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Briefing Report to the Chairman, Committee on Labor and Human Resources, U.S. Senate

January 1990

EARLY CHILDHOOD EDUCATION

What Are the Costs of High-Quality Programs?

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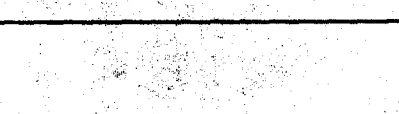

GAO

United States
General Accounting Office
Washington, D.C. 20548

Human Resources Division

B-236126

January 24, 1990

The Honorable Edward M. Kennedy
Chairman, Committee on Labor
and Human Resources
United States Senate

Dear Mr. Chairman:

To assist the Congress in its deliberations on your proposed "Smart Start" bill (S. 123) and other pending legislation relating to early childhood education and child care, you requested that we determine the costs of providing high-quality early childhood education. In later discussions with your office, we agreed to (1) estimate the average annual cost per child of providing high-quality early childhood education, (2) compare the average annual salary for early childhood education teachers with that of public elementary school teachers, and (3) determine the extent to which the costs of a typical early childhood education center change when certain factors, such as the number of children enrolled and the ratio of teaching staff to children, change. This report elaborates on briefings provided to your office on May 25 and December 5, 1989.

As currently proposed, S. 123 would provide financial assistance to state and local governments for early childhood education programs for prekindergarten-aged children (primarily 4-year-olds). Smart Start programs would operate full day and full year; they would be required to meet certain criteria (see app. I). At least 67 percent of the funds allotted to the states under the bill would be targeted to centers to serve children from low-income families.

Interest in expanding high-quality early childhood education programs for children from low-income families has grown as a result of both recent demographic trends and studies showing significant benefits from preschool programs. Of women with children under the age of 6, the percentage who are employed has tripled in the last three decades, from 20 percent to 63 percent; this trend is expected to continue. Thus, increasingly, children are being cared for by people other than their parents. Low-income children are much less likely to attend early childhood education programs than high-income children (33 percent versus 67 percent). Yet, research has shown that high-quality early childhood education programs help low-income children through higher educational attainment and higher levels of employment later in life (see pp. 15-16).

To collect information on the costs of and services provided by high-quality early childhood education programs, we sent copies of a questionnaire to the directors of 265 full-day, full-year preschool and early childhood education programs accredited by the National Association for the Education of Young Children (NAEYC). NAEYC is the only national accreditation system for early childhood education, and its criteria are similar to those in S. 123. For the most part, the centers surveyed had essentially the same program requirements as those included in S. 123. Most centers exceeded the bill's requirements in some ways (child-staff ratio, daily group size, meals served, and teachers' and teacher aides' training) (see p. 40).

We believe the information obtained from the centers we surveyed gives a reasonable understanding of the costs of high-quality early childhood education in the United States; the data, however, were not meant to be nor are they necessarily representative of costs of all early childhood programs nationwide (see app. II). Further, they are not necessarily representative of the costs of the programs reporting long-term benefits.

What Are the Overall Costs of the Centers We Surveyed?

In fiscal year 1988, on average, full-day, full-year NAEYC centers' out-of-pocket costs, for all ages of children, were $4,200 per child; in-kind donations for rent or mortgage, repairs, equipment and materials, and other items were estimated at an additional $600 per child. Centers were funded mostly through parent fees. Centers typically served about 80 children. As shown in table 1, out-of-pocket costs varied by region of the country from about $3,900 in the West to about $4,900 in the Northeast.

Table 1: Average Annual Cost Per Child Reported by NAEYC Centers
(Fiscal Year 1988)

Average costs per child	Nation	Regions			
		Northeast	Midwest	South	West
Costs reported by NAEYC centers	$4,200	$4,949	$4,286	$3,978	$3,864
Estimated costs if no in-kind donations were received	4,797	5,608	4,751	4,689	4,472

What Are the Major Center Costs?

Personnel costs make up 65 percent of total costs for the centers surveyed. The other major center costs are rent and mortgage (11 percent) and miscellaneous operating expenses, such as educational materials

and equipment, insurance, office supplies, repairs and maintenance, utilities, health and social services, and food (24 percent).

Salaries for center directors, teachers, and teacher aides make up almost three-fourths of centers' personnel costs. Other personnel costs were for (1) noninstructional personnel (for example, janitors and cooks) and (2) employee benefits. The average annual salary for early childhood education teachers was $14,100, which was substantially less than that of public school teachers and generally slightly less than that of private school teachers. The average salary for teachers in urban centers was $14,400 compared with a salary of $11,100 for teachers in rural centers (see p. 26).

What Are the Sources of Centers' Income?

On average, the centers received 69 percent of their income from parent fees; the remainder came from federal, state, and local funds (16 percent) and other sources, such as colleges and universities, churches and synagogues, and center fundraisers (15 percent).

The centers' average monthly tuition fee for full-time 4-year-olds was $304 per child. However, 77 (37 percent) of the 208 centers we surveyed used sliding-fee schedules, which resulted in parents of low-income children paying much lower monthly tuition fees (see p. 45). Of the 77 centers, 32 based their sliding fees on family size and income. At these 32 centers, for example, a family with 2 members and an annual income of $8,000 paid, on average, a monthly fee of $81 for a 4-year old child. On the other hand, a family of the same size with an annual income of $35,000 paid, on average, a monthly fee of $280 for a 4-year old child.

How Is the Per-Child Cost of Early Childhood Education Affected by Variations in Center Characteristics?

Our analyses (see pp. 35-36) indicate that, holding other factors constant, the annual cost per child in an early childhood education program decreases as the number of children enrolled in a center's program increases. In addition, not surprisingly, the average cost per child increases as child-staff ratios decrease.

For example, we found that:

1. A 10-percent increase in center size (measured by the number of full-time equivalent children[1] served) results in a less than proportional

[1]Includes full-time children and the full-time equivalent of part-time children.

increase of only 8 percent in total center operating costs if all other factors remain the same. Therefore, if a center with 50 children and an annual per child cost of $4,500 enrolled 5 additional children (while providing all the additional supplies and materials needed for the new enrollees), its cost per child would decrease by $82.

2. A reduction in a center's child-to-staff ratio from, for example, 11:1 to 10:1 (to meet the maximum allowable Smart Start criteria) results in a 4.6 annual percentage increase in its total operating costs. Consequently, if a center with 50 children, a child-to-staff ratio of 11:1, and a cost per child of $4,500 decreased its child-staff ratio to 10:1, its annual cost per child would increase by $207, to $4,707.

We also found that wages for teachers and teacher aides increase with additional years of education or experience or both. For example, for teachers, 1 year of additional education increases wages by almost 6 percent, and generally, 1 year of additional experience increases wages by slightly more than 2 percent. In addition, centers that enroll more than the average percentage of children with handicapping conditions appear to pay higher wages to both teachers and teacher aides. For example, a 10-percent increase in the proportion of children with handicapping conditions is associated with a 5.7-percent increase in teacher wages (see p. 37).

What Were the Characteristics of Children Enrolled in NAEYC Centers Surveyed?

In slightly more than one-third of the 208 centers surveyed, 25 percent or more of the children enrolled were from low-income families; about one-fourth of the centers enrolled no low-income children. Almost 70 percent of the centers enrolled one or more children with handicapping conditions. (See pp. 48-49.)

We are sending copies of this report to other congressional committees, the Secretary of Education, the Secretary of Health and Human Services, and other interested parties. Please call me on (202) 275-1793 if you or your staff have any questions. Other major contributors are listed in appendix V.

Sincerely yours,

Franklin Frazier

Franklin Frazier
Director, Education
and Employment Issues

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Abbreviations

NAEYC	National Association for the Education of Young Children
NCES	National Center for Education Statistics
NEA	National Education Association

Introduction

In recent years, the increase in women in the work force has resulted in a growing need for child care for prekindergarten-aged children. This need, coupled with the demonstrated benefits of high-quality early childhood education programs, has led to numerous legislative proposals for federal funding of these programs. One such measure, Smart Start: The Community Collaborative for Early Childhood Development Act of 1989 (S. 123), would help states and local governments provide comprehensive, developmentally appropriate programs to preschool—or prekindergarten—aged children.[1]

"Smart Start" Program Provisions

"Smart Start" programs would be required to meet certain criteria that are usually characteristic of high-quality programs. For example, child-teaching staff ratios could not exceed 10 to 1, and the maximum daily group size (the number of children per group) could not exceed 20. Further, early childhood education teachers and teacher aides would have to be properly trained in early childhood education or child development. Moreover, centers would be required to provide lunch to children and, if requested by parents, breakfast. In addition, programs would be required to provide certain supplementary services, including

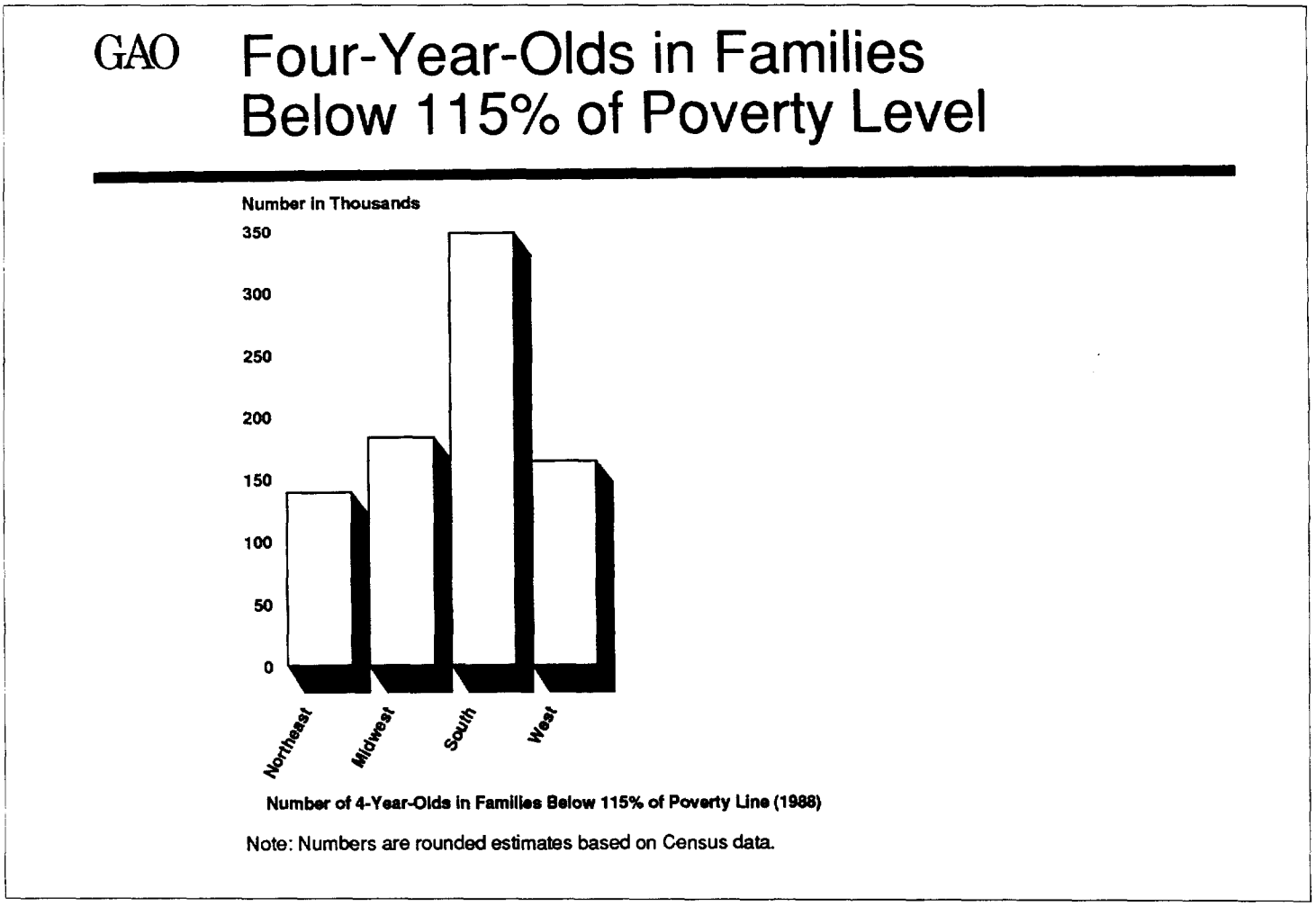
- health screening and screening for handicapping conditions,
- information and referral for health and social services, and
- parenting education, which may be conducted through such means as conferences, newsletters, and orientation meetings.

These program criteria are also similar to the current accreditation standards used by the National Association for the Education of Young Children (NAEYC) (see app. I). NAEYC, a membership organization of more than 70,000 professionals in the field of child development and early childhood education, provides the only national voluntary accreditation system for early childhood education centers and schools.

According to S. 123, at least 67 percent of program funds made available to localities with approved applications would be allocated on the basis of the number of poor children under the age of 5 in each locality. Only centers that provide full-day, full-year programs would be eligible to receive funds. Services would be targeted primarily to 4-year-olds, although 3- and 5-year-olds could also be served if all eligible 4-year-olds whose parents request services were enrolled.

[1] A developmentally appropriate program is one that is appropriate for the child's age and all areas of the child's development, such as educational, physical, emotional, and social.

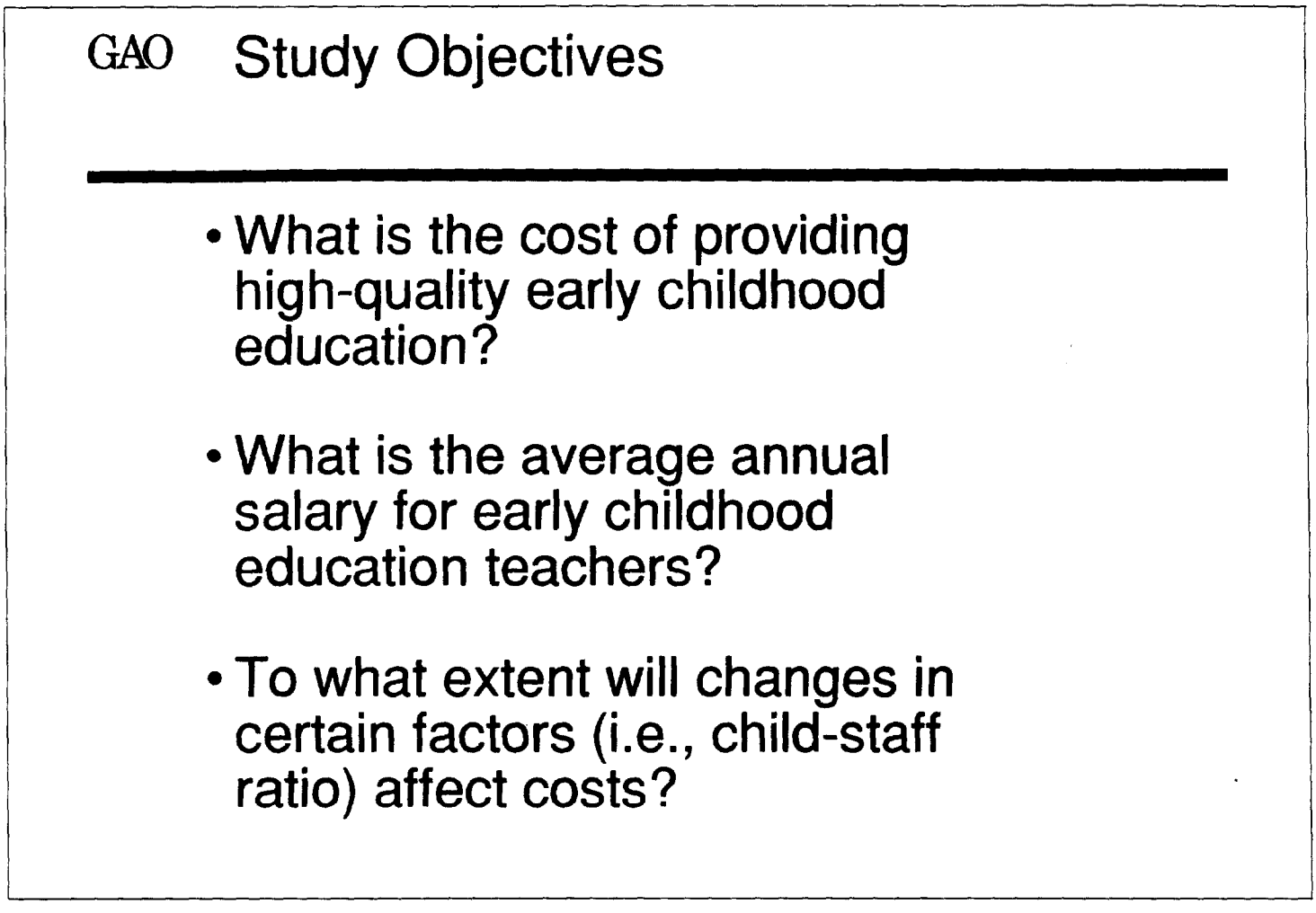
Figure 1.1



Under S. 123, poor children in each state would be eligible to participate without charge if their family incomes fell below 115 percent of the poverty level.[2] According to Census Bureau data, in fiscal year 1988, more than 800,000 4-year-old children were living in such families. This population ranged from about 140,000 children in the Northeast to about 350,000 in the South (see fig. 1.1). The South has both a larger poverty rate and more children than the other three regions.

[2]For example, the 1988 poverty level for a family of four persons is $12,092; 115 percent of this income level is $13,906.

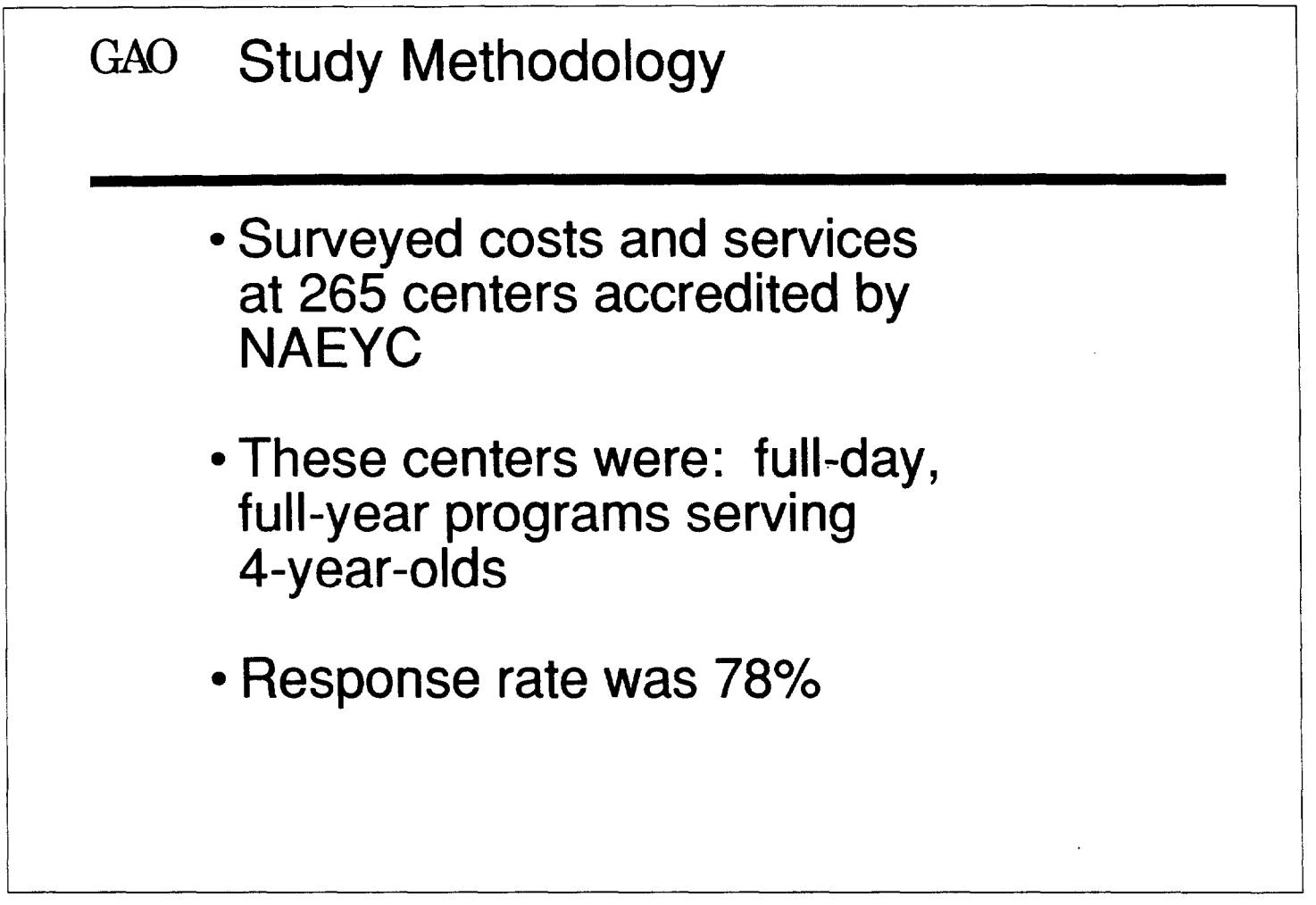
Figure 1.2



Objectives, Scope, and Methodology

To assist the Senate Committee on Labor and Human Resources in its deliberations on S. 123, the Committee Chairman asked us to determine the costs of providing high-quality early childhood education. Our study objectives are shown in figure 1.2.

Figure 1.3



To collect information on the costs and services at high-quality early childhood education centers, we agreed to survey centers with criteria similar to those specified in S. 123 (see app. I). We identified such centers as those full-day, full-year programs accredited by NAEYC. We believe the costs of NAEYC-accredited programs would most likely be similar to the costs of programs funded under the proposed Smart Start bill. Our study methodology is shown in figure 1.3. Of the 265 centers we surveyed, 208 (78 percent) responded to our mail questionnaire. This report was reviewed by two national experts in the area of economics and education, W. Norton Grubb and Henry M. Levin. (See app. II for a complete description of our objectives, scope, and methodology.)

Increased Need for Preschool Care

Traditionally, mothers have been the primary caretakers of preschool-aged children. The percentage of women with children under the age of 6 who are employed has tripled from 20 to 63 percent, however, as compared with three decades ago. This and other estimates of women's work-force participation indicate a likely increase in demand for child care and educational services.

Care for preschool-aged children can be provided in a variety of settings, from private homes to professionally operated programs, including programs that have an early childhood education component. Generally, early childhood education programs emphasize children's development; they are designed to support and encourage the child's intellectual, emotional, and social growth. In recent years, these programs have grown in popularity. The percentage of children from 3 to 4 years of age enrolled in early childhood education programs has risen more than threefold since the mid 1960s—from 11 percent in 1965 to 39 percent in 1986.

Low-Income and Minority Children Less Likely to Receive Preschool Services

Despite increased enrollments in early childhood education programs, disproportionately fewer low-income and minority children receive a preschool education than children of higher income families. For example, in 1984 only 33 percent of 4-year-old children in families with annual incomes below $10,000 were enrolled in preschool programs, compared with 67 percent of those with annual incomes over $35,000. The enrollment of white children from high-income families with non-working mothers in early childhood education programs increased at a greater rate than the enrollment of all other children during the period 1975-84.[3]

While the Department of Health and Human Services' Head Start program—the largest national public program providing educational and developmental services to preschool-aged children from economically disadvantaged families—served about 450,000 children (primarily 3- and 4-year-olds) in fiscal year 1988, many of the nation's eligible children remain unserved. Only one out of every six eligible low-income preschool children are served by Head Start. Many education experts believe that additional funding will be needed for early childhood education programs for low-income children if these children are to begin school with preparation similar to that of children in higher income families.

[3]Nancy L. Karweit, "Effective Preschool Programs for Students at Risk," in Effective Programs for Students at Risk, eds. Robert E. Slavin, Nancy L. Karweit, and Nancy A. Madden (Boston: Allyn and Bacon, 1989).

In addition, experts expect the need for early childhood education programs to increase in future years as the proportion of at-risk children in the school system increases.[4] A recent study projects that the number and proportion of children at risk will increase steadily from the 1980s through 2020; this is because of increases in several factors that have been associated with low student achievement. These include substantial increases in the number of children (1) in poverty, (2) living with only one parent, or (3) living with poorly educated mothers (those not completing high school) or whose mothers' primary language is not English.[5]

Benefits of High-Quality Early Childhood Education

Several recent research studies have demonstrated the benefits of high-quality early childhood education programs for children from economically disadvantaged families.[6] The Perry Preschool Program longitudinal study measured the cost-effectiveness of a high quality preschool educational program for 3- and 4-year-olds in Ypsilanti, Michigan. The study found that about $7 is saved for each $1 invested in these programs.[7] The study compared achievement measures in education and employment for disadvantaged youth (who had previously attended the Perry Preschool Program) with a group of students who were similar as to preprogram measures of intelligence and family socioeconomic characteristics, but who did not attend the program. Those who attended the program were found to have greater educational attainment and better levels of employment. Although some benefits—such as increases in scores on intelligence tests—appeared to be temporary gains, other gains—such as lower retention rates in the same grade and lower placement rates in special education classes—appeared to be longer lasting.

[4]At-risk children are those who, on the basis of several risk factors, are unlikely to graduate from high school. These risk factors include low socioeconomic status, low achievement, retention in grade, and poor attendance.

[5]Aaron Pallas and others, "The Changing Nature of the Disadvantaged Population: Current Dimensions and Future Trends," Educational Researcher, Vol. 18, No. 5 (1989), pp. 16-22.

