

AK LEGISLATURE SPECIAL COMMITTEE FILES SCOMM 153 326640

These findings are consistent with research done nationally. Ingersoll (2001) found that for most teachers, school and district characteristics were as critical to their decision to leave their jobs as was compensation. He found that turnover was *lower* in schools where: (1) salaries are higher; (2) teachers receive more administrative support; (3) fewer problems with student discipline were reported; and (4) teachers had relatively more influence on the decision-making process.

These results suggest several possible actions to improve working conditions in rural schools.

Policy Implications: How Can We Reduce Turnover and Increase Recruitment?

- ***School improvement efforts should include conversations between educators and the community on goals for the school and academic and behavioral expectations for students.***

To address issues of student motivation and behavior requires a concerted, collaborative effort by educators, on the one hand, and parents and community members, on the other. Problems with behavior and motivation can often be traced to inconsistent messages coming from home and school. Other research in Alaska has shown that when parents and educational professionals agree on values, and when students receive the same messages about appropriate behavior and learning goals at home and at school, students are unable to play one side off against the other and must bear down and do their work (Kleinfeld, 1979; Kleinfeld, McDiarmid, and Hagstrom, 1985).

State assessments have identified schools that clearly need additional support. A key part of that support will be convening school-community meetings to discuss goals and expectations.

- ***Professional development for principals could help them broker the conversation between the school and the community about goals and expectations for student performance and behavior.***

The conversation required to develop common expectations for student behavior and school performance should be at the core of communications between the school and the community. Each must listen to the other. Educators who do not plan to stay in the community need to make a special effort to hear what parents want from the school. As temporary residents, they need to be careful about imposing their agenda on the school when they will be gone in a year or two. Residents have to live with the consequences of educators' decisions long after most of them are gone.

The school principal is obviously the person to broker these conversations. As the results of our survey show, principals' failure to communicate with parents and community members is a major dissatisfaction among those who leave their teaching positions. This role for the principal is one that must be emphasized—and practiced—both in principal preparation programs and in state and district training for principals.

- ***District- and school-level professional development must include teachers in identifying their needs and planning activities.***

Districts and school administrators need to address teachers' perception that much of their professional development is irrelevant to the issues and problems they face.

Although a mounting body of evidence clearly demonstrates the importance of teacher involvement in planning their professional development, some districts insist on controlling the agenda (McDiarmid and Kelly, in review; Sparks 2002). Involving teachers in planning professional development activities is not difficult (for a description of how this has been done elsewhere, see McDiarmid and Kelly). What apparently is a challenge for some administrators is relaxing their control. The advent of the benchmark tests and the High School Graduation Qualifying Examination has, understandably, ratcheted up administrators' levels of anxiety, making them even less inclined to take the risk of turning professional development planning over to teachers. State-level policy interventions—such as those that were part of the Kentucky Educational Reform Act—may be needed to put teachers in control.

• *Induction programs that support teachers through the difficulties of the first-year of teaching help keep them in the classroom.*

A major problem all states face is that a high number of new teachers—between 30 and 50 percent, depending on location—leave the profession within the first five years. Much of that attrition can be traced to the frustrations and sense of failure that new teachers feel. Even the best teacher education programs cannot fully prepare teachers for the unrelenting demands made on them when they are solely in charge of a classroom. Clearly, as other countries such as China have demonstrated, beginning teachers need and respond well to support from their more veteran colleagues and the school and district administration.

As research from California has shown, well-designed and funded induction programs for beginning teachers can dramatically reduce the number of teachers leaving the profession in their first few years (Bullard, 1998). Using a federal grant, the Alaska Department of Education and Early Development in 2001-02 funded mentor programs for new teachers in eighteen districts. Although it is too early to determine the effects of the program on teacher retention, data suggest that first-year teachers found the program helpful and felt encouraged to stay in their jobs.

The State of Alaska should fund induction programs in all districts, especially those experiencing high rates of teacher turnover. Districts can work in collaboration with the University of Alaska and NEA-Alaska to prepare teachers as mentors. This preparation is critical to the success of the program. The costs of such a program need to be weighed against the costs districts bear in recruiting and training new teachers.

In conclusion, the shortages that some Alaska districts face are unlikely to disappear in either the short- or long-term, without some major policy changes at the state and district levels and at the University of Alaska. Although graduating more highly qualified teachers should clearly remain a goal, the evidence suggests that we cannot simply "produce" our way out of our current shortages. Policymakers must directly address the conditions that cause high rates of turnover and difficulties in recruiting in some districts, if all students in all Alaska's schools are to have the high quality opportunities to learn that they need and deserve.

VII. REFERENCES

- Alaska Teacher Placement. (various years). *Alaska Statewide Educator Supply and Demand Report*. Fairbanks: Alaska Teacher Placement, University of Alaska Fairbanks.
- Andrew, M.D. (1981). A Five-Year Education Program: Successes and Challenges. *Journal of Teacher Education*, 32(3), 40-43.
- Andrew, M.D. (1990). Differences Between Graduates of 4-Year and 5-Year Teacher Preparation Programs. *Journal of Teacher Education*, 41(2), 45-51.
- American Association for Employment in Education. (2001). *Educator Supply and Demand in the United States*. Columbus, OH: Author. Online at: www.aace.org.
- American Federation of Teachers. (2001 and 1998). *Survey and Analysis of Teacher Salary Trends*. Washington, D.C: Author. 1998 report online at <http://www.aft.org/research/survey/final.pdf> ; 2001 report at <http://www.aft.org/research/survey01/index.html>
- Bullard, C. (1998). *Qualified Teachers for All California Students: Current Issues in Recruitment, Retention, Preparation and Professional Development*. Sacramento: California Research Bureau, CRB-98-012.
- Darling-Hammond, L. (2000). Teacher Quality and Student Achievement: A Review of State Policy Evidence. *Education Policy Analysis Archives*, 8 (1). Online at <http://epaa.asu.edu/epaa/v8n1>.
- DeWitt Wallace Readers Digest. (1997, August). *Pathways: Recruiting, Preparing and Retaining Teachers for America's Schools*. New York: Author.
- Education Trust. (2002). *All Talk, No Action: Putting an End to Out-of-Field Teaching*. Washington D.C.: Education Trust. Online at <http://www.edtrust.org/main/main/index.asp>
- Feistritzer, E. (1999). *The Making of a Teacher*. Washington, D.C.: Center for Education Information.
- Feistritzer, E. (1998, January 28). The Truth Behind the Teacher Shortage. *The Wall Street Journal*.
- Gold, Y. (1996). Beginning Teacher Support: Attrition, Mentoring and Induction. In J. Sikula, (Ed.), *Handbook of Research on Teacher Education* (2nd ed.). New York: Simon & Schuster/Macmillan.
- Goldsmith, S. (2001). *Economic Projections for Alaska and the Southern Railbelt*. Anchorage: Institute of Social and Economic Research, University of Alaska Anchorage. Online at www.iser.uaa.alaska.edu.

Goldsmith, S. (2002). Institute of Social and Economic Research, University of Alaska Anchorage. Personal communication.

Grissmer, D., Flanagan, A. Kawata, J., and Williamson, S. (2002). *Improving Student Achievement: What State NAEP Test Scores Tell Us*. Santa Monica, CA: RAND.

Hanushek, E., Kain, J., and Rivkin, S. (2001). *Why Schools Lose Teachers*. NBER Working Paper 8599. Cambridge, MA: National Board of Economic Research.

Ingersoll, R. (2001). *Teacher Turnover, Teacher Shortages, and the Organization of Schools*. Seattle, WA: Center for Policy and Teaching, University of Washington.

Kardos, S., Johnson, S., Peske, H., Kauffman, D., and Liu, E. (2001). Counting on Colleagues: New Teachers Encounter the Professional Culture of Their Schools. *Educational Administration Quarterly*, 37(2), 250-290.

Kelley, C. (1998). The Kentucky School-Based Performance Award Program: School-Level Effects. *Educational Policy*, 12(3), 305-324.

Kleinfeld, J. (1973). *A Long Way From Home*. Fairbanks: Center for Northern Educational Research and Institute of Social and Economic Research, University of Alaska.

Kleinfeld, J. (1979). *Eskimo School on the Andreafsky*. New York: Praeger Publishers.

Kleinfeld, J., McDiarmid, G. W., and Hagstrom, D. (1985). *Alaska's Small Rural High Schools: Are They Working?* Anchorage: Institute of Social and Economic Research, University of Alaska Anchorage.

McDiarmid, G.W., Goldsmith, S., Killorin, M., Sharp, S., and Hild, C. (1998). *Expanding Job Opportunities for Alaska Natives. Interim Report*. Anchorage: Institute of Social And Economic Research, University of Alaska Anchorage. Online at: <http://www.iser.uaa.alaska.edu>.

McDiarmid, G. W. and Kelly, P. (in review). Teachers Planning Professional Development in a Reform Context: The Case of Kentucky. Submitted to *Educational Evaluation and Policy Analysis*.

National Center for Education Statistics (NCES). (1997). *America's Teachers: Profile of a Profession, 1993-94*. Washington, D.C.: U.S. Department of Education.

National Center for Education Statistics. (1997). *Characteristics of Stayers, Movers, and Leavers: Results from the Teacher Follow-up Survey: 1994-95*. Washington, D.C.: U.S. Department of Education.

National Center for Education Statistics. (various years). *Digest of Education Statistics*. Washington, D.C.: U.S. Department of Education.

National Center for Education Statistics. (various years). *Projections of Education Statistics*. Washington, D.C.: U.S. Department of Education.

National Center for Research on Teacher Learning. (1991). *Findings from the Teacher Education and Learning to Teach Study: Final Report, The National Center for Research on Teacher Education*. E. Lansing, MI: Michigan State University, Author.

National Commission on Teaching and America's Future. (1996). *What Matters Most: Teaching for America's Future*. New York: Teachers College, Columbia University. Online at <http://www.teacherscollege.edu/nctaf/publications/index.html>)

North Central Regional Educational Laboratory (NCREL). (2000) *Teacher Shortages in the Midwest: Current Trends and Future Issues*. Oak Brook, IL: Author.

Oakes, J. (1990). *Multiplying Inequities: The Effects of Race, Social class, and Tracking on Opportunities to Learn Mathematics and Sciences*. Santa Monica, CA: RAND.

Oregon University System. (1999, July). *K-12 Educator Supply and Demand: Facts, Figures and Trends*. Eugene: OR: Author.

Shin, H. (1994). *Estimating Future Teacher Supply: An Application of Survival Analysis*. Paper presented at the Annual Meeting of the American Educational Research Association, April 8-13, New Orleans, LA.

Sparks, D. (2002). *Designing Powerful Professional Development for Teachers and Principals*. Oxford, OH: National Staff Development Council. Available only online at: <http://www.nsd.org/sparksbook.html>

The Study of Personnel Needs in Special Education (SPeNSE). (2001). Funded by Office of Special Education Programs, U.S. Department of Education, and conducted by Westat. See SPeNSE Web site at: <http://www.spense.org>

Texas Center for Educational Research. (2000, November). *The Cost of Teacher Turnover*. Austin, TX: Author.

U.S. Bureau of the Census. (2000). Summary File 1, available online at: <http://factfinder.census.gov/servlet/BasicFactsServlet>

Washington Education Association. (2002). *Special Education Task Force, 2002 Special Education Survey Report*. Available online at: http://www.wa.nea.org/Jumps/2002_2/workload.htm

STATE OF ALASKA THE LEGISLATURE

2007

Source
SCR 11

Legislative
Resolve No.
26



Establishing and relating to the Joint Legislative Education Funding Task Force.

BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

WHEREAS Alaskans clearly believe in the value of the quality of education for our children; and

WHEREAS, under art. VII, sec. 1, Constitution of the State of Alaska, a system of public schools is required to be established and maintained; and

WHEREAS the legislature finds that the present system of providing assistance to the public school system is a complex matter and should be studied for possible modification and improvement; and

WHEREAS, during the period of study, an alternative mechanism to the existing system of financial support for public schools may be desirable; and

WHEREAS a study conducted in the state in 2004 by the Institute of Social and Economic Research recommended that the school district cost factors under AS 14.17.460(a) be increased to more accurately reflect the cost differentials in rural school districts;

BE IT RESOLVED by the Alaska State Legislature that the Joint Legislative Education Funding Task Force is established for the purpose of examining school district cost

differentials and the existing formula for distributing state aid for education; and be it

FURTHER RESOLVED that the duties of the task force include

(1) evaluating proposals that are based on available facts and conclusions pertaining to school district cost factors and the foundation formula;

(2) recommending improvements or additions to the laws providing for education funding; and

(3) taking public comments on education funding and school district cost factors; and be it

FURTHER RESOLVED that the task force consists of 11 members as follows:

(1) five shall be from the senate appointed by the president of the senate;

(2) five shall be from the house of representatives appointed by the speaker of the house of representatives; and

(3) one shall be appointed by the governor; and be it

FURTHER RESOLVED that the president of the senate and the speaker of the house of representatives shall jointly appoint the chair and vice-chair of the task force; and be it

FURTHER RESOLVED that the task force shall meet during the interim between sessions; and be it

FURTHER RESOLVED that the task force shall submit a report of its findings and proposed legislative changes to the governor and the legislature by September 1, 2007, and may make any additional reports it considers advisable; and be it

FURTHER RESOLVED that, if the task force is not able to propose a solution for school funding, including the treatment of school district cost factors, the governor is encouraged to call the legislature into a special session before the date the Second Regular Session of the Twenty-Fifth Legislature convenes in order to address school funding; and be it

FURTHER RESOLVED that the Joint Legislative Education Funding Task Force is terminated on October 15, 2007.

SCOMM

153:2



AMERICAN INSTITUTES FOR RESEARCH

Alaska School District Cost Study:

Volume I – Summary of Results

Submitted to:

Ms. Heather Brakes
Legislative Budget & Audit Committee
State Capitol, Room 121
Juneau, AK 99801-1182

Submitted by:

Dr. Jay Chambers
Dr. Lori Taylor
Joe Robinson
Phil Esra, Editor

With contributions by
Marc Schuldt, SBW Consulting, Inc.

