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DEVELOPING SERVICE AREA INDICES FOR COMMUNITY COLLEGES: CALIFORNIA'S METHOD AND EXPERIENCE

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The economic, educational and social environments of the students served by a community college are important factors in college performance accountability, policy analysis, program evaluation, and strategic planning. For example, previous research shows that income per county is a significant predictor of transfer rates for community colleges. However, conditions for the actual geographic area of the students served by a community college may differ, for various reasons, from the economic conditions for the county in which the college is located. This article describes the development of institutional or college-level indices as an enhancement to county-level data, their use as adjustment variables for California's Accountability Reporting for the Community Colleges (ARCC), and their applicability to other research and planning studies. The service area indices are created by combining the enrollment patterns of students by ZIP Code of residence with ZCTA (ZIP Code Tabulation Area) level economic and educational data from Census 2000.

In the past few decades, higher education has experienced an increasing emphasis on accountability. For community colleges across the country, this has taken the form of implementing performance measurement and reporting systems. The ability to demonstrate institutional effectiveness is not only required from accrediting

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institutions and the federal government, but also more recently mandated by state legislators. State reporting requirements stem from the growing concern for the quality of higher education, increasing competition for public funding, and declining resources among the educational sectors (Dougherty & Esther, 2005). The two-year colleges in California have been no exception to this national trend. In 2004, state legislation prompted the design and implementation of a performance measurement system for the California Community Colleges (CCC) known as the Accountability Reporting for the Community Colleges or ARCC (California Community Colleges Chancellor's Office [CCCCO], 2007). The sheer size of the CCC system and its somewhat unique history lend significance to other states that have current or planned accountability programs. The CCC is the largest postsecondary educational system in the world, serving more than 2.5 million students during academic year 2005–06, with 109 college campuses spread across 72 districts. The locally controlled colleges, each with multiple and complex missions, provide a variety of educational programs to a diverse student population in assorted communities throughout California (EdSource, 2005; Gill & Leigh, 2004).

The study presented in this paper describes (a) the development of institutional or college-level service area indices based on combining student-level data with census-level data, (b) the comparison of these college-level indices with county-level data, and (c) the use of the indices as adjustment variables in hierarchical regression modeling for the ARCC performance measurement system. We anticipate that the service area indices more accurately represent student backgrounds and college environments, in contrast to the county-level data traditionally used for comparing the colleges.

California has recognized student and community diversity among its colleges and the importance of accounting for this diversity when comparing institutional performance (California Postsecondary Education Commission, 2006; Wassmer, Moore, & Shulock, 2003). In evaluating community college transfer rates, previous California studies have captured institutional differences through adjustment factors or selection variables (Bahr, Hom, & Perry, 2005; CCCCCO, 2002). In these studies, variables affecting transfer included the distance from the college to the nearest four-year institution, the academic preparedness of incoming high school students, and household income of the county in which the college is located. Comparing institutional performance has also led to the use of institutional peer groups. Several studies describe the use of selection variables to identify the groups for institutional comparison (Weeks, Puckett, & Ruth,

2000; Zhao & Dean, 1997). Hurley (2002) discusses the importance of further research in the improvement of peer grouping methodology, including identification of selection variables. With the increasing focus on accountability, the recognition and refinement of adjustment factors or variables is an important focus for college researchers and policymakers.

Classifying institutions of higher education has been an accepted practice for several decades, with an increasing emphasis on community colleges by respected organizations such as the Carnegie Commission on Higher Education (Phipps, Shedd, & Merisotis, 2001). According to Bailey (2003), the Carnegie Classification of Institutions of Higher Education and other similar methods of categorizing colleges based on outputs or outcomes do not necessarily reflect the diversity and missions of the colleges. The diverse academic and economic environments of the students served by a community college are important factors affecting individual student achievement and overall institutional performance (Astin, 1993). Studies have shown that students from lower social and economic backgrounds often achieve lower educational outcomes (Adelman, 1999; Pascarella & Terenzini, 1991). This research centers on four-year colleges and universities. But several community college studies report strong associations between social class and educational outcomes that are specifically related to the transfer from community colleges to four-year institutions (Bahr, Hom, & Perry, 2005; Banks, 1994; Dougherty & Kienzl, 2006; Lee & Frank, 1990). Several authors have captured these differences in their outcome studies in the form of institutional characteristics (Bailey, Calcagno, Jenkins, Kienzl, & Leinbach, 2005; Ehrenberg & Smith, 2004). This study furthers the identification of institutional characteristics that reveal differences between the colleges.