[6]John R. Berrueta-Clement and others, Changed Lives: The Effects of the Perry Preschool Program on Youths Through Age 19 (Ypsilanti, Michigan: High/Scope Educational Research Foundation, 1984). Irving Lazar and Richard Darlington, Lasting Effects After Preschool: A Report of the Consortium for Longitudinal Studies, DHEW Publication No. (OHDS) 79-30178, (Washington, D.C.: U.S. Government Printing Office, 1978). Department of Health and Human Services, Head Start Bureau, Path to the Future: Long-Term Effects of Head Start in the Philadelphia School District (Sept. 1987).

[7]John R. Berrueta-Clement and others, Changed Lives, p. 90.

The estimated cost savings from the Perry program included both the savings from reduced costs of educational remediation classes, crime, and unemployment and welfare payments, and the revenue generated from taxes paid from increased earnings. One analysis indicates that approximately 60 percent of the additional tax revenues generated as a result of this investment would likely accrue to the federal government.[8]

Benefits of early childhood education programs also have been documented by studies of other such programs. For example, lower grade retention rates were found in studies of five preschool programs in Murfreesboro, Tennessee; New York City; New York State; Philadelphia; and Rome, Georgia.[9] Early childhood education programs also have been found to be effective in reducing special education placements and high school dropout rates.

[8]Henry M. Levin, "Financing the Education of At-Risk Students," Educational Evaluation and Policy Analysis, Vol. 11, No. 1, (Spring 1989), p. 47.

[9]See John R. Berrueta-Clement and others, Changed Lives, chapter 6. See also Department of Health and Human Services, Head Start Bureau, Path to the Future.

Costs of NAEYC Centers Surveyed

A typical full-day, full-year NAEYC-accredited early childhood education center's annual costs are $4,200 per child, with in-kind donations amounting to about another $600 per child. The centers are funded chiefly through parents' fees.

Personnel costs account for almost 65 percent of total costs for the centers surveyed. Rent and mortgage costs make up about 11 percent of center costs. The remaining costs, nearly 25 percent of all costs, are for educational materials and equipment, insurance, office supplies, repairs and maintenance, utilities, supplementary services, food, and additional operating expenses.

What Is the Annual Center Cost of Educating a Preschool Child?

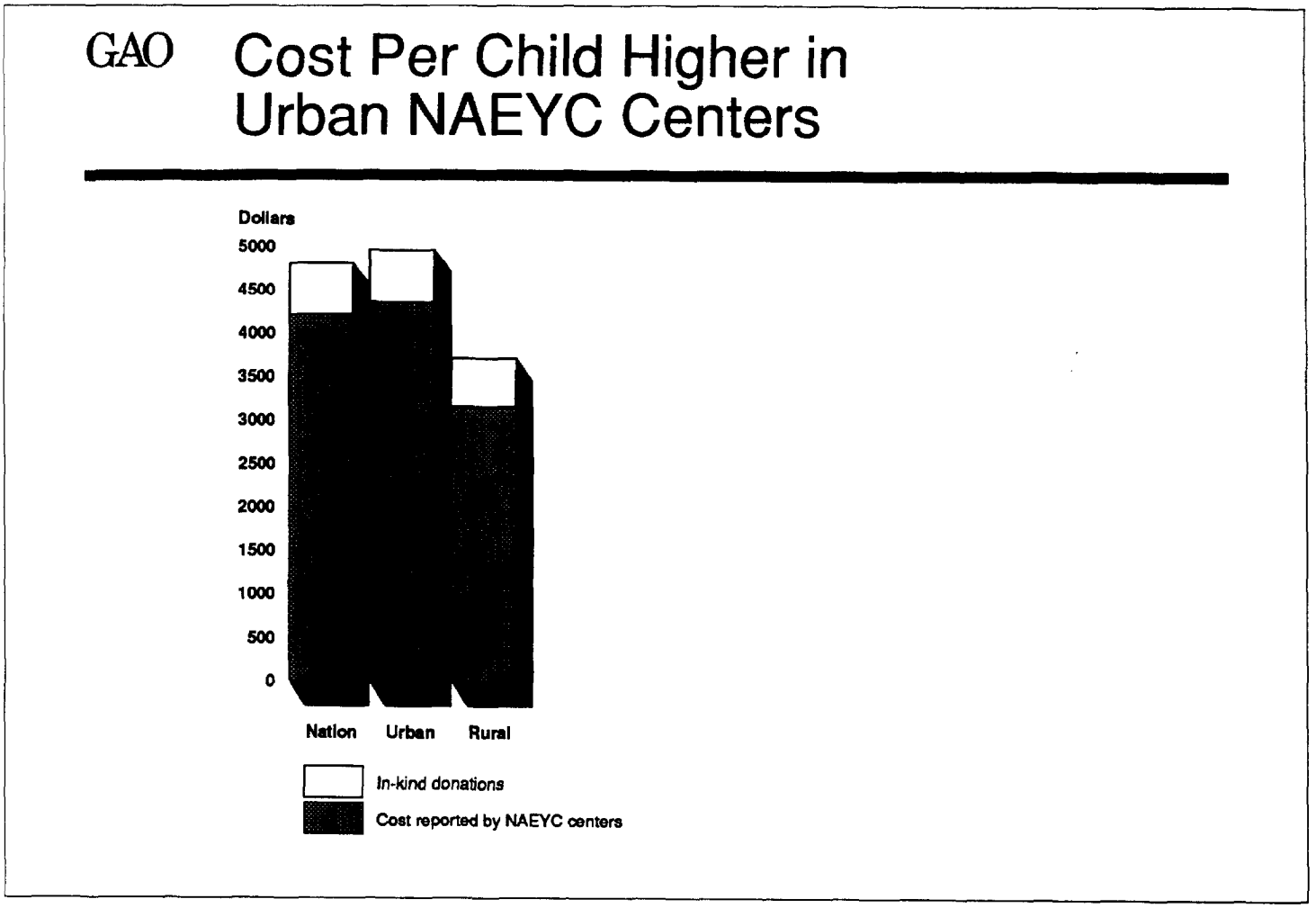
On average, early childhood education centers reported a cost per child of $4,200 in fiscal year 1988.[1] After adjusting for in-kind donations,[2] however, we estimate an average cost per child of about $4,800.[3] Overall estimated costs, including the value of in-kind donations, in urban centers is about $1,250 more than in rural centers (see fig. 2.1). (See app. III for tables reporting data used in figures.)

[1]Although the centers we surveyed enrolled 4-year-olds, some centers also enrolled children of other ages. For example, 33 percent of the centers served infants and 45 percent served toddlers. Lower child-staff ratios necessary for serving infants and toddlers generally contribute to higher per child costs at these centers. Although our data suggest that centers not serving infants and toddlers have lower costs than centers that do, our data do not allow us to accurately determine the cost difference between centers serving infants and toddlers and those not serving such children.

[2]On the basis of information provided by NAEYC centers, we added to their reported costs the value of in-kind donations, including rent, labor, supplies, equipment, and supplementary services, such as health and social services to enrolled children. For centers that reported no rent or insurance costs—costs essential for operating an early childhood education center—and indicated no value for donations of these essential center expenditures, we estimated regional rent and insurance costs.

[3]This estimate is generally consistent with estimates from other studies on child care costs, although many of these studies were limited in scope. See W. Norton Grubb, "Young Children Face the State: Issues and Options for Early Childhood Programs," American Journal of Education, Vol. 97, No. 4 (Aug. 1989), p. 379.

Figure 2.1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Cost Per Child Higher in Urban NAEYC Centers
Dollars
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2000
1500
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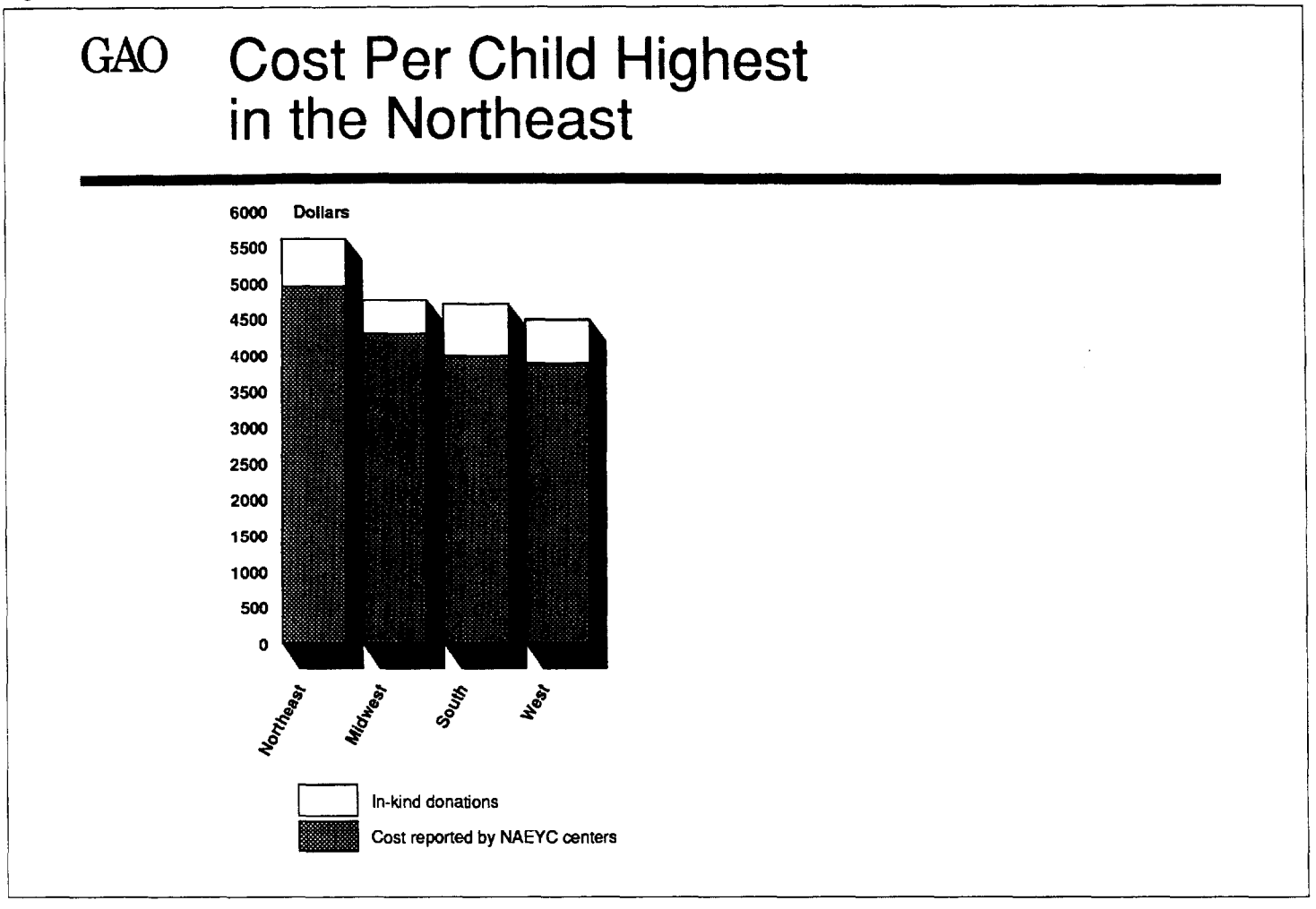
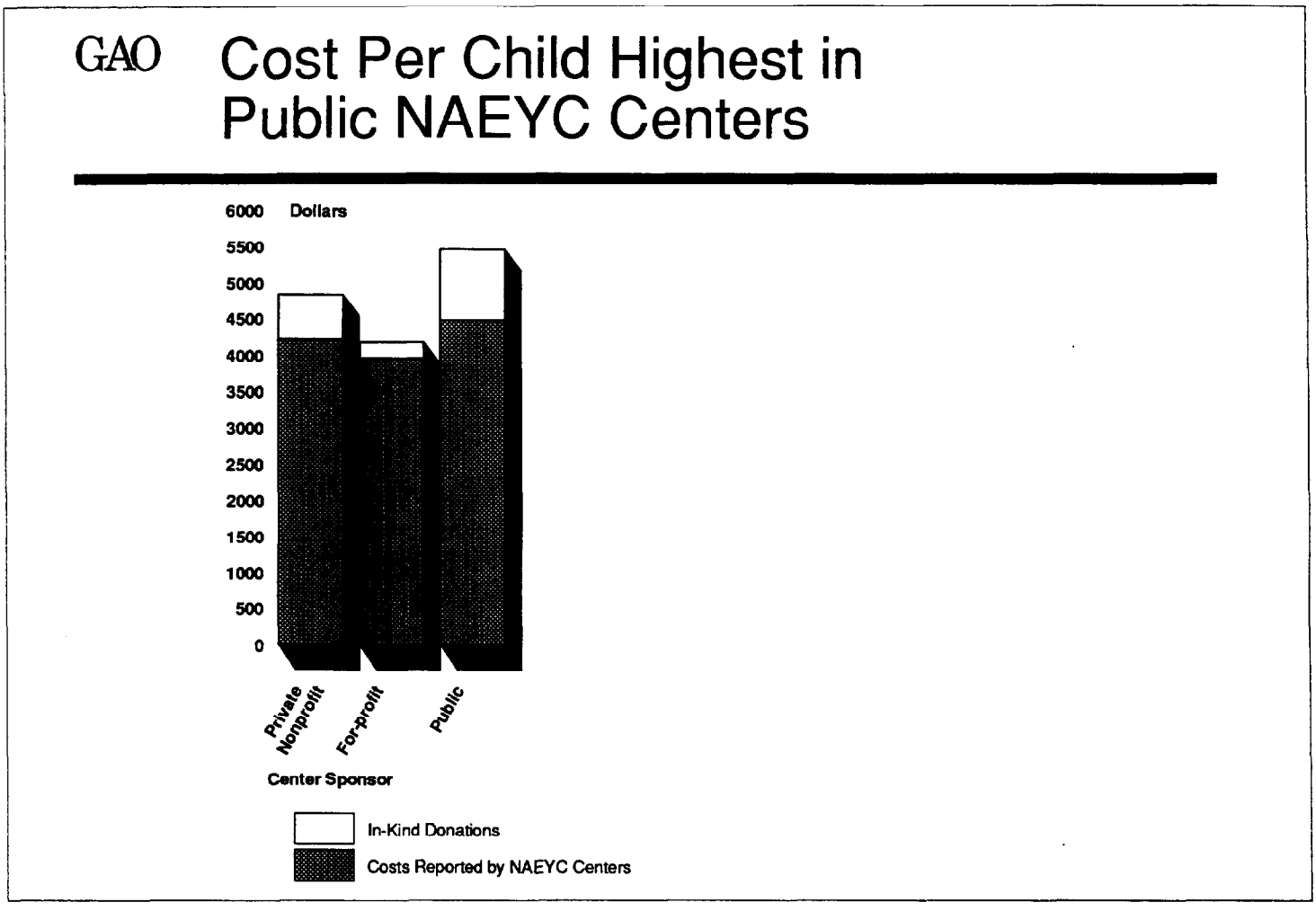
Nation
Urban
Rural
In-kind donations
Cost reported by NAEYC centers

Figure 2.2



As shown in figure 2.2, the cost of early childhood education per child is lowest in the West ($4,472) and highest in the Northeast ($5,608). In-kind donations made up between 10 percent (Midwest) and 15 percent (South) of centers' estimated annual costs.

Figure 2.3



Cost at Profit and at Nonprofit Centers

The estimated cost to educate a child in a public center[4] is almost $1,300 more than in a for-profit center and about $650 more than in a private nonprofit center (see fig. 2.3). The greater cost per child in public centers is borne largely through in-kind donations.

[4]Public centers may include programs operated by federal, state, and local agencies, including public schools. Only three centers surveyed were public-school-based. If public-school-based centers pay early childhood education teacher salaries that are comparable to the salaries of other public school teachers, costs at these centers are likely to be higher than those of other programs we surveyed.

In addition, annual costs per child are nearly $1,400 lower in religiously sponsored centers than in nonreligiously sponsored centers (see table 2.1). The lower cost per child at religiously sponsored centers appears to be due primarily to the comparatively lower teacher salaries as well as rent and mortgage expenses. Many religiously sponsored centers receive free or subsidized rent from their church or synagogue sponsors.

Table 2.1: Early Childhood Education Costs at Religiously and Nonreligiously Sponsored Centers (Fiscal Year 1988)

			Per child	
Center sponsorship	Number of centers	Annual cost[a]	Average annual rent or mortgage costs[a]	Average teacher salaries
Religious	37	$3,459	$398	$13,359
Nonreligious	168	4,824	589	14,225

[a]Includes in-kind donations and estimated rent expenses for centers that neither reported rent costs nor indicated a value for in-kind donations.

Do Costs Per Child Differ at Centers Serving Children From Different Income Levels?

The estimated annual cost per child is about $500 to $900 higher at centers that reported serving no low-income children than at centers that reported serving such children (see fig. 2.4). This cost difference appears to be due primarily to the higher average teacher salaries and rent expenses at centers with no low-income children than at other centers (see table 2.2).

Table 2.2: Average Teacher Salaries and Rent Expenses at Centers Serving Different Proportions of Low-Income Children

Center	Number of centers	Average teacher salary	Annual rent or mortgage costs per child[a]
Serves no low-income children	46	$14,983	$491
Serves 1% to 25% low-income children	69	14,264	371
Serves more than 25% low-income children	63	13,396	388

[a]Includes in-kind donations and estimated rent or mortgage expenses for centers that neither reported rent or mortgage costs nor indicated a value for in-kind donations.

Figure 2.4

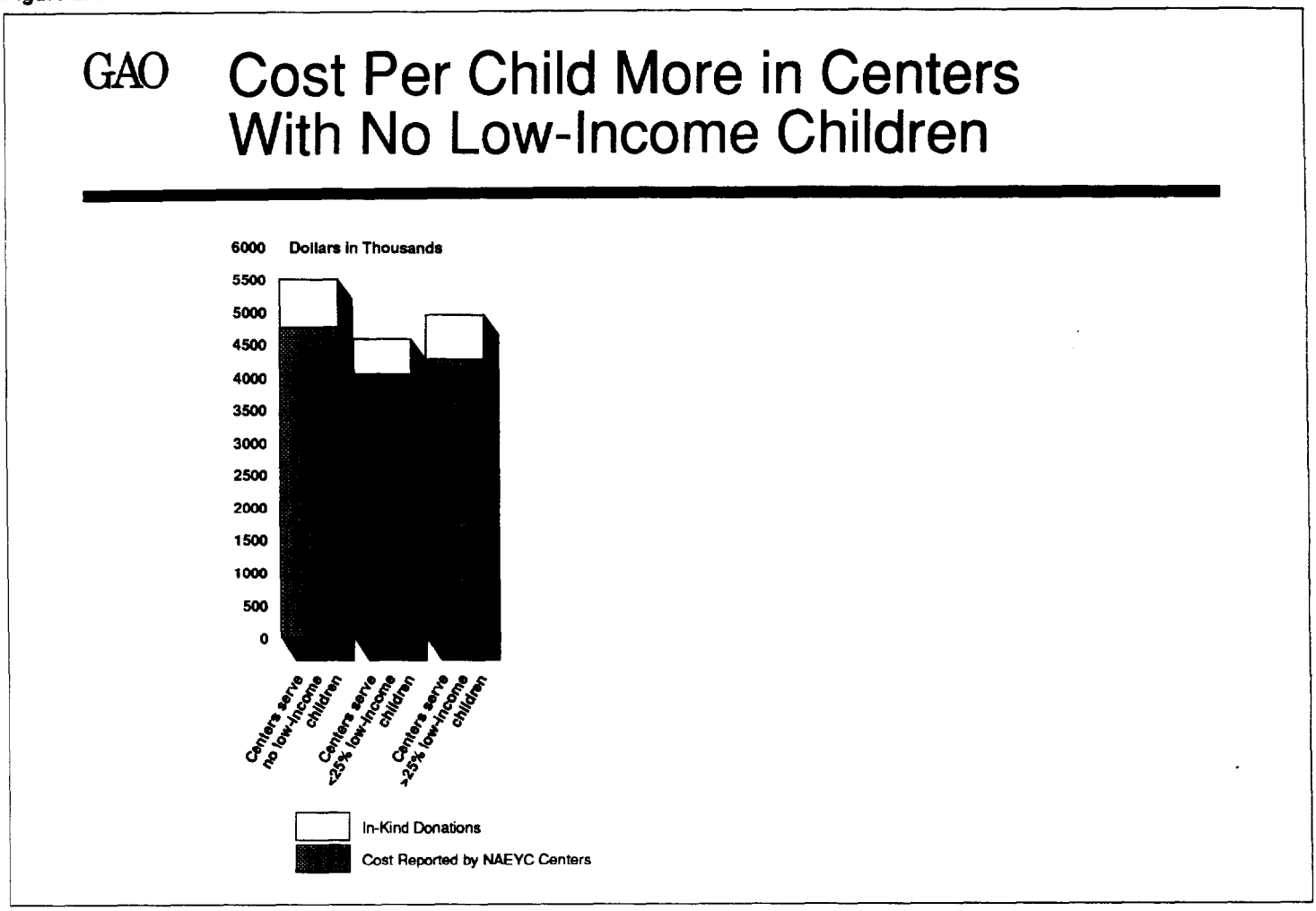
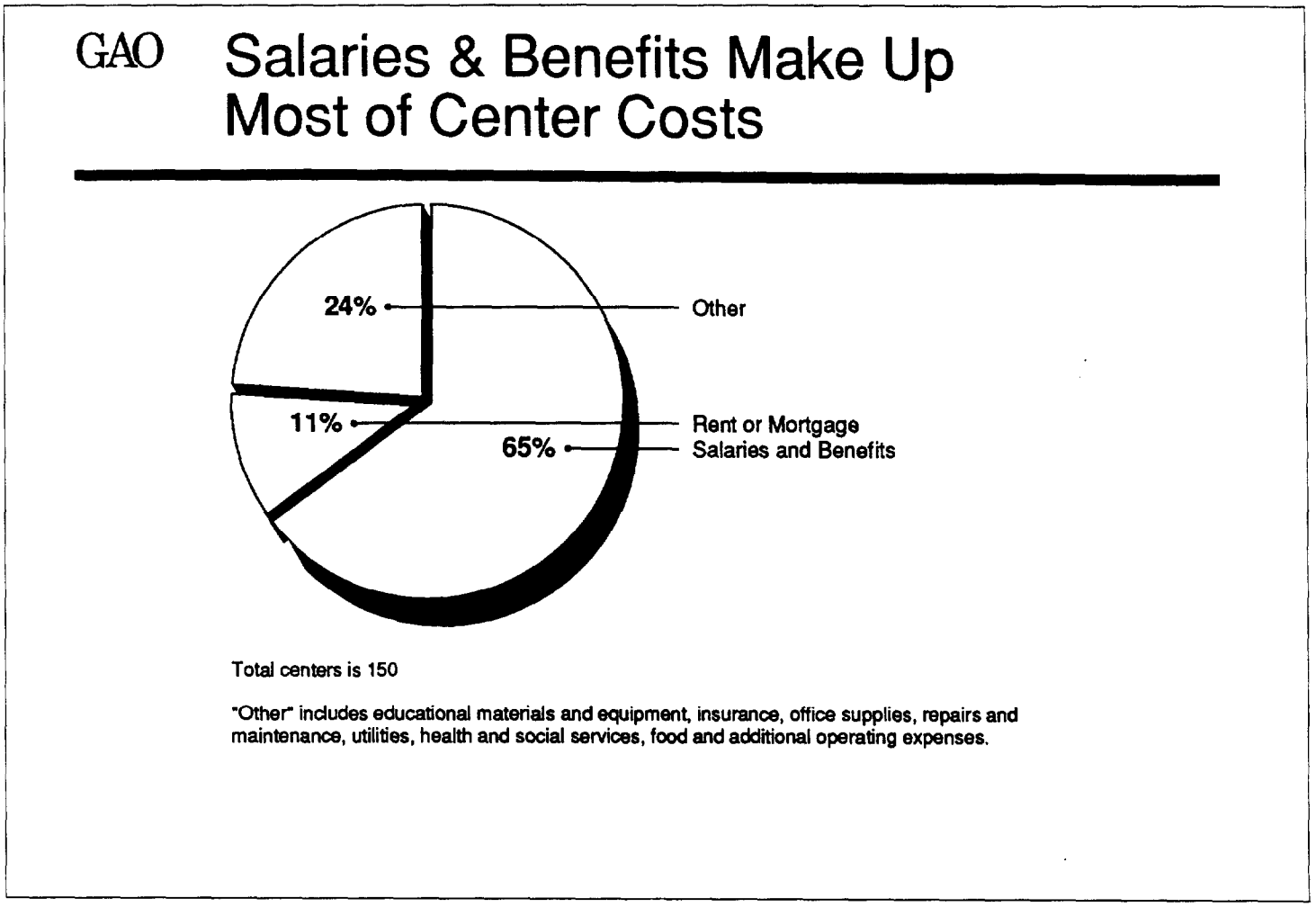

GAO
Cost Per Child More in Centers With No Low-Income Children
6000
Dollars in Thousands
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Centers serve no low-income children
Centers serve <25% low-income children
Centers serve >25% low-income children
In-Kind Donations
Cost Reported by NAEYC Centers

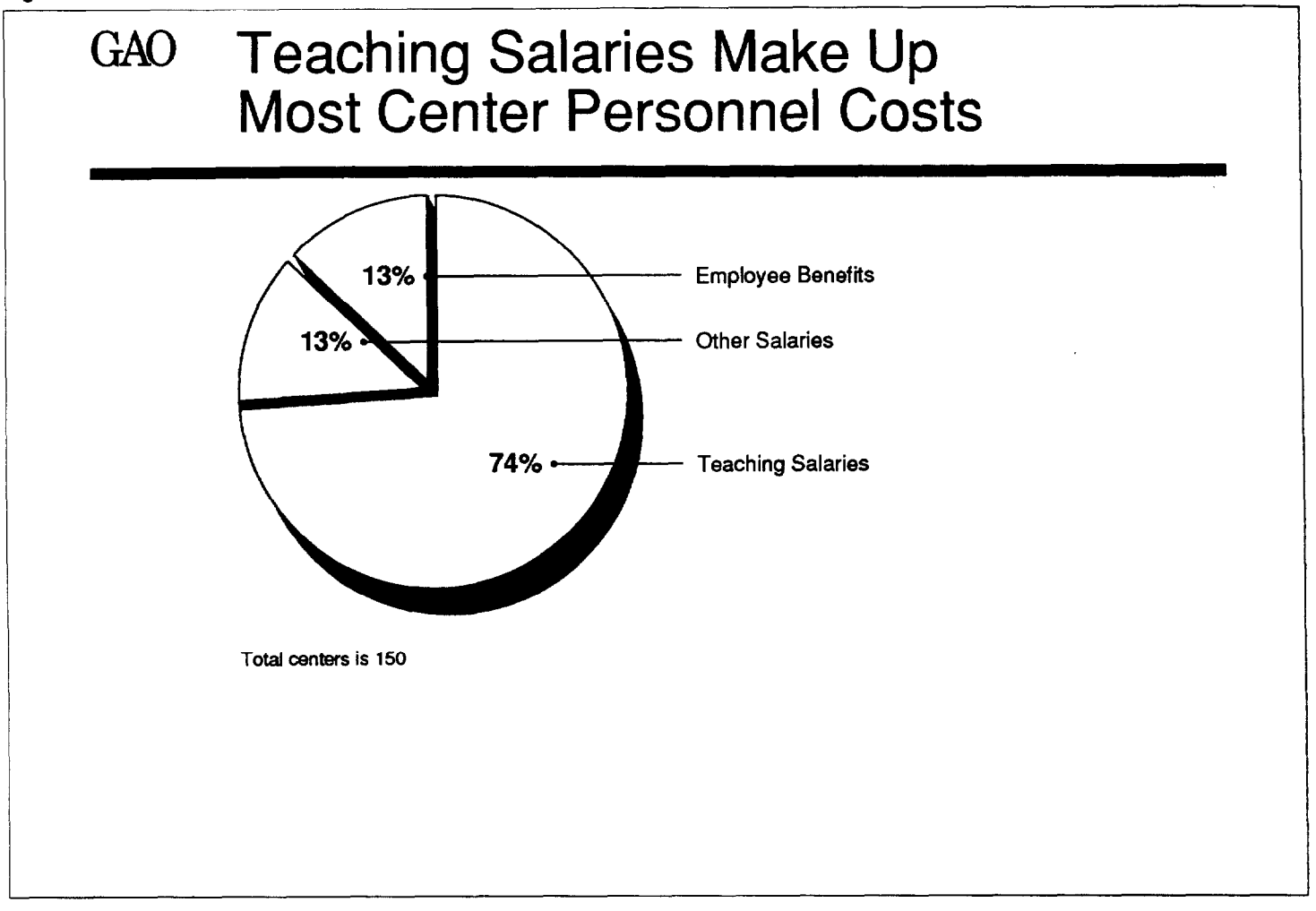
Figure 2.5



What Are the Centers' Personnel Costs?

