportion to the focal pre-K system a share of staff time and other program resources that cut across sites, age groups, and organizational levels (e.g., school, district, and intermediary administrator). Future cost analyses could provide more-refined estimates of provider pre-K program costs based on the collection of additional information from providers or system administrators regarding how staff time and other resources are allocated to children in the focal pre-K system versus in the rest of the provider's services. However, such an approach will require an even greater burden on respondents, many of whom are already taxed in reporting expenditure detail at the level employed in this study. This added burden would need to be weighed against the greater accuracy in pre-K cost estimation that might be achieved with a more detailed survey instrument.

Alternatively, publicly funded pre-K systems may choose to adopt a set of standard accounting practices (possibly with accompanying financial

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software) that allow providers to consistently capture the resources required for implementing a pre-K program, whether direct costs associated with the pre-K program at the site level or other supports provided through higher administrative units (e.g., a school, district, intermediary implementing hub, or larger community-based organization). With such accounting practices at the site level, information on total or per-child expenditures could be monitored by program leaders in real time against budgets, and fiscal year summaries could be generated for internal decisionmaking by program leaders or for reporting to other administrative units (e.g., a fiscal hub or state-level pre-K administration unit). The child care sector more generally has a growing focus on improving fiscal management and developing tools to improve business practice. One example is the Early Childhood Education Fiscal Hub in Philadelphia, which has developed several resources for child care program leaders in the region to improve their business management practices and fiscal operations. For example, the organization created a standard chart of accounts for the city and state and proposed industry

standards with metrics for tracking and reporting financial performance (Early Childhood Education Fiscal Hub, undated).

A comprehensive set of fiscal resources, accompanied by technical assistance for capacity-building, may ultimately reduce the burden for pre-K programs of keeping accurate financial information for internal planning and may help other stakeholders understand the true cost to deliver any given pre-K program. This would be especially useful for providers in the private sector, where financial capacity is often limited. A parallel set of resources for producing standardized fiscal metrics could be developed for public schools or districts that deliver pre-K programs, especially when a distinct funding stream is involved and delivery may entail practices that differ from typical operations for kindergarten through grade 12 (e.g., using different facilities or hiring practices). By reducing the cost of understanding a pre-K provider's fiscal profile, pre-K program administrators could implement more-tailored reimbursement policies rather than flat rates that do not account for variation across provider circumstances.

Notes

¹ Each of the PPI partner states is committed to improving the quality of its pre-K systems through technical assistance, research-to-practice partnerships, and advocacy support.

² NIEER has defined ten features associated with high-quality pre-K programs (e.g., teacher education and training requirements, group size, teacher-child ratio, and so on) and provides an annual assessment of the number of benchmarks met by each state-funded pre-K system (Friedman-Krauss et al., 2020).

³ See Karoly and Auger, 2016, for a summary of the evidence of effectiveness for pre-K programs operated by states or school districts, including the three additional systems in this study.

⁴ When converting to the national price level, dollar figures increase for states or areas where the cost of living is lower than the national average, while dollar figures decline for states or areas where the cost of living is higher than the national average.

⁵ We exclude studies that focus on estimating the cost of child care for children from birth to kindergarten entry (see, for example, Karoly and Walsh, 2020; Sirinides and Collins, 2020).

⁶ In particular, the Allen and Backes (2018) per-child cost estimate assumed 40 hours of care per week for 52 weeks per year (i.e., 2,080 annual hours). Thus, we prorated this estimate to be comparable with the other school-day academic-year programs, assuming a 6.5-hour school day and a 180-day academic year (1,170 annual hours).

⁷ Before making the regional price adjustment, most per-child cost estimates for a school-day, academic-year pre-K program fell in a range from \$11,100 to \$15,500 in 2019 dollars. This wider range reflects the fact that the cost estimates are for both jurisdictions that have a cost of living below the national average (e.g., Oklahoma and South Carolina) and jurisdictions that have a cost of living above the national average (e.g., Boston and New Jersey).

⁸ For Oregon, we provide some descriptive information about providers in the two programs separately, but the cases are pooled when presenting summary results from the cost analysis.

⁹ The fiscal year in Michigan ran from October 2018 to September 2019. In Oregon and Tennessee, the fiscal year started in July 2018 and ended in June 2019. The fiscal year captures expenditures and other resources used to deliver the pre-K program that occurred over the 12-month accounting period. All of the pre-K systems we studied deliver services during the academic (or school) year. Providers were asked not to include any expenditures for programming beyond the academic-year program (e.g., excluding summer school). Some expenditures may, however, occur outside of the academic programming year; for example, teacher salaries may be paid on an 11- or 12-month basis even though the academic year operates for nine or ten months. Professional development activities for the academic-year program may also occur in the summer months, and some materials and supplies may be purchased in advance of the start of the academic year. Thus, we use the complete fiscal year as the relevant accounting period but exclude expenditures for other types of programming.