Previous California Community College Chancellor's Office experience with matching student-level data to develop a college-level index (Bahr, Hom, & Perry, 2004) allowed us to create similar indices using census-based economic and educational data. The use of census-level data to determine socioeconomic factors associated with populations has been widely applied in the health care field (Geronimus & Bound, 1998; Krieger, 1992; Krieger, Williams, & Moss, 1997). In sociology, researchers refer to "neighborhood effects" in illustrating the relationship between community characteristics based on census-level data and social outcomes (Sampson, Morenoff, & Gannon-Rowley, 2002). Several studies focused on the various dimensions of educational attainment (Connell & Halpern-Felsher, 1997; Duncan, Connell, & Klevanov, 1997; Garner & Raudenbush,

1991; South, Baumer, & Lutz, 2003). Most recently, community college researchers (Crosta, Leinbach, & Jenkins, 2006) extracted socioeconomic variables from census-level data to determine the characteristics of community college students. In previous outcome studies, community college researchers used environmental factors, based on county-level data, to adjust educational performance for environmental differences among the institutions (Bahr, Hom, & Perry, 2005; Ehrenberg & Smith, 2004). However, the conditions for the actual geographic area of the students served by a community college may differ from the conditions for the county in which the college is located.

In the first part of this study, we describe the development of indices representing the economic and educational conditions of the service area for each of the California community colleges. These service area indices are then compared with the county-level data for the colleges traditionally used as adjustment variables by community college researchers. We explore the usefulness of the indices in accounting for the variations among the colleges on the performance outcomes outlined in our most recent accountability study, ARCC (CCCCO, 2007). We highlight some of the limitations of the indices, and conclude with suggestions for applying the indices and opportunities for further research.

METHOD

Developing Service Area Indices

We created eight college-level indices representing the economic and educational characteristics or environments of the students served. The indices correspond to factors related to student performance in the education literature. To develop the indices, we used two datasets. The first dataset contained the proportion of students attending each college residing in each Zone Improvement Plan (ZIP) Code. To calculate these proportions, we divided the number of students in each ZIP Code by the total number of students at that particular college. We included only students taking credit courses because of the disproportionate number of missing ZIP Codes for noncredit students at several colleges. In order to most closely approximate Census 2000 data, we used the ZIP Codes of students taking courses during the Fall 2000 term. The source for this first dataset is the Chancellor's Office Management Information System (COMIS), which collects student and course information from all the community colleges in California. In 1999–2000, there were 108 community colleges. While

each local college collects the student's full address, COMIS receives only the student's ZIP Code of residence. Of the more than one million students taking credit courses in Fall 2000, only 2.2% were missing ZIP Codes.

The second dataset represents selected socioeconomic data identified from each Census 2000 ZIP Code Tabulation Area (ZCTA) in California. In 2000, the U.S. Census Bureau developed ZCTAs for the first time as approximations of United States Postal Service ZIP Code service areas (U.S. Census Bureau, 2000). According to the Census Bureau, ZCTAs define the land areas covered by each ZIP Code. It is important to note that postal service ZIP Codes are not spatial entities but categories for grouping mailing addresses created to expedite mail delivery. Census ZCTAs are aggregations of census blocks that have the same predominant ZIP Code. In most cases, five-digit ZCTA codes equal five-digit ZIP Codes. This second dataset depicts the economic and educational data collected at the ZCTA-level extracted from the Census 2000 Summary File 3 (SF3). SF3 represents a sample of households that responded to the Census 2000 long form, representing 19 million housing units nationwide, or about 1 in 6 households. Since several community colleges in California closely border several states, we also extracted ZCTA-level data from Arizona and Nevada.

To create the service area indices for each community college, we combined the datasets by multiplying the ZCTA-level values by the proportion of students from a college (in Fall 2000) having a ZIP Code of residence that corresponded to that ZCTA. For example, in the case of an index for median household income, if the proportion of students at College "A" residing in the 95214 ZIP Code was .29 and the ZCTA-level value of median household income for the 95214 ZCTA was \$42,890, the product of these two values is \$12,438. We repeated this process, by college, for each variable. In this way, we adjusted or "weighted" the census data for each corresponding ZCTA by the proportion of students from a college with a residence ZIP Code corresponding to that ZCTA. We summed these weighted values for College "A" to create its service area index for median household income (\$33,796). Table 1 exemplifies the process with simulated data. We repeated this process for the eight indices.

The eight indices listed in Table 2 correspond to four types of income and four variables representing unemployment, poverty, foreign-born status, and bachelor's degree or higher attainment. The column "SF3 (Census) Population Table" identifies the specific Census 2000 population table (P) used from SF3.