January 2003

About the authors:

Jay G. Chambers is a Senior Research Fellow and a Managing Director of the Business Development Committee on Economic Indicators and Education Finance within the Education Program at the American Institutes for Research (AIR). He is also a member of the President's Commission on Excellence in Special Education and served on the Task Force on Finance and on Systems Administration. Dr. Chambers is currently President of the American Education Finance Association and a consulting professor at Stanford University's School of Education. He is a nationally recognized expert in school finance and educational cost analysis.

Lori L. Taylor, a consultant to the study, is a Senior Economist and Policy Advisor at the Federal Reserve Bank of Dallas. Dr. Taylor recently served as Principal Researcher on the Texas Cost-of-Education Project. The Texas CEI project developed a number of strategies for adjusting the Texas school finance formula to reflect variations in the cost of education.

Joe Robinson is a Research Associate at AIR, and has served as Project Manager for the Alaska School District Cost Study and the Nebraska Cost of Education Index Study. Before joining the AIR staff, Joe taught elementary school. He brings his experience as a teacher to his research projects. Joe holds a B.S. in Industrial and Labor Relations from Cornell University, and is continuing his education in SAS programming and higher mathematics courses.

Phil E. Esra is an Editor and Staff Writer at AIR. He has contributed to numerous articles and federal and state reports on education finance and special education issues.

Marc Schuldt, President of SBW Consulting, Inc., holds an M.S. in Mechanical Engineering from the University of Washington and a B.S. in Aeronautical Engineering from Purdue University. Mr. Schuldt has more than 22 years of experience as a project manager and lead engineer for studies of residential, commercial, and industrial energy use. He directs a team of SBW engineers who provide program design assistance and conduct commercial building energy audits for a number of public and private agencies.

Acknowledgements

This study benefited from the input and participation of many people. The study team would like to express their appreciation for the efforts of the Technical Working Group, whose members provided critical guidance over the course of the project. Members of the Working Group are as follows:

- Kerry Jarrell (Bering Strait SD)
- Michael Fisher (Fairbanks North Star Borough SD)
- Melody Douglas (Kenai Peninsula Borough SD)
- Dave Jones (Kodiak Island Borough SD)
- Dennis Niedermeyer (Lake and Peninsula Borough SD)
- Lucienne Harger (North Slope Borough SD)
- Barbara Stocker (Sitka Borough SD)
- Karen Goodwin (Southeast Island SD)

We greatly appreciate their support during the data collection phase of this project and owe a great debt of gratitude for helping us accomplish a 100 percent response rate on virtually all of our data collection instruments. They not only provided encouragement, but help to the beleaguered school business offices who attempted to interpret our needs. This group of hardy individuals also contributed to the design of our approach to addressing the costs of goods, services, and travel.

A special word of thanks goes to Melody Douglas and Dave Jones, who worked closely with AIR in the final stages to review assumptions and make follow-up phone calls to individual school business officers to check data elements that were used in the construction of the final index numbers. Their willingness to work in collaboration with the AIR research team made the results of our work a better product.

The Oversight Committee also provided critical guidance, and helped coordinate our requests for data during the course of the study. Its members are Pat Davidson, Representative Hugh Fate, Eddy Jeans, David Teal, and Senator Gene Therriault.

In particular, Eddy Jeans and his staff were instrumental in helping us obtain data from ADEED and in serving as liaisons with school business officials and superintendents. Elizabeth Sweeney spent countless hours on the phone with the research team, both reviewing the Chart of Accounts and individual district fiscal audits, and guiding decisions about assignment of budget shares. Karen Lipson worked with the research team to quickly provide personnel data in whatever form necessary. Tim Mearig obtained important building and facility data for the energy prototype analysis and served as a liaison with school district facilities managers.

The study team would like to thank all of the school and district personnel who responded to our surveys and requests for information. Without their efforts, this study would not have been possible.

Joanne Lieberman, who laid the foundation for the project and managed it in its early stages, was instrumental in creating a well-conceived study, and demonstrated an uncanny ability to anticipate every contingency and plan for every eventuality.

Gur Hoshen, Ann Win, and Bob Morris all provided technical assistance through their programming skills using SAS statistical software.

Last, but certainly not least, we wish to acknowledge the hard work and significant effort put forth by Phil Esra, who has provided tremendous editorial support in developing this document.

Executive Summary

The purpose of this study is to develop an improved methodology for measuring differences in the cost of school resources across geographic locations within Alaska. State policy makers in Alaska have long recognized the importance of adjusting state education aid for geographic cost differences and, for the past five years, have utilized a cost adjustment index derived from a study conducted by the McDowell Group (1998). The present study is intended to develop a geographic cost of education index (GCEI) that will replace the existing cost adjustment and provide a more sophisticated approach to measuring cost differences. The application of such geographic cost adjustments in state aid is intended to equalize the purchasing power of the educational dollar across local school districts.

The costs of four major categories of school inputs are analyzed as part of this study:

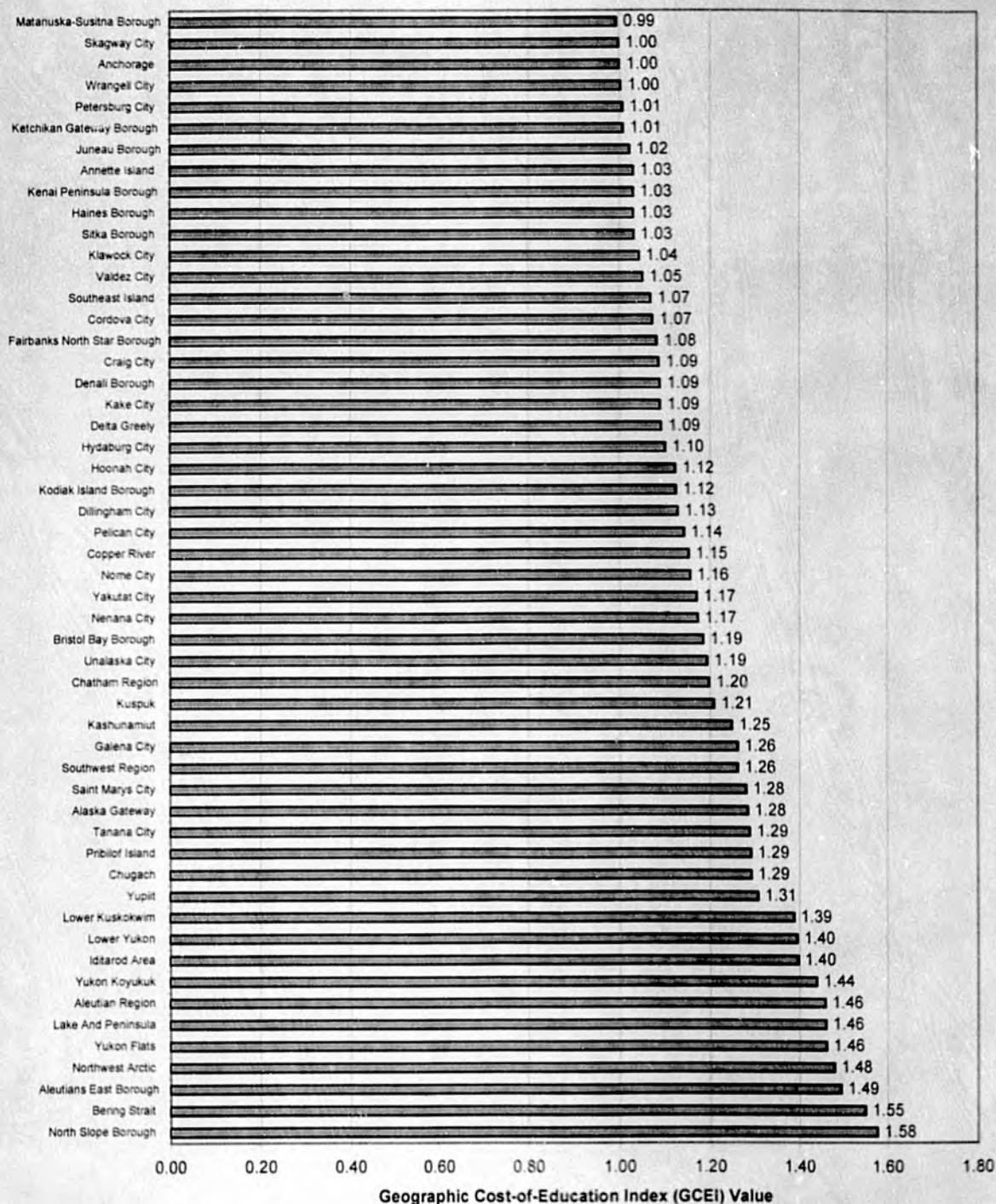
- personnel services
- energy services
- supplies, materials, and small capital items
- travel

The AIR research team collaborated closely with a group of eight school business officers representing a diverse sample of districts from across Alaska. These eight school business officers formed a Technical Working Group (subsequently referred to as the TWG) that provided feedback on components of the methodology for this analysis, assistance in the design of data collection instruments, and support in data collection efforts.

Overall Variations in Costs

Based on the study's analysis, the purchasing power of the educational dollar varies tremendously in the State of Alaska. The highest-cost district needs to spend about 1.6 times what the lowest cost district spends in order to provide comparable educational services. Using Anchorage School District as the benchmark (i.e., with a GCEI of 1.00), the analysis of costs reveals that the North Slope Borough School District exhibits the highest cost of education, with an index value of 1.58 (see exhibit). This means that this district needs to spend about 58 percent more than the Anchorage School District to provide comparable educational services to the students it serves. On the other end of the spectrum is the Matanuska-Susitna Borough School District, with an index value of 0.99. This means that this district needs to spend about 1 percent less than the Anchorage School District to provide comparable educational services.

A GCEI for Alaska School Districts



NOTES TO EXHIBIT: The districts listed on the vertical axis in this diagram are sorted in ascending order according to the value of the geographic cost-of-education index (GCEI), with the lowest on top.

Organizing the school districts by region reveals that the highest-cost districts in Alaska are located in the Far North (with average GCEIs of 1.38) and the Southwest (with average GCEIs of 1.31). The lowest-cost districts in the state are located in the Southeast (with an average GCEI of 1.07).

Differences between the values of the AIR GCEI and the current Alaska cost index for education may reflect a combination of methodology differences and changes in the costs of educational services since the last cost index was calculated. The largest differences are most likely attributable to methodological differences underlying the two studies' calculations.¹ The range, standard deviation, and mean values of the GCEI and the current Alaska cost index are quite similar. The AIR GCEI ranges from a low of 0.99 to a high of 1.58, while the range of the current Alaska cost adjustment is from 1.00 to 1.74. The standard deviation of the AIR GCEI is 0.17, and the standard deviation of the current adjustment is 0.21. Moreover, the correlation between the AIR GCEI and the Alaska cost index is 0.91, suggesting that the general patterns of variation in costs are quite similar between the AIR GCEI and the current Alaska cost index. More than 70 percent (38) of the districts exhibit a GCEI with less than a 0.10 difference from the current Alaska cost index. Forty-four percent (24) of the school districts in Alaska exhibit less than a 0.05 difference from the current Alaska cost index.

Personnel Cost Differences

Looking at the four major component indices reveals what one would expect. School personnel costs play a major role in explaining the variations in the overall costs of education across local school districts. The school personnel category accounts for a major portion of school district budgets, ranging in Alaska from 45 to 90 percent of total expenditures, with a median of 78 percent. AIR used econometric models of the school personnel labor market to provide a basis for simulations of the compensation levels that would be required if all districts employed *comparable* teachers, school administrators, and classified personnel. The key is comparability: what are the costs in different parts of the State of Alaska for school personnel with *comparable* levels of experience, education, and other demographic characteristics?

Using Anchorage as the basis for calculation of the index values (i.e., setting the Anchorage index to a value of 1.00), personnel costs range from a low of 0.93 in Southeast Island School District to a high of 1.28 in North Slope Borough School District. In other words, the highest-cost district pays, on average, about 28 percent more than Anchorage for comparable personnel, while the lowest-cost district pays about 7

¹ The actual values of the two indices are presented for purposes of comparison in Exhibit I-6 In Appendix I of the report entitled "Alaska School District Cost Study: Volume II-The Technical Report."

percent less than Anchorage for comparable school personnel. Comparing these two districts to each other, North Slope pays 38 percent more than Southeast Island for comparable personnel.

Energy Cost Differences

A second component index, energy cost, is influenced by several factors. Alaska's significant climate variation across districts affects the consumption of fuels and energy required to provide heat to classrooms and school buildings. In addition, the degree of remoteness of each district affects the prices of these fuel and energy sources.

The study's approach to calculating energy costs relies on an engineering computer simulation model. This model requires the development of prototype buildings to permit estimation of the energy requirements to provide heating, cooling, and power for all aspects of school and district operations. Each prototype is associated with a specific climate parameter expressed in terms of heating degree-days. The estimated energy consumption levels necessary for the prototype buildings in different climatic zones are then combined with information on the unit energy prices at each school site throughout Alaska to estimate the cost of energy services.

The results of this analysis show a range of index values for the cost of energy services per square foot from 0.74 in the Juneau School District to 9.31 in the North Slope School District. Typically, the school districts with the highest index values are located within the very cold climate zone, largely represented by the Far North region. High costs in less cold districts can be attributed to the relative costs of energy sources faced by these districts.

Costs of Supplies, Materials, and Small Capital Items

The third component index, supplies, material, and capital equipment, is most influenced by geographic differences in shipping costs. The base prices of supplies purchased by districts in different parts of the state may vary to some extent because of volume purchasing, but this difference is small compared to the difference associated with the cost of transporting these items from the major centers of commerce to the remote areas of the state. The costs range from a low of 1.00 in Anchorage School District to a high of 6.81 in Pelican City School District.

In general, larger districts (i.e., districts with higher enrollment figures) tend to exhibit lower costs of goods. Larger districts are able to purchase items in bulk more easily than smaller districts. Another factor contributing to the lower index values for districts with greater enrollments is their proximity to the suppliers of these goods. These districts operate in or near Alaska's major centers of commerce. Transportation costs are

lower, and competition among suppliers in these centers of commerce drives down prices.

Travel Costs

The fourth component index is the cost of travel. Because of the remote locations of some schools and communities in Alaska, travel costs can have a significant impact on the expenditures necessary to operate schools in the state. The majority of the low-cost districts in this index are city school districts and districts located near Anchorage or in another relatively accessible area of the state. These districts tend to have very low costs associated with travel between the district office and the school(s) in the district. For those districts located near Anchorage, travel costs to Anchorage for statewide training tends to be a relatively low-cost item. Districts located close to a center of commerce enjoy low costs for maintenance service travel, resulting in lower cost index values in this travel input index.