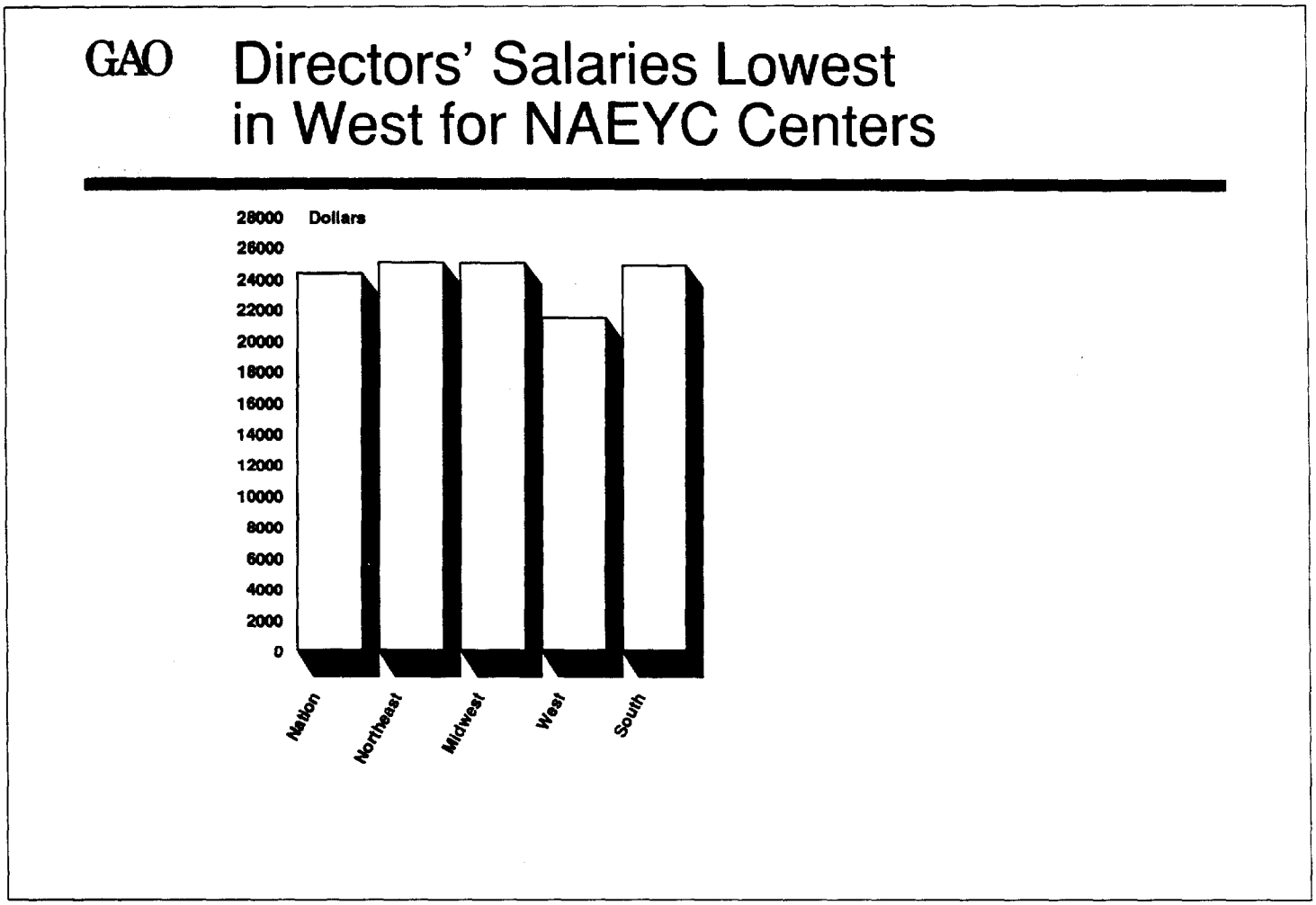
Nearly two-thirds of center costs go to salaries and benefits (see fig. 2.5).

Figure 2.6



On average, salaries for instructional staff make up 74 percent of centers' personnel costs. Salaries for noninstructional personnel make up 13 percent of personnel costs. An additional 13 percent is spent on employee benefits, including employer contributions for Social Security and Medicare (see fig. 2.6).

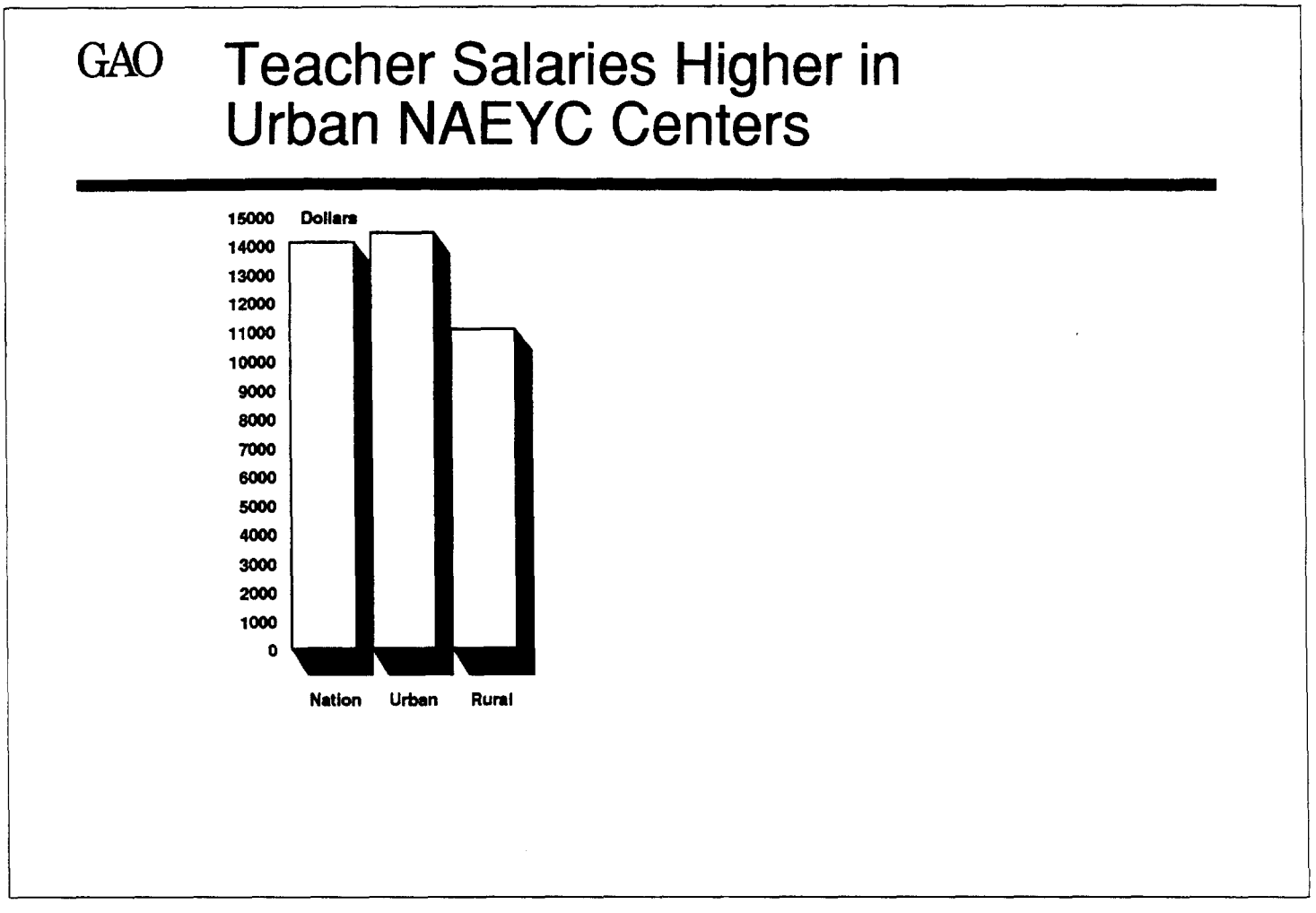
Figure 2.7



Director Salaries

The average annual salary for directors of early childhood education centers in our survey was $24,340. On average, directors' salaries were lowest in the West at $21,500. In each of the other three regions, the average annual salary for center directors was about $25,000 (see fig. 2.7).

Figure 2.8



Teacher Salaries

We estimate that the fiscal year 1988 average annual salary for early childhood education teachers at NAEYC centers was about $14,100.[5] Teacher salaries, on average, were substantially higher in urban centers than in rural centers. The average salary for teachers in urban centers was $14,400; the average salary in rural centers was $11,100 (see fig. 2.8).

[5]This estimate is slightly higher than that reported for child care teaching staff with 4-year college degrees in the Child Care Employee Project's 1989 National Child Care Staffing Study.

The average annual salary for teachers varied across regions, ranging from $12,900 in the West to $15,500 in the Northeast. As shown in table 2.3, in each region, salaries of early childhood education teachers are approximately half that of public elementary school teachers.

Table 2.3: Salaries of Early Childhood Education Teachers Compared With Those of Public Elementary School Teachers (Fiscal Year 1988)

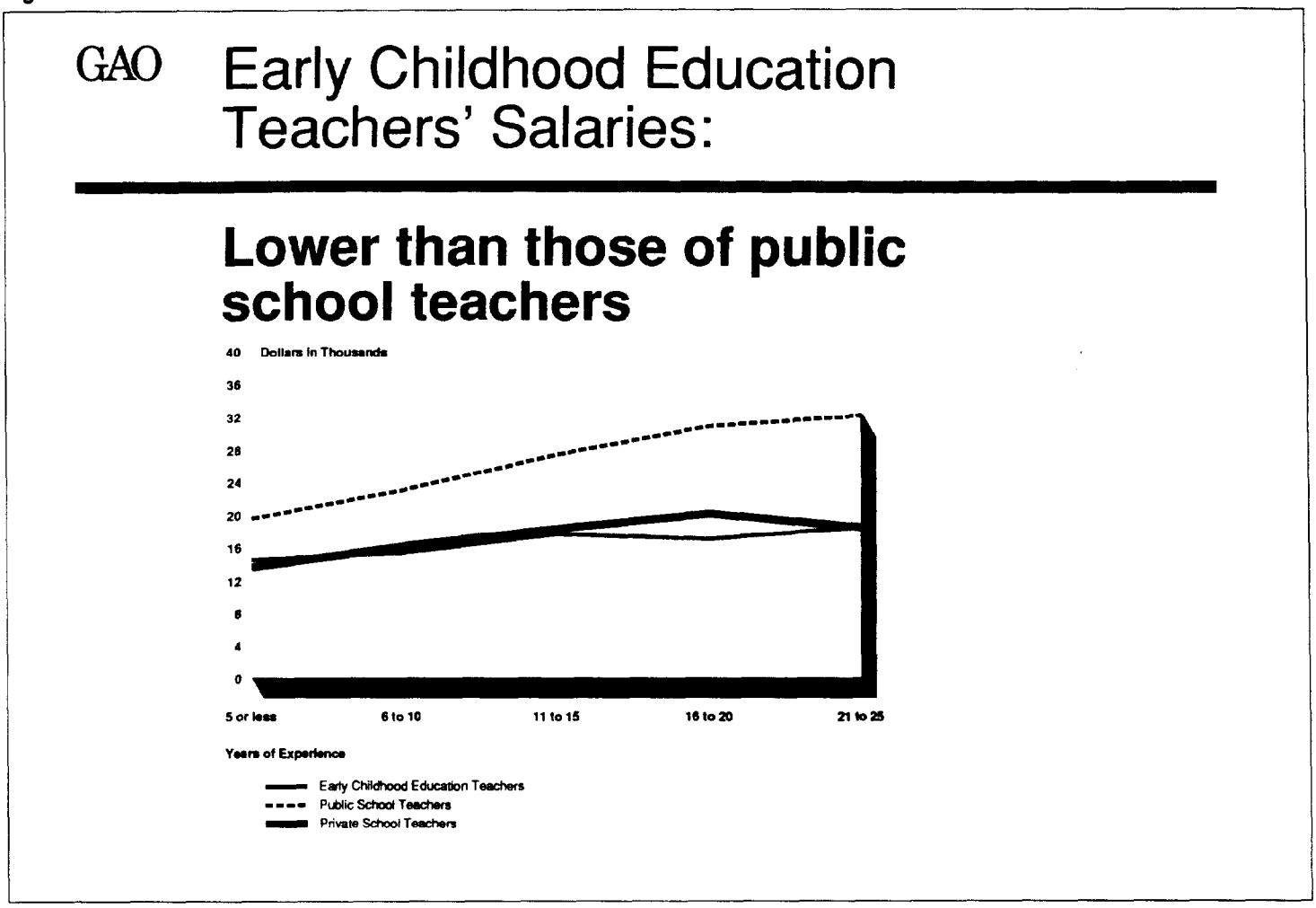
	Teachers	
Region	Early childhood education	Public elementary school[a]
Northeast	$15,500	$30,200
Midwest	14,100	27,800
South	14,200	24,500
West	12,900	29,600

[a]Source: National Education Association, Estimates of School Statistics: 1987-88.

Using salary data from a recent survey report from the National Center for Education Statistics (NCES), we also compared the salaries of early childhood education teachers with those of public and private school teachers[6] with varying experience (see fig. 2.9). When comparisons were made across groups with similar years of experience, the differences between the salaries of early childhood education teachers and public school teachers narrowed somewhat. The public and private school teacher salaries included in figure 2.9 are based on a school year of approximately 10 months.

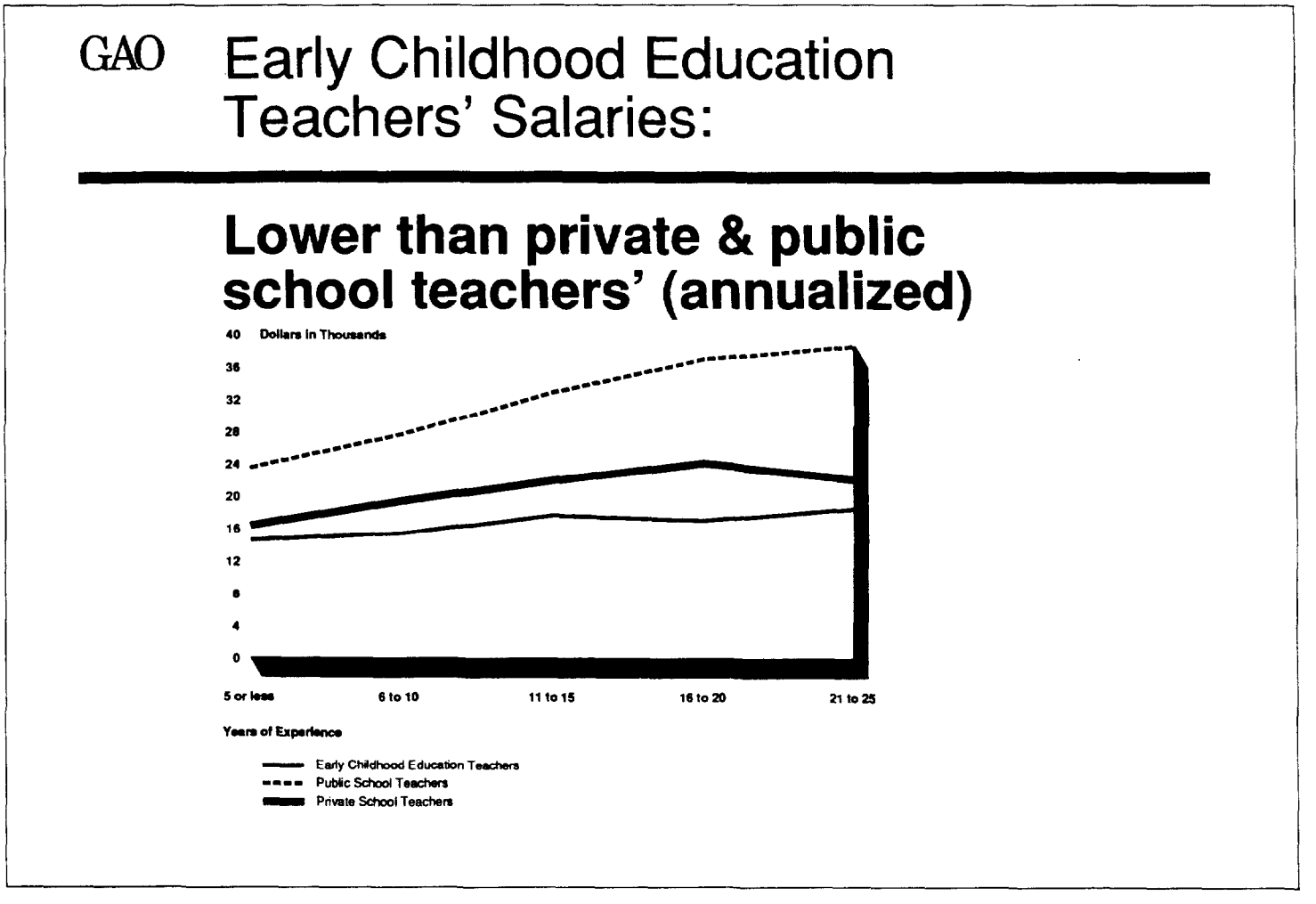
[6]These include both elementary and secondary school teachers because separate data were not available for private elementary school teachers.

Figure 2.9



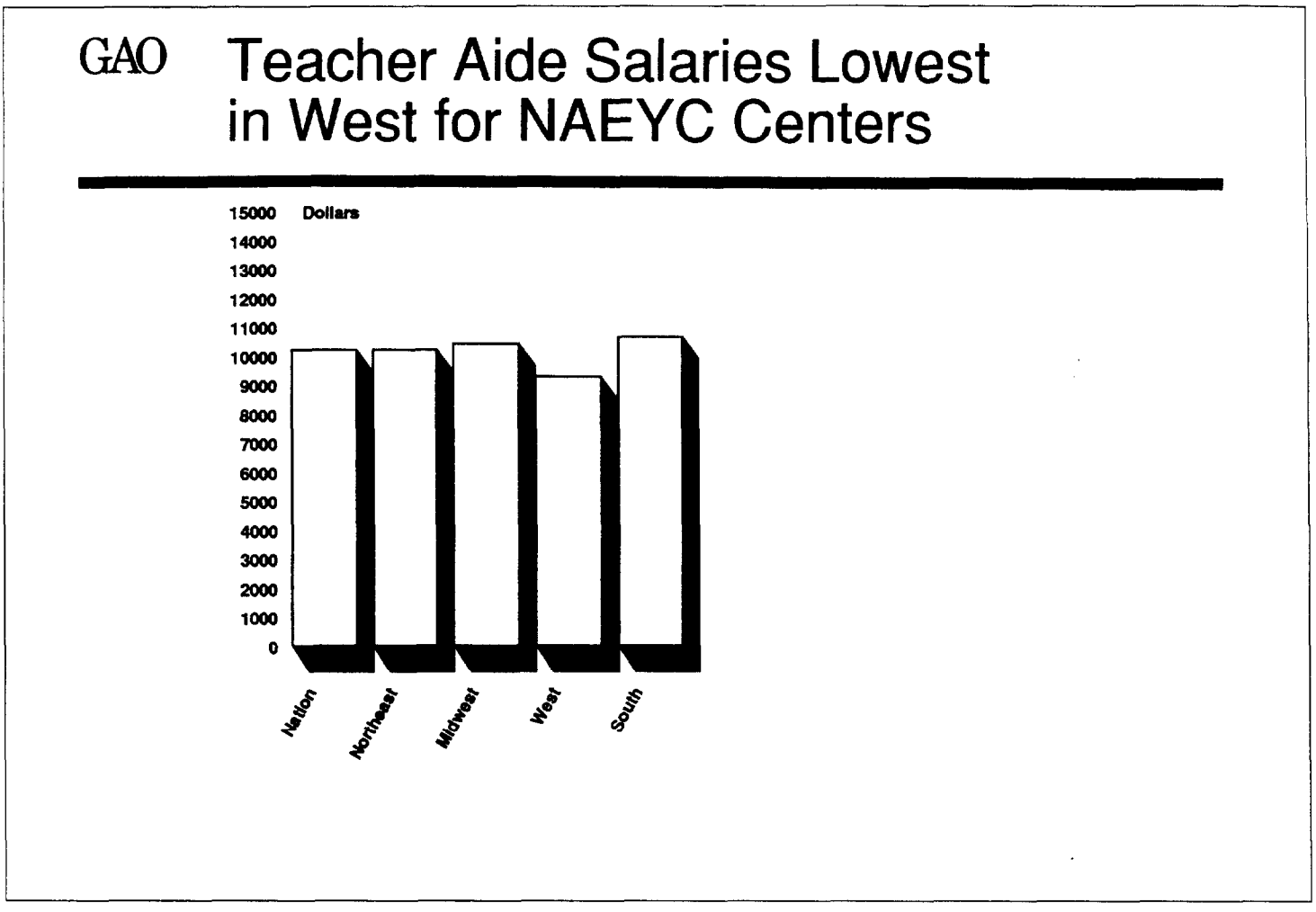
NCES has noted that private school salaries reported do not include in-kind income. It found that 23 percent of private school teachers earned an average in-kind income of $2,900, which may include housing, meals, transportation, and reduced tuition rates. In-kind income does not apply to public school teachers. In addition, NCES found that in private schools, lay teachers (those who are not from a religious order) earn salaries that are higher than those paid to teachers who are members of a religious order. According to NCES, approximately 1 in 10 private school teachers surveyed is a member of a religious order.

Figure 2.10



Across all levels of experience, public school teacher salaries are substantially higher than those of early childhood education teachers. Early childhood education teacher salaries were roughly similar, however, to those of private school teachers. Figure 2.10 compares annualized salaries (assuming that teachers are working 12 months rather than 10) for public and private school teachers. Most early childhood teachers worked 12 months, and salaries have been annualized for the others.