Table 1. Median household income index development for college "A"

Student ZIP codes	Proportion of students (B)	ZCTA-level values (C)	Weighted values (B × C)
95214	.29	\$42,890	\$12,438
95216	.24	\$32,324	\$7,758
95217	.15	\$25,548	\$3,832
95218	.19	\$20,012	\$3,802
95220	.13	\$45,890	\$5,966
Total	1.00		\$33,796

Comparing Service Area Indices with County-Level Data

The county in which the educational institution is located has conventionally been the unit of analysis for a community college's social and economic conditions. Previous research at the California Community Colleges Chancellor's Office identified county unemployment rate and per capita income as significant predictors in the

Table 2. Definition of the service area indices and data source in Census 2000

Service area index	Definition	SF3 (census) population table
Household median income	Median income (1999) of all members, 15-years-old and over, related or not to the householder	P53
Family median income	Median income (1999) of all members, 15-years-old and over, related to the householder	P77
Nonfamily median income	Median income (1999) of a householder living alone, or all members not related to the householder	P80
Per capita income	Mean income (1999) computed for every person, including a child, in a particular group	P82
Poverty	Proportion of households whose income (1999) is below the appropriate poverty threshold	P87
Unemployment	Proportion of civilians, 16-years-old and over, classified as unemployed	P43
Foreign born	Proportion of the population who were not U.S. citizens at birth (naturalized or non-citizens)	P21
Bachelor plus	Proportion of the population, 25-years-old and over, whose educational degree was a bachelor's or higher	P37

analysis of student transfer rates to four-year institutions (Bahr, Hom, & Perry, 2005; CCCCCO, 2002).

To compare the service area indices with the county-level data for the colleges, we obtained data on income, poverty, unemployment, foreign-born status, and bachelor or higher status from the 2000 Census by the individual county in which each of the 108 colleges is located. Similar to ZCTA-level data, the Census 2000 Summary File 3 (SF3) captures household data at the county-level. We calculated statewide averages for the indices and for the county-level data and compared these averages using paired-sample *t* tests.

Using Service Area Indices in Regression Modeling

As part of the ARCC project, the eight service area indices we developed were included with other variables in a hierarchical regression modeling effort. Our purpose was to find the best set of uncontrollable factors (adjustment variables) related to predicting community college outcomes, also known as performance indicators. We used the final set of uncontrollable factors to identify colleges that most closely resemble each other and, therefore, seemed appropriate for peer comparisons in the accountability project.

The ARCC addresses six college-level performance indicators, which were developed from data available in the COMIS. Table 3

Table 3. College-level performance indicators for the 2007 ARCC report

Performance indicators	Definition
Student progress and achievement	Percentage of students who completed degree, certificate or transfer within six years of enrollment (2000–1 to 2005–6)
Completed 30 or more units	Percentage of students who completed at least 30 units within six years of enrollment (2000–1 to 2005–6)
Persistence (Fall to Fall)	Percentage of students with at least six units who persisted in the subsequent academic year (Fall 2004 to Fall 2005)
Vocational course completion	Annual percentage of students who successfully completed credit vocational courses in 2005–6
Basic skills course completion	Annual percentage of students who successfully completed credit basic skills courses in 2005–6
Basic skills course improvement	Percentage of students who completed a higher level basic skills course within three years of completing an initial basic skills course (2003–4 to 2005–6)

provides a brief description of each indicator. Each performance indicator served as the outcome in a regression model, resulting in six separate models.

After reviewing the literature for factors affecting college performance indicators, we used three criteria to identify the set of adjustment variables for model development. First, an adjustment variable had to be an uncontrollable factor that theoretically could affect at least one of the performance indicators in the ARCC analysis. Second, we determined that an adjustment variable had to have a significant correlation ($p < 0.05$) with the outcome variable for consideration in the regression models. Finally, if we found that the indices correlated with each other, or with other adjustment variables, we selected the index or other adjustment variable having the highest association with the outcome variable for inclusion in regression modeling.

For each of the six college performance indicators, we used the hierarchical regression model with the highest adjusted R -squared to determine the final set of adjustment variables related to each outcome.

In order to determine if the indices were better predictor variables than the county-level data in the regression models, we compared the models developed using the indices with those developed using county-level data. Keeping the outcome variable and the other predictor variables the same, we substituted county-level data for the indices, where applicable, in our regression models. As part of this comparison, we calculated the Hotelling's t test, an extension of the t test, for each pair of models to establish whether they differed significantly based on whether we used the index or the county data as a predictor (Garbin, 2007; Hotelling, 1931).

RESULTS

Comparing Service Area Indices with County-Level Data

Table 4 displays results of the comparison of statewide averages of the indices with the associated county-level statewide averages, using paired-sample t tests. Overall, the mean values of the indices are lower than the corresponding mean county-level values. We found statistically significant differences between the Bachelor Plus and Nonfamily Median Income indices and related county-level data ($p < .001$) and between Per Capita Income and Foreign Born indices and related county-level data ($p < .05$).