Summary of Recommendations

AIR makes a number of recommendations regarding implementation of the GCEI:

- Adoption of the new GCEI presented in this report.
- Improvements and expansion of the personnel databases currently collected by ADEED.
- Adoption of new data collections on non-personnel items including energy fuels; supplies, materials, and capital items; and travel costs.
- Updating the GCEI every 3 to 5 years.
- Using a professional economist for the analysis of personnel costs.
- Phasing in the new index over time to avoid disrupting district budgets.

Table of Contents

I. Introduction.....	1
Limitations to the Scope of the Present Study	2
Overview of the Report.....	2
II. Overview of the GCEI	3
III. Personnel Costs.....	7
The Methodology	7
The Results.....	8
IV. Costs of Energy Services	10
The Methodology	10
The Results.....	11
V. Costs of Supplies, Materials and Small Capital Items	14
The Methodology	14
The Results.....	15
VI. Costs of Travel	17
The Methodology	17
The Results.....	18
VII. Overall Geographic Cost of Education Index.....	20
Determination of Budget Shares and Application of the Index Values.....	21
VIII. Recommendations and Implementation.....	24
Bibliography	30

Exhibits

Exhibit II-1. A GCEI for Alaska School Districts.	4
Exhibit II-2. Variations in the Geographic Cost of Education Index by Region.	5
Exhibit II-3. Current Alaska Index Compared with Superlative GCEI	6
Exhibit III-1 Personnel Cost Index.....	9
Exhibit III-2. Descriptive Statistics for Personnel Cost Indices By Region.....	10
Exhibit IV-1. Energy Cost Index	13
Exhibit IV-2. Comparison of Energy Index Values by Region.....	14
Exhibit V-1. Index of the Cost of Supplies, Materials, and Small Capital Equipment....	16
Exhibit V-2. Comparison of Total Goods Index Values by District Enrollment.....	17
Exhibit VI-1. Index for the Cost of Travel	19
Exhibit VI-2. Comparison of Total Travel Index Values by Distance	20
Exhibit VI-3. Comparison of Total Travel Index Values by District Enrollment	20
Exhibit VII-1(a). GCEI Values and the Relative Impact of the Four Component Indices	22
Exhibit VII-1(b). GCEI Values and the Budget Weights of the Four Component Indices	23

I. Introduction

The purpose of this study is to develop an improved methodology for measuring differences in the cost of school resources across geographic locations within the State of Alaska. State policy makers in Alaska have long recognized the importance of adjusting state education aid for geographic cost differences and, for the past five years, have utilized a cost adjustment index derived from a study conducted by the McDowell Group (1998). The present study is intended to develop a geographic cost of education index (GCEI) that will replace the existing cost adjustment used by the State of Alaska and provide a more sophisticated approach to measuring cost differences. The application of such geographic cost adjustments in state aid is intended to equalize the purchasing power of the educational dollar across local school districts.

The costs of four major categories of school inputs are analyzed as part of this study:

- Personnel services
- Energy services
- Supplies, materials, and small capital items
- Travel (as it affects maintenance services, administrative oversight of school operations, district level meetings for professional staff, and statewide professional meetings)

With the exception of energy services, each of these categories includes subcategories of inputs for which separate cost indices were calculated. For example, the personnel service index is derived from separate indices for teachers, administrators and other professional staff, and classified staff. Each subcategory is weighted to reflect its relative importance within each school district's budget.

Combining these subcategories into larger indices requires a technique developed by economists to take into account the substitution between inputs that occurs in response to relative differences in the prices of the inputs across districts.² Using this technique, the calculation of the GCEI value for a district 'j' weights each component cost index by the average of the budget share allocated to this input by the district 'j' and the Anchorage School District. This weight will subsequently be referred to as the budget share weight.³ This weighting allows the overall GCEI to reflect the relative amount of a district's budget allocated to each input.

² For example, as the cost of using external skilled maintenance workers increases relative to the cost of internal maintenance workers (classified employees), one would expect districts to use internal employees more often to maintain the quality and level of services.

³ This technique is referred to as a *superlative* or 'true cost index. For a more technical discussion, the reader is referred to the work of Diewert (1976) and Caves, Christensen, and Diewert (1982). The budget share weight for input 'i' in district 'j' is defined by $(1/2) \cdot [S_{ij} + S_{iA}]$ where S_{ij} = the budget share of input 'i' in district 'j' and S_{iA} is the budget share for input 'i' in Anchorage (i.e., district 'A').

The following is an overview of the study's analysis and its results. A more detailed description of the methodology and the assumptions underlying this analysis may be found in a separate document entitled "*Alaska School District Cost Study, Volume II-The Technical Report*" (subsequently referred to as the *Technical Report*).

The AIR research team worked in close collaboration with a group of eight school business officers representing a diverse sample of districts from across Alaska. These eight school business officers formed a Technical Working Group (subsequently referred to as the TWG) that provided feedback on components of the methodology for this analysis, assistance in the design of data collection instruments, and support in data collection efforts.

Limitations to the Scope of the Present Study

It is important to point out what this study does do and what it does *not* do. The study develops a cost adjustment index that reflects the variations in the prices paid for comparable school inputs in different geographic locations in the state. However, this study does *not* address cost differences associated with pupil needs, nor does it address other factors related to the scale and concentration of district operations. For example, it does not address differences in the levels of staff and other non-personnel resources required to meet the different needs of students who are from disadvantaged backgrounds, students who are English language learners, or students with physical or mental disabilities. In addition, this study does not address the different administrative staffing requirements that may be associated with operating school districts in remote and sparsely populated regions of the state. While the study does address the differential costs of personnel travel within large remote school districts and does address the costs of transporting goods within these remote locations, it does not address the increased need for staff that may be required to provide necessary administrative and support services.⁴

Overview of the Report

Section II presents an overview of the results of the study, focusing on the range of costs represented by the GCEI. Sections III through VI describe the methodology and the results of the analysis for each of the four categories of inputs (personnel, energy, supplies and equipment, and travel). Section VII describes the procedure for assigning the budget weights and the calculation

⁴ These additional cost factors related to the measurement of pupil needs and the costs of operating districts in sparsely populated and remote regions of the state must be addressed through more comprehensive studies designed to estimate the costs of providing adequate educational services in Alaska. The previous work done by Chambers and Parrish (1984) represents one model for conducting these kinds of studies, while a newer proposal for costing out an adequate education in New York State prepared by Chambers, Smith, Parrish, and Guthrie (2002) provides an even more comprehensive and more up-to-date approach to addressing these complex issues. The newer methodology for measuring adequacy in education focuses more attention on the relationship between outcome standards for students and the levels of resources necessary to achieve those standards.

of the GCEI. Section VIII discusses implementation issues and issues related to the utilization and updating of the GCEI.

II. Overview of the GCEI

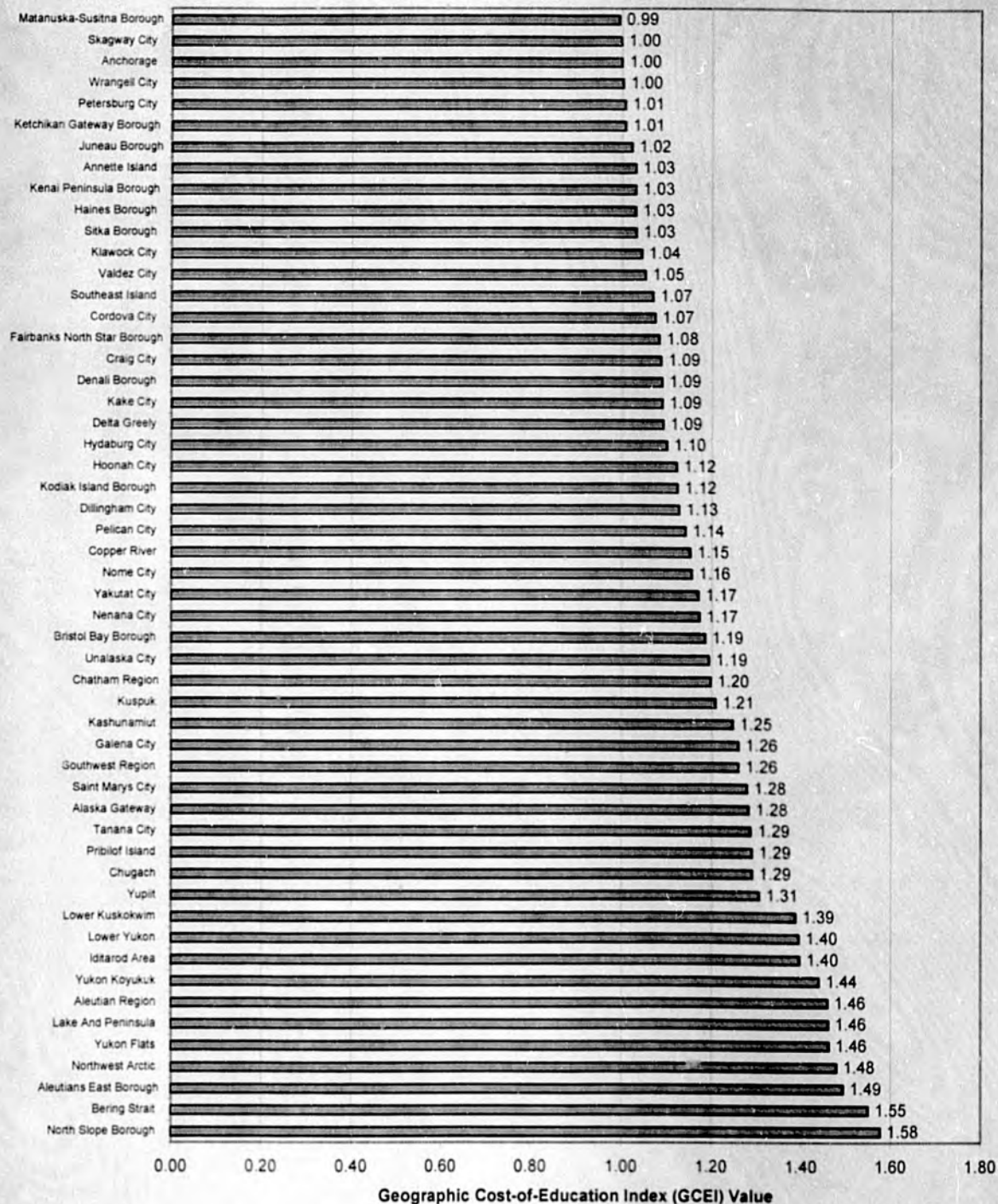
Based on the study's analysis, the purchasing power of the educational dollar varies tremendously in the State of Alaska. The highest-cost district needs to spend about 1.6 times what the lowest cost district spends in order to provide comparable educational services.

Another way to understand these variations is to select a benchmark district to which all districts can be compared. Following the conventional approach that has been used in Alaska for these kinds of studies, we use Anchorage, the largest and most urbanized district in the state, as the benchmark.⁵ Thus, the value for the GCEI in Anchorage has been arbitrarily set at 1.00. Using Anchorage as the base, the analysis of costs reveals that the North Slope Borough School District exhibits the highest cost of education, with an index value of 1.58 (Exhibit II-1). This means that this district needs to spend about 58 percent more than the Anchorage School District to provide comparable educational services to the students it serves.

On the other end of the spectrum is the Matanuska-Susitna Borough School District, with an index value of 0.99. This means that Matanuska-Susitna needs to spend about 1 percent less than the Anchorage School District to provide comparable educational services.

⁵ In most studies, the district attended by the average student is used as the benchmark school district. This is so that the GCEI, when applied to state aid allocations, will have no impact on the overall amount of aid to be allocated. That is, the GCEI would be neutral with respect to the total allocation of state education aid. In these situations, the district attended by the average student, which is in actuality a fictitious district that has been created purely for statistical purposes, is assigned a GCEI value of 1.00. In the case of Alaska, state policy makers have chosen to scale everything to Anchorage, which is far and away the largest school district in the state.

Exhibit II-1. A GCEI for Alaska School Districts



NOTES TO EXHIBIT: The districts listed on the vertical axis in this diagram are sorted in ascending order according to the value of the geographic cost-of-education index (GCEI), with the lowest on top.

Organizing the school districts by region (Exhibit II-2) reveals that the highest-cost districts in Alaska are located in the Far North (with average GCEIs of 1.38) and the Southwest (with average GCEIs of 1.31). The lowest-cost districts in the state are located in the Southeast. As discussed later in this report, the factor behind these numbers appears to be the impact of the degree of districts' remoteness on personnel salaries, transportation costs for goods and services, and travel costs for district staff. In addition, climatic factors have a significant impact on the cost of energy services. The attractiveness of living in the urban centers of Alaska in terms of access to shopping, medical services, and other cultural amenities clearly plays a role in personnel costs.

