
**REGRESSION ANALYSIS OF COST PER CHILD
BY AGE GROUP**

As we have discussed in this report, the existing literature and common sense suggested some initial hypotheses that relate the cost of CDC care to certain aspects of the setting in which that care is provided. Specifically, we hypothesized that larger centers might have a lower cost per child due to their economies of scale, centers located in areas with a high cost of living would have greater care costs because of their higher wage rates for caregivers, and centers in remote areas might have greater care costs because they might have to pay higher wages to attract caregivers to their remote locations.

It was also hypothesized that costs would vary by Military Service, based on Service reports on APF funding of child-care slots. To analyze the relationship between these factors and cost, we conducted a simple regression analysis. We modeled the cost per child as a linear function, as follows:

$$\text{Cost per child} = \alpha + \beta_1 \text{Army} + \beta_2 \text{AirForce} + \beta_3 \text{Navy} + \beta_4 \ln(\text{medinc}) + \beta_5 \text{Remote} + \beta_6 \text{Size} + \beta_7 \text{Percentyoung} + \varepsilon$$

Army, *Air Force*, *Navy*,¹ and *Remote* are dummy variables that take on a value of 1 if the CDC is located on an installation that has that characteristic and take on a value of 0 otherwise. $\ln(\text{medinc})$ is a continuous variable reflecting the natural logarithm of the median income in the local area (the SMSA) in which the installation is located. *Size* is a continuous variable reflecting the average enrollment

¹The Marine Corps is omitted from each equation.

of the child-care centers on the installation (number of full-time equivalent [FTE] children enrolled, divided by the number of centers). *Percentyoung* is a continuous variable reflecting the percentage of total center enrollment accounted for by infants and pre-toddlers. We estimated several cost equations, using different dependent variables. First, we analyzed the total annual cost for each age group.² We then conducted a regression analysis on the separate components of cost discussed in Chapter Four: other cost per child, food cost per child, and direct labor cost per child. Regression results are reported later in this appendix. In reporting the results on direct labor cost per child, we give only the results for infants and simply note that the results for infants mirror those for other age groups.

ANNUAL COST PER CHILD BY AGE GROUP

For each age group, the parameter estimates on average center size are negative and significant at the 1-percent level (see Tables B.1 through B.4). Installations with more children per center have lower per-child operating costs. The parameter estimate on average size is -21 for infants, indicating that if Installation A, for instance, has ten more children per center than Installation B, then all other things being equal, Installation A's annual cost per infant will be \$210 per year lower. This negative relationship between center size and cost applied to all age groups. We tested for nonlinear relationships between average center size and cost, but the linear model provided a better fit, suggesting that within the range of the observed data (centers with 54 to 341 children and a median size of 150 children), there are economies of scale to be exploited.

The cost of living in the local area also appears to impact costs. For each age group, the parameter estimate on $\ln(\text{income})$ was positive and significant at the 10-percent (but not at the 5-percent) level. This suggests that installations located in areas with a higher cost of living have higher annual operating costs.

²We do not conduct a regression analysis for school-age care because only ten of the installations offered school-age care in the CDCs and, therefore, the parameter estimates were not significant.

Table B.1
Analysis of Cost per Infant

	Degrees of Freedom	Sum of Squares
Regression	7	330943141
Residual	50	544167905
Total	57	875111046

	Coefficient	Standard Error	T-statistic	P-value
Intercept	-25526.18	18737.22	-1.362	0.179
Army	1431.811	1540.386	0.930	0.357
Air Force	2955.154	1537.023	1.923	0.060
Navy	2957.932	1600.012	1.849	0.070
Median income	3520.12	1763.894	1.996	0.051
Remoteness	-117.813	1038.69	-0.113	0.910
Average center size	-22.50853	6.784662	-3.318	0.002
Percentage of infants and pre-toddlers	10254.42	7783.455	1.317	0.194

NOTE: Number of observations = 58. R-squared = 0.3782.

Table B.2
Analysis of Cost per Pre-toddler

	Degrees of Freedom	Sum of Squares
Regression	7	258393983
Residual	50	489130292
Total	57	747524275

	Coefficient	Standard Error	T-statistic	P-value
Intercept	-23504.57	17458.98	-1.346	0.184
Army	1437.754	1435.302	1.002	0.321
Air Force	2647.505	1432.168	1.849	0.070
Navy	2628.949	1490.86	1.763	0.084
Median income	3212.979	1643.562	1.955	0.056
Remoteness	-230.2143	967.8315	-0.238	0.813
Average center size	-21.01294	6.321817	-3.324	0.002
Percentage of infants and pre-toddlers	9634.509	7252.473	1.328	0.190

NOTE: Number of observations = 58. R-squared = 0.3680.

Table B.3
Analysis of Cost per Toddler

	Degrees of Freedom	Sum of Squares
Regression	7	211309392
Residual	51	370338021
Total	58	581647413

	Coefficient	Standard Error	T-statistic	P-value
Intercept	-20179.73	15201.63	-1.327	0.190
Army	1215.98	1256.537	0.968	0.338
Air Force	2192.872	1252.314	1.751	0.086
Navy	2264.796	1299.164	1.743	0.087
Median income	2726.593	1437.187	1.897	0.063
Remoteness	-327.2508	830.1784	-0.394	0.695
Average center size	-18.40343	5.53198	-3.327	0.002
Percentage of infants and pre-toddlers	7989.061	5636.365	1.417	0.162

NOTE: Number of observations = 59. R-squared = 0.3633.