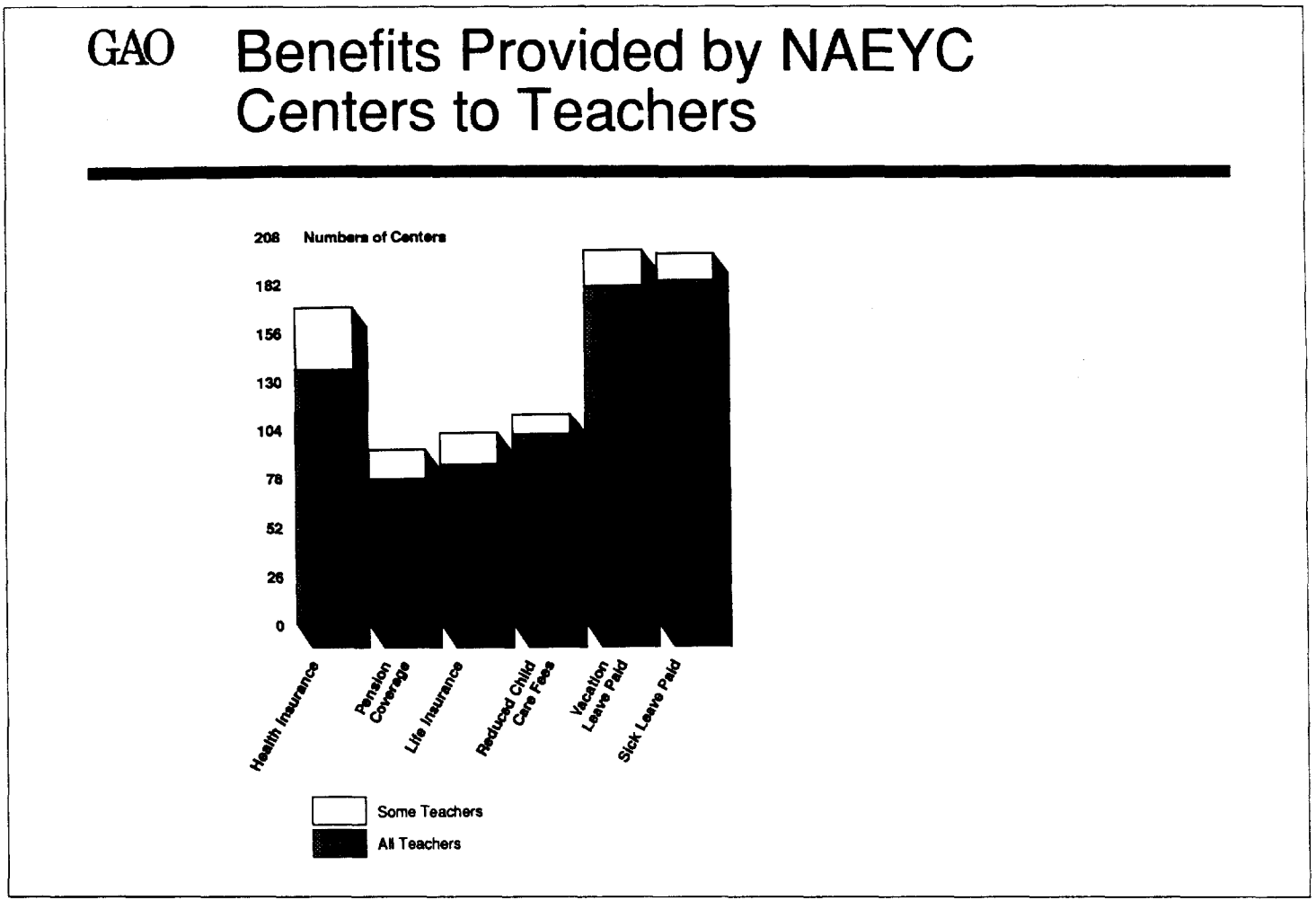
Figure 2.11



Teacher Aide Salaries

Teacher aides in the centers we surveyed earned, on average, salaries of approximately $10,200. Regional variations in aides' salaries were similar to those for directors, with teacher aide salaries lowest in the West and about the same in the other three regions. As shown in figure 2.11, teacher aide salaries in the four regions were, on average, as follows: $9,200 in the West, $10,200 in the Northeast, $10,400 in the Midwest, and $10,600 in the South.

Figure 2.12

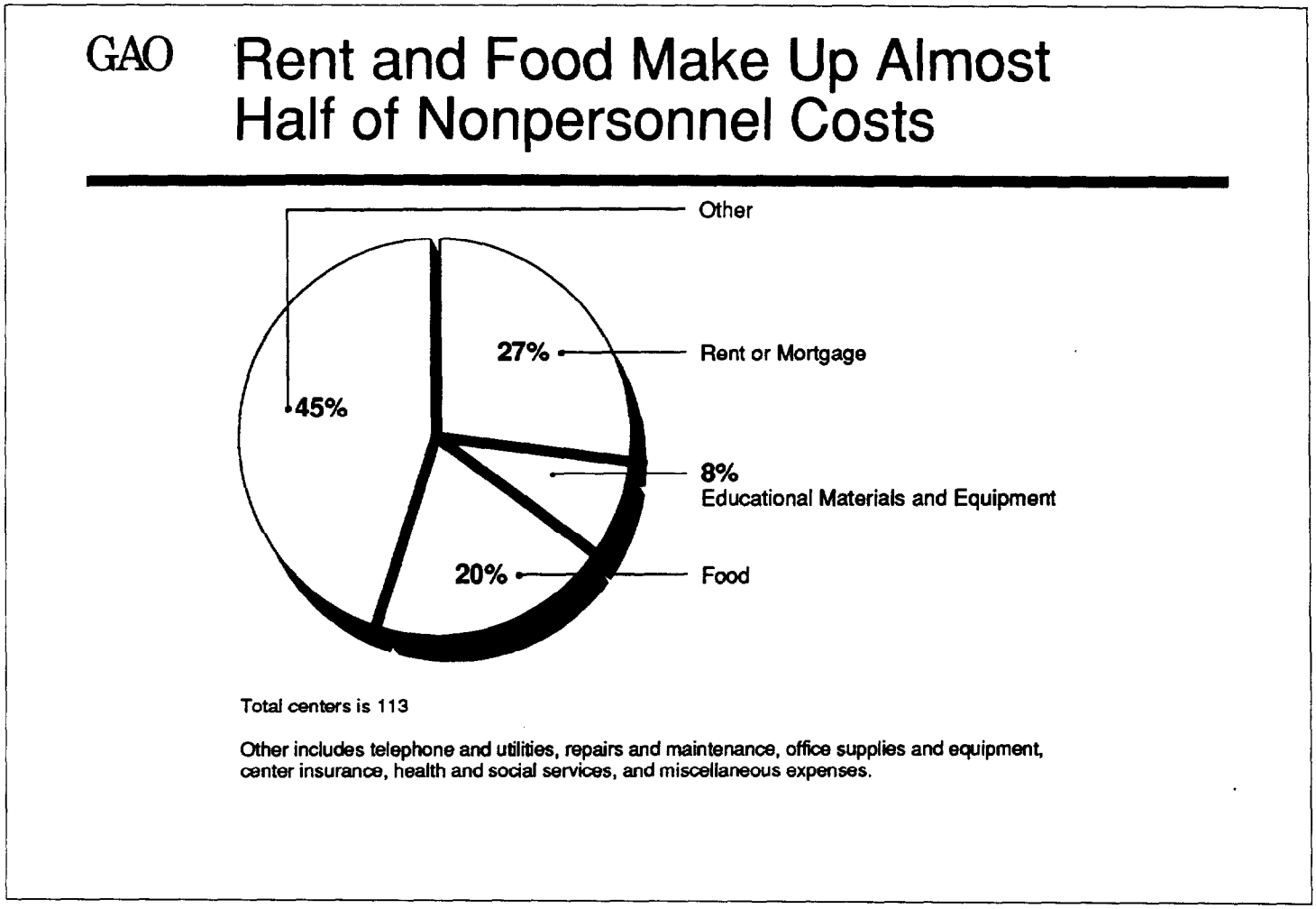


Staff Benefits

On average, centers spent approximately $416 per child on staff benefits, which make up about 15 percent of total staff salaries. Estimated staff benefit costs include employer contributions for Social Security and Medicare coverages. The extent to which other benefits are offered to teachers is shown in figure 2.12.

A vast majority (about 88 percent) of centers offered paid sick leave and vacation leave to all their teachers. Health insurance was offered to all teachers in 65 percent of all centers. Less than 50 percent of centers offered such benefits as pension coverage, life insurance, and reduced child care fees to its teachers.

Figure 2.13



What Are the Centers' Major Nonpersonnel Costs?

Of centers' nonpersonnel costs, rent or mortgage costs made up slightly more than one-fourth; food costs made up almost one-fifth; educational materials and equipment (which may also include the cost of field trips) made up approximately 8 percent; and the costs of insurance, office supplies, repairs and maintenance, utilities, supplementary services, and additional operating expenses made up the other 45 percent (see fig. 2.13).

Rent or Mortgage Costs

Out-of-pocket rent or mortgage costs averaged $338 per child. When the value of donated space is also considered, the average rent or mortgage costs increased to $532 per child. After estimating rent or mortgage costs for centers that did not report either out-of-pocket expenses or donations of space, the average rent or mortgage cost was $555 per child.

Food Costs

In fiscal year 1988, centers spent an average of $255 per child for food. Costs were higher—at $300 per child—for centers that serve, at a minimum, breakfast and lunch.

Insurance Costs

Overall, centers paid an average of $90 per child for insurance in fiscal year 1988. Insurance costs include primarily coverage for liability (such as bodily injury, property damage, and personal injury), real property, personal property, theft, and employee dishonesty. The average per-child cost of insurance decreased as the size of the center increased. For example, annual insurance costs for centers with 50 or fewer children averaged $102 per child compared with $84 per child for centers with more than 100 children.

Costs of Supplementary Services

On average, each center spent $151 per child in fiscal year 1988 for supplementary services.[7] See table 2.4 for the average costs of each of these services.

Table 2.4: Reported Annual Costs of Supplementary Services

Supplementary services	Average cost per child	Number of centers reporting costs
Parent education and family support	$7	106
Information and referral for health and social services	22	34
Health screening[a]	15	67
Screening for handicapping conditions	14	22
Mental health services	21	27
Social services	16	17
Transportation	56	47
Total	**$151**	

[a]Includes speech, language, hearing, and vision tests; medical treatment; and preventive care.

What Are the Average Start-Up Costs for an Early Childhood Education Center?

Of the 27 accredited centers that had been in operation less than 5 years, 24 (89 percent) provided information on start-up costs. These costs ranged from $8,000 to $900,000, with a median of $48,500, and included, in descending order of amount spent, costs for space, supplies and equipment, planning and administration, and teacher training.

[7]The costs for supplementary services may be underestimated. Because many centers do not separately budget or account for expenses related to supplementary services, such costs may be included under a center's educational expenses account or staff salaries account. In addition, NAEYC center costs for supplementary services may not be reflective of the costs of supplementary services under S. 123, because centers may not provide services to the extent intended by S. 123.

How Sensitive Is the Cost of Early Childhood Education to Staff Salaries, Quality, and Other Center Characteristics?

On the basis of our analysis, we conclude that (1) the cost per child decreases significantly as the number of children enrolled in a center increases and (2) tightening of quality standards for early childhood education centers will likely increase the cost per child, either directly, as a result of centers' hiring additional teachers to lower the child-staff ratio, or indirectly, as a result of centers' paying higher wages to attract better qualified teachers and aides. However, the "quality" standards specified in S. 123 should increase the cost per child only of early childhood education centers that do not currently meet such standards. In addition, an increase in the number of children attending centers that would result from the enactment of S. 123 will necessitate hiring additional teachers. Evidence from previous economic research suggests that this need for additional teachers will cause wages (and hence average cost) to rise moderately. (See app. IV for a description of our economic cost model and detailed analysis of results.)

Average Cost Declines as Center Size Increases

Our regression results indicate that as the number of full-time equivalent children enrolled[1] in a center increases, the cost per child decreases. That is, a 10-percent increase in center size results in an increase of only 8 percent in total cost if all other factors remain the same.[2] For example, if a center with 50 children and a cost per child of $4,500 enrolled 5 additional children (while maintaining the original child-staff ratio and providing the necessary additional supplies and space), its cost per child would decrease by $82.[3]

These results must be interpreted with care, as the implied cost advantage of large centers may be overstated for two reasons. First, if the administrative burden on each director increases with center size, larger centers might have to offer higher salaries than those paid at smaller centers to attract capable administrators. Higher salaries would at least partially offset the cost per child differential between small and large centers.

Second, an increase in center size achieved by the consolidation of many small centers into fewer larger centers would impose additional costs on parents. For example, the decrease in the number of centers could

[1]Includes full-time children and the full-time equivalent of part-time children.

[2]The standard errors of the estimates discussed in this section are reported in table IV.2.

[3]Cost per child declined with increases in center size even when we restricted our analysis to centers with more than 68 children. See footnotes 8 and 9 in app. IV for a discussion of the economies-of-scale issue.

increase the average commuting distance for parents and children. Accordingly, center size may be limited by local conditions—such as population density—that affect the number of children who can be served by a given center.[4]

Because quality standards in early childhood education are not directly measured in our study, we cannot determine from our data whether quality is higher or lower in larger centers. Our analysis, however, included several variables generally thought to be associated with quality—average group size, child-to-staff ratio, and the wages of the directors, teachers, and teacher aides.[5] Nonetheless, when these variables are held constant, average cost decreases as center size increases.[6]

Impact of Quality and Other Center Characteristics on Cost

Child-to-Staff Ratios

Our regression results show that a reduced child-to-staff ratio increased total costs for the centers in our survey. A decrease of one child per teaching staffmember increased costs by 4.6 percent. That is, if a center with 50 children, a child-staff ratio of 11 to 1, and a cost per child of $4,500 reduced its child-staff ratio to 10 to 1—without increasing the number of children enrolled in the center—its cost per child would increase by about $207, resulting in a cost per child of $4,707.[7]

[4]Low population density does not necessarily mean that, on average, rural centers will be smaller than urban centers. In our survey of 208 centers, the average number of full-time equivalent children was nearly identical for rural and urban centers (83 and 81, respectively). See footnote 11 in app. IV.

[5]For example, in a 1978 study of day care costs, Abt Associates found group size to be negatively correlated with quality. In addition, wages are positively correlated with the education and experience of directors, teachers, and aides.

[6]If the larger centers have been in existence longer than smaller centers, it is possible that some of the cost reduction may be due to efficiency gained through experience in operation, rather than economies of scale. Our results indicate, however, that this is unlikely; total costs for centers that have been in operation for less than 5 years are not statistically different from centers that have been in operation longer.

[7]The additional staffing requirement could be met by hiring part-time teachers or teacher aides.

Conversely, an increased child-to-staff ratio resulted in lower total costs for the centers in our survey.

Although one might expect that increased child-to-staff ratios would result in higher wages (because of the greater responsibility required of each staff member)—and hence greater center costs—we found no evidence of this from our analyses. Instead, the only effect of increased ratios seems to be a center's saving in the amount of teaching staff needed (with its concomitant salary saving).

Children's Group Size

There is no statistical evidence to suggest that group size (the number of children assigned to a particular classroom or group in the center) affects average cost.

Costs for Children With Handicapping Conditions

Centers that enrolled higher percentages of children with handicapping conditions tend to pay higher wages to both teachers and aides. A 10-percentage-point increase in the number of these children increases wages by 5.7 percent for teachers and 1.9 percent for aides.

For-Profit Centers

We estimate that for-profit centers pay wages that are 3 percent lower for teachers and 7.2 percent lower for aides (even after controlling for the education and experience levels of those staff) than nonprofit centers. No evidence suggests, however, that for-profit centers are any more efficient than nonprofit centers. That is, after controlling for salaries, occupancy cost, and the cost of supplies, the total costs of for-profit centers are roughly equivalent to those of nonprofit ones.

Cost Differentials Because of Location

The cost of early childhood education is lower in the West, Midwest, and South than in the Northeast, in part because salaries for teachers and aides are lower in those regions: in the West, roughly 14 percent lower for teachers and 8 percent lower for aides; in the Midwest, about 19 percent lower for teachers and 9 percent lower for aides; and in the South, about 17 percent lower for teachers and 5 percent lower for aides, even when other factors that our analysis showed affect salaries (such as experience and education) are held constant.

Salaries are about 20 percent higher for teachers and 9 percent higher for aides in urban areas than in nonurban areas. After controlling for

other costs, the total costs for centers in urban areas are about 7 percent more than for centers in nonurban areas.

Wages for both teachers and aides appear to be lower at centers with higher proportions of children from low-income families. For example, on average, a 10-percentage-point increase in the proportion of low-income children is associated with wages that are approximately 2 percent lower for both teachers and aides. This may reflect demand conditions (less demand from low-income families for early childhood education and teachers and/or less ability to pay), supply conditions (less costly to hire workers in depressed areas), or both. After adjusting for the impact on wages, the proportion of low-income children does not, however, have a significant effect on total cost of operating a center.

Indirect Influences on Total Cost: Factors That Affect Wages

Wages Rise With Education and Experience

Wages for staff—both teachers and teacher aides—rise with additional years of education or experience or both. On average, each additional year of education increases wages by 6.0 percent for teachers and 3.3 percent for aides. Additional years of experience also increase wages, although the percentage increase declined with years of experience. The average teacher reported 5.8 years of experience; an additional year of experience would increase wages by 2.3 percent. The average aide has 3.1 years of experience; an additional year of experience would increase wages by 1.9 percent.

Center Size and Wages

Larger centers—as measured by the total number of directors, teachers, and aides—tended to pay higher wages to teachers, but lower wages to aides, even after adjusting for the staff's education and experience.

A Higher Minimum Wage

The increase in the federal minimum wage from $3.35 to $3.80, slated to occur in April 1990, will raise the average wage for teachers and teacher aides. In fiscal year 1988, at the centers we surveyed, 4.5 percent of the teachers and 13.9 percent of the aides reported earning less than $3.80 per hour. However, the percentage of child care teachers and teacher

aides affected by the increase in the federal minimum wage could be even larger if centers attempt to maintain relative pay scales by also raising the wages of teaching staff making more than $3.80 per hour.

Link Between Wages and Total Center Cost

A 10-percent increase in teachers' hourly wages causes a center's total cost to increase by 3 percent. The same increase in aides' hourly wages causes a 1.3-percent increase in total center costs. An increase of 10 percent in directors' monthly wages caused an increase of 1.7 percent in total center costs.

Increased Need for Teachers and Aides Will Require Slightly Higher Wages

An expansion in the number of children attending early childhood education centers will require increased wages to attract additional teachers and aides to the field. Although we made no attempt to estimate the cost, previous economic research on teachers suggests that moderate wage increases attract many new workers to the field. If quality standards for teachers, such as academic achievement, remain unchanged, a 10-percent increase in wages is likely to result in a 24- to 32-percent increase in the number of teachers.[8] Because aides have less formal training than teachers, the same percentage increase in aides' wages would most likely result in an even larger percentage increase in the number of aides. However, the actual wage increase caused by the enactment of S. 123 or other child care bills will depend on the number of new teachers required, the availability of qualified personnel, and other institutional factors—such as the degree to which early childhood education workers are covered by collective bargaining agreements.

[8]Charles F. Manski, "Academic Ability, Earnings, and the Decision to Become a Teacher: Evidence from the National Longitudinal Study of the High School Class of 1972," in Public Sector Payrolls, ed. David A. Wise (Chicago: University of Chicago Press, 1987).

What Were the Characteristics of and Services Provided by the NAEYC Centers Surveyed?

According to our survey of NAEYC-accredited centers, a typical early childhood education center is urban, nonprofit, and located in the South or Midwest, and serves about 80 children.

The NAEYC centers surveyed generally had the same characteristics as the proposed Smart Start centers, discussed in S. 123. In some cases (child-staff ratio, daily group size, meals served, and teachers' and teacher aides' training), the NAEYC centers exceeded the bill's criteria for high-quality early childhood education. All NAEYC centers surveyed had full-day, full-year programs serving 4-year-olds. The typical center also

- had a 9-to-1 child-staff ratio for 4-year-olds;
- had a daily group size of 17 for 4-year-olds;
- provided lunch and snacks and, in some cases, lunch and breakfast;
- employed directors with bachelor's or graduate degrees and 15 years of experience;
- employed teachers, most of whom had bachelor's degrees and 6 years of experience;
- employed teacher aides with at least some college training and 3 years of experience; and
- provided parent education and information or referrals for health and social services.

In addition, most of the centers enrolled one or more low-income children, although only 12 percent of the centers enrolled 50 percent or more low-income children. The total average monthly fee for 4-year-olds attending on a full-time basis was $304, with 37 percent of the centers using sliding-fee schedules, which permitted low-income families to pay much lower fees for their children.

Characteristics of Centers

Where Were Centers Located?

Most of the centers that responded to our survey (88 percent) were in urban areas. As shown in figure 4.1, most of the NAEYC centers surveyed were in the South or Midwest.

Figure 4.1

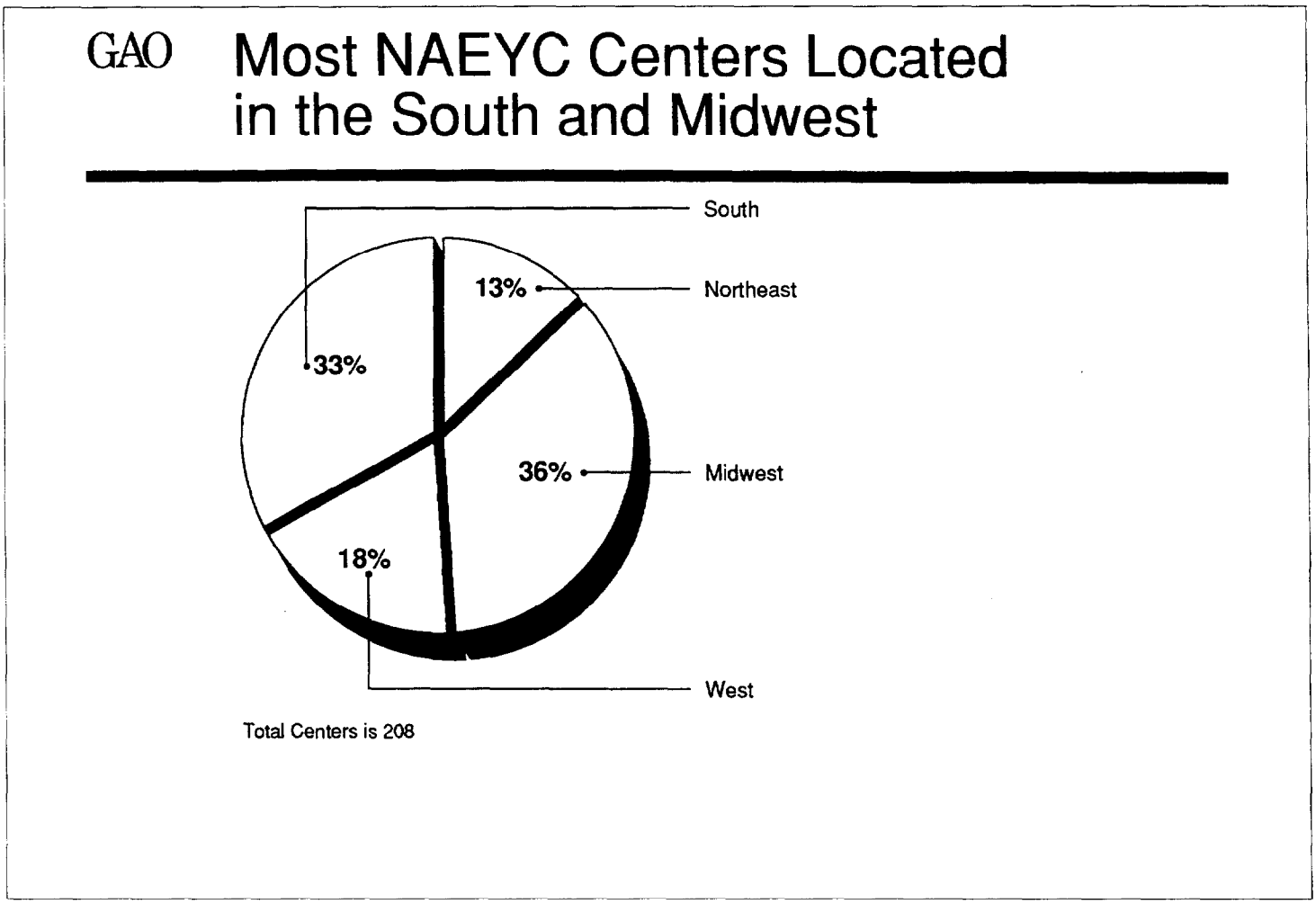
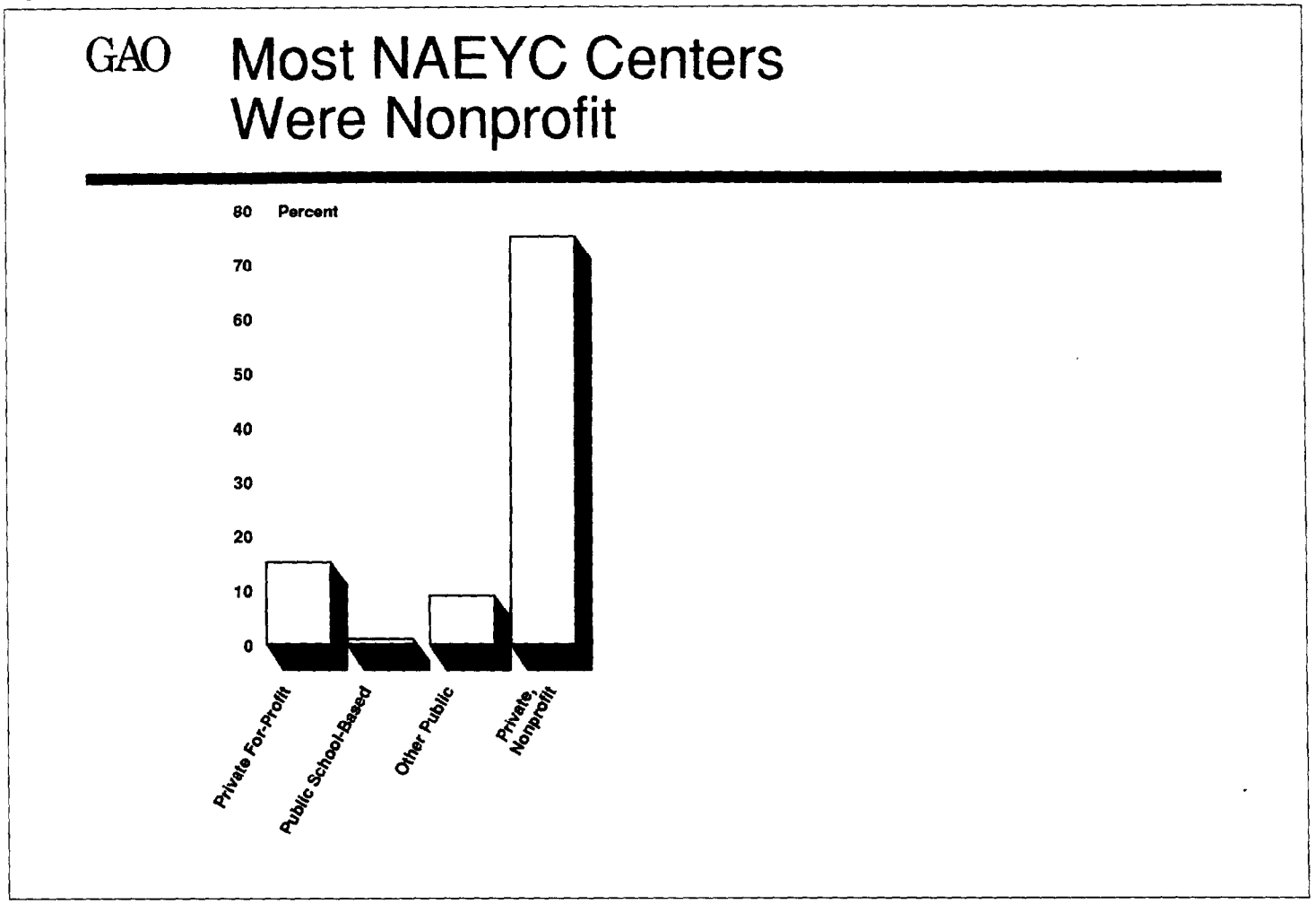