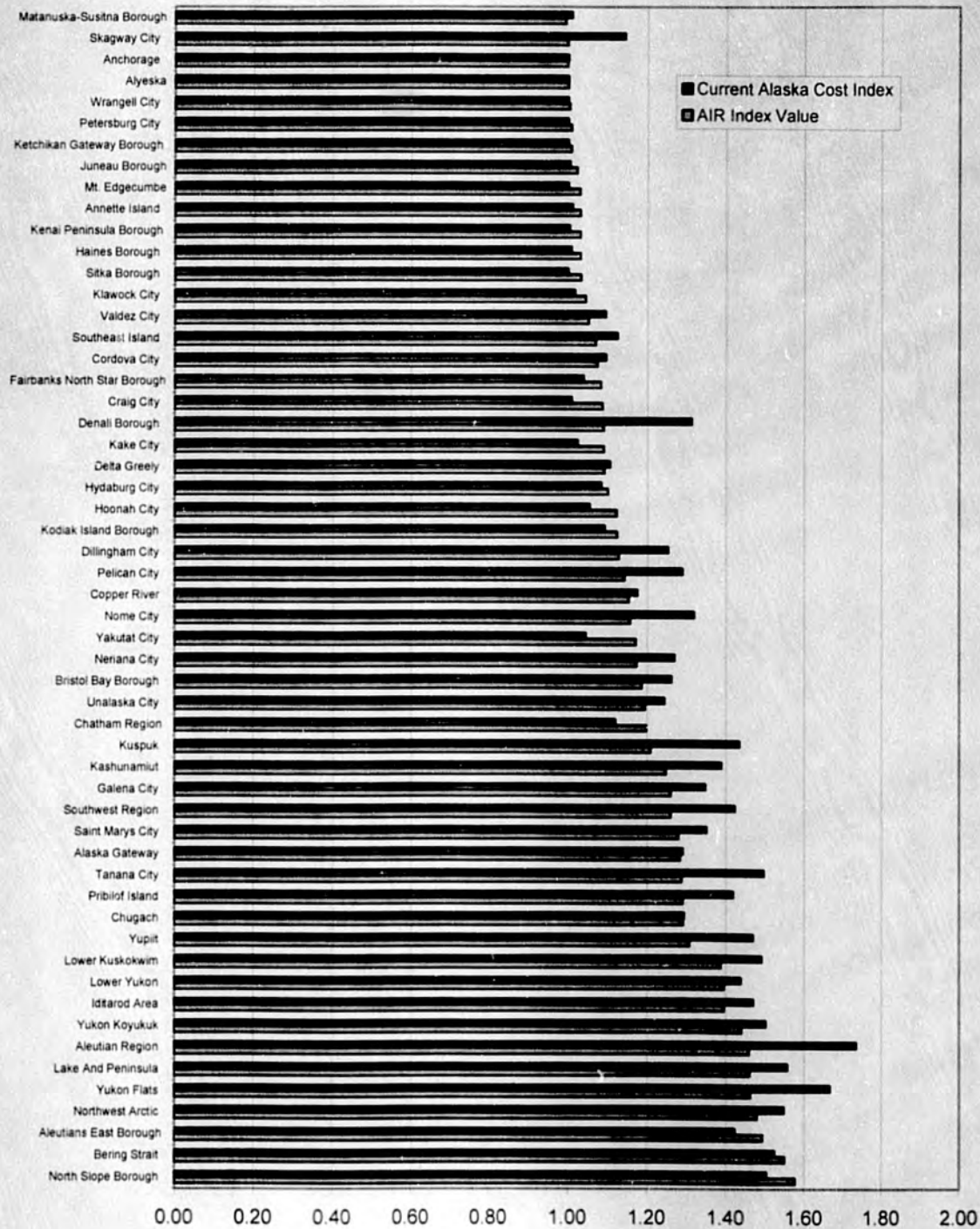
Exhibit II-2. Variations in the Geographic Cost of Education Index by Region

Region	Number of Districts	Mean	Standard Deviation	Minimum	Maximum
Statewide	53	1.20	0.17	0.99	1.58
Far North	10	1.38	0.15	1.16	1.58
Interior	3	1.09	0.00	1.08	1.09
South Central	9	1.11	0.11	0.99	1.29
Southeast	17	1.07	0.06	1.00	1.20
Southwest	14	1.31	0.11	1.13	1.49

Exhibit II-3 compares the GCEI derived from this study with the education cost adjustment that is the current law in Alaska. Districts are in ascending order according to the AIR GCEI calculated in the present study. Differences between these cost index values may reflect a combination of methodology differences and changes in the costs of educational services since the last cost index was calculated. The largest differences are most likely attributable to methodological differences underlying the two studies' calculations.⁶ The range, standard deviation, and mean values of the GCEI and the current Alaska cost index are quite similar. The AIR GCEI ranges from a low of 0.99 to a high of 1.58, while the range of the current Alaska cost adjustment is from 1.00 to 1.74. The standard deviation of the AIR GCEI is 0.17, and the standard deviation of the current adjustment is 0.21. Moreover, the correlation between the AIR GCEI and the Alaska cost index is 0.91.

⁶ The actual values of the two indices are presented for purposes of comparison in Exhibit I-6 In Appendix I of this report.

Exhibit II-3. Current Alaska Index Compared to the AIR GCEI



However, there are a number of districts that exhibit significant differences between the two index values. Nine districts exhibit a difference of 0.15 or more (positive or negative) and 17 districts exhibit a difference of 0.10 or more. A difference of 0.01 means a one-percent difference relative to the benchmark district of Anchorage. For example, the Aleutian Region district exhibits a GCEI of 1.46, while the current Alaska cost index is 1.74, a difference of 0.28. In addition, the Denali Borough, Kuspuk, Nome City, Pelican City, Southwest Region, Tanana City, Yukon Flats, and Yupiit School Districts exhibit GCEI values that differ by 0.15 or more from the current values.

On the other hand, slightly more than 70 percent (38) of the districts exhibit a GCEI with a less than 0.10 difference from the current Alaska cost index. Forty-four percent (24) of the school districts in Alaska exhibit less than a 0.05 difference from the current Alaska cost index.

The next few sections present separate discussions of the four major components of the overall GCEI.

III. Personnel Costs

The Methodology

Because expenditures on school personnel dominate school district budgets, previous research on geographic cost differences in education has focused on analysis of labor markets for school personnel.⁷ This has led to a growing recognition among education policy makers nationwide that districts in different parts of a state face different conditions in local labor markets, and that these conditions impact the ability of local school districts to recruit and employ comparable school personnel.

Many schools in Alaska are located in remote regions of the state, creating challenges in recruiting and employing professional school personnel. Costs of living are higher in the remote regions of the state because the cost of transporting consumer goods and services to these communities results in higher prices. In addition, access to cultural amenities and to shopping and medical facilities is more difficult in remote communities than it is in more urban areas such as Anchorage or Fairbanks. The degree of isolation can be significant, particularly during winter months, because of the time required to reach the more urban centers of the state. All of these factors impact the compensation (salaries and benefits) that must be paid to attract comparable school personnel.

This study addresses these personnel cost differences through sophisticated econometric models of the labor market for school personnel. The study goes beyond simply using average

⁷ For a summary of the early work done on this topic see Chambers (1981a).

wages or annual salaries; the analysis starts by examining all of the factors that are associated with variations in school personnel. For example, the econometric model includes personal characteristics, characteristics of job assignments, and characteristics of the schools, districts and regions in which school personnel live and work. Because of differences in the labor markets for subcategories of personnel, separate statistical analyses were conducted for teachers, school administrators, and classified personnel.

These econometric labor market models for school personnel then provide the basis for a series of simulations of the compensation levels that would be required if all districts employed *comparable* teachers, school administrators, and classified personnel. The key is comparability: what are the costs in different parts of the State of Alaska for school personnel with *comparable* levels of experience, education, and other demographic characteristics?

The Results

As one would expect, school personnel costs play a major role in explaining the variations in the overall costs of education across local school districts. The school personnel category accounts for a major portion of school district budgets, ranging in Alaska from 45 to 90 percent of total expenditures, with a median of 78 percent.

Exhibit III-1 shows the personnel cost differences among Alaska's school districts. This graph displays the district personnel index values, with the lowest at the top and the highest at the bottom. Using Anchorage as the basis for calculation of the index values (i.e., setting the Anchorage index to a value of 1.00), personnel costs range from a low of 0.93 in Southeast Island School District to a high of 1.28 in North Slope Borough School District. In other words, the highest-cost district pays, on average, about 28 percent more than Anchorage for comparable personnel, while the lowest-cost district pays about 7 percent less than Anchorage for comparable school personnel. Comparing these two districts to each other, North Slope pays 38 percent more than Southeast Island for comparable personnel.

Exhibit III-1: Personnel Cost Index

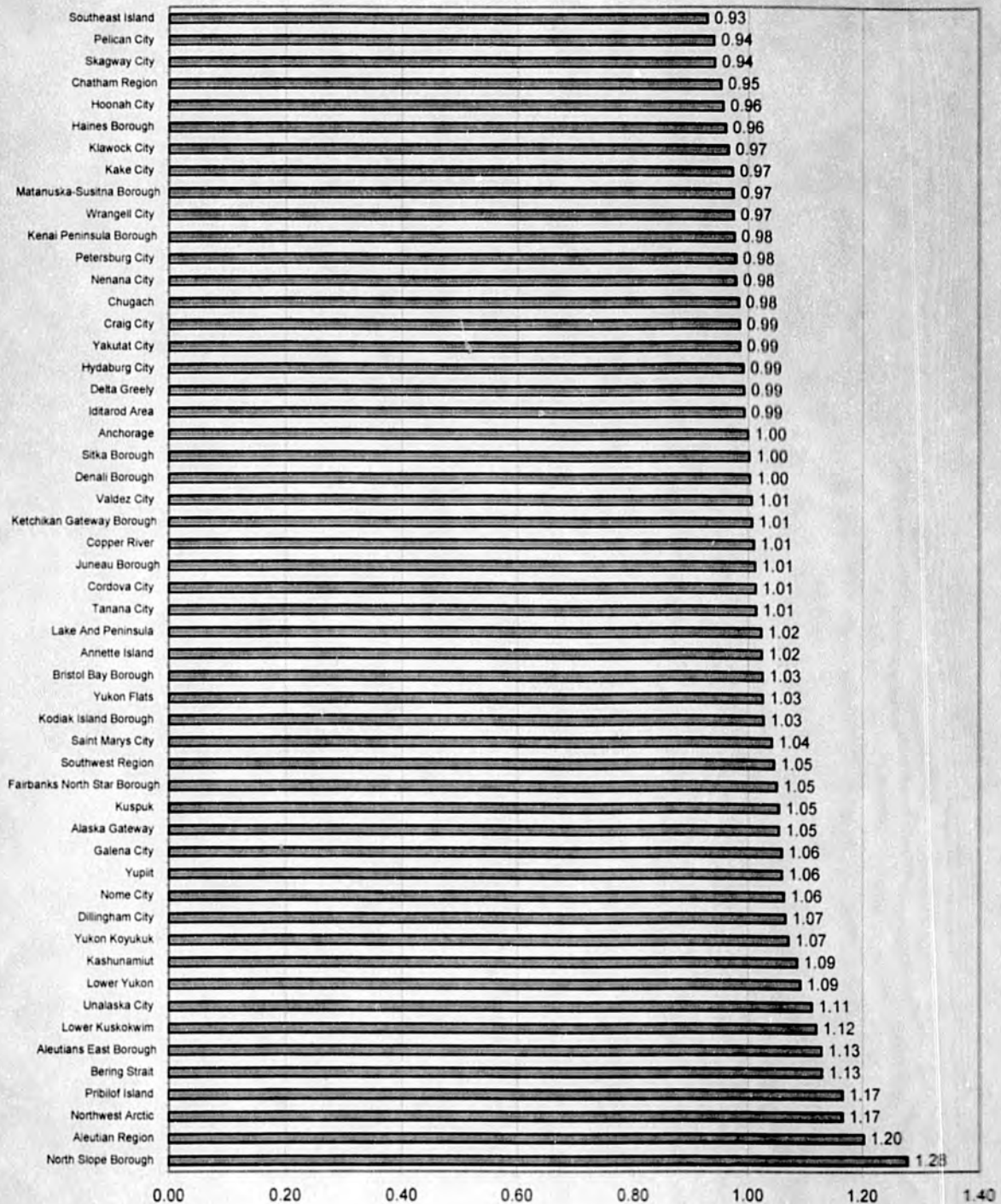


Exhibit III-2 displays the descriptive statistics associated with the personnel cost differences for various regions of the state. School districts located in the Southwest and Far North regions of the state exhibited the highest average costs while the districts located in the Southeast were among the lowest-cost districts in the state. In terms of distance from the nearest center of commerce, personnel costs generally were higher for the districts furthest (500 miles or more) from a major center of commerce, with an average index of 1.16 (16 percent above Anchorage).

Exhibit III-2. Descriptive Statistics for Personnel Cost Indices By Region⁸

District Characteristics	N	Mean	Standard Deviation	Minimum	Maximum
Region of the state					
Statewide	53	1.03	0.07	0.93	1.28
Far North	10	1.08	0.09	0.98	1.28
Interior	3	1.02	0.03	0.99	1.05
South Central	9	1.01	0.03	0.97	1.05
Southeast	17	0.98	0.03	0.93	1.02
Southwest	14	1.09	0.05	1.02	1.20
Distance from the nearest center of commerce*					
Statewide	53	1.03	0.07	0.93	1.28
Less than 10 miles	6	1.00	0.04	0.93	1.05
At least 10 miles	4	0.99	0.03	0.96	1.02
At least 50 miles	12	0.97	0.02	0.94	1.00
At least 100 miles	23	1.04	0.04	0.98	1.12
At least 500 miles	8	1.16	0.07	1.06	1.28

*The centers of commerce used for this analysis include Anchorage, Fairbanks, Juneau, Ketchikan, and Kodiak

IV. Costs of Energy Services

The Methodology

There are several factors that influence each district's energy costs. Alaska's significant climate variation across districts affects the consumption of fuels and energy required to provide heat to classrooms and school buildings. In addition, the degree of remoteness of each district

⁸ Data sources: Teacher data from regression analysis for teacher salaries and benefits. Administrator data from tobit model for administrators. Classified personnel data from regression analysis for classified personnel salaries.

affects the prices of these fuel and energy sources. Also, some districts may operate older school buildings that require more fuel or energy to maintain similar comfort levels within classrooms.

The study's approach to calculating energy costs relies on an engineering computer simulation model. This model requires the development of prototype buildings to permit estimation of the energy requirements to provide heating, cooling, and power for all aspects of school and district operations. The AIR research team (including SBW Consulting engineers) consulted with officials in the Alaska Department of Early Education and Development (ADEED), the TWG, and the Anchorage School District to develop a series of prototype school buildings. Each prototype building encompasses a set of structural and operational characteristics of school buildings including square footage; the allocation of square footage among end uses (classroom and office space); the levels of insulation in the walls and ceilings; the heating, ventilation, and air conditioning systems; the lighting and equipment power densities; and the hours of operation. In addition, each prototype is associated with a specific climate parameter expressed in terms of heating degree-days.

The parameters that define each prototype are entered into an engineering simulation model to estimate the energy consumption levels required in the different climatic regions of the state. Part of this model also simulates the different efficiency levels of alternative sources of energy such as natural gas, electricity, fuel oil, wood, and liquid propane. The results of these prototype simulations serve as points from which equations are calculated to capture each school's individualized projected energy consumption, given its specific heating degree-days and fuel type used for each end use.