¹⁰ The bulk of Washington ECEAP participants attended a part-day program. We treated such slots as the equivalent of 0.5 school-day equivalents. Slots for extended days were weighted the same as school-day slots.

¹¹ The ICF team removed some records as outliers and imputed total salaries and benefits in some cases that appeared to exceed expected values based on reported salaries and hours at the individual staff level. Given our smaller sample, our analyses for Michigan, Oregon, and Tennessee used all cases. We and our field staff from RAND also spent considerable time with providers to review the reported results and resolve any gaps and inconsistencies in order to be as accurate as possible.

¹² ICF International (forthcoming) does not provide a similar set of tabulations for the providers in the ECEAP sample beyond reporting on the distribution of providers by operator (school-based versus community-based) and length of the program day (part-day versus school-day).

¹³ For one case each in Oregon and Tennessee and three cases in Michigan, the reported spending on administrative personnel or food were reported to be zero. Because it is highly likely that those are underestimates, we removed those cases when computing the minimum to show the lowest value or share other than zero. The zero amounts are used to compute the average over all cases, but these are likely to be underestimates. Given that administrative spending on a per-child basis is considerably larger than spending on food per child, the missing amounts in the former category are likely to be more consequential for the underestimation of the category and the total than the missing values for the latter category are likely to be. The underreporting in these categories will also affect the estimated percentage distributions. The zero amounts were retained in the professional development and transportation categories, where zero values are likely. The affected estimates in Table 3.4 are marked with a table note.

¹⁴ Given that each of the estimates is based on a pre-K program with the same number of days and annual hours, the ranked order of costs per child and per child-hour are the same.

¹⁵ Hong et al. (2019) is based on analysis of observational data for six large-scale data sources, four of which are nationally representative and two of which are representative of individual states. Jenkins et al. (2018, 2019) provide estimates based on five large-scale data sources, four of which are nationally representative and several of which overlap with those used in the Hong et al. (2019) study.

¹⁶ We do not rely on the estimates of impact for social skills produced by these studies. We also exclude estimates that are negative or zero in order to investigate the potential range of cost-effectiveness measures, assuming positive impacts.

¹⁷ As reported in Table 1.2, Michigan spent about \$6,600 per child in 2018–2019, which would be a weighted average of the funding for part- and school-day programs.

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About This Report

As states and localities expand their investments in pre-kindergarten (pre-K) programs, policymakers need to understand the cost, at both the provider and system levels, of delivering a high-quality program. The expected per-child cost of a high-quality pre-K program may inform the initial planning for or expansion of a pre-K investment, guide the mechanism for reimbursing providers of the pre-K program, support estimates of the incremental cost of further quality investments, and even identify the quality enhancements that are most cost-effective (i.e., those that are the most cost-effective).

As part of its Partnership for Pre-K Improvement (PPI) initiative, the Bill & Melinda Gates Foundation sponsored the RAND Corporation to study the cost of high-quality pre-K programming. The RAND study included three states—Oregon, Tennessee, and Washington—that were partnering with the foundation under PPI. The Gates Foundation selected these states for its PPI initiative partly because they had differences in program requirements (e.g., teacher qualifications) that reflected some of the diversity across state and local pre-K investments. Together, these three states are implementing four pre-K systems: Oregon Pre-Kindergarten, Oregon’s Preschool Promise, Tennessee’s Voluntary Pre-K, and Washington state’s Early Childhood Education and Assistance Program. The RAND researchers then selected three other pre-K systems to include in the study, with standards and evidence of effectiveness as high as, if not higher than, those of the PPI states. Those additional systems are Universal Pre-K Boston, Michigan’s Great Start Readiness Program, and Oklahoma’s Early Childhood Four-Year-Old Program. Including these other systems helped shed light on how much higher per-child costs could go under higher-quality standards.

The objective of the study was to estimate the cost per child of a high-quality publicly funded pre-K program in the United States at the state or district level, accounting for cost at the provider level and at the system level). The study was also designed to help stakeholders understand the incremental costs associated with key program features of high-quality systems. The cost analysis described in this report drew on data collected from 36 providers in pre-K systems in Michigan, Oregon, and Tennessee, where such data collection was possible before and during the COVID-19 pandemic. The researchers also incorporated a cost analysis that was conducted in a closely related study based on data collected from pre-K providers in Washington’s Early Childhood Education and Assistance Program. Finally, the project employed a cost model to explore how cost per child varies with key program features.

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