GAO
Most NAEYC Centers Located in the South and Midwest
South
13%
Northeast
33%
36%
Midwest
18%
West
Total Centers is 208

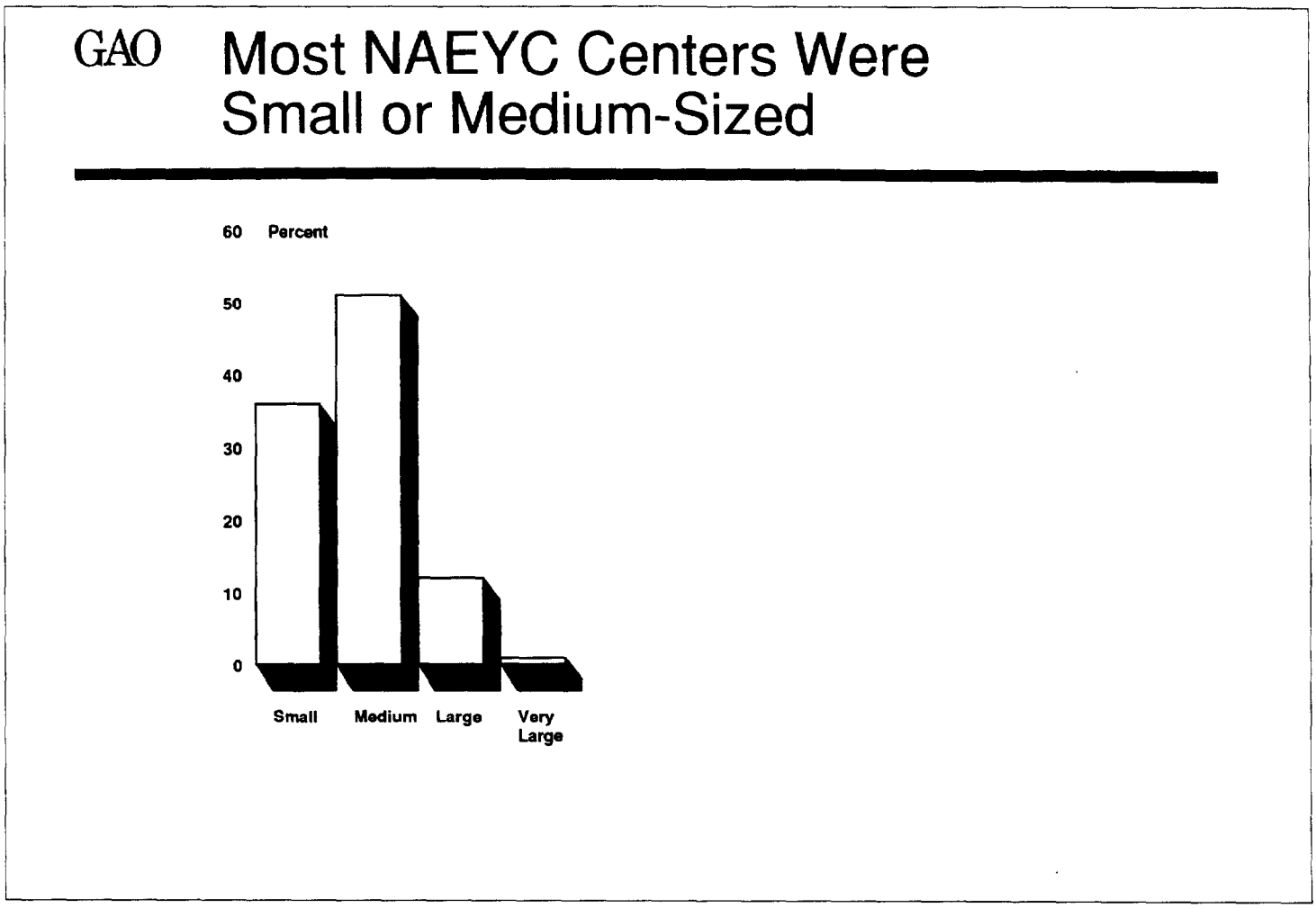
Figure 4.2



To What Extent Were Centers Publicly or Privately Operated?

Eighty-five percent of the centers surveyed were private nonprofit or public; the others were private for-profit (see fig. 4.2). In addition, of the 208 centers that responded to our questionnaire, 18 percent were sponsored by churches, synagogues, or other religious organizations.

Figure 4.3



How Many Children Were Enrolled in Each Center?

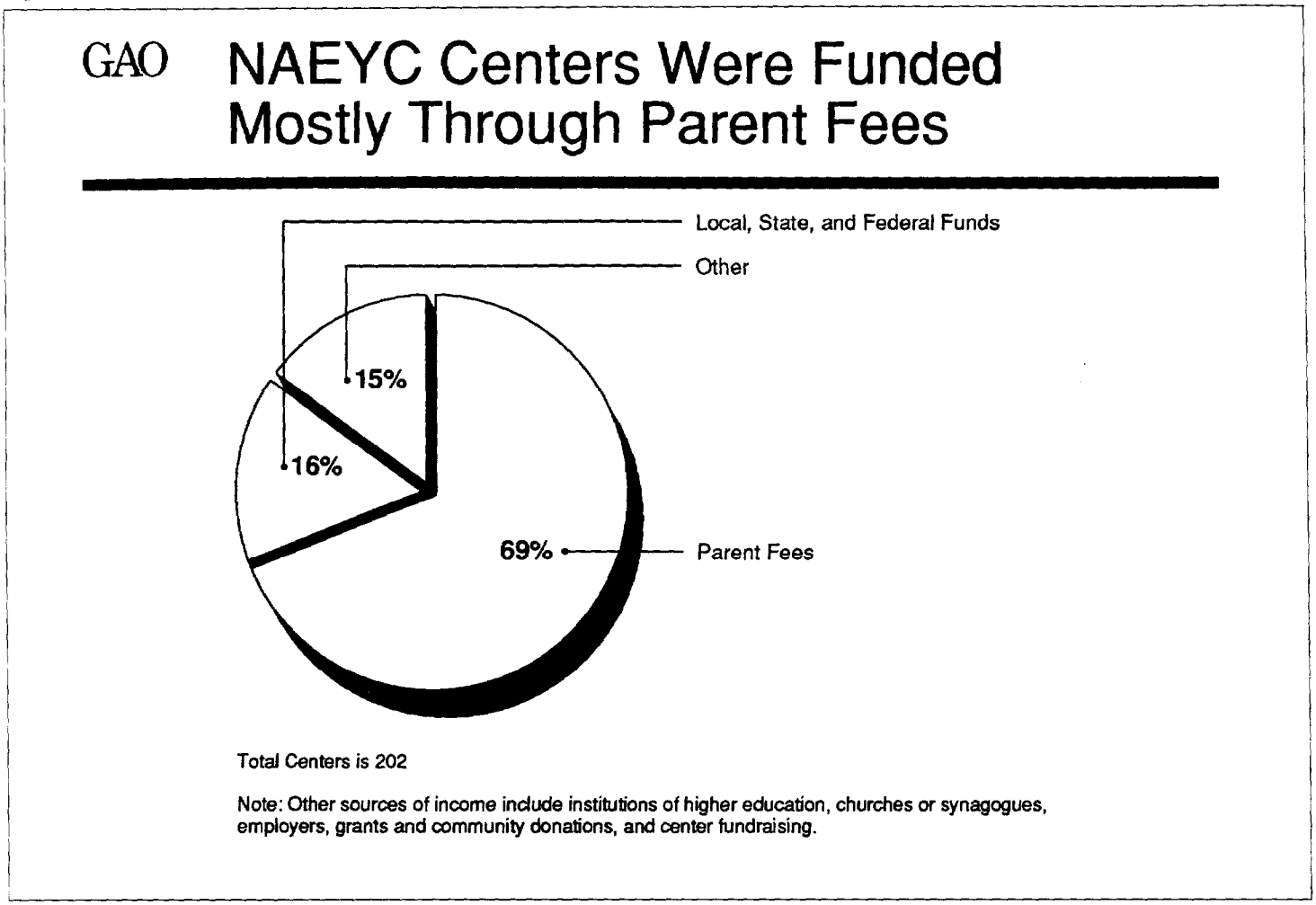
On average, in the centers we surveyed, 82 children were enrolled.[1] NAEYC classifies center sizes according to the following guidelines:

- Small: Center with fewer than 60 children enrolled.
- Medium: Center with 60 to 120 children enrolled.
- Large: Center with 121 to 240 children enrolled.
- Very Large: Center with more than 240 children enrolled.

Based on these guidelines, as shown in figure 4.3, most of the centers we surveyed were small and medium-sized.

[1]Includes full-time children and the full-time equivalent of part-time children.

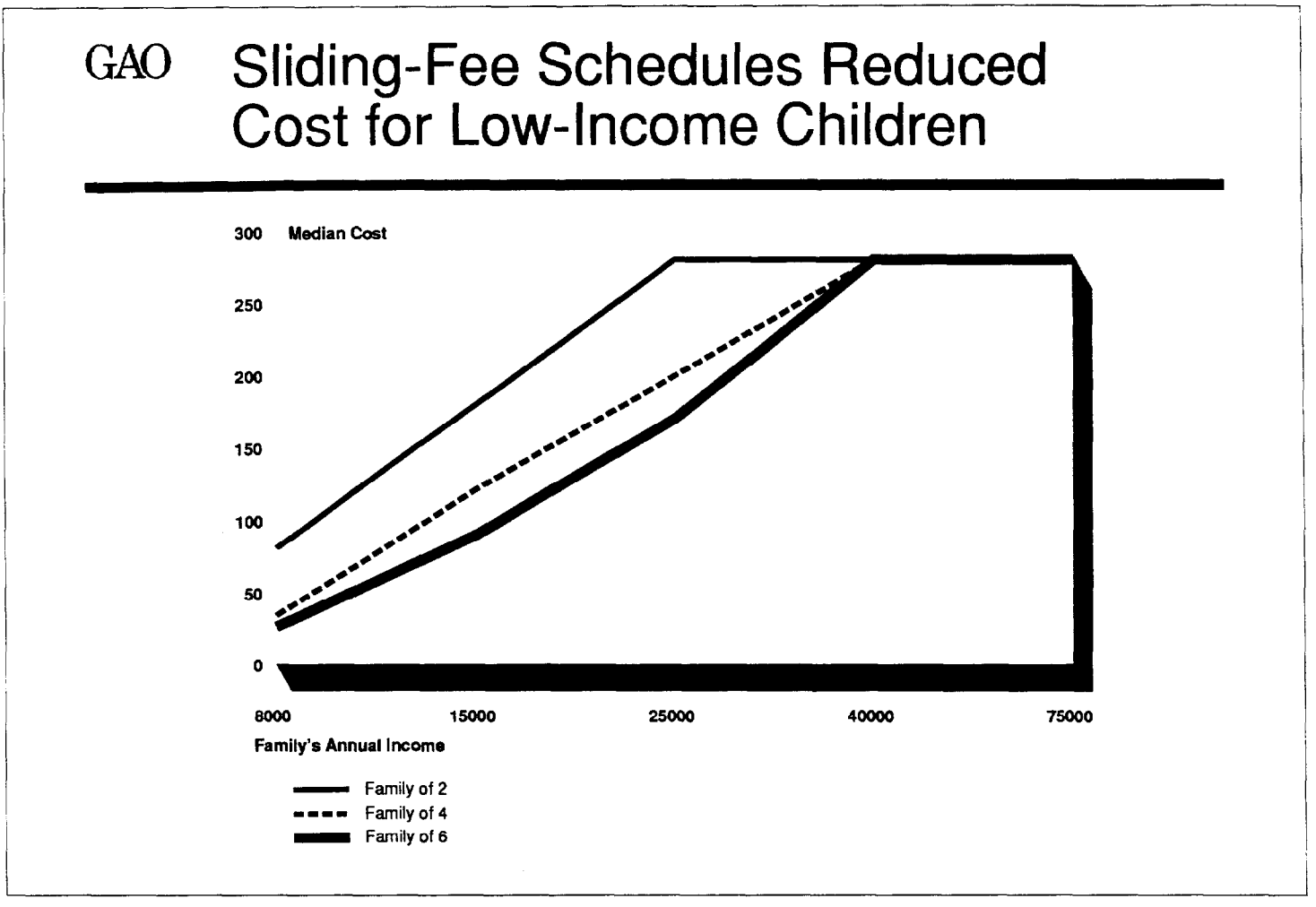
Figure 4.4



What Were the Centers' Revenue Sources?

NAEYC centers responding to our survey received 69 percent of their revenues from parent fees; other center revenues came from federal, state, and local funds, as well as other sources, such as colleges and universities, churches and synagogues, and center fundraising (see fig. 4.4).

Figure 4.5



Monthly Fees/ Fee Schedules

Overall, the average monthly fee for a full-time 4-year-old was $304. At the centers that adjust fees according to annual family income and family size,[2] however, the monthly fee for low-income children was much less. For example, the median monthly fee for the 32 centers that adjusted fees according to family size and income was $34 for children from families that (1) have four members and (2) earn no more than $8,000 annually (see fig. 4.5).

[2]Of the 208 centers surveyed, 77 (37 percent) reported using sliding-fee schedules. Of these 77 centers, 32 adjusted fees according to both family income and size.

What Meals Do Centers Provide?

All of the 208 centers surveyed provided at least one meal or snack. Of the centers surveyed, 80 percent provided at least lunch; 58 percent provided at least breakfast and lunch. Virtually all of the centers provided an afternoon or morning snack.

Characteristics of Children

What Age Groups Are Served?

The centers surveyed enrolled a total of 21,417 children, ranging in age from infants (aged 0-12 months) to children aged 5 and older. Children aged 3 and 4 were enrolled by virtually all of the centers we surveyed (see fig. 4.6). Only 33 percent of the centers enrolled infants, and 45 percent of the centers enrolled toddlers (aged 1 to less than 2 years).

Figure 4.6

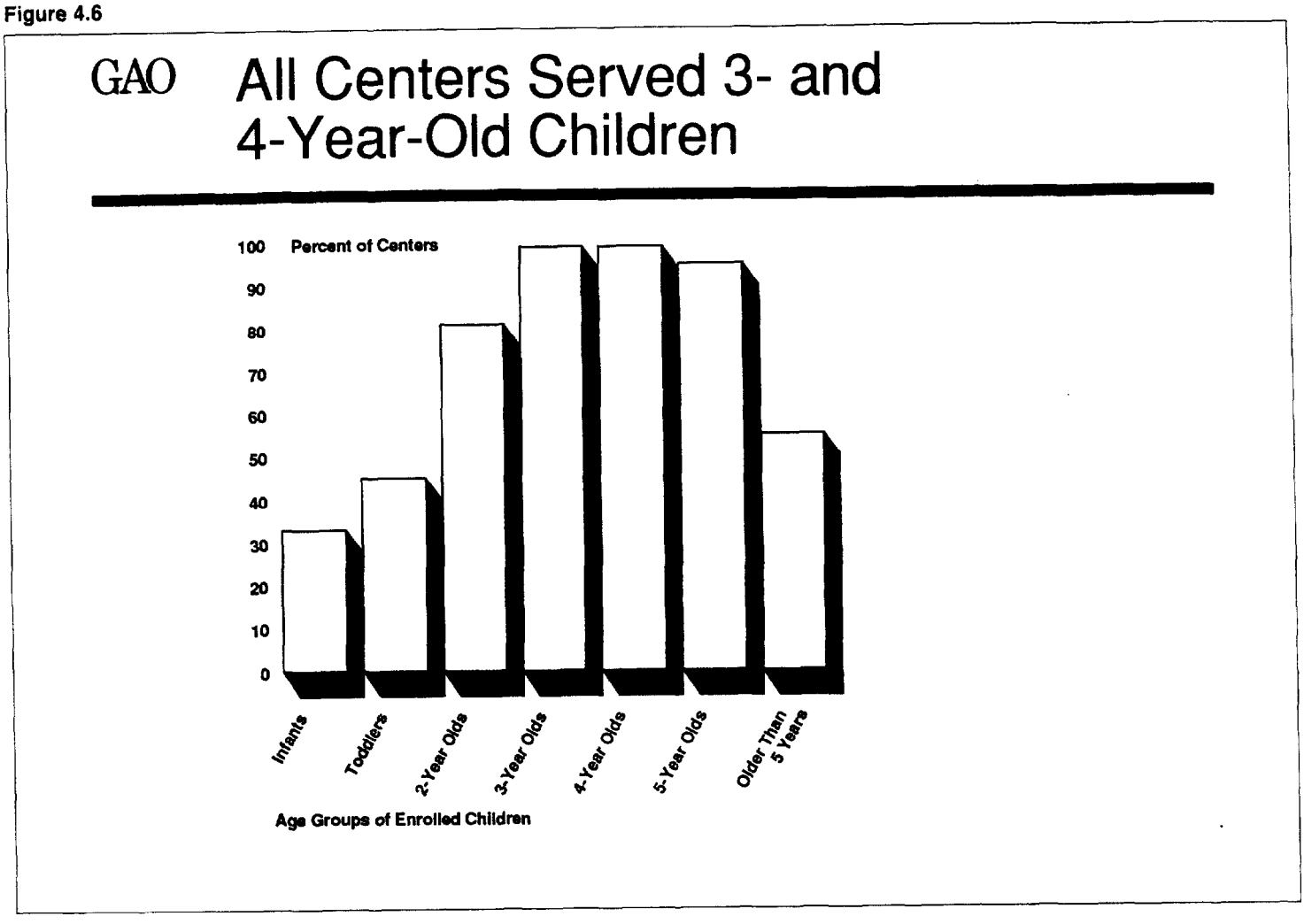
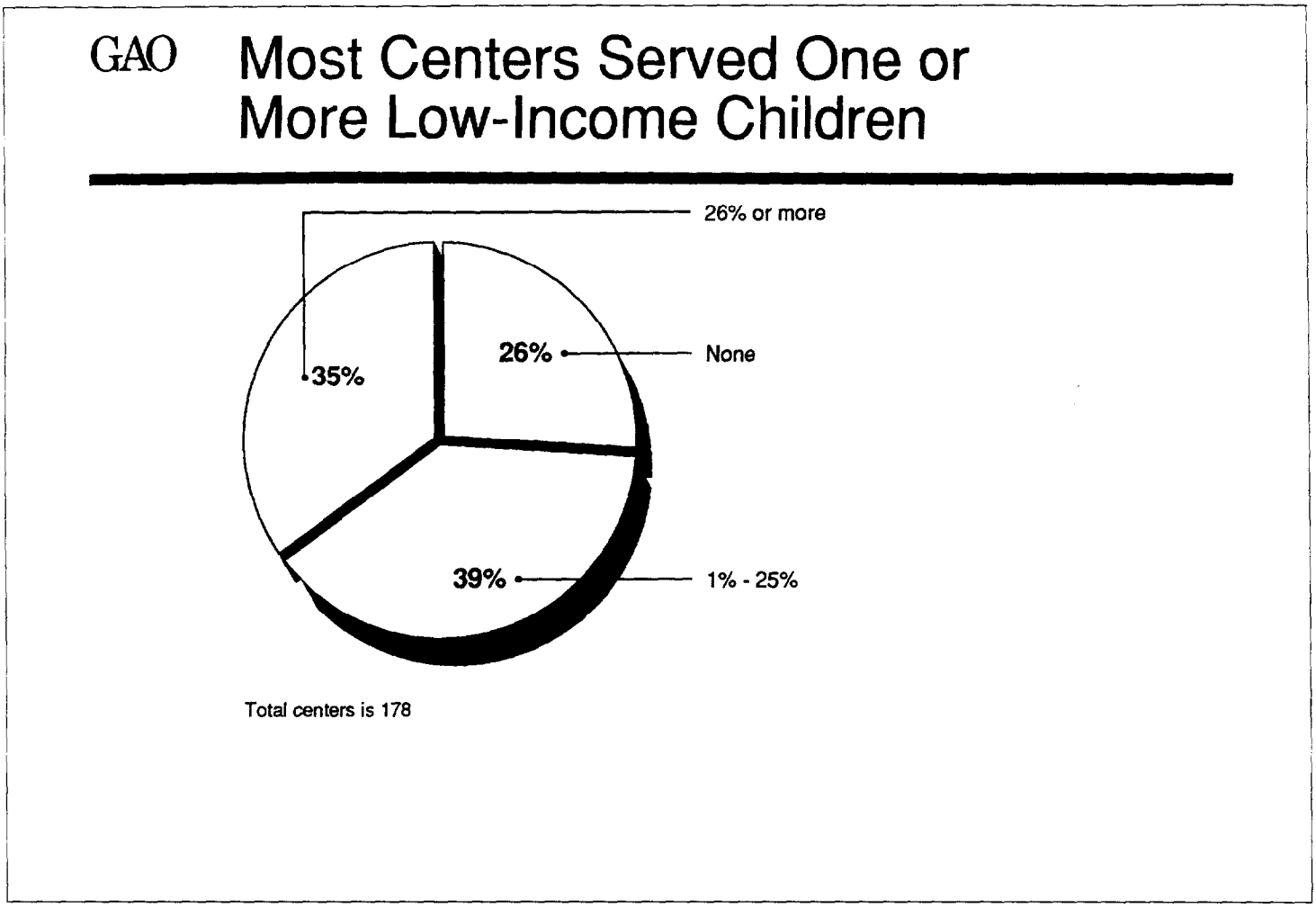

GAO
All Centers Served 3- and 4-Year-Old Children
100
90
80
70
60
50
40
30
20
10
0
Percent of Centers
Infants
Toddlers
2-Year Olds
3-Year Olds
4-Year Olds
5-Year Olds
Older Than 5 Years
Age Groups of Enrolled Children

Figure 4.7



What Proportion of Children Served Are From Low-Income Families?

Slightly more than one-third of the centers counted 25 percent or more of their enrollees as low-income children (see fig. 4.7). About one-fourth of the centers enrolled no low-income children. In addition, 44 centers (25 percent of all centers) reported serving 50 percent or more low-income children. Overall, 21 percent of the children enrolled in the centers surveyed were identified by center directors as being from low-income families.

How Many Children With Handicapping Conditions Are Enrolled?

Almost 70 percent of the 208 centers enrolled a total of about 900 children with handicapping conditions; the other 30 percent enrolled no such children. The number of children with handicapping conditions attending a center ranged from 1 to 78. As shown in table 4.1, centers served children with a variety of handicapping conditions, including developmentally delayed, speech-impaired, and emotionally disturbed children.