Finally, the estimated energy consumption levels necessary for the prototype buildings in different climatic zones are combined with information on the unit energy prices at each school site throughout Alaska to estimate the cost of energy services. With the assistance of the TWG, the AIR research team collected data on these price levels for each school site from the school district offices. Energy costs were calculated at the school building level and aggregated to the district level using the square footage of school buildings at each site as weights.

The Results

The results of this analysis (Exhibit IV-1) show a range of index values for the cost of energy services per square foot from 0.74 in the Juneau School District to 9.31 in the North Slope School District. Typically, the school districts with the highest index values are located within the very cold climate zone, largely represented by the Far North region. High costs in less cold districts can be attributed to the relative costs of energy sources faced by these districts. For example, energy prices per BTU (*British Thermal Unit*) within the Bristol Bay School District

were second only to the North Slope Borough School District.⁹ This resulted in a relatively high index value for Bristol Bay that was not caused by climate. For the North Slope Borough School District, it is clear that the combination of an extremely cold climate and the highest energy costs give this district the highest index value. It is likely that a significant component of these differences in energy prices can be attributed to variations in the cost of transporting fuels to the different school sites.

Located near the Bristol Bay School District is the Dillingham City School District. Unlike its neighbor, Dillingham has a low energy cost index value. While Dillingham is still in a high-cost area for energy prices, schools in the Dillingham School District generate their own electricity and use the waste heat to heat their schools, thereby saving a substantial amount of money. This is also reflected in their assigned budget weight for energy, which is among the lowest in the state at 6 percent of the total operating fund.

⁹ A recent report entitled "Bristol Bay, Alaska, Comprehensive Economic Development Strategy" highlights the high cost of energy in the region and can be found on the Department of Commerce and Economic Development website at: http://www.dced.state.ak.us/cbd/oedp/pubs/BBNA_CEDS2002.pdf

Exhibit IV-1. Energy Cost Index

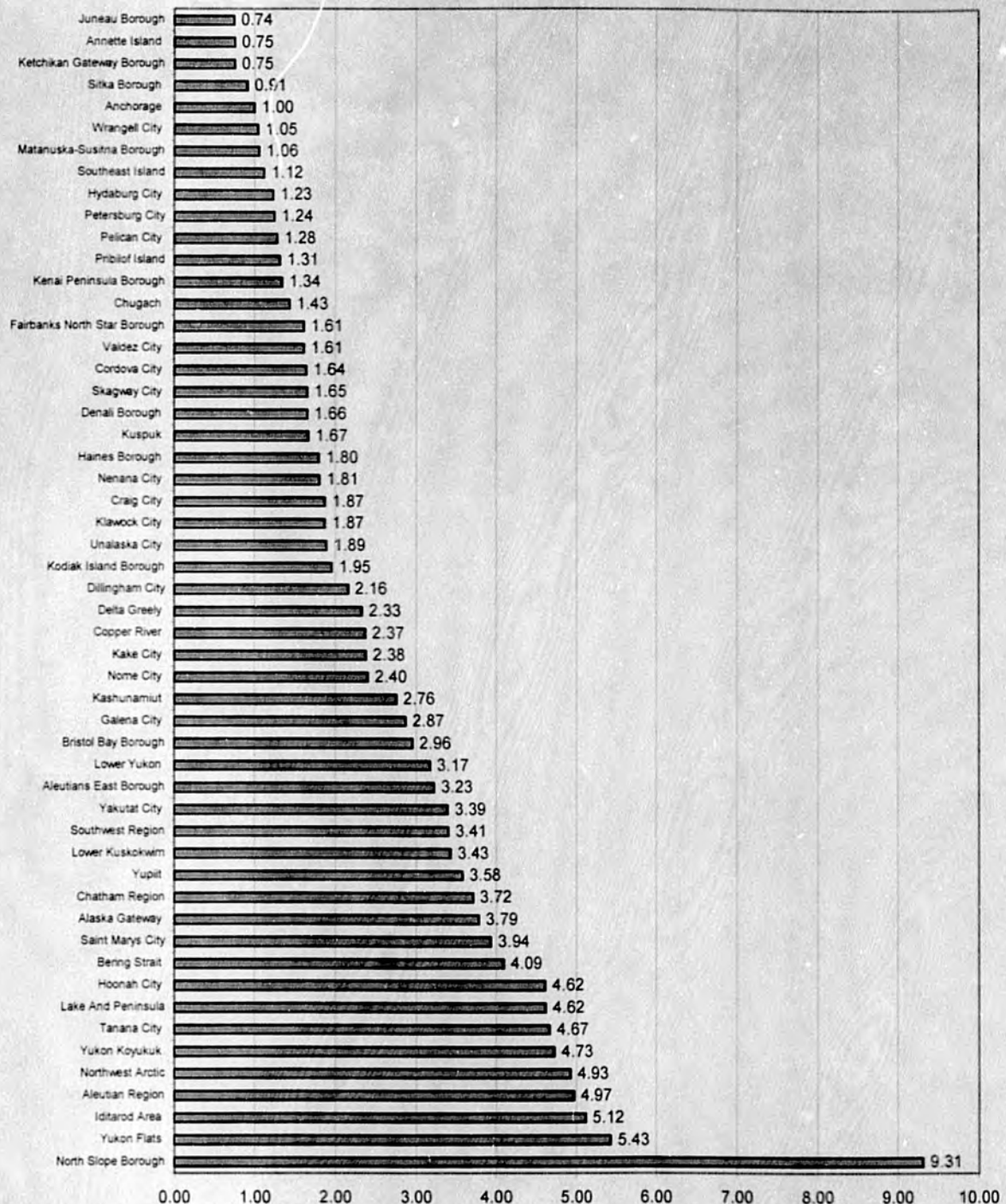


Exhibit IV-2 reveals that geographic location plays a significant role in the energy index values. Those districts located in the Far North region typically face a climate harsher than the rest of the state, and the cost of transporting fuel supplies here can also be much higher. Outside

of the Far North region, the highest-cost districts tend to be in the Southwest region, where they may also face high costs for transportation of fuel. Schools located in the Far North region tend to have more efficiently insulated school buildings than school districts in other regions, but the fact remains that they face higher costs to heat their buildings.

Exhibit IV-2. Comparison of Energy Index Values by Region

Region	N	Mean	Standard Deviation	Minimum	Maximum
Statewide	53	2.65	1.64	0.74	9.31
Far North	10	4.54	2.09	1.81	9.31
Interior	3	1.87	0.40	1.61	2.33
South Central	9	1.80	0.86	1.00	3.79
Southeast	17	1.79	1.13	0.74	4.62
Southwest	14	3.08	1.06	1.31	4.97

V. Costs of Supplies, Materials and Small Capital Items

The Methodology

Shipping cost is the major factor underlying cost differences in supplies, materials, and capital equipment across local schools and districts in Alaska. The base prices of supplies purchased by districts in different parts of the state may vary to some extent because of volume purchasing, but this difference is small compared to the difference associated with the cost of transporting these items from the major centers of commerce to the remote areas of the state. After extensive deliberations between the TWG and the AIR research team, a limited set of items was selected to represent the purchases of school districts. This set of items reflects the impact of transportation costs on the final prices paid.

The index developed for this portion of the GCEI is based on variations in the prices paid across the state for one case (10 reams) of white copier paper (8.5" by 11") and one 4' by 5' windowpane. AIR obtained this price information with a district questionnaire that requested information for each of the schools within the district. The total cost of the items reflects not only the cost of the item itself, but also the shipping and storage costs incurred for delivery of the item to the specific school site. The ream of copier paper was chosen as a proxy for instructional supplies, such as textbooks, and also for office supplies consumed by administrators. The windowpane represents the cost of bulky items that would commonly be purchased out of capital outlay expenditures. For districts located in the Far North region, this was usually a triple-paned

window, while schools in less harsh climates more often purchased single- or double-paned windows.

The district questionnaire took into account the fact that using only one method of transportation is not feasible for some districts. For example, districts located above the Bering Strait will not always be able to ship goods by barge. The questionnaire asked for the percentage of time an alternative shipping method was utilized for each school site. All calculations were made at the school level and then aggregated to the district level by pupil enrollment weights.

The Results

Exhibit V-1 displays the aggregate cost index for supplies, materials, and small equipment items. The districts are sorted in order from lowest to highest cost. The costs range from a low of 1.00 in Anchorage School District to a high of 6.81 in Pelican City School District.

Exhibit V-2 shows the relationship between the cost of goods and district size (measured by enrollment). In general, larger districts tend to exhibit lower costs of goods. Larger districts are able to purchase items in bulk more easily than smaller districts. Another factor contributing to the lower index values for districts with greater enrollments is their proximity to the suppliers of these goods. These districts operate in or near Alaska's major centers of commerce. Transportation costs are lower, and competition among suppliers in these centers of commerce drives down prices.

These trends do not hold true for all districts. Chugach and Chatham School Districts are relatively close to Anchorage and Juneau, respectively. However, they have index values above the average value in this input category. Both districts reported high transportation costs, as did Pelican City School District. All reported prices of goods were verified for accuracy with the respondent by the data collectors at AIR and by representatives from ALASBO. Any corrections necessary were made, and the remaining data have been deemed accurate.

Exhibit V-1: Index for the Cost of Supplies, Materials, and Small Capital Equipment

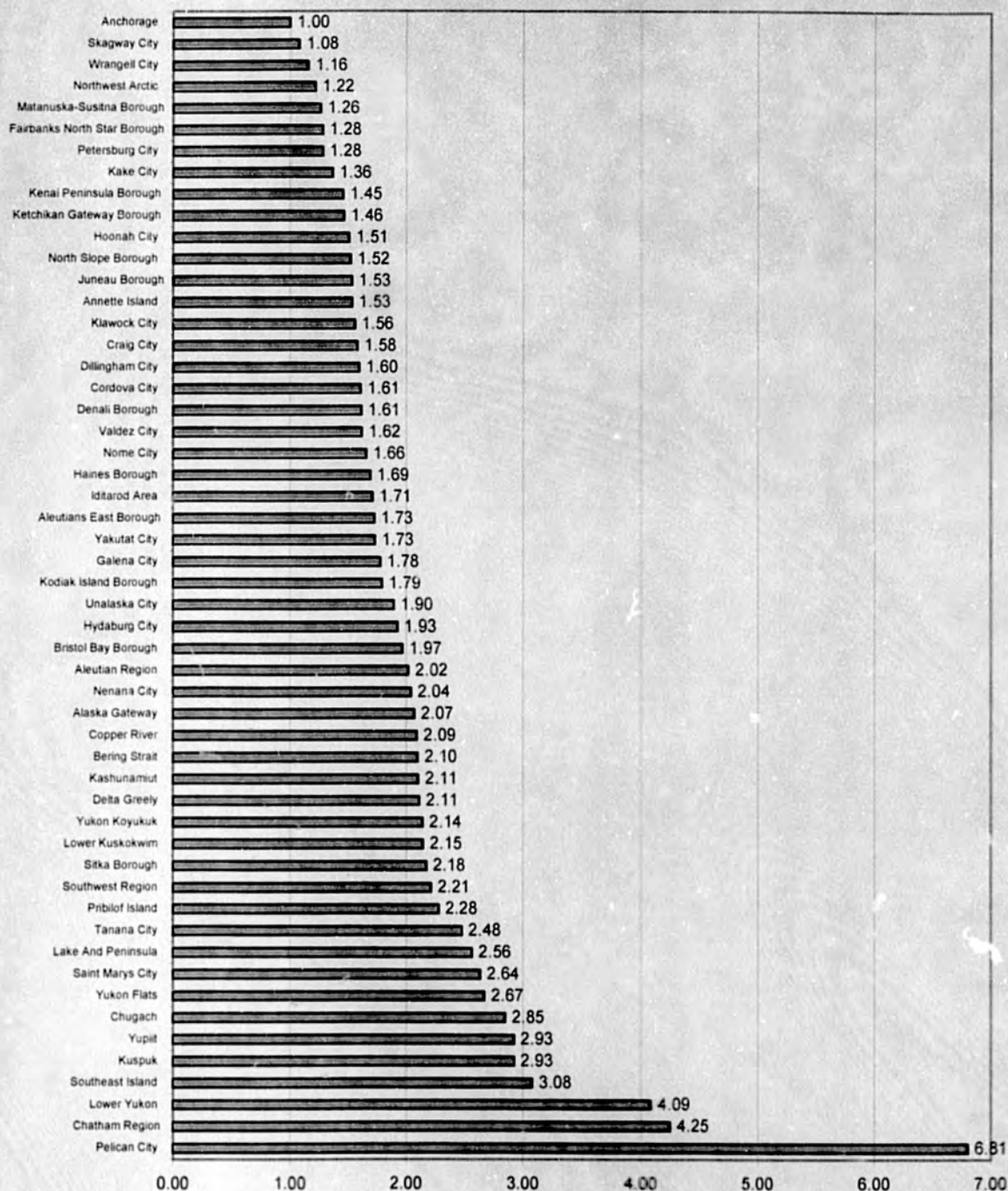


Exhibit V-2. Comparison of Total Goods Index Values by District Enrollment

Region	N	Mean	Standard Deviation	Minimum	Maximum
Statewide	53	2.05	0.94	1.00	6.81
0 to <250	13	2.50	1.53	1.08	6.81
250-999	25	1.98	0.52	1.16	3.08
1000-2499	6	2.19	1.00	1.22	4.09
2500-9999	6	1.69	0.27	1.46	2.15
10,000+	3	1.18	0.16	1.00	1.28

VI. Costs of Travel***The Methodology***

Because of the remote locations of some schools and communities in Alaska, travel costs can have a significant impact on the expenditures necessary to operate schools in the state. Travel cost affect the cost of maintenance services, itinerant instructional services, professional development activities, administrative oversight of school activities, and statewide meetings for professional staff. The distances of the district offices from the centers of trade impact access to skilled maintenance personnel and technicians.

With the advice of the TWG, the AIR research team estimated the cost of a specified service call by a skilled technician. The cost included the amount of time for the call (16 hours), the cost of the time required to travel to the school site, and the cost of transportation, lodging (where necessary), and meals. The rate for the service technician was based on the Anchorage rate adjusted to the nearest center of trade. For schools located in a center of trade, there was generally no cost associated with travel time. The cost of transportation was based on the mode of transportation most commonly used between the school site and the corresponding center of trade (i.e., airfare for air travel, or mileage reimbursement for automotive travel). Lodging and meals were set at \$150 per day.