Table 4. Comparison of the service area indices with county-level data of the colleges

	Index of the college		County of the college		<i>t</i> (107) (2-tailed)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Household median income	\$47,786	\$12,086	\$48,610	\$11,736	-1.377
Family median income	\$53,671	\$13,205	\$54,834	\$13,229	-1.656
Nonfamily median income	\$30,679	\$8,601	\$32,196	\$8,760	-3.703***
Per capita income	\$21,663	\$5,880	\$22,795	\$5,859	-3.288*
Poverty	13.34%	5.11%	13.91%	4.71%	-1.817
Unemployment	7.06%	2.59%	7.07%	2.45%	-.130
Foreign born	22.80%	10.26%	24.23%	9.50%	-2.834*
Bachelor plus	24.05%	9.12%	26.17%	8.54%	-3.670***

**p* < .05.

****p* < 0.001.

Because we observed overall differences between the service area indices and the county-level data, we wanted to examine the relationships between the two different types of units. In other words, even if the index values were lower than the county data, we still expected an association. Therefore, we calculated correlation coefficients between the eight college indices and the corresponding county-level data for the colleges. The eight correlations were significant at *p* < .001 and ranged from the highest association between the service area index and county-level data for Nonfamily Median Income (*r* = .878) to the lowest correlation between the Bachelor Plus index and its county-level counterpart (*r* = .791). The significant correlations for all the indicators suggested a strong relationship between the two types of measurement, service area index, and county-level data for each college.

The results for comparisons of the regression models using indices with those using county-level data are presented in the next section, following the initial results of regression modeling.

Using Service Area Indices in Hierarchical Regression Modeling

Prior to regression modeling, we examined the correlations between the large set of potential adjustment variables, including the indices, and the outcome variables. Table 5 presents the eight indices and

Table 5. Correlations of the ARCC performance indicators with the service area indices

Service area indices	ARCC performance indicators					
	SPAR	30UR	PR	VCCR	BSCCR	BSIR
Household median income	.626**	.309**	.459**	.143	.429**	.301**
Family median income	.676*	.310*	.428*	.135	.440*	.269*
Nonfamily median income	.643*	.278*	.423*	.108	.451*	.260*
Per capita income	.715*	.324*	.344*	.119	.448*	.202**
Poverty	-.626*	-.251*	-.312*	-.131	-.421*	-.264*
Unemployment	-.636*	-.225**	-.269*	-.158	-.437*	-.231**
Foreign born	-.020	.191**	.281*	-.018	.109	.092
Bachelor plus	.746*	.280*	.315*	.060	.445	.150

Note. SPAR = Student Progress and Achievement Rate; 30UR = At Least 30 Units Rate; PR = Persistence Rate; VCCR = Vocational Course Completion Rate; BSCR = Basic Skills Course Completion Rate; BSIR = Basic Skills Improvement Rate.

* $p < 0.01$.

** $p < 0.05$.

their correlations with the six college-level performance indicators. The economic indices, such as income and poverty, show significant correlations with most of the performance outcomes. Compared to the other outcomes, the Student Progress and Achievement Rate (SPAR) has the highest correlation with each of the indices, with the exception of its correlation with the Foreign Born index ($r = -.020$). On the other hand, the Vocational Course Completion Rate (VCCR) did not correlate significantly with any of the service area indices. Only those service area indices with statistically significant correlations (where $p < .05$) with that particular performance indicator were considered as potential variables for model development.

Three of the eight indices proved to be significant adjustment variables in four of the six hierarchical regression models. The Bachelor Plus index was a significant predictor of the Student Progress and Achievement Rate (SPAR), a measure that includes awards (i.e., degrees, or certificates) and transfers to four-year institutions. The complete model for the SPAR had an adjusted $R^2 = .72$, $F(3, 102) = 88.62$, $p < .001$, with the regression weights for the three predictors significant at the .05 level. Based on the standardized beta coefficients, the Bachelor Plus index provides the largest contribution to the model. The two other adjustment variables in the model were the percentage of students that are 25 years or older at the college and an academic preparation index. Two of the four economic indices, Per Capita Income and Household Median Income, proved to be

significant predictors for three other performance indicators. The Per Capita Income index was a significant predictor for the Basic Skills Course Completion Rate and the At Least 30 Units Rate. The Household Median Income index proved to be a significant predictor for the Persistence Rate model.

As a last step, we again compared service area indices with county-level data, this time in terms of their use in the ARCC regression models. The models that included the indices accounted for more variance than did the models using county-level data. In other words, the indices appeared to perform better than the county-level data as adjustment variables in all four models. When we applied Hotelling's t test, the regression model using the index as one of the predictors for the SPAR differed significantly from the SPAR model using the county-level data, $t(106) = 4.45$, $p < .05$. However, the other three models did not differ significantly based on whether we used an index or county-level data in the set of predictors.

LIMITATIONS

There are several limitations and considerations in the development and application of the indices. First, we created the indices by linking student enrollment proportions based on ZIP Code with ZCTA-level data from Census 2000. The Census Bureau developed ZCTAs to correspond with ZIP Codes, but they are not