Table 4.1: Percentage of Children With Handicapping Conditions at Centers

Figures in percents

Handicapping condition	Centers serving children
Developmentally delayed	54
Speech impaired	50
Emotionally disturbed	31
Orthopedically impaired	17
Visually impaired	16
Hearing impaired or deaf	16
Mental retardation	15
Multiple handicaps	11
Deafness and blindness	1
Other health impaired	1

What Is the Average Child-Staff Ratio and Group Size?

On average, the centers we surveyed reported a 9-to-1 child-staff ratio for 4-year-old children. The average child-staff ratio for all age groups was 8 to 1.

The average daily group size was 17 for 4-year-old children and 14 for all age groups.

Services Provided

What Supplementary Services Are Provided at NAEYC Centers?

More than 85 percent of the 208 centers reported providing (1) parent education in the form of conferences, newsletters, and orientation meetings and (2) information on and referrals for health and social services for the child and family—two of the four supplementary services specified in S. 123 (see table 4.2). Less than 25 percent of the centers reported providing screening for handicapping conditions and health screening—the other two services specified in S. 123.

In addition, slightly more than one-fifth of the centers provided mental health and social services to children attending their center—services not specified in S. 123 (see table 4.2). Of the centers surveyed, 15 percent provided transportation services, which also are not specified in S. 123.

Table 4.2: Percentage of Centers Providing Supplementary Services

Figures in percents

Services that S. 123 would require:	Centers providing service
Parent education and family support	87
Information and referrals for health and social services	86
Screening for handicapping conditions	24
Health screening[a]	19
Services that S. 123 would not require:	
Mental health services	22
Social services	21
Transportation	15

[a]In addition, (1) vision tests and (2) speech, language, and hearing tests were provided by 58 percent and 67 percent of the centers, respectively. Although not specified in S. 123, these tests are considered types of health screening services.

What Services Are Provided for Children With Handicapping Conditions?

Seventy-one percent of the centers that enrolled children with handicapping conditions provide specialized services for these children (see table 4.3). Of these centers, 81 percent reported that, at a minimum, they provide supplementary services, such as transportation, speech therapy, physical therapy, and counseling. Other services provided by the centers included special classroom materials and equipment, such as wheelchair ramps, specialized teacher training, and teacher aides.

Table 4.3: Percentage of Centers Providing Specialized Services for Children With Handicapping Conditions

Figures in percents

Service provided	Centers providing service
Supplementary services	81
Specialized teacher training	48
Special classroom and building materials	20
Teacher aides	20

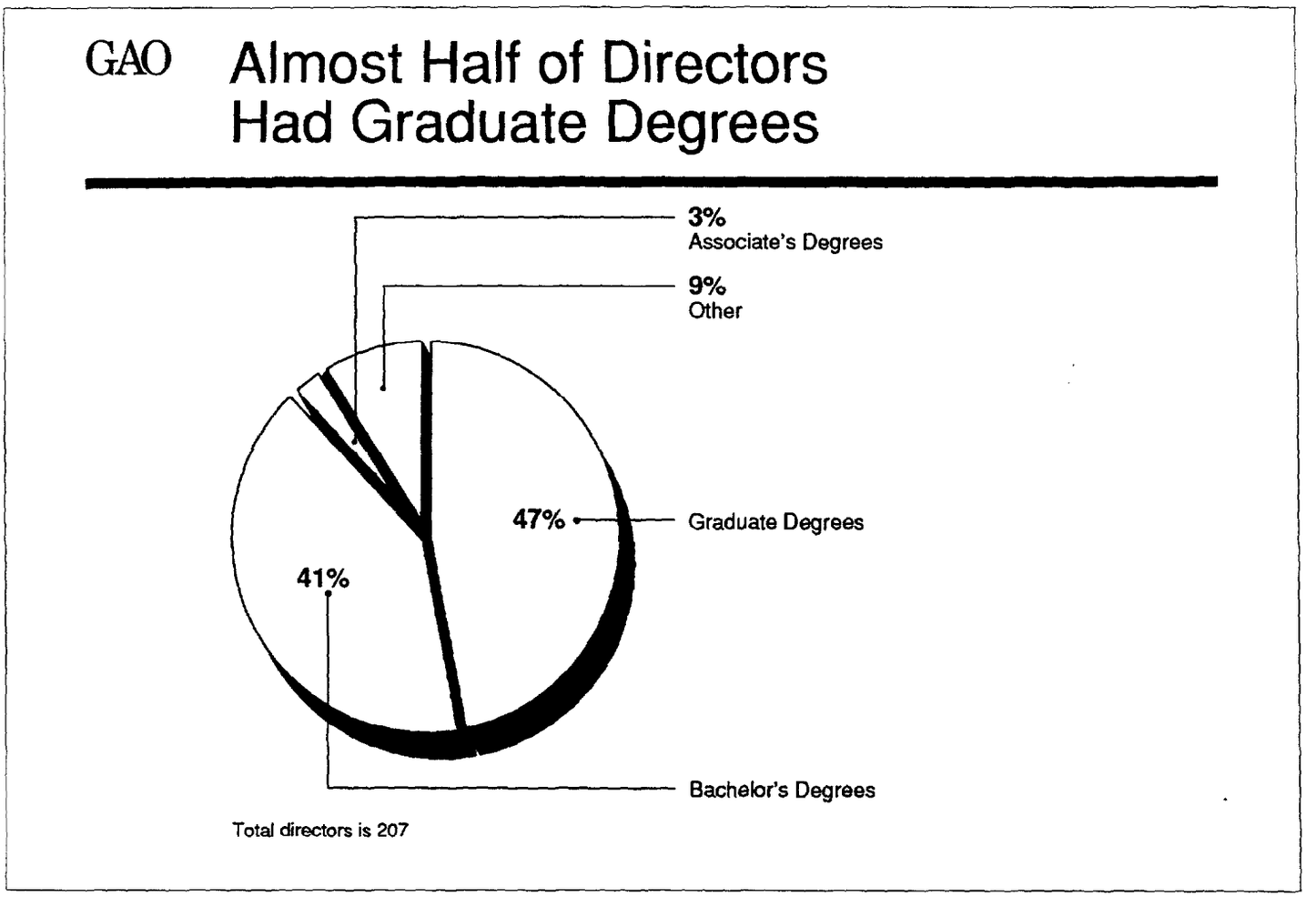
Characteristics of Staff

Staff Education and Experience Levels

Overall, educational staff at the NAEYC centers, including directors, teachers, and teacher aides,[3] had specialized training or experience in early childhood education.

[3]For the purposes of our questionnaire, we defined educational staff members as the following: director—a person who has primary responsibility for administering the program, which may also include teaching responsibilities; teacher—a person in charge of a group of children, often with staff supervisory responsibilities; teacher aide—a person working under the supervision of a teacher who helps with the care and education of a group of children.

Figure 4.8



Directors

Almost half of all early childhood education center directors reported having graduate degrees (see fig. 4.8), with most in early childhood education. Another 41 percent reported having bachelor's degrees; the other directors reported having associate's degrees or other training. Figure 4.9 illustrates the profile of a typical director at the centers surveyed.

Figure 4.9

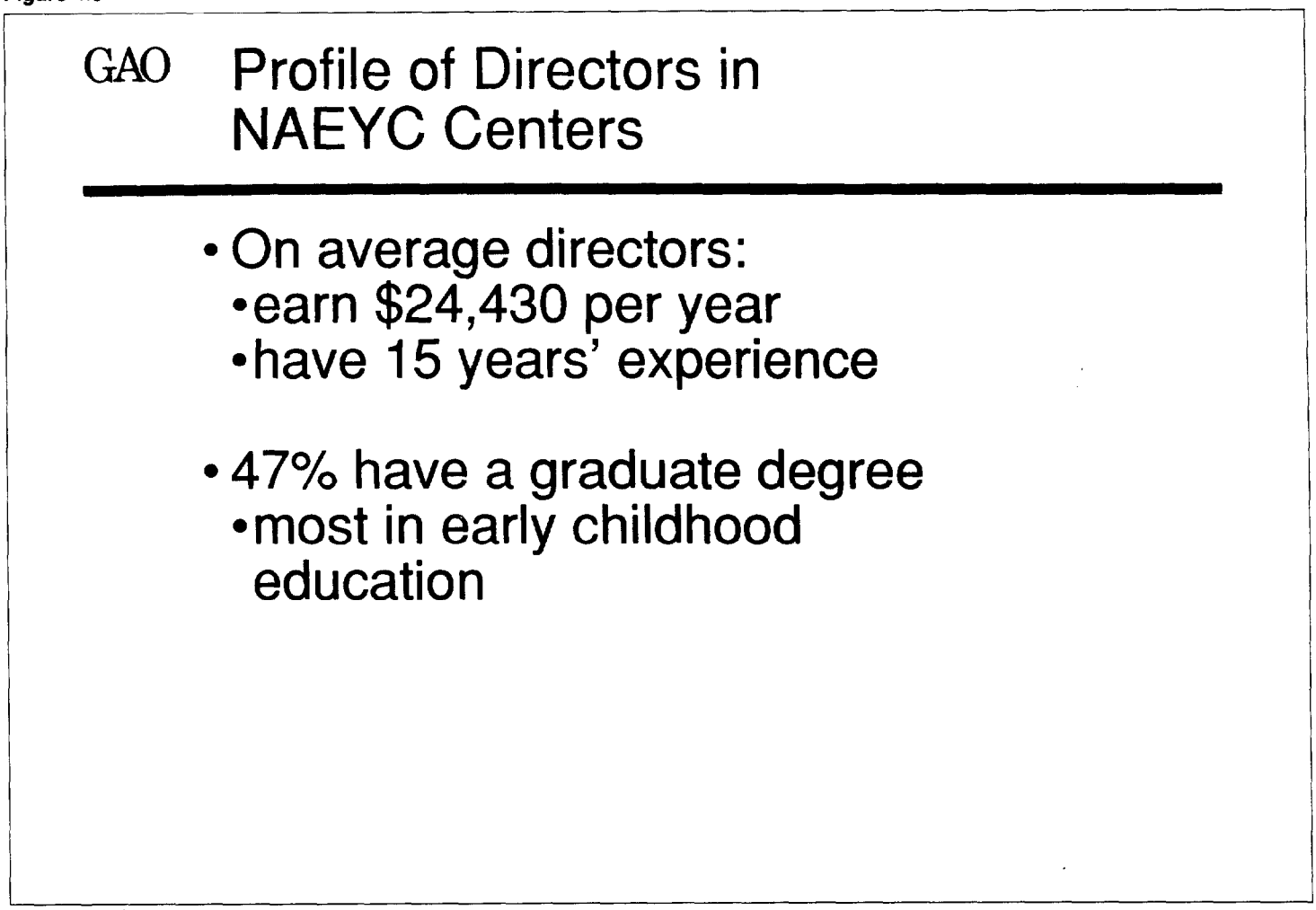
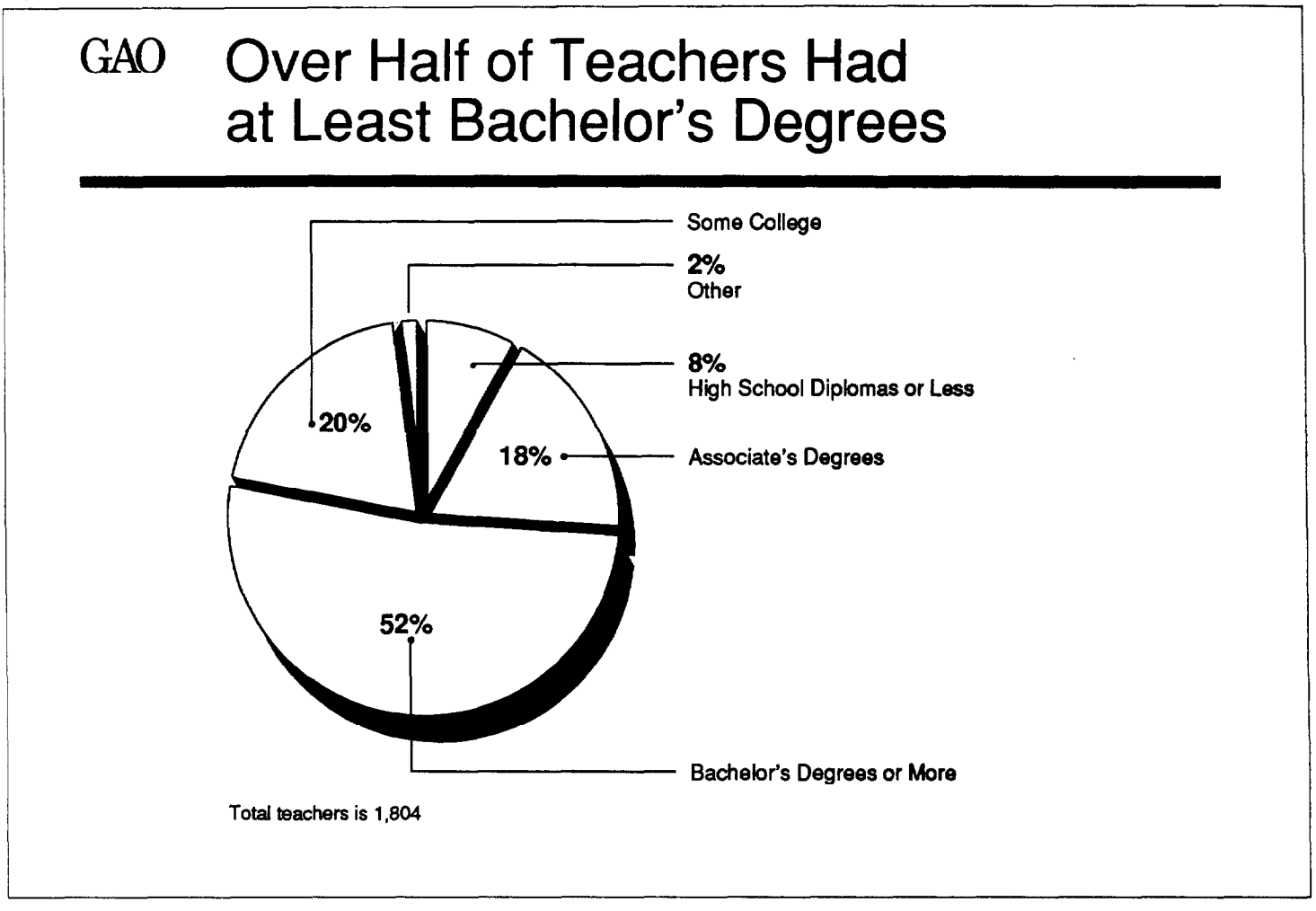

GAO
Profile of Directors in NAEYC Centers
• On average directors:
•earn $24,430 per year
•have 15 years' experience
• 47% have a graduate degree
•most in early childhood education

Figure 4.10



Teachers

Of the teachers in the centers surveyed, 52 percent had at least bachelor's degrees (see fig. 4.10). Of these, a minimum of 38 percent had degrees in early childhood education or child development. An additional 38 percent had associate's degrees or some college education; of those with associate's degrees, 90 percent had degrees in early childhood education or child development. The remaining teachers had other training or high school diplomas or less. Figure 4.11 illustrates the profile of a typical teacher at the centers surveyed.

Figure 4.11

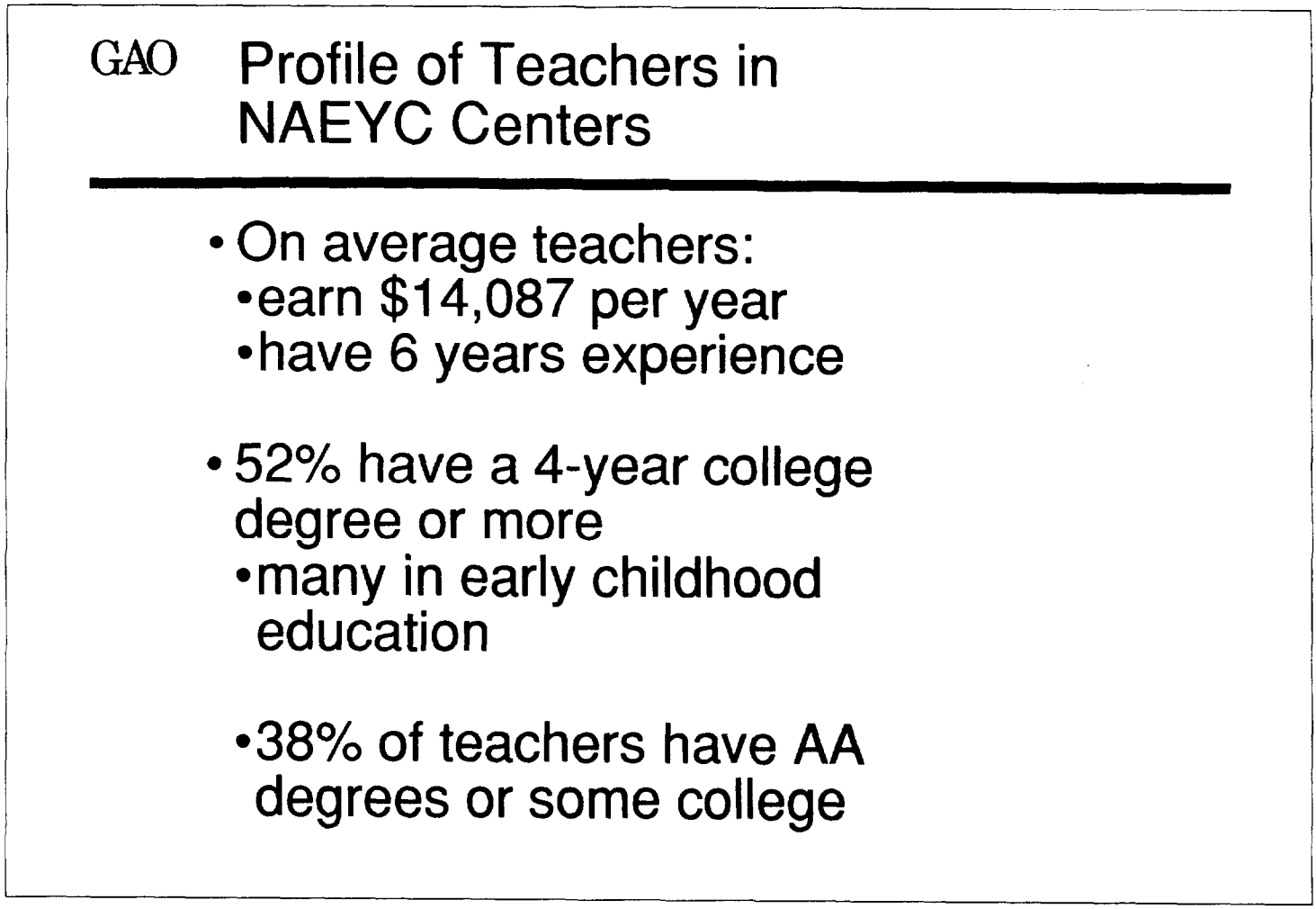
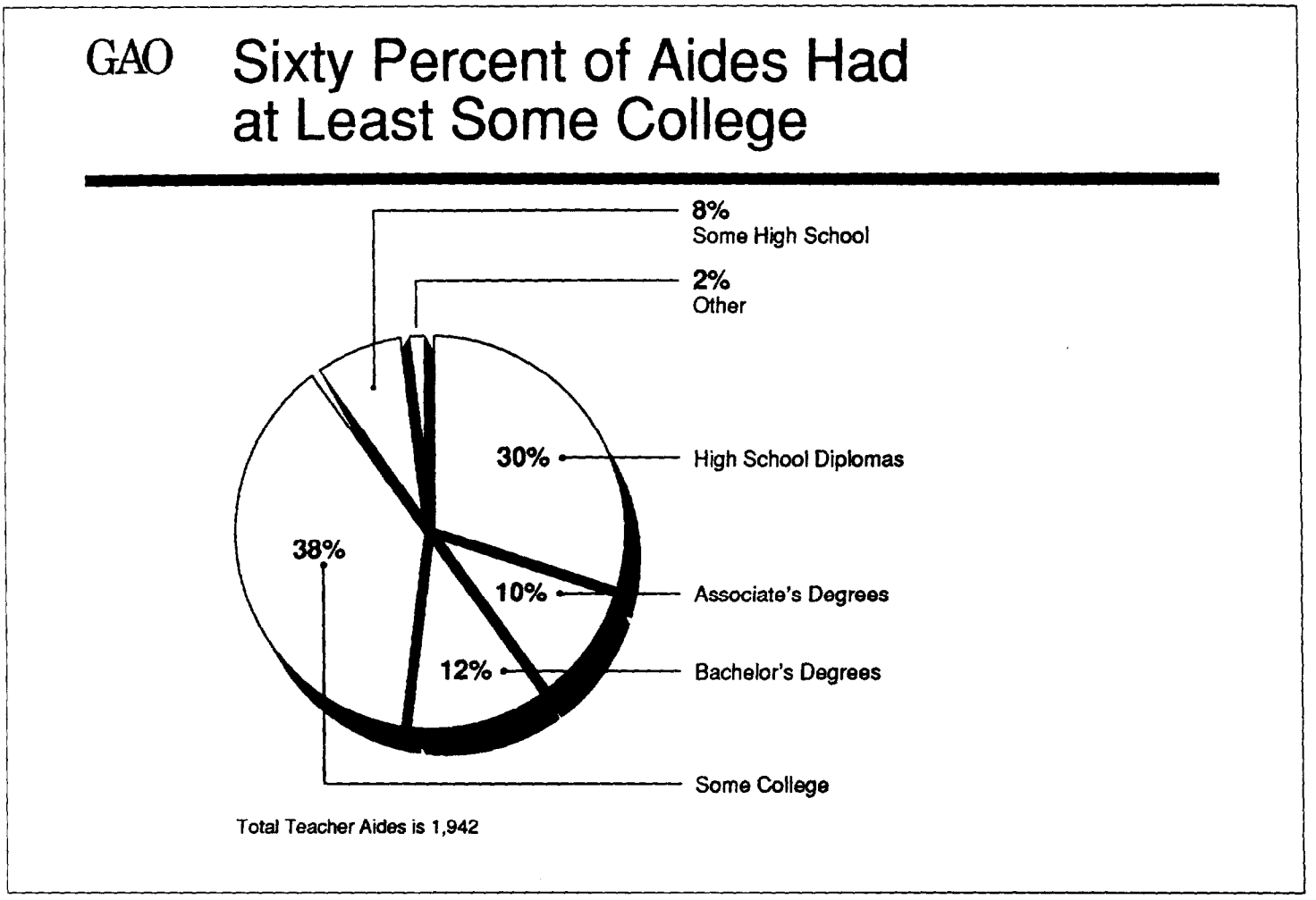

GAO
Profile of Teachers in NAEYC Centers
• On average teachers:
•earn $14,087 per year
•have 6 years experience
• 52% have a 4-year college degree or more
•many in early childhood education
•38% of teachers have AA degrees or some college

Figure 4.12



Teacher Aides

Of all aides, 48 percent had associate's degrees or some college training; 12 percent had bachelor's degrees (see fig. 4.12). Of the aides with bachelor's or associate's degrees, 50 percent had degrees in early childhood education or child development. Figure 4.13 illustrates the profile of a typical teacher aide at the centers surveyed.