Travel costs associated with itinerant services and other services necessitating trips between the district office and the school site were estimated based on the appropriate mode of transportation and whether or not such travel was commonly associated with an overnight stay (common in some remote locations because of limited schedules of carriers). The data on the modes of transportation and the common airfares paid for travel were gathered through the questionnaires administered during the data collection process. Similarly, travel for statewide

meetings was based on the cost of transportation, lodging, and meals for a trip to Anchorage from each of the school sites.

All travel costs and the costs of the maintenance services were assigned to the school site and aggregated to the district level based on the relative enrollment of the school. The three subcomponents of travel were aggregated into a single index for travel using the appropriate budget share weights described earlier.

The Results

The majority of the low-cost districts in this index are city school districts and districts located near Anchorage or in another relatively accessible area of the state. These districts tend to have very low costs associated with travel between the district office and the school(s) in the district. For those districts located near Anchorage, travel costs to Anchorage for statewide training tends to be a relatively low-cost item.

Districts located close to a center of commerce enjoy low costs for maintenance service travel, resulting in lower cost index values in this travel input index. This is evidenced in Exhibit VII-2, as there is a general trend of higher index values associated with travel in the more remote districts of the state.

Exhibit VII-3 reveals that districts in the middle ranges of enrollment (i.e., between 1,000 to 2,499 students) have the highest costs of travel relative to smaller or larger districts. This can be confirmed intuitively: districts with the highest enrollment numbers are located in areas where they have easier access to travel and readily available maintenance services, combined with a concentration of schools near the district office. Districts comprising the lowest enrollment category tend to be city school districts, making travel cost between schools and the district office almost negligible. However, the average travel index value for these schools is higher than for the largest district enrollment category. Since some small districts are in remote areas of the state, they will have higher travel index values associated with them. Districts with mid-range enrollments usually span a large area and can be in very remote areas of the state, thus generating higher index values for the districts in these categories.

Exhibit VI-1. Index for the Cost of Travel

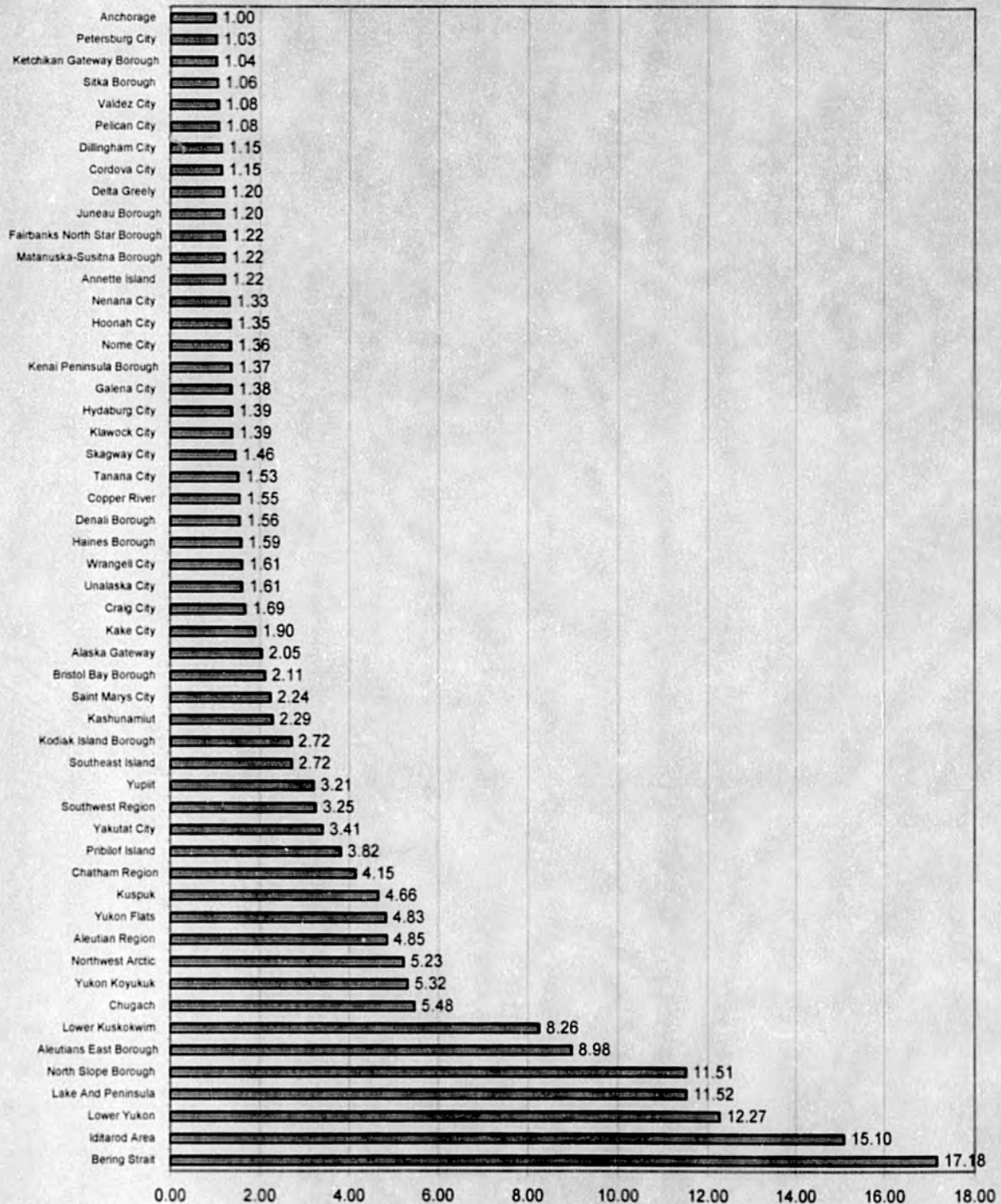


Exhibit VI-2. Comparison of Total Travel Index Values by Distance

Region	N	Mean	Standard Deviation	Minimum	Maximum
Statewide	53	3.51	3.78	1.00	17.18
Less than 10 miles	6	1.42	0.65	1.00	2.72
At least 10 miles	4	1.29	0.09	1.22	1.39
At least 50 miles	12	2.01	1.36	1.06	5.48
At least 100 miles	23	4.06	3.96	1.03	15.10
At least 500 miles	8	6.82	5.43	1.36	17.18

Exhibit VI-3. Comparison of Total Travel Index Values by District Enrollment

Region	N	Mean	Standard Deviation	Minimum	Maximum
Statewide	53	3.51	3.78	1.00	17.18
0 to <250	13	2.62	1.52	1.08	5.48
250-999	25	3.35	3.54	1.03	15.10
1000-2499	6	8.10	6.56	1.06	17.18
2500-9999	6	2.66	2.81	1.04	8.26
10,000+	3	1.14	0.13	1.00	1.22

VII. Overall Geographic Cost of Education Index

This project has undertaken a comprehensive analysis to address the various factors that affect the ability of districts in Alaska to access comparable school resources in the different regions of the state. The end product is a geographic cost-of-education index (GCEI), which addresses the following question:

How much more or less does it cost to recruit and employ comparable school personnel (i.e., teachers, administrators, and classified personnel); and to pay for comparable energy services (i.e., heating, lighting and power); comparable supplies, materials, and small capital equipment; and travel costs as they affect maintenance and operations, itinerant services, professional development, administrative oversight, and statewide professional meetings in different geographic locations around the state?

The GCEI is a cost adjustment index that permits translation of nominal dollar values into *real* dollars of purchasing power for school resources and services. It can be used to provide equal purchasing power by adjusting funding levels for individual school districts.

Determination of Budget Shares and Application of the Index Values

To calculate the GCEI, the AIR research team first needed to estimate the budget shares allocated by each district for each of the inputs. AIR utilized audited budget data provided by the ADEED. The budget shares were calculated based on the "operating budget" reported in the audited budget files. The operating budget data are organized into a matrix by function and object of expenditure. The assignment of each function and object cell in the budget matrix is presented in the *Technical Report* for this project. Once the budget cells were assigned to a component cost index, AIR calculated the index values for the four categories of inputs: personnel, energy, goods, and travel. A final overall GCEI was then calculated using the aggregate budget shares for each of these four categories of inputs. Exhibit VII-1 shows how each of the index values for the four major categories of inputs contributes to the overall GCEI. This exhibit reflects the overall contribution of each of the four input categories based on two elements: (a) the *relative costs* (i.e., reflected by the component geographic cost index) and (b) the *relative budget weights* (i.e., each district's budget share averaged with that of Anchorage for each input category). To arrive at the overall GCEI, one needs simply to multiply the four input category values in the exhibit together.

EXHIBIT VII-1(a). GCEI Values and the Relative Impact of the Four Component Indices

District Name	GCEI	Personnel Contribution	Energy Contribution	Travel Contribution	Goods Contribution
Alaska Gateway	1.28	1.04	1.15	1.03	1.04
Aleutian Region	1.46	1.16	1.08	1.11	1.06
Aleutians East Borough	1.49	1.10	1.08	1.23	1.03
Anchorage	1.00	1.00	1.00	1.00	1.00
Annette Island	1.03	1.02	0.98	1.01	1.02
Bering Strait	1.55	1.10	1.12	1.22	1.04
Bristol Bay Borough	1.19	1.02	1.08	1.05	1.02
Chatham Region	1.20	0.96	1.10	1.07	1.06
Chugach	1.29	0.99	1.03	1.16	1.10
Copper River	1.15	1.01	1.05	1.02	1.06
Cordova City	1.07	1.01	1.03	1.01	1.02
Craig City	1.09	0.99	1.03	1.05	1.02
Delta Greely	1.09	0.99	1.05	1.01	1.03
Denali Borough	1.09	1.00	1.04	1.02	1.03
Dillingham City	1.13	1.05	1.04	1.01	1.02
Fairbanks North Star Borough	1.08	1.04	1.02	1.01	1.01
Galena City	1.26	1.04	1.08	1.02	1.11
Haines Borough	1.03	0.97	1.03	1.01	1.02
Hoonah City	1.12	0.96	1.12	1.02	1.02
Hydaburg City	1.10	0.99	1.01	1.02	1.07
Iditarod Area	1.40	0.99	1.19	1.14	1.03
Juneau Borough	1.02	1.01	0.99	1.01	1.02
Kake City	1.09	0.98	1.06	1.04	1.01
Kashunamiut	1.25	1.07	1.06	1.04	1.06
Kenai Peninsula Borough	1.03	0.98	1.01	1.02	1.02
Ketchikan Gateway Borough	1.01	1.01	0.98	1.00	1.02
Klawock City	1.04	0.97	1.04	1.01	1.02
Kodiak Island Borough	1.12	1.02	1.04	1.03	1.03
Kuspuk	1.21	1.05	1.04	1.06	1.05
Lake And Peninsula	1.46	1.02	1.17	1.16	1.06
Lower Kuskokwim	1.39	1.10	1.09	1.12	1.04
Lower Yukon	1.40	1.08	1.09	1.12	1.06
Matanuska-Susitna Borough	0.99	0.98	1.00	1.01	1.01
Nenana City	1.17	0.99	1.03	1.01	1.14
Nome City	1.16	1.05	1.06	1.01	1.02
North Slope Borough	1.58	1.23	1.15	1.09	1.02
Northwest Arctic	1.48	1.13	1.16	1.12	1.01
Pelican City	1.14	0.95	1.01	1.00	1.18
Petersburg City	1.01	0.98	1.02	1.00	1.01
Pribilof Island	1.29	1.13	1.02	1.07	1.05
Saint Marys City	1.28	1.03	1.10	1.04	1.08
Sitka Borough	1.03	1.00	1.00	1.00	1.03
Skagway City	1.00	0.95	1.03	1.01	1.01
Southeast Island	1.07	0.94	1.01	1.07	1.06
Southwest Region	1.26	1.04	1.08	1.06	1.06
Tanana City	1.29	1.01	1.20	1.01	1.04
Unalaska City	1.19	1.09	1.04	1.02	1.03
Valdez City	1.05	1.01	1.03	1.00	1.02
Wrangell City	1.00	0.98	1.00	1.02	1.01
Yakutat City	1.17	0.99	1.09	1.06	1.03
Yukon Flats	1.46	1.02	1.26	1.08	1.06
Yukon Koyukuk	1.44	1.06	1.18	1.11	1.04
Yupit	1.31	1.05	1.07	1.08	1.08

EXHIBIT VII-1(b). GCEI Values and the Budget Weights of the Four Component Indices