Table B.4
Analysis of Cost per Preschooler

	Degrees of Freedom	Sum of Squares
Regression	7	153382410
Residual	51	285643359
Total	58	439025769

	Coefficient	Standard Error	T-statistic	P-value
Intercept	-16914.47	13350.67	-1.267	0.211
Army	977.6788	1103.54	0.886	0.380
Air Force	1709.35	1099.832	1.554	0.126
Navy	1869.599	1140.977	1.639	0.107
Median income	2231.315	1262.194	1.768	0.083
Remoteness	-408.8148	729.0953	-0.561	0.577
Average center size	-15.72219	4.858403	-3.236	0.002
Percentage of infants and pre-toddlers	6602.974	4950.078	1.334	0.188

NOTE: Number of observations = 59. R-squared = 0.3494.

Our regressions also suggest some differences across Services. For infants, pre-toddlers and toddlers, the parameter estimates on *Navy* and *Air Force* are positive and significant at the 10-percent (but not at the 5-percent) level, suggesting that the cost per child is higher in the Navy and Air Force than it is in the Marine Corps for all age groups. Holding other factors constant, the annual cost of infant care at a Marine Corps installation is nearly \$3,000 less than at a Navy or Air Force installation.

Remoteness of an installation and the percentage of infants and pre-toddlers did not have a measurable effect on cost.

ANALYSIS OF COST COMPONENTS

We also estimated separate regression equations for the three cost components: other costs per child, food costs per child, and direct labor costs per child. As discussed in Chapter Three, we calculated a single value for other cost per child and food cost per child for each installation; these estimates do not vary by child age. Direct labor cost estimates were calculated separately by child age, as described in Chapter Three. In reporting the regression results on direct labor cost per child, we give only the results for infants and simply note that the results for infants mirror those for other age groups.

The regression results on the individual cost components are presented in Tables B.5 through B.7. They provide some additional insight into the factors driving the results presented earlier in this appendix. First, we observe that installations with more children per center have lower other costs and lower direct-care labor costs. This suggests that larger centers, through economies of scale and through a more efficient use of staff, are able to reduce the cost per child for indirect and administrative costs. These relationships are significant at the 1-percent level. For other costs, the parameter estimate on average size is -11 , indicating that if Installation A, for instance, has ten more children per center than Installation B, then all other things being equal, Installation A's annual other cost per infant will be \$110 per year lower. We also observe a small negative relationship between average center size and food cost per child that is significant at the 10-percent level.

Table B.5
Analysis of Other Costs per Child

	Degrees of Freedom	Sum of Squares		
Regression	7	85024061.3		
Residual	51	186403245		
Total	58	271427307		

	Coefficient	Standard Error	T-statistic	P-value
Intercept	-11725.32	10784.94	-1.087	0.282
Army	434.1357	891.4617	0.487	0.628
Air Force	928.7167	888.4663	1.045	0.301
Navy	1305.055	921.7039	1.416	0.163
Median income	1434.974	1019.626	1.407	0.165
Remoteness	-468.9281	588.9779	-0.796	0.430
Average center size	-11.23112	3.924716	-2.862	0.006
Percentage of infants and pre-toddlers	4289.251	3998.772	1.073	0.288

NOTE: Number of observations = 59. R-squared = 0.3132.

Table B.6
Analysis of Food Cost per Child

	Degrees of Freedom	Sum of Squares		
Regression	7	411390.35		
Residual	51	2276726.72		
Total	58	2688117.08		

	Coefficient	Standard Error	T-statistic	P-value
Intercept	-617.7862	1191.918	-0.518	0.606
Army	209.9207	98.52159	2.131	0.038
Air Force	103.7022	98.19055	1.056	0.296
Navy	11.26796	101.8639	0.111	0.912
Median income	102.9533	112.6859	0.914	0.365
Remoteness	-54.07627	65.09201	-0.831	0.410
Average center size	-0.7373302	0.4337474	-1.700	0.095
Percentage of infants and pre-toddlers	373.2009	441.932	0.844	0.402

NOTE: Number of observations = 59. R-squared = 0.2618.

Table B.7
Analysis of Direct-Care Labor Cost per Infant

	Degrees of Freedom	Sum of Squares		
Regression	7	87550251.0		
Residual	51	195872829		
Total	58	283423080		

	Coefficient	Standard Error	T-statistic	P-value
Intercept	-13714.1	11055.49	-1.240	0.220
Army	1000.867	913.825	1.095	0.279
Air Force	2030.794	910.7545	2.230	0.030
Navy	1659.827	944.8259	1.757	0.085
Median income	2080.165	1045.204	1.990	0.052
Remoteness	342.5687	603.7531	0.567	0.573
Average center size	-11.2612	4.023172	-2.799	0.007
Percentage of infants and pre-toddlers	5821.565	4099.086	1.420	0.162

NOTE: Number of observations = 59. R-squared = 0.3089.

No other variables are significant in the estimation of other costs per child. In particular, there are no significant differences across Services. With respect to food cost per child, *Army* is positive and significant at the 5-percent level. The Army food costs are \$210 per child higher than the food costs for the Marine Corps. This could reflect differences in how food costs are accounted for or the fact that the Army provides formula for infants.

The cost of living in the local area appears to impact only direct-care labor costs. The parameter estimate for direct-care infant labor costs on $\ln(\text{income})$ was positive and significant at the 5-percent level. This is not surprising in view of the fact that federal government wages are tied to a locale's cost of living through locality pay.

Our regressions also suggest that the Service differences reported earlier in this appendix are primarily driven by differences in direct-care labor costs. For infants, the parameter estimates on *Air Force* are positive and significant at the 5-percent level, and the estimates on *Navy* are positive and significant at the 10-percent (but not the 5-percent) level, suggesting that the cost per child is higher in the Navy and Air Force than it is in the Marine Corps.