Figure 4.13

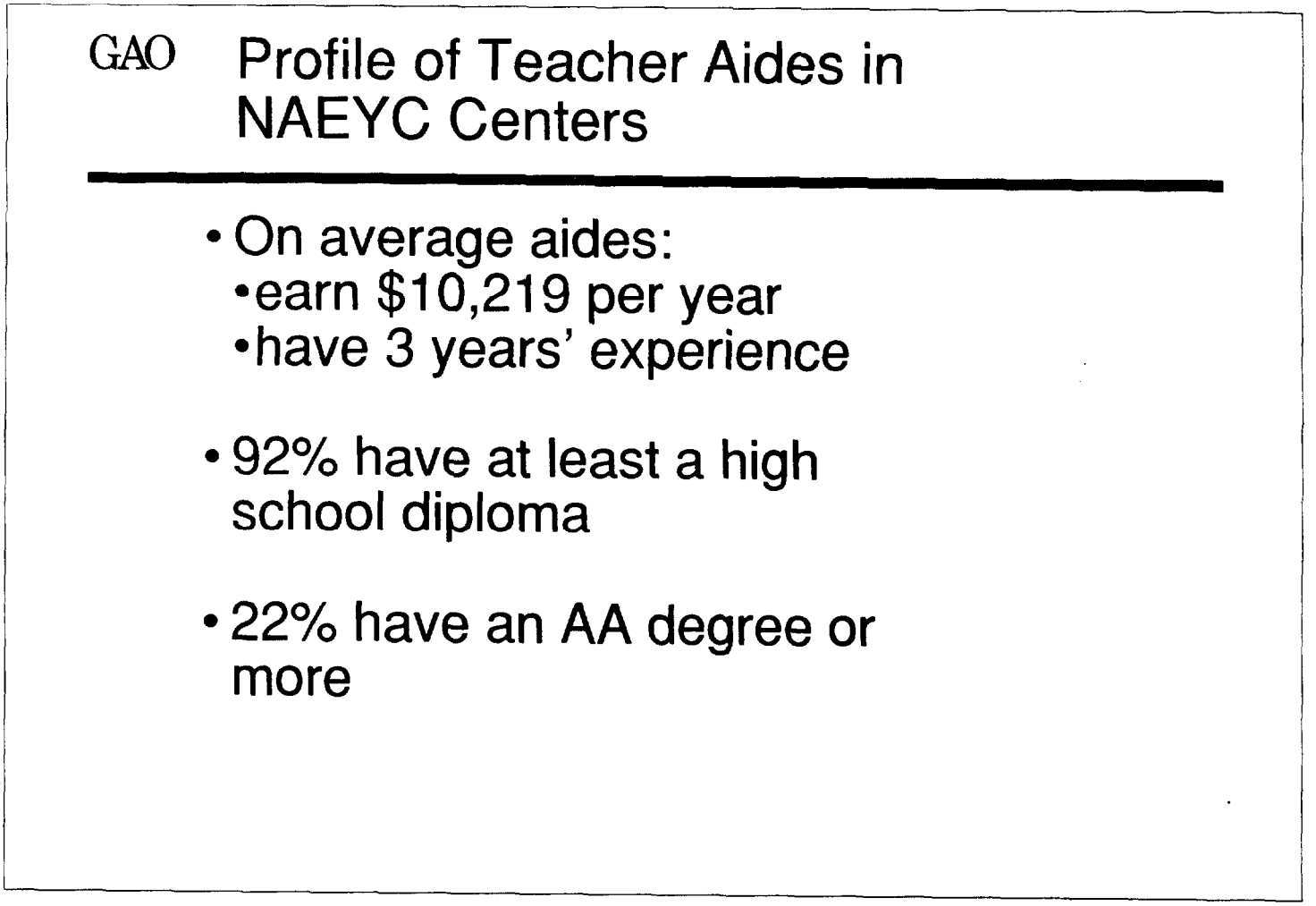
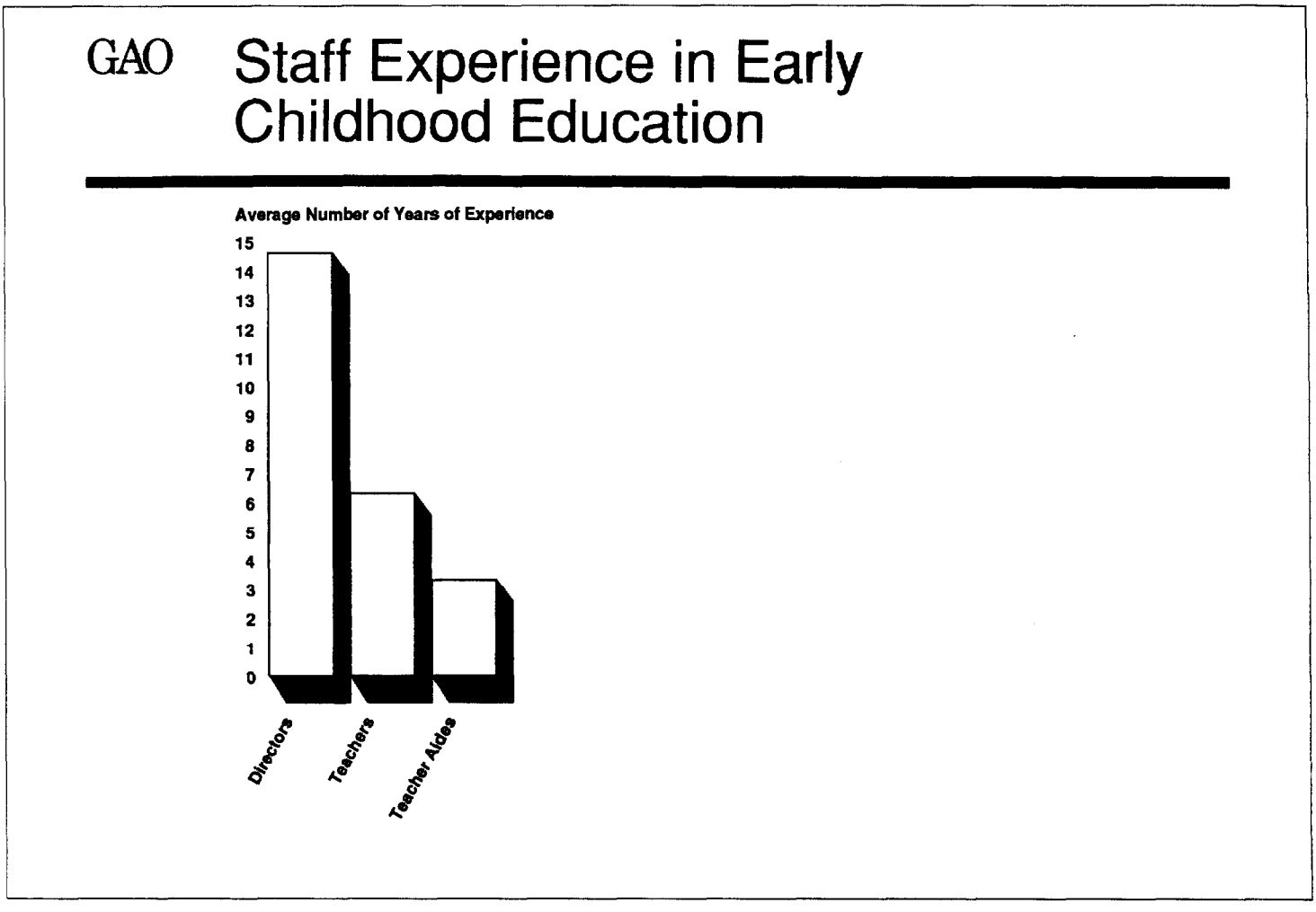

GAO
Profile of Teacher Aides in NAEYC Centers
• On average aides:
•earn $10,219 per year
•have 3 years' experience
• 92% have at least a high school diploma
• 22% have an AA degree or more

Figure 4.14

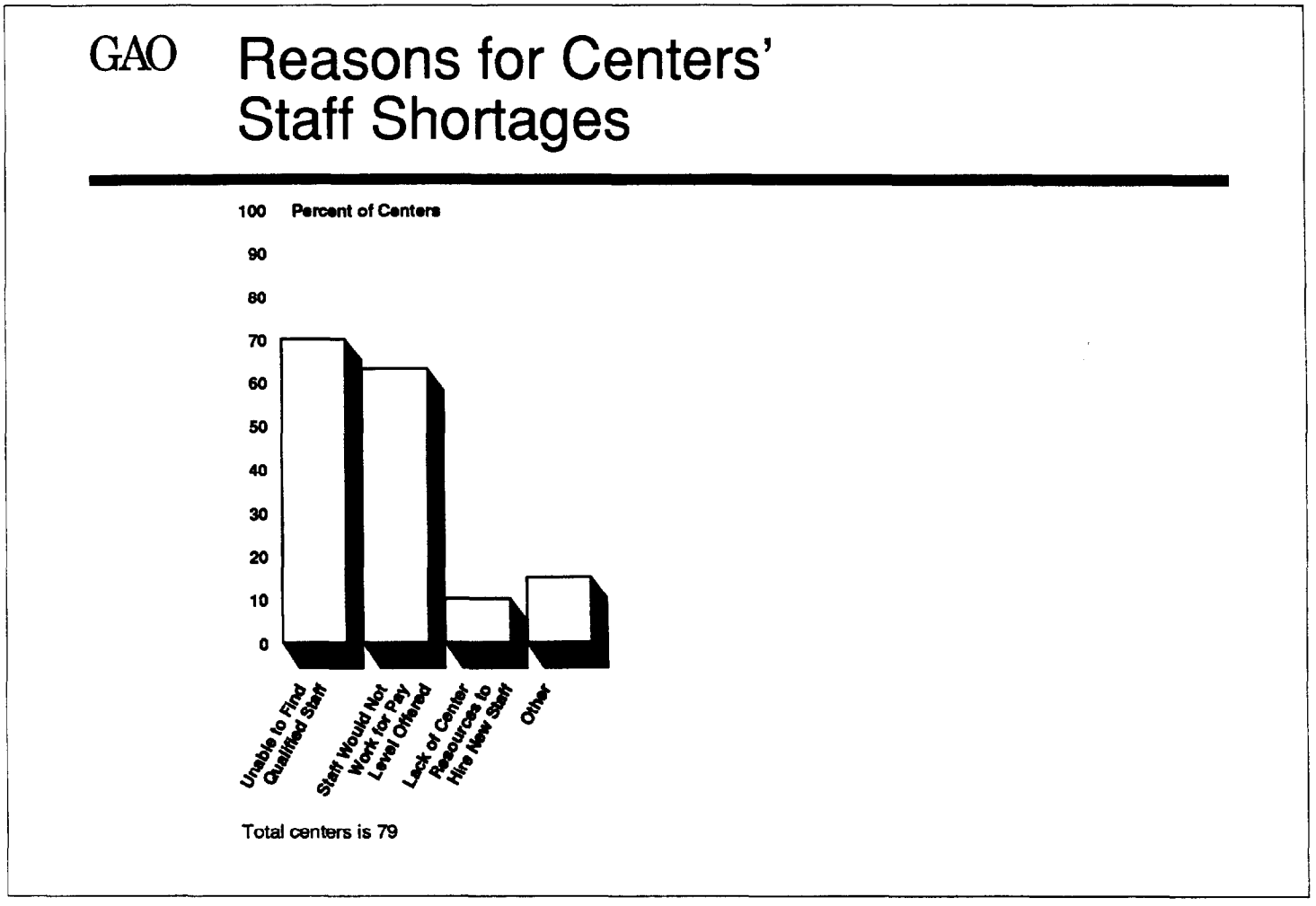


Experience Levels

On average, directors of the early childhood education centers surveyed had 15 years of experience in the field; teachers, 6 years; and teacher aides, 3 years (see fig. 4.14).

Teacher experience did not significantly vary by teacher education level, that is, teachers with bachelor's degrees and those without such degrees had 6 years of experience. In addition, the teacher experience level was the same in urban and rural centers. The average years of experience was also the same across regions, except in the South, where teachers averaged 7 years of experience, about 1 year more than that of teachers in other regions.

Figure 4.15



Similarly, teacher aides in the South averaged 4 years of experience, compared to an average of 3 years in other regions. In addition, teacher aides in both urban and rural centers had, on average, the same amount of experience, 3 years.

Turnover Rates

The annual staff turnover rate was 26 percent for teachers and 54 percent for teacher aides. In addition, 79 centers reported operating with a staff shortage for 1 month or more in fiscal year 1988. As shown in figure 4.15, the primary causes underlying staff shortages were lack of qualified staff and low pay.

Comparison of Selected Requirements for Early Childhood Education Programs: S. 123 Criteria and NAEYC Standards

Program requirement	S. 123 criteria	NAEYC standards
Curriculum	Developmentally appropriate for the child's age and all areas of the child's development, including educational, cognitive, physical, emotional, and social	Developmentally appropriate activities and materials that are selected to emphasize experiential learning
Child-staff ratio for 4-year-olds	10 to 1	10 to 1
Maximum group size	20 children	20 children
Staff qualifications: Teachers	State certification in early childhood education or child development, if available; nationally recognized child development credential; or significant college coursework in early childhood education	Associate degree in early childhood education, child development, or nationally recognized child development credential
Aides/teacher assistants	40 hours of preservice training	High school degree and preservice training
In-service training	24 hours annually	Required, but no minimum number of hours established
Meals	Must provide adequate and nutritious meals and, at parent's request, breakfast	Must ensure that children receive nutritious meals, but not required to provide them
Supplementary services	Must provide screening for handicapping conditions and health problems, information and referral services, and parent education	Must provide health and social service referrals and developmental assessments of children
Health and safety	Comply with applicable state and local laws and federal and state standards	Comply with applicable state and local program requirements; staff trained to detect illness and at least one member trained in emergency aid

Objectives, Scope, and Methodology

In February 1988, the Chairman, Senate Labor and Human Resources Committee, requested that we obtain information on the costs of providing high-quality early childhood education to assist the Committee in its ongoing deliberations over S. 123 (Smart Start: The Community Collaborative for Early Childhood Development Act of 1989). In later discussions with the Committee staff, we agreed to

- estimate the average annual cost per child of providing high-quality early childhood education;
- identify the specific costs of an early childhood education center's budget;
- compare the average annual salary for teachers of early childhood education with that for teachers in public elementary schools;
- determine the extent to which center costs change when certain factors, such as the number of children enrolled and the ratio of teaching staff to children, change; and
- identify the proportion of centers surveyed that were located in churches, synagogues, or other religious organizations.

To collect information on costs and services of programs of high-quality early childhood education, we sent copies of a questionnaire to directors of all of the 265 full-day, full-year preschool and early childhood education programs accredited by the National Association for the Education of Young Children,[1] as of October 1988. As of October 1988, there were 658 accredited programs. (We did not survey those accredited programs that operated only on a part-day or part-year basis or served only school-aged children.) The 265 full-day programs surveyed may serve children on a part-time as well as full-time basis.

NAEYC, a membership organization of more than 70,000 professionals in the field of child development and early childhood education, provides the only national voluntary accreditation system exclusively for all types of early childhood centers and schools. We surveyed NAEYC-accredited programs because many of NAEYC's accreditation standards are similar to program criteria in S. 123 (see app. I). Thus, we believe the costs of NAEYC-accredited programs would most likely be similar to the costs of programs funded under the proposed bill. For example, both S. 123 criteria and NAEYC's standards require a maximum child-teacher

[1]The 265 excludes 20 of 28 centers that were part of eight programs that operated more than 1 center. In order that the administrators of these programs would not be burdened with completing a questionnaire for more than one center, we asked that each of the eight administrators complete a questionnaire for the largest center serving 4-year-olds in his or her program.

ratio of 10 to 1, a developmentally appropriate curriculum, and properly trained staff.

Two nationally recognized experts in the area of economics and education, W. Norton Grubb and Henry M. Levin, reviewed earlier drafts of this report, and we have incorporated their comments throughout. W. Norton Grubb is Professor of Education at the Graduate School of Education of the University of California at Berkeley. Henry M. Levin is Director of the Center for Educational Research at Stanford and Professor of Education and Economics at Stanford University.

Our questionnaire asked NAEYC-affiliated centers to report information on center costs, services, and children served for fiscal year 1988. Of the 265 centers in our survey, 78 percent (208) responded to our request for information. The 265 centers represent the universe of full-day, full-year NAEYC-accredited programs.

We visited five centers to (1) verify questionnaire responses and (2) test the feasibility of respondents' providing accurate data. We telephoned all other respondents to follow up on their questionnaire responses, particularly those responses relating to salaries and other center costs. Through center visits and telephone calls to respondents, we attempted to minimize a potential for respondents to underreport center costs.

Our fiscal year 1988 regional estimates of 4-year-olds from families below 115 percent of the poverty level were based on the 1980 Bureau of the Census Survey. Using the Census Bureau's March 1981 and March 1988 Current Population Surveys, we adjusted the data from the 1980 survey for population growth rate between 1980 and 1988.

We determined average annual center costs[2] per child by region and urban or rural location. For determining regional costs, we used the four geographical regions—Northeast, Midwest, South, and West—designated by the Bureau of the Census. For determining costs by urban and rural locations, we defined "urban" centers as those in counties that are

[2]We used means—rather than medians—as measures of average costs, which resulted in slightly higher (more conservative) estimates of costs. Mean costs were generally less than 10 percent higher than median costs.

in metropolitan statistical areas[3] and "rural" centers as those located in nonmetropolitan statistical areas.

We believe that information obtained from the centers provides reliable data for developing a reasonable estimate of the cost per child of providing full-day, full-year high-quality early childhood education.[4] Yet these centers—which sought and obtained accreditation on a voluntary basis—may not be statistically representative of all high-quality early childhood education centers in the nation. Therefore, our report data are not necessarily representative of costs nationwide.

For example, the nation's five largest chains of child care providers,[5] representing almost 2,700 child care centers, generally are not NAEYC-accredited, but they are state-licensed. According to officials at four of the five chains,[6] the chains require centers, at a minimum, to meet state licensing standards. Thus, program criteria, such as those regarding maximum child-to-staff ratios or group sizes, can be expected to vary from state to state.

Although all centers we surveyed enrolled 4-year-olds, some centers also enrolled children of other ages. For example, 33 percent of the centers served infants and 45 percent served toddlers. Lower child-staff ratios necessary for serving infants and toddlers generally contribute to higher per child costs at these centers. Although our data suggest that centers not serving infants and toddlers have lower costs than centers that do, our data do not allow us to determine the cost difference between centers serving infants and toddlers and those not serving such children.

We obtained and reported information on the documented benefits of several early childhood education programs. However, our cost data are not necessarily representative of the costs of these programs, some of which were experimental and had lower child-staff ratios than the NAEYC centers we surveyed.

[3]Metropolitan statistical areas are defined by the Office of Management and Budget as having one or more central counties with an urbanized area of at least 50,000 inhabitants. Metropolitan statistical areas may also include outlying counties that have close economic and social ties with the central counties.

[4]These data do not reflect, and should not be used to estimate, the cost of part-day or part-year programs.

[5]These include KinderCare, La Petit Academy, Children's World Learning Centers, Gerber's Children's Centers, and Children's Discovery Centers.

[6]Officials at one of the five chains did not respond to our inquiry.

We based our calculation of average cost per child on centers' reported enrollment of full-time and part-time children. We determined that for 35 centers in our survey, on average, part-time children attended their centers 42 percent of the time that full-time children attended. We, therefore, weighted part-time children accordingly when calculating the cost per child.

Many centers we surveyed indicated that they received in-kind donations, which reduced outlays they would otherwise have had to make for such items as rent and repairs, equipment and materials, and supplementary services. Therefore, we included donations received by centers in calculating the average cost per child. We then added to the center's reported cost per child the value of the donations as estimated by the center. Assuming that in-kind donations will continue to be obtained by centers to the same degree in the future as they have been in the past, our estimate of average annual cost per child (which includes the value of donated services) overestimates the actual costs that will be borne directly by centers.

In addition, many centers reported no costs for (1) rent or mortgage or (2) insurance—costs necessary for operating an early childhood education center—but did not indicate whether these costs were donated or, if donations were received, the value of the donations. To correct for a possible underestimation of costs for these centers, we estimated (1) rent and mortgage and (2) insurance costs by determining the average in each geographic region for those centers reporting such costs.

For example, a center that occupies space which it owns and for which the mortgage has been paid off might have reported no expenditures for occupancy. The cost of the space, in this case, is the rent forgone that could have been earned if the space was rented to others. Again, as in the case of in-kind donations, our estimate of cost per child, which includes the estimated value of the space and insurance coverage, overstates the costs that will be borne directly by centers.

We compared early childhood education teacher salaries with those of public elementary school teachers by region (see p. 27).[7] To obtain comparable data on public school elementary teacher salaries, we used estimates from Estimates of School Statistics: 1987-88, collected from states

[7]For the purpose of this comparison, we used only salary data reported for early childhood education teachers working 35 or more hours per week. The vast majority of public school teachers worked full time.

by the National Education Association. According to the association's manager of research services, these estimates are determined by dividing the total salaries for elementary school teachers by the number of public elementary school teachers for each state. To determine an average salary for the nation as a whole and for the regions in which these states are located, we in turn weighted state averages by the numbers of those teachers in each state.

In addition, we compared the average salaries of those full-time teachers of early childhood education who had bachelor's degrees and various experience with estimates of average salaries of full-time public and private school teachers with similar experience. We included private school teacher salaries in the comparison because a majority of the early childhood education centers we surveyed are privately operated. We included both elementary and secondary school teachers in the comparison because salary data were not available separately for private school elementary teachers by years of experience. We included in the comparison only teachers of early childhood education with bachelor's degrees since more than 95 percent of all public and private school teachers have such degrees.

We obtained data on roughly 8,300 public school teachers and 4,700 private school teachers from surveys conducted by the Department of Education's National Center for Education Statistics. Because the data on public and private school teachers reported by NCES were for school year 1985-86, we adjusted the salary levels to those of 1987-88, so that they would be in line with fiscal year 1988 salaries reported by the early childhood education centers we surveyed. From school year 1985-86 to 1986-87, we used an inflation factor of 5.4; from school year 1986-87 to 1987-88, we used a factor of 5.5.

Most of the early childhood education teachers in our survey worked in centers for 12 months of the year. We annualized salaries for those teachers who worked less than 12 months. On the other hand, the public and private school teacher salaries, as reported by NCES, are based on a school year that we assumed to be about 10 months. Therefore, we made and reported two separate comparisons of salaries of early childhood education teachers with those of public and private school teachers. In one comparison, public and private school teachers' salaries are based on a school year of 10 months; and in the other, such salaries are annualized.

To determine center cost for insurance, we averaged the costs of the 168 centers in our survey that reported such costs. The other 40 centers reported no costs for insurance. Presumably, their insurance costs were paid by their program sponsors, for example, churches, public school systems, or hospitals. We determined the average center cost for each of the four supplementary services required under S. 123 and for each of the three other supplementary services not required. To determine the center cost for each supplementary service, we averaged the costs of the centers in our survey that reported such costs or indicated the value of in-kind donations received for that service.

In identifying which centers surveyed were religiously affiliated, we considered a "religiously affiliated" center to be one in which a religious organization is involved in the center's administration or has control over the content or structure of the program, the hiring of personnel, or the selection of children.

We used regression analysis to estimate the impact of various factors on the total cost of operating an early childhood education center. The analysis was conducted in two parts: (1) a total cost equation to estimate the direct influences on total cost and (2) wage equations (one for teachers and one for aides) to estimate the indirect influences, that is, factors that affect total cost by affecting wages of teachers or aides.[8] A total of 187 centers with usable data were included in the analysis.

[8]For example, centers that only hire teachers with many years of experience must pay higher wages to attract qualified workers. Thus, because the experience requirement increases salary costs, it indirectly raises total costs. Other factors, such as the number of full-time equivalent children, directly affect total cost.

The cost of operating a center was hypothesized to depend on the wages paid to the staff (directors, teachers, and aides); the rental, mortgage, and maintenance costs of the center; the cost of other supplies; the number of full-time equivalent children; and several factors thought to be associated with center quality (such as average group size and child-staff ratio), as well as location and the percentage of children from low-income families served by the center.

The hourly wage of teachers and aides was hypothesized to be affected by their education and experience, full-time or part-time status, benefits received (such as paid vacation and paid health benefits), working conditions and requirements (such as child-staff ratio and percentage of children with handicapping conditions), and other center-specific factors (such as for-profit or nonprofit sponsorship, total number of adults employed, as well as regional and urban or rural location).

Tables Supporting Figures in Report Text

Table III.1: National Cost Per Child (Data for Fig. 2.1)

	Costs reported by NAEYC centers	In-kind donations	Total	Total respondents
Nation	$4,200	$597	$4,797	205
Urban	4,339	605	4,944	181
Rural	3,154	536	3,690	24

Table III.2: Regional Cost Per Child (Data for Fig. 2.2)

	Costs reported by NAEYC centers	In-kind donations	Total	Donations as percentage of total	Total respondents
Northeast	$4,949	$659	$5,608	12	28
Midwest	4,286	465	4,751	10	73
South	3,978	711	4,689	15	67
West	3,864	608	4,472	14	37

Table III.3: Cost Per Child by Center Sponsor (Data for Fig. 2.3)

	Costs reported by NAEYC centers	In-kind donations	Total	Total respondents
Public	$4,467	$987	$5,454	22
Private nonprofit	4,211	614	4,825	153
For-profit	3,947	226	4,173	30

Table III.4: Cost Per Child at Centers Serving Children of Different Income Levels (Data for Fig. 2.4)

Center target group	Costs reported by NAEYC centers	In-kind donations	Total	Total respondents
Serves no low-income children	$4,752	$731	$5,483	43
Serves >0 but ≤25%	4,034	533	4,567	69
Serves >25% low-income children	4,263	687	4,950	63

Table III.5: Teacher Salaries in Urban Compared With Rural Areas (Data for Fig. 2.8)

	Teacher salaries	Total respondents
Nation	$14,087	1,137
Urban	14,400	1,030
Rural	11,056	107

Table III.6: Salaries of Early Education Teachers and Public and Private School Teachers by Years of Experience (Data for Fig. 2.9)

Years of experience	Early childhood education teacher salaries	Total respondents	Public teacher salaries	Total respondents	Private teacher salaries	Total respondents
5 years or less	$14,460	306	$19,453	1,068	$13,556	1,409
6 to 10 years	15,324	117	23,015	1,586	16,124	1,126
11 to 15 years	17,582	29	27,381	1,933	18,253	830
16 to 20 years	16,982	21	30,801	1,570	20,092	461
21 to 25 years	18,448	9	32,117	922	18,399	277

Table III.7: Salaries of Early Education Teachers and Public and Private School Teachers by Years of Experience (Annualized) (Data for Fig. 2.10)

Years of experience	Early childhood education teacher salaries	Total respondents	Public teacher salaries	Total respondents	Private teacher salaries	Total respondents
5 years or less	$14,460	306	$23,452	1,068	$16,267	1,409
6 to 10 years	15,324	117	27,617	1,586	19,348	1,126
11 to 15 years	17,582	29	32,857	1,933	21,904	830
16 to 20 years	16,982	21	36,961	1,570	24,111	461
21 to 25 years	18,448	9	38,540	922	22,078	277

Table III.8: Average Directors' and Teacher Aides' Salaries by Region (Data for Figs. 2.7 and 2.11)

	Northeast	Total respondents	Midwest	Total respondents	West	Total respondents	South	Total respondents
Directors	$25,041	32	$25,007	74	$21,462	37	$24,853	71
Teacher aides	10,213	97	10,407	255	9,244	137	10,639	206

Table III.9: Centers Offering Certain Benefits to All or Some Teachers (Data for Fig. 2.12)

Benefit	All teachers		Some teachers		Total respondents
	Centers	Percentage of total	Centers	Percentage of total	
Health insurance	136	65	33	16	208
Pension and retirement coverage	77	37	16	8	208
Life insurance	85	41	17	8	208
Reduced child care fees	101	49	11	5	208
Vacation leave (paid)	180	87	19	9	208
Sick leave (paid)	183	88	14	7	208

Table III.10: Centers in Public and Private Sectors (Data for Fig. 4.2)

Center sector	Number	Percent	Total respondents
Private for-profit	31	15	208
Public school-based	3	1	208
Other public	19	9	208
Private nonprofit	155	75	208

Table III.11: Center Size (Data for Fig. 4.3)

	Number	Percent	Total respondents
Small	75	36	208
Medium	106	51	208
Large	24	12	208
Very large	3	1	208

Table III.12: Median Monthly Fees for Families by Income (Data for Fig. 4.5)

Income	Median fees		
	Family of 2	Family of 4	Family of 6
$8,000	$81	$34	$26
15,000	180	121	90
35,000	280	200	170
40,000	280	280	280
75,000	280	280	280

Table III.13: Enrollments by Age Group (Data for Fig. 4.6)

Age group of enrolled children	Centers	Percentage of centers	Total respondents
Infants	69	33	208
Toddlers	94	45	208
2-year-olds	169	81	208
3-year-olds	207	99	208
4-year-olds	207	99	208
5-year-olds	198	95	208
Older than 5 years	114	55	208

Table III.14: Staff Experience in Early Childhood Education (Data for Fig. 4.14)

Staff	Years of experience	Total respondents
Directors	14.6	207
Teachers	6.3	1,739
Teacher aides	3.3	1,625

Table III.15: Reasons for Centers' Staff Shortages (Data for Fig. 4.15)

	Number	Percent	Total respondents
Unable to find qualified staff	55	70	79
Staff would not work for pay level offered	50	63	79
Lack of center resources to hire new staff	8	10	79
Other	12	15	79

Technical Description of GAO's Economic Analysis of the Costs of High-Quality Early Childhood Education

To learn how various factors affect the cost of operating an early childhood education center, we developed two related economic models. The first model examines the direct influences of input prices, center characteristics, and location on center cost. The second model analyzes those factors that affect the wages of teachers and aides. Because labor is an important input, any change that affects wages will have a substantial (indirect) impact on the cost of early childhood education. By analyzing the results of both models, we were able to understand how various factors directly and indirectly affect center cost.

We estimated both models using multiple regression—a standard statistical technique that quantifies the relationship between a dependent variable and a set of independent variables. The construction of each model (center cost and wage) and its results are discussed below.

Center Cost Regression Model

Our cost model is derived strictly from economic theory. We assume that all centers attempt to minimize total cost for any given center size and quality level.[1] The total annual center cost is hypothesized to depend on the price of inputs used in the production process, the amount of output produced, and characteristics of the center. We used multiple regression to estimate the parameters of the cost equation and quantify the relationship between total annual cost, input prices, level of output, and

[1]All centers are assumed to be efficient (in the sense that they minimize the cost of producing any given level of output) because penalties exist for inefficiency. In a competitive environment, inefficient firms are soon driven out of business. In a nonprofit environment—where the vast majority of the early childhood education centers operate—the consequence of inefficiency is not bankruptcy, but a reduction in the number of children that can be served with a given amount of funds. Thus, it is reasonable to believe that even nonprofit centers attempt to be efficient.

center characteristics.[2] A complete definition for each variable is contained in table IV.1.

Total cost is the total annual cost of operating a center. It is calculated as the sum of all explicit (out-of-pocket) costs plus the reported value of all donated labor, supplies, equipment, services, and space.

For each center we calculated five input price variables: the average hourly wage rate of teachers (WAGET) and aides (WAGEA); the average monthly wage of the directors[3] (WAGED); the occupancy cost—annual rent or mortgage payments plus repair and maintenance costs—per square foot of total center space (RENT); and the combined cost of supplies, equipment, supplementary services, insurance, and nonteaching labor—all divided by the number of FTE children (OCOST). Many centers reported receiving donations in one or more of the above categories. In those instances, the self-reported value of the donation was included in the computation of the input price.[4]

[2]We chose the Cobb-Douglas functional form for the cost equation. This functional form has been widely employed in economic research and fulfills the economic theoretical requirements for a cost function.

Because output quality is not measured and may vary between centers, we added an additional category to the standard cost function that contains center quality indicators as well as measures of other center characteristics. The characteristics in this category (denoted by Q) are summarized by a nonnegative index function:

$$Q = \exp(Z'B),$$

where Z is a vector of center characteristics and B a vector of weights (to be estimated in the cost equation).

Consequently, the estimated cost equation can be expressed as:

$$\ln C = f(\ln P, \ln Y, Z),$$

where C is total center cost, Y is output, P is a vector of input prices, and Z is defined as above.

[3]Includes assistant directors.

[4]For example, many centers reported that the monthly rent they paid was below market value. For those centers we substituted the fair market value (as determined and reported by the center) for the rental payment. The difference between the fair market value and the annual amount actually paid is considered to be the value of donated space.

We measure the output of a center by the number of FTE children (CHILDREN) enrolled at that center. It should be noted that our measure represents a proxy, albeit the best available one, for the true output "education" that each center produces.[5] Because higher quality centers likely face higher operating costs than lower quality centers, it is important to control for any quality differentials that may exist to prevent included variables--especially CHILDREN—from serving as a proxy for quality.[6] However, as the true "value added" output is unobserved, intrinsic center quality can only be inferred from center and input characteristics. Our model includes two observed center characteristics—average children's group size (GROUPSZ) and the child to adult ratio (CARATIO)—thought to be partial indicators of center quality. Everything else equal, centers with smaller children's group sizes and lower child/adult ratios are believed to be superior. Centers may enhance quality by improving the quality of the inputs used—hiring teachers with more education or aides with more years of experience. These latter types of quality differentials are reflected in the price paid for a given input and affect total cost indirectly through higher input prices.

Finally, we included several other variables that could help explain cost differentials between centers. OUTPC measures the amount of outdoor space in square feet (in thousands) per child. Centers with large amounts of outdoor space—some have as much as 10 acres—likely have higher costs compared to other centers in similar areas. Because recently established centers are likely to be smaller than older ones, the dummy variable NEW is included to prevent the center output variable, CHILDREN, from picking up any cost differences due to center age. NEW is equal to one if the center has been in operation for less than 5 years and zero otherwise. PROFIT and INFANTS are also binary variables. PROFIT indicates that the center is for-profit, while INFANTS indicates that the center serves children under 2 years of age. For-profit centers may have lower costs than nonprofit centers if the forces of competition are needed to insure economic efficiency. Centers that serve infants, in addition to 4-year-olds, are likely to have higher costs than centers that serve only 4-year-olds. Center cost is hypothesized to

[5]A true output measure could only be constructed if we observed the "value added"—that is the increase in knowledge, skills, and capabilities (all broadly defined)—imparted in each child and, in addition, could quantify that (multidimensional) output in some meaningful way.

[6]All of the early childhood centers included in our analysis are accredited by NAEYC. As such, they all meet minimum quality standards determined by NAEYC. Nonetheless, within this group, quality levels may vary.

increase with the percentage of children that are handicapped (HANDICAP).[7] Finally, two variables—location in a metropolitan statistical area (URBAN) and the percentage of children from low-income families (LOINCOME)—are included to capture any cost differentials due to center location.

Cost Model Empirical Results

We estimated the regression models by the method of ordinary least squares for 187 centers with usable data. Table IV.2 presents the estimates of the regression coefficients, the standard error for each of the estimated coefficients, and the t-statistic for the null hypothesis that the true parameter value is equal to zero. Because the dependent variable is measured in logarithms, the estimated coefficients show the percentage change in a center's total cost caused by a 1-percent change in CHILDREN or any of the input price variables. For a one-unit change in any of the other independent variables, the estimated coefficients show the approximate percentage change in total cost.

An estimate is considered statistically significant if the probability is low that the true value of the coefficient is zero. We chose as our criterion a significance level of 0.05; that is, we required that the probability of the true coefficient being zero is no greater than 0.05. The critical t-statistic (two-tailed test), given the size of our data set, is approximately 1.96. The number of children, child-to-adult ratio, and all of the input price variables have a significant effect on center cost. Two additional variables introduced mainly as control variables, the amount of outdoor space per child and an indicator for whether the center serves infants, are also statistically significant.

Our results indicate that statistically significant economies of scale exist in early childhood education, that is, average cost (cost per child) falls as center size increases. The estimated coefficient on CHILDREN indicates that a 10-percent increase in center size (measured by the number of full-time-equivalent (FTE) children) would decrease average cost by about 2 percent.[8] Economies of scale existed even when we restricted

[7]HANDICAP is measured as the proportion of children in each center that were emotionally disturbed; mentally retarded; developmentally delayed; speech, hearing, visually, or orthopedically impaired; deaf and blind; multihandicapped; or otherwise health impaired.

[8]Economies of scale are said to exist because the estimated coefficient on CHILDREN (0.8) is statistically less than 1.0 at the 1-percent level of significance. A 10-percent increase in center size causes total cost to rise by only 8 percent; thus average cost decreases by 2 percent.

our analysis to include only centers with more than 68 FTE children.[9] It is unlikely that the cost advantage of large centers is due to their age and efficiencies gained from experience. We found no cost differential between centers that were less than 5 years old and those that had been in business longer.

The findings of scale economies must be interpreted with care, as the implied cost advantage of large centers may be overstated for two reasons. First, if the administrative burden on each director increases with center size, then larger centers might have to offer higher salaries than those paid at smaller centers to attract capable administrators. Higher salaries would at least partially offset the cost per child differential between small and large centers. Second, an increase in center size achieved by the consolidation of many small centers into fewer larger centers would impose additional costs on parents. The decrease in the number of centers would increase the average commuting distance for each child and thus increase commuting costs for parents.[10] Thus center size may be limited by local conditions—such as population density—that affect the number of children potentially served by any given center.[11]

Total costs rise significantly with all five of the measured input prices (WAGET, WAGEA, WAGED, RENT, and OCOST). Of the three variables that represent labor costs, total cost is most sensitive to changes in the wages of teachers. A 10-percent increase in teachers' wages increases

[9]Because the Cobb-Douglas imposes constant elasticity of cost with respect to output, we initially divided the sample into two groups–centers with no more than 68 FTE children and those with more than 68 FTE children—and estimated the cost equation separately for the two groups. However, all centers were pooled together when an F-test failed to reject the null hypothesis that the estimated coefficients in the first group were identical to the coefficients in the second group.

Although not reported here, we also estimated a quadratic average cost equation. Those results indicate that scale economies are eventually exhausted: the lowest cost per child occurred at a center size of 287. Only 2 out of 208 centers reported serving more than 287 FTE children.

[10]Commuting costs include both direct costs (for example, costs of using public transportation or operating a private vehicle) and time costs (the value that parents place on additional minutes of commuting time).

[11]A rural center—because of the sparseness of the surrounding population—would have to attract children from farther away than an urban center of the same size. This means that the average direct transportation costs would be higher for rural parents than for urban parents. However, if wages are lower in rural areas, the time or opportunity costs would be less than in urban areas. Thus it is unclear whether rural or urban centers are best able to lower the cost per child by increasing center size. In our sample of 208 centers, the average number of FTE children was nearly identical for rural and urban centers (83 and 81, respectively).

total cost by 3 percent. In contrast, the same increase in aides' and directors' wages would increase total cost by only 1.3 and 1.7 percent, respectively.

Of the two variables introduced to capture quality differences between centers directly, only one, the child-to-staff ratio, had a statistically significant impact on total cost. An increase of one child per staff, holding all other factors constant, reduced costs by 4.4 percent.

Economic Model of Wage Determination

Using economic theory, we developed a model of wage determination for teachers and aides in the early childhood education industry. The wage equation model relates the wage rates to factors—specific to the individual worker, the center where the worker is employed, or the location of the center—hypothesized to influence wages.[12] We then used the technique of ordinary least squares to obtain estimates of the coefficients in our multiple regression model. Although the basic model is identical for both teachers and aides, the impact of specific factors may be dissimilar for the two groups. Thus, teachers and aides were analyzed separately.

According to economic theory, wages of workers are determined in the labor market through the interaction of the supply of labor by workers and the demand for labor by firms. The supply of workers is determined by the level of skills or knowledge required in an occupation and the economic opportunities offered in alternative industries. In general, the demand for workers is a "derived demand," that is, a firm's demand for workers is determined by the demand for the good or service produced by the firm, as well as the availability and relative prices of substitute inputs. Thus, factors that influence the demand for early childhood education will also affect the demand for teachers and aides.

Each of the variables in our model originate from one of three basic categories suggested by economic theory:

1. Measures of a worker's human capital, i.e., skills and training.

2. Working conditions and nonpay compensation of the job.

3. Factors that influence demand.

[12]Because our model includes information on centers as well as teachers and aides, it is considered to be a "reduced-form" wage equation—that is, one that incorporates both demand for labor and supply of labor effects.

The level of a worker's "human capital" is captured by the number of years of formal education (EDUC) and years of employment experience (EXP) in early childhood education or childhood development. We expect that wages will increase with both education and experience. However, because additional years of experience may not increase wages at a constant rate, EXP is entered quadratically in the wage equation.

A number of variables were introduced to control for working conditions and nonpay compensation. These variables are defined for each teacher or aide, based on the center where the worker is employed. Working conditions include the child-to-adult ratio[13] (CARATIO) and the percentage of children that are handicapped (HANDICAP). Nonpay compensation factors are captured by three dummy variables: LEAVE, REDFEE, and HEALTH. Each of these variables indicates if the teacher/aide works at a center that provides some or all of its teachers/aides with the specified fringe benefit: paid leave or vacation time (LEAVE), reduced fees for care of employees' children (REDFEE), and fully or partially paid health insurance (HEALTH).

Because the wage equation incorporates both demand-side and supply-side effects, the expected effect of CARATIO is ambiguous; a higher child-to-adult ratio could increase or decrease wages. That is, a lower child-to-adult ratio indicates easier working conditions and should result—other things being equal—in workers being willing to work for lower wages. However, if centers with a low CARATIO (a possible indication of center quality) employ only the best teachers, and years of education and experience do not completely control for teacher quality, then a positive correlation between CARATIO and WAGE would exist.

The expected effect of HANDICAP and the three nonpay compensation variables on wages is unambiguous. If the percentage of handicapped children directly influences the difficulty of the job, wages should rise along with HANDICAP. The existence of any of the three fringe benefits is expected to lower the wage received because some of the worker's compensation is received in a nonmonetary form.

The percentage of children from low-income families (LOINCOME) is expected to have a negative effect on wages for two reasons. As the percentage of children from low-income families increases, the demand

[13]The number of adults is calculated as the total number of teachers, aides, and directors.

for early childhood education—and hence teachers—may fall. In addition, this variable may serve as a proxy for local price levels—low wages and low prices may be seen typically in areas with many low-income families.

Centers that are for-profit (PROFIT) or are larger in terms of the total number of employees (ADULTS—total number of teachers, aides, and directors) may not pay the same wage rate as nonprofit or smaller centers.

Location factors capture the net influence on wages from both demand and supply influences that are not explicitly represented by the other variables. For example, teachers who work in urban areas (URBAN) are likely to command higher wages than teachers in rural areas both because of superior alternative job opportunities in urban areas (a supply of labor effect), and because the demand for early childhood education is greater (a demand for labor effect). Because differences in supply and/or demand may exist between regions, we also introduced a set of dummy variables that controls for teachers' and aides' regional location (MIDWEST, WEST, SOUTH, NORTHEAST).

Wage Model Results

We estimated the regression models by the method of ordinary least squares. This was done separately for the 1,280 teachers and 1,423 aides. Table IV.3 presents the estimates of the regression coefficients from the two wage equations. Because the dependent variable is measured in logarithms, the estimated coefficients show the percentage change in the wage rate caused by a one-unit change in the independent variable. The table also reports the standard error for each of the estimated coefficients and the t-statistic for the null hypothesis that the true parameter value is equal to zero.

As in the center cost regression, we chose as our criterion a significance level of 0.05. The critical t-statistic (two-tailed test), given the size of our data set, is approximately 1.96. Almost all of the estimated coefficients are of the expected sign and significant at the 5-percent level or better.

An additional year of education increases wages by 6.0 percent for teachers and 3.3 percent for aides. Additional years of experience increase wages, but at a decreasing rate for both teachers and aides. For example, our results indicate that an additional year of experience would increase the wage rate by 2.5 percent for a teacher with 5 years of experience, but by only 1.6 percent for a teacher with 10 years of

experience. A similar result held for aides. An additional year of experience would increase by 1.6 percent the wage of an aide with 5 years of experience, but would increase by only 1.0 percent the wage of an aide with 10 years of experience.

The wages of both teachers and aides are higher in centers that enroll a larger proportion of handicapped children. Our results indicate that each percentage point increase in the number of handicapped children results in a 0.6-percent increase in teachers' wages and a 0.2-percent increase in aides' wages. The child-to-adult ratio had no statistical impact on wages. The provision of fringe benefits as compensation factors are also important determinants of wages. As expected, centers that provided paid vacation time offered lower wages—19.5 percent lower for teachers and 11.5 percent lower for aides—than centers without a paid leave policy. Centers that offered reduced child care fees for children of employees paid lower wages to teachers (10.5 percent), but we found no statistical impact on aides' wages. Surprisingly, there was a statistically significant positive relationship between wages and a center's provision (full or partial) of health insurance. Centers with health insurance plans paid 11.5 percent higher wages to teachers and 15.1 percent higher wages to aides.[14]

Other variables that controlled for the size, profit-making status, and location of the center were found to be important determinants of wages. Wages were higher for teachers, but lower for aides in centers that were larger in terms of employment levels, although the magnitude of the difference was relatively small.[15] Relative to nonprofit centers, for-profit centers paid 7.2 percent lower wages to aides; there was no statistical difference in the teachers' wages. Urban centers paid wages that were 19.8 and 9.3 percent higher for teachers and aides, respectively. The set of regional dummy variables was statistically significant. Wages were lower in the West, Midwest, and South than in the Northeast. The proportion of low-income children in a center also affected wages, lowering them for both teachers and aides. Wages of full-time

[14]Our measures of fringe benefits are imperfect. We do not know if an individual teacher received the benefit; instead we only know if the benefit was offered to all or some of the teachers or some or all of the aides working at a particular center. In addition, we do not know the value of the benefit received. This shortcoming is especially relevant for health insurance as there may be great variation in the proportion of this benefit that is paid by the center. Thus our HEALTH variable may be serving, in part, as a proxy for an omitted indicator of average center employee quality, rather than as a direct measure of nonwage compensation--subsidized health insurance.

[15]The average center employed a total of 18 teachers, aides, and directors. Our results indicate that a center with 10 additional employees would pay wages 1.6 percent higher for teachers and 1.0 percent lower for aides.

teachers were 7.6 percent higher than wages of part-time teachers. Full time aides received 2.6 percent higher wages than part-time aides.

Table IV.1: Variable Definitions

Variable	Definition
WAGET	Average hourly wage, teacher
WAGEA	Average hourly wage, aide
WAGED	Monthly wage, director
RENT	Total annual rent or mortgage cost (including the value of donated or subsidized space) plus annual maintenance and repair costs, divided by the total number of square feet of space
OCOST	Cost of supplies and other miscellaneous costs, divided by the number of FTE children
CHILDREN	Number of FTE children
CARATIO	Child-to-adult ratio—number of FTE children divided by the total number of directors, teachers, and aides
GROUPSZ	Average children group size
OUTPC	Number of square feet (in thousands) of outdoor space per FTE child
NEW	Equals 1 if center has been in existence for less than 5 years, 0 otherwise
PROFIT	Equals 1 if center is for-profit, 0 otherwise
HANDICAP	Proportion of handicapped children
INFANTS	Equals 1 if center serves children younger than 2 years of age, 0 otherwise
URBAN	Equals 1 if located in an urban area, 0 otherwise
LOINCOME	Proportion of children from low-income families
COST	Total annual cost of center operation—includes value of donated labor, space, and supplies
EDUC	Years of formal education
EXP	Years of employment experience in early childhood education/ childhood development
FULLTIME	Equals 1 if considered working full time, 0 otherwise
ADULTS	Total number of adults employed by each center
LEAVE	Equals 1 if some or all teachers/aides receive paid vacation leave, 0 otherwise
REDFEE	Equals 1 if some or all teachers/aides eligible for reduced child care fee, 0 otherwise
HEALTH	Equals 1 if some or all teacher/aides eligible for partly or fully paid health insurance, 0 otherwise
MIDWEST	Equals 1 if in Midwest, 0 otherwise
WEST	Equals 1 if in West, 0 otherwise
SOUTH	Equals 1 if in South, 0 otherwise

Table IV.2: Multiple Regression Cost Equation Estimates

Dependent Variable= ln (Total cost)

Variable	Description	Est coeff	Std error	T-stat	Mean value
WAGET	Teacher avg. wage/hr	0.304	0.052	5.89	7.29
WAGEA	Aide avg. wage/ hr	0.127	0.062	2.05	5.11
WAGED	Director avg. wage/mo	0.165	0.038	4.36	2060.25
RENT	Occupancy cost/sq foot	0.055	0.007	7.40	3.05
OCOST	Other cost/FTE child	0.362	0.024	15.01	1364.33
CHILDREN	No. of FTE children	0.801	0.029	28.02	81.65
CARATIO	Child-to-adult ratio	−0.045	0.008	−5.41	4.99[a]
GROUPSZ	Child group size	0.001	0.002	0.64	16.78
OUTPC	Outdoor space(000)/ child	0.033	0.014	2.38	0.28
NEW	New center (less 5 yrs)	−0.021	0.041	−0.50	0.12
PROFIT	For-profit center	−0.030	0.040	−0.75	0.15
HANDICAP	Handicapped children	0.017	0.174	0.10	0.06
INFANTS	Serves infants	0.110	0.031	3.55	0.45
URBAN	Located in an MSA	0.069	0.044	1.54	0.89
LOINCOME	Low Income Children	−0.053	0.053	−1.01	0.28
CONSTANT		4.719	0.271	17.398	
COST	Total annual center cost				340660

Number of Observations	187
Adjusted R-Square	0.906
F-Statistic	120.96
F-Statistic Significance Level	0.00

Total cost is the total annual cost of operating the center, including the value of donated services, supplies, and space.

Total cost, the five input price variables (WAGET, WAGEA, WAGED, RENT, and OCOST), and CHILDREN are all measured in logarithms. The means reported for these variables in the last column represent the mean values of these variables in levels.

[a]The mean CARATIO is lower than the average child-to-teacher ratio reported earlier for two reasons. First, CARATIO includes children of all ages, not just 4-year-olds. Because the child-to-teacher ratio typically is higher for older children, the inclusion of infants and toddlers along with 4-year-olds tends to lower the overall center ratio. Second, part-time workers are included in the calculation of CARATIO.

Table IV.3 Estimates of Regression Equation for Teachers and Aides

Dependent Variable: Ln Wage

		Est. coefficients		Standard errors		T-statistic		Mean value	
Variable	**Description**	**Teachers**	**Aides**	**Teachers**	**Aides**	**Teachers**	**Aides**	**Teachers**	**Aides**
EDUC	Yrs of education	0.058	0.032	0.005	0.003	11.93	9.25	15.01	13.40
EXP	Yrs of experience	0.033	0.022	0.003	0.004	9.53	6.03	5.77	3.08
EXP*EXP		−0.001	−0.001	0.0002	0.0002	−5.59	−3.01	58.33	20.44
FULLTIME	Work full time	0.074	0.026	0.028	0.013	2.63	2.02	0.93	0.72
CARATIO	Child/ adult ratio	−0.003	0.005	0.005	0.004	−0.64	1.51	4.80	4.62
HANDICAP	Handicapped	0.551	0.192	0.110	0.083	4.99	2.32	0.05	0.05
ADULTS	No. of adults	0.002	−0.001	0.0006	0.0004	2.91	−2.37	22.32	23.49
PROFIT	For-profit	−0.030	−0.075	0.023	0.021	−1.34	−3.64	0.17	0.10
LEAVE	Paid leave	−0.217	−0.122	0.045	0.019	−4.83	−6.45	0.97	0.85
REDFEE	Reduced child fee	−0.111	0.014	0.017	0.013	−6.43	1.03	0.62	0.57
HEALTH	Paid health ins.	0.109	0.141	0.020	0.015	5.31	9.25	0.80	0.68
LOINCOME	Low income	−0.223	−0.185	0.032	0.024	−7.03	−7.56	0.22	0.24
URBAN	Urban location	0.181	0.089	0.028	0.021	6.52	4.19	0.92	0.91
MIDWEST		−0.205	−0.090	0.024	0.018	−8.69	−5.12	0.35	0.35
WEST		−0.147	−0.087	0.027	0.020	−5.41	−4.29	0.17	0.19
SOUTH		−0.184	−0.051	0.025	0.019	−7.38	−2.65	0.34	0.29
CONSTANT		0.994	1.088	0.096	0.058	10.33	18.91		

Number of Observations	1280[a]	1423[b]
Adjusted R-Square	0.351	0.225
F-Statistic	44.2	26.84
F-Statistic Significance Level	.000	.000

[a] Teachers.

[b] Aides.

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