District Name	GCEI	Personnel Budget Weight	Energy Budget Weight	Travel Budget Weight	Goods Budget Weight
Alaska Gateway	1.28	0.81	0.04	0.11	0.05
Aleutian Region	1.46	0.79	0.06	0.05	0.08
Aleutians East Borough	1.49	0.79	0.08	0.07	0.05
Anchorage	1.00	0.87	0.04	0.04	0.05
Annette Island	1.03	0.85	0.05	0.06	0.04
Bering Strait	1.55	0.80	0.06	0.08	0.05
Bristol Bay Borough	1.19	0.82	0.06	0.07	0.04
Chatham Region	1.20	0.83	0.04	0.08	0.04
Chugach	1.29	0.77	0.08	0.07	0.09
Copper River	1.15	0.81	0.05	0.06	0.08
Cordova City	1.07	0.84	0.05	0.06	0.05
Craig City	1.09	0.82	0.07	0.04	0.05
Delta Greely	1.09	0.84	0.05	0.06	0.05
Denali Borough	1.09	0.82	0.04	0.08	0.06
Dillingham City	1.13	0.84	0.05	0.05	0.05
Fairbanks North Star Borough	1.08	0.88	0.04	0.04	0.04
Galena City	1.26	0.66	0.06	0.07	0.20
Haines Borough	1.03	0.87	0.03	0.06	0.03
Hoonah City	1.12	0.81	0.07	0.07	0.05
Hydaburg City	1.10	0.75	0.05	0.06	0.12
Iditarod Area	1.40	0.78	0.05	0.11	0.06
Juneau Borough	1.02	0.89	0.04	0.04	0.04
Kake City	1.09	0.82	0.06	0.07	0.04
Kashunamiut	1.25	0.81	0.04	0.06	0.08
Kenai Peninsula Borough	1.03	0.84	0.07	0.05	0.04
Ketchikan Gateway Borough	1.01	0.86	0.03	0.06	0.05
Klawock City	1.04	0.84	0.04	0.07	0.04
Kodiak Island Borough	1.12	0.86	0.03	0.06	0.05
Kuspuk	1.21	0.83	0.04	0.08	0.04
Lake And Peninsula	1.46	0.77	0.06	0.10	0.06
Lower Kuskokwim	1.39	0.84	0.05	0.07	0.05
Lower Yukon	1.40	0.83	0.04	0.08	0.04
Matanuska-Susitna Borough	0.99	0.88	0.03	0.05	0.04
Nenana City	1.17	0.70	0.04	0.06	0.19
Nome City	1.16	0.85	0.04	0.07	0.04
North Slope Borough	1.58	0.84	0.04	0.06	0.06
Northwest Arctic	1.48	0.79	0.06	0.09	0.05
Pelican City	1.14	0.79	0.04	0.06	0.09
Petersburg City	1.01	0.85	0.03	0.07	0.04
Pribilof Island	1.29	0.81	0.05	0.07	0.06
Saint Marys City	1.28	0.79	0.05	0.07	0.07
Sitka Borough	1.03	0.87	0.04	0.04	0.04
Skagway City	1.00	0.82	0.04	0.06	0.07
Southeast Island	1.07	0.83	0.06	0.06	0.05
Southwest Region	1.26	0.81	0.05	0.07	0.07
Tanana City	1.29	0.78	0.03	0.12	0.05
Unalaska City	1.19	0.83	0.04	0.07	0.05
Valdez City	1.05	0.87	0.03	0.05	0.04
Wrangell City	1.00	0.85	0.04	0.05	0.05
Yakutat City	1.17	0.83	0.05	0.07	0.05
Yukon Flats	1.46	0.75	0.05	0.14	0.06
Yukon Koyukuk	1.44	0.78	0.06	0.10	0.05
Yupit	1.31	0.80	0.06	0.05	0.07

VIII. Recommendations and Implementation

This section presents six recommendations to the Alaska State Legislature (ASL) based on this report. In each case, the recommendation is followed by a discussion of some of the details associated with implementation.

RECOMMENDATION 1: Adopt a New Cost Adjustment. *The ASL should replace the current Alaska cost index for education with the new AIR GCEI.*

The purpose of this report has been to produce a GCEI that can be used to adjust nominal distributions of state aid to reflect real purchasing power for the individual school districts in Alaska. The GCEI produced in this report is intended to replace the previous cost adjustment developed by the McDowell Group more than five years ago. A major difference between the AIR and McDowell studies is that, while both rely to some degree on existing information about educational spending patterns in Alaska School Districts, the AIR GCEI applies a methodology that goes beyond simply reflecting current spending behavior by school districts. The AIR GCEI includes only those factors that are *beyond the control of local school district decision makers*.

RECOMMENDATION 2: Improve Personnel Databases. *The ASL should direct the ADEED to improve and maintain the quality of the school personnel data systems in order to permit utilization of the hedonic wage model for updating the personnel components of the GCEI in the future. Specifically, this recommendation includes the following components:*

- (a) Improve the quality of the current Certified Staff Assignment Reporting (CSAR) system by running routine auditing checks on the files to ensure that information reported on individual personnel are accurate.*
- (b) Convert the current data collected on certification for school personnel into an electronic form that is capable of being merged with the CSAR files.*
- (c) Develop a data system similar in structure to the CSAR for classified staff (e.g., paraprofessionals, clerical support staff, custodial and skilled maintenance staff, and technical or managerial staff) so that these data may also be utilized for analysis of patterns of compensation using the hedonic wage method.*

Two categories of variables are necessary for the analysis of personnel compensation: the *personal qualifications and job assignment characteristics* and the *cost factors*. The first group of variables includes those that we want to control for (hold constant) in the simulations necessary to calculate the personnel cost indices. However, it is important to have as many control variables as possible that might impact the patterns of employment of different categories of school personnel. While the current Certified Staff Accounting Report (CSAR) was sufficient for the analysis in this project, AIR believes that there are some improvements that ADEED

could make in its data collection procedures that would improve the quality of the database and analysis of personnel compensation.

First, AIR suggests that ADEED be charged with responsibility for maintaining and auditing the personnel files for accuracy. Data-checking routines should be put in place to examine changes over time and to search for inconsistencies in the information reported to ADEED. During the course of the analysis, AIR discovered some inconsistencies in the way data were reported for the same school district employees over time. For example, experience levels of the same employees over time sometimes decreased, and the birth dates for the same employees differed over time. If these data are to be used as the basis for future analysis of personnel compensation, it is important that they accurately reflect employee qualifications. It should be noted that if districts are informed that these personnel data will be used in the future to determine school funding distributions, they will be more likely to spend the time to ensure the accuracy of the records.

Second, AIR recommends that the ADEED consider using the certification applications of teachers to create electronic records of teacher examination test scores and colleges attended, both of which are on the applications. The test scores and the data on the colleges could be used by analysts to determine the average selectivity or quality of the colleges attended as a proxy for quality of the individuals who are employed by public schools. ADEED should also consider reorganizing the CSAR to permit analysts to ascertain the percentage of teacher assignments for which each teacher is appropriately or fully certified. ADEED should also attach a unique identifier to each certified employee, so that they may be more easily tracked throughout the years. These changes would provide a stronger and more comprehensive set of personal qualifications that would help in the analysis of variations in personnel compensation.

Third, given the differences in the labor markets for classified and certified personnel, AIR recommends that ADEED consider implementing a data collection for classified personnel similar to the one for certified personnel, adapted to the needs of that population of employees. Such a data collection should gather some of the following data elements, permitting future analyses to control more accurately for qualifications of classified staff:

- Identification codes to permit tracking of personnel over time
- Compensation in the form of hourly wage rates
- Job title (e.g., school secretary, custodian, skilled maintenance, teacher aide)
- Total hours of work per week and per year
- Educational preparation (e.g., high school diploma, vocational training in a relevant field)
- Years of experience in this type of work
- Years working for the present district
- Date of birth

- Gender
- Race-ethnicity

While AIR collected some of these data during this project, it was clear that many districts did not keep all of this information in an easily accessible form. Establishing such a regular and periodic data collection would provide the state with a valuable source of information about staffing of public schools and a source of data that could be used to analyze patterns of compensation for updating the GCEI. Having data that would allow tracking these patterns over time would allow ADEED to determine the stability of these patterns of variation, which is currently not possible given the single year of data collected for the present study. We do not know the extent to which turnover might be a factor in analyzing the patterns of compensation of classified personnel, as there were no time series data that would allow us to determine turnover rates as we were able to do for certified personnel.

RECOMMENDATION 3: Adopt Data Collection on Non-Personnel Elements. *AIR recommends that the ADEED develop regular and periodic data collections to gather information on the prices of energy services; the prices of certain supplies, materials, and small capital equipment; and the prices of travel between the schools and district office and the district office and Anchorage.*

While some of the factors that affect the costs of non-personnel inputs will not change substantially (if at all) over time, there are a number of factors that may be subject to change on a year-to-year basis. For example, it is expected that the following elements involved in the calculation of the non-personnel cost indices will be subject to change over time:

- prices of energy sources (e.g., heating oils or utility rates)
- airfare or other travel costs used to determine the cost of traveling between the school sites and the district office and between the district office and Anchorage or other centers of commerce
- delivered prices of the selected items used to estimate the relative cost of transporting goods to the districts from the centers of commerce

AIR suggests that the ADEED adapt the AIR data collection instruments for collecting some of the critical elements used as part of the analysis contained in this report. The procedures AIR utilized for the current project are relatively efficient and could easily be adapted with the help of school business officers such as those who served on the TWG for this project.

A key ingredient to the success of this kind of data collection is establishing each component as a standard part of the reporting system by ADEED. ADEED should expect a 100

percent response for maintaining and updating the GCEI, and district officials will adapt their own database systems to facilitate their ability to respond to such requests for data.

RECOMMENDATION 4: Frequency of Updates. *AIR recommends that the ASL conduct a study of school district cost differences at an interval of approximately every three to five years.*

Previous research suggests that the GCEI values are not likely to change very much from one year to the next or, for that matter, over a period of years. Such cost indices reflect relative differences in the costs of educational services. That is, while the absolute prices of certain inputs (e.g., the wages of school personnel) may change over time, the factors that affect the differences in prices across local school districts do not change very rapidly over time. Indeed, Chambers has done numerous studies of wage differences across school districts in the U.S., and has found that the correlations between these index values estimated at different points in time are quite high. Chambers (1981c) reported that the correlations between the Missouri GCEI for the 1974-75 and 1975-76 school years was 0.94. In California, the correlation across two different years, with a major property tax limitation measure passed between the two years (the famous Proposition 13), was 0.87. In a nationwide study of geographic cost differences using data for 1987-88, 1990-91, and 1993-94 (Chambers, 1997a), the correlation between the geographic cost indices for each pair of years (87-88 with 90-91, and 90-91 with 93-94) was 0.98, while the correlation across the six-year span was 0.96.

As a dramatic test of how such indices change over time, we decided to take the equivalent of the GCEI index values developed out of the previous Alaska cost study conducted by Chambers and Parrish (1984) and compare them to the values calculated in the current project.¹⁰ The correlation between these two indices, which were calculated 18 years apart, exceeded 0.85.

The analysis of the Alaska personnel data is consistent with the findings of previous research on the stability of the index values over time. As part of our current project, the AIR research team acquired the personnel data files for four different school years from ADEED. Using these data, we were able to estimate a variety of statistical models and test the stability of these index values for different years. Correlations among the personnel indices calculated for different years were all well above 0.90, and for adjacent years these correlations were above

¹⁰ The earlier study by Chambers and Parrish was designed to develop a more comprehensive model of the cost of an "adequate" education in Alaska schools and included measures of cost differences arising out of differences in pupil need, scale of district and school operations, and the prices of comparable school inputs. Thus, the implicit cost index calculated from this model is not strictly comparable to the GCEI calculated in this report. In part this results from the fact that the budget weights used to aggregate the component index values into an overall index are based on the service delivery systems specified by a committee of educators selected from school districts in Alaska. Nevertheless, the basic component indices from which the 1984 GCEI was calculated were developed using methods very similar to those used in the current study.

0.95. (The actual parameter estimates for these statistical models are presented in Appendix E of the *Technical Report* along with the correlations among all of the indices.)

The personnel components, which dominate the GCEI calculations, tend to be stable over a five to six year period of time. The non-personnel elements may tend to vary over a shorter time period, but there are no data other than the overall patterns to rely on for some assurance on these non-personnel components. Thus, AIR suggests that five-year studies on personnel are likely to be sufficient for changes in that component. However, it would be useful for further analysis of the patterns of change in the non-personnel components to be conducted over the next few years to explore how rapidly these components change. Given that the overall patterns over an 18-year period have been fairly stable, the non-personnel components could be done every three years until a database has been developed to sufficiently test the stability of these components. The energy component relies heavily on an engineering component that predicts the energy consumption levels, and this relies heavily on climatic norms that do not change dramatically over time. However, energy costs are also impacted by price differences in the energy fuel sources. Travel costs and other prices of goods do change from year to year, but much of the difference in these is associated with relative distances and the associated travel or transportation costs between points in Alaska. While these may change over time, the relative differences may not vary as much as the absolute values.

Recommendation 5: Use an Economist for Labor Market Analyses. *AIR recommends that the ASL employ or contract with a professional economist or an individual with proven experience and training in labor market studies to conduct the analyses of the compensation of school personnel that underlie the personnel cost index components.*

It is important to employ an individual with experience in labor market analysis and in the use of procedures such as the hedonic wage model. While the techniques appear fairly simple on the surface, this analysis does require an understanding of the conceptual framework and its limitations in empirical application. There are some significant judgments that need to be made in the selection of the independent variables, the measurement of the dependent variable, the choice of functional form, and the application of statistical techniques that require highly specialized training and experience. Employing an economist ensures that the person conducting future studies is familiar with standard techniques of analysis of labor markets. Because of changes over time in the labor markets, one cannot simply re-estimate the exact equations used for the current analysis of school personnel. It may also be important to take into account the potential for new measures of school, district, and regional characteristics that may be included in this analysis.

RECOMMENDATION 6: Phase in the New Index. *AIR recommends that the ALS develop procedures to phase in new GCEI numbers over time.*

It is important to recognize that the index values derived from the econometric models described in this report represent only approximations to the complex, real-world transactions that make up the labor markets for school personnel. While cost adjustments do not change rapidly over time, there are a number of factors that may result in some significant changes in the relative costs over time. For the current study, a completely different methodology was used to calculate the new GCEI than was used for the current district cost adjustment. In the future, even with a constant methodology, there may be changes in the index numbers that could have substantial impact on district budgets. Some of this occurs because of the statistical nature of the procedures used to estimate these index numbers. Even these estimates' relatively small standard error of one percent implies a confidence interval of plus or minus two percent. This means that over a five-year period, changes of as much as four percent could easily be accounted for by statistical error alone. A four percent change in budgets can mean hundreds of thousands of dollars in the budget of a given district. Therefore, in order not to cause any major disruptions in the flow of services, the ALS should consider methods for adjusting or phasing in new GCEI numbers over a period of approximately five years. For example, the allocations of aid could be adjusted so that any gap in funding resulting from changes in the GCEI over time would be closed at a rate of, for example, 20 percent per year. At the end of a five-year period, the full impact of the index value would be felt. Alternatively, the state could adopt a moving average technique that averages the values of the indices over a period of time (e.g., three years) so that changes are less disruptive.

Bibliography

- Alexander, Celeste D, Timothy Gronberg, Dennis Jansen, Harrison Keller, Lori Taylor, and Philip Uri Treisman. "A Study of Uncontrollable Variations in the Costs of Texas Public Education." Prepared for the 77th Texas Legislature (November 1, 2000).
- Augenblick, John and Kathleen Adams. "An Analysis of the Impact of Changes in the Funding of Elementary/Secondary Education in Texas: 1974/75 to 1977/78." Denver, CO: Education Commission of the States (1979).
- Barro, S.M. "The Impact of Intergovernmental Aid on Public School Spending." Unpublished doctoral dissertation, Stanford University, Department of Economics (1974).
- Brazer, Harvey E. "Adjusting for Differences Among School Districts in the Costs of Educational Inputs: A Feasibility Report." In *Selected Papers in School Finance 1974*. Washington, DC: U.S. Department of Health, Education, and Welfare, Office of Education (1974).
- Caves, Douglas W., Laurits R. Christensen, and W. Erwin Diewert. "Multilateral comparisons of output, input, and productivity using superlative index numbers," *The Economic Journal*, 92, 73-86 (March 1982).
- Caves, Douglas W., Laurits R. Christensen, and W. Erwin Diewert. "The economic theory of index numbers and the measurement of input, output, and productivity." *Econometrica*, Vol. 50, No. 6, 1393-1414 (November 1982).
- Chambers, J.G. "Measuring Geographic Differences in Public School Costs." Washington, DC: U.S. Department of Education, National Center for Education Statistics (working paper, 1997a).
- Chambers, J.G. "Volume III - The Measurement of School Input Price Differences: A Technical Report on Geographic and Inflationary Differences in the Prices of Public School Inputs." Washington DC: U.S. Department of Education, National Center for Education Statistics (1997b).
- Chambers, J.G. "Public School Teacher Cost Differences Across the U.S.: the Development of a Teacher Cost Index." Final report to the National Center for Education Statistics, Task 2 of the Elementary Secondary Education Statistics Project, NCES Report #95-758. Palo Alto, CA: American Institutes for Research (1995).
- Chambers, J.G. and T.B. Parrish. "The development of a program cost model and a cost-of-education index for the State of Alaska: Final Report, Volumes I-IV." Stanford, CA: Associates for Education Finance and Planning, Inc. (1984).

- Chambers, J.G. "Cost and price level adjustments to state aid for education: A theoretical and empirical review." In K. Forbis Jordan (Ed.), *Perspectives in state school support programs* (2nd annual yearbook of the American Educational Finance Association). Cambridge, MA: Ballinger Publishing Co. (1981a).
- Chambers, J.G. "The hedonic wage technique as a tool for estimating the costs of school personnel: A theoretical exposition with implications for empirical analysis." *Journal of Education Finance* (Winter, 1981b).
- Chambers, J.G. "The impact of bargaining and bargaining statutes on the earnings of public school teachers: A comparison in California and Missouri." *Review of Economics of Education* (Fall, 1981c).
- Chambers, J.G. and P.E. Vincent. "Interim development and progress report on alternative cost-of-education models and indices (SRI International Report Number 3)." Prepared for the Florida Department of Education (1980).
- Chambers, J.G. "Educational cost differentials across school districts in California." Report prepared under subcontract to the Education Finance Center of the Education Commission of the States for the School Finance Equalization Project of the California State Department of Education (1978).
- Chambers, J.G., James Smith, Thomas Parrish, and James Guthrie. "A Proposal for Determining Adequate Resources for New York Public Schools" Palo Alto, CA: American Institutes for Research and Management Analysis and Planning, Inc. (2002).
- Diewert, W.E. "Exact and superlative index numbers," *Journal of Econometrics* 4 (November 1976), 115-145.
- Diewert, W.E. "The economic theory of index numbers: a survey." Discussion Paper No. 79-09, Department of Economics, University of British Columbia (March 1979).
- Goldhaber, Dan D. "An Alternative Measure of Inflation in Teacher Salaries." In *Selected Papers in School Finance*, 1997. William J. Fowler, Jr., editor. Washington, DC: U.S. Department of Education, National Center for Educational Statistics (1999).
- Guthrie, James and Richard Rothstein. "Enabling 'Adequacy' to Achieve Reality: Translating Adequacy into State School Finance Distribution Arrangements." In Helen F. Ladd, Rosemary Chalk, and Janet S. Hansen (Eds.), *Equity and Adequacy in Education Finance*. Washington, DC: National Academy Press (1999).
- Grubb, W. Norton and James Hyman. "Construction Teacher Cost Indices: Methodological Explorations with California Unified School Districts." In *Selected Papers in School Finance 1975*. Washington, DC: U.S. Department of Health, Education, and Welfare, Office of Education (1975).

McMahon, Walter W. "Interstate Cost Adjustments." In William J. Fowler, Jr. (Ed.), *Selected Papers in School Finance*. Washington, DC: U.S. Department of Education, National Center for Educational Statistics (1994).

Rothstein, Richard and James R. Smith. "Adjusting Oregon Education Expenditures for Regional Cost Differences: A Feasibility Study." Sacramento, CA: Management Analysis & Planning Associates, L.L.C. (1997).

Wendling, Wayne. "Cost-of-Education Indices for New York State School Districts." Denver, CO: Education Commission of the States (1979).

Wynne, Mark and Fiona Sigalla. "The Consumer Price Index." *Federal Reserve Bank of Dallas Economic Review* (2nd quarter, 1994).



AMERICAN INSTITUTES FOR RESEARCH

Alaska School District Cost Study:

Volume II – The Technical Report

Submitted to:

Ms. Heather Brakes
Legislative Budget & Audit Committee
State Capitol, Room 111
Juneau, AK 99801-1182

Submitted by:

Dr. Jay Chambers
Dr. Lori Taylor
Joe Robinson
Phil Esra, Editor

With contributions by
Marc Schuldt, SBW Consulting, Inc.

January 2003

About the authors:

Jay G. Chambers is a Senior Research Fellow and a Managing Director of the Business Development Committee on Economic Indicators and Education Finance within the Education Program at the American Institutes for Research (AIR). He is also a member of the President's Commission on Excellence in Special Education and served on the Task Force on Finance and on Systems Administration. Dr. Chambers is currently President of the American Education Finance Association and a consulting professor at Stanford University's School of Education. He is a nationally recognized expert in school finance and educational cost analysis.

Lori L. Taylor, a consultant to the study, is a Senior Economist and Policy Advisor at the Federal Reserve Bank of Dallas. Dr. Taylor recently served as Principal Researcher on the Texas Cost-of-Education Project. The Texas CEI project developed a number of strategies for adjusting the Texas school finance formula to reflect variations in the cost of education.

Joe Robinson is a Research Associate at AIR, and has served as Project Manager for the Alaska School District Cost Study and the Nebraska Cost of Education Index Study. Before joining the AIR staff, Joe taught elementary school. He brings his experience as a teacher to his research projects. Joe holds a B.S. in Industrial and Labor Relations from Cornell University, and is continuing his education in SAS programming and higher mathematics courses.

Phil E. Esra is an Editor and Staff Writer at AIR. He has contributed to numerous articles and federal and state reports on education finance and special education issues.

Marc Schuldt, President of SBW Consulting, Inc., holds an M.S. in Mechanical Engineering from the University of Washington and a B.S. in Aeronautical Engineering from Purdue University. Mr. Schuldt has more than 22 years of experience as a project manager and lead engineer for studies of residential, commercial, and industrial energy use. He directs a team of SBW engineers who provide program design assistance and conduct commercial building energy audits for a number of public and private agencies.

Acknowledgements

This study benefited from the input and participation of many people. The study team would like to express their appreciation for the efforts of the Technical Working Group, whose members provided critical guidance over the course of the project. Members of the Working Group are as follows:

- Kerry Jarrell (Bering Strait SD)
- Michael Fisher (Fairbanks North Star Borough SD)
- Melody Douglas (Kenai Peninsula Borough SD)
- Dave Jones (Kodiak Island Borough SD)
- Dennis Niedermeyer (Lake and Peninsula Borough SD)
- Lucienne Harger (North Slope Borough SD)
- Barbara Stocker (Sitka Borough SD)
- Karen Goodwin (Southeast Island SD)

We greatly appreciate their support during the data collection phase of this project and owe a great debt of gratitude for helping us accomplish a 100 percent response rate on virtually all of our data collection instruments. They not only provided encouragement, but help to the beleaguered school business offices who attempted to interpret our needs. This group of hardy individuals also contributed to the design of our approach to addressing the costs of goods, services and travel.

The Oversight Committee also provided critical guidance, and helped coordinate our requests for data during the course of the study. Its members are Pat Davidson, Representative Hugh Fate, Eddy Jeans, David Teal, and Senator Gene Therriault.

In particular, Eddy Jeans and his staff were instrumental in helping us obtain data from ADEED and in serving as liaisons with school business officials and superintendents. Elizabeth Sweeney spent countless hours on the phone with the research team, both reviewing the Chart of Accounts and individual district fiscal audits, and guiding decisions about assignment of budget shares. Karen Lipson worked with the research team to quickly provide personnel data in whatever form necessary. Tim Mearig obtained important building and facility data for the energy prototype analysis and served as a liaison with school district facilities managers.

The study team would like to thank all of the school and district personnel who responded to our surveys and requests for information. Without their efforts, this study would not have been possible.

Joanne Lieberman, who laid the foundation for the project and managed it in its early stages, was instrumental in creating a well-conceived study, and demonstrated an uncanny ability to anticipate every contingency and plan for every eventuality.

Last, but certainly not least, we wish to acknowledge the hard work and significant effort put forth by Phil Esra, who has provided tremendous editorial support in developing this document.

Table of Contents

Chapter I. Introduction.....	1
Background and Motivation	1
Scope of the Study	2
Collaboration with Alaska Policy Makers and Educators	3
Overview.....	4
Chapter II. Overview of Study Results	5
Chapter III. School Personnel Inputs	10
Introduction.....	10
Controllable Versus Uncontrollable Factors in Analysis of School Personnel Inputs	10
The Comparable Wage Model	11
A Comparable Wage Model for Alaska.....	13
Wage Variations in Alaska	13
Caveats.....	16
Hedonic Wage Model	16
Data for This Analysis	17
The Salary Models	18
Models of Teacher Compensation	19
Models of Non-Teacher Compensation	20
Summary of Results.....	21
Chapter IV. The Costs of Energy Services	23
Approach to Energy Cost Analysis.....	23
Prototype Definition.....	24
Data Collection	24
Climate Zones	25
Analysis of Prototype Energy Consumption	26
Analysis of Other Buildings.....	26
Annual Energy Costs	26
Rates, Usage, and Total Energy Costs	27
Summary Of Results For Energy Cost Analysis.....	27
Chapter V. Analysis of Non-Personnel Costs.....	33
Costs Of Goods	33
The Approach to Estimating the Cost of Goods	34
The Results Of The Analysis Of The Cost Of Goods.....	35
Travel for purchased services	40
Costs of Travel by District Employees	44
Costs Of Travel To And From District Offices	44
Costs Of Travel To Anchorage	44
Results of the Analysis of Travel Costs.....	45
Chapter VI. Calculation of the Overall Geographic Cost-of-Education Index (GCEI).....	50

Fixed-Market-Basket (FMB) Approach	51
Superlative Indexes and Commodity Substitution Bias	52
Determination of Budget Shares and Application of the Index Values.....	53
A Comparison of the FMB and Superlative Indices.....	54
Chapter VII. Implementation Issues	57
Bibliography	63
Appendix A. Data sources	67
Appendix B. Data collection and Survey Forms	71
Appendix C. Comparable Wage Analysis	73
Appendix D1. Final Estimating Equations for Administrators, Teachers, and Classified Personnel.....	75
Appendix D2. Alternative Estimating Equations for School Personnel.....	79
Appendix E. Index Values of Alternatives, and Correlations between Final and Alternative Equations	83
Appendix F. Energy Cost Analysis.....	87
Appendix G. Detailed Analysis of the Costs of Supplies.....	95
Appendix H. Detailed Analysis of the Cost of Travel.....	99
Appendix I. Calculation of the GCEI	103

Exhibits

Exhibit II-1. A GCEI for Alaska School Districts	II-6
Exhibit II-2. Variations in the Geographic Cost of Education Index by Region	II-7
Exhibit II-3. Current Alaska Index Compared to the Superlative GCEI	II-8
Exhibit III-1. Comparable Wage Index and Average Wage Index by Labor Market Area.....	III-15
Exhibit III-2. Factors Included in the Alaska Compensation Models	III-18
Exhibit III-3. Descriptive Statistics for Personnel Cost Indices By Region.....	III-22
Exhibit IV-1. Features of Three School Prototypes.....	IV-24
Exhibit IV-2. Selected Climate Zone Cities	IV-26
Exhibit IV-3. Electric End Use Consumption, kBTU per Square Foot per Year	IV-29
Exhibit IV-4. Non-Electric End Use Consumption, kBTU per Square Foot per Year	IV-29
Exhibit IV-5. District and Outbuilding Consumption, kBTU per Square Foot per Year	IV-29
Exhibit IV-6. Comparison of Energy Index Values by Region.....	IV-31
Exhibit IV-7. Comparison of Energy Budget Shares by Region.....	IV-31
Exhibit IV-8. Energy Cost Index	IV-32
Exhibit V-1. Comparison Of Index Values For Office And Instructional Supplies, By Distance To The Nearest Center Of Commerce	V-35
Exhibit V-2. Comparison Of Index Values For Office And Instructional Supplies, By District Enrollment	V-36
Exhibit V-3. Index: Maintenance Supplies	V-37
Exhibit V-4. Comparison Of Index Values For Small Capital Items, By District Enrollment	V-38
Exhibit V-5. Comparison Of Index Values For Small Capital Items, By Region	V-38
Exhibit V-6. Index: Office and Teaching Supplies	V-39
Exhibit V-7. Comparison Of Index Values For Purchased Services, By Distance To The Nearest Center Of Commerce.....	V-41
Exhibit V-8. Comparison Of Budget Share For Purchased Services, By Distance To The Nearest Center Of Commerce.....	V-42
Exhibit V-9. Index: Maintenance Travel.....	V-43
Exhibit V-10. School to District Office Travel.....	V-45
Exhibit V-11. Comparison Of Travel Between Schools And The District Office, By District Enrollment	V-46
Exhibit V-12. Index: Travel, Schools to District Office.....	V-47
Exhibit V-13. Comparison Of Travel From Schools To Anchorage, By Region.....	V-48
Exhibit V-14. Index: Teacher Professional Development Travel to Anchorage	V-49
Exhibit VI-1. Comparison of the Fixed Market Basket GCEI and the Superlative GCEI	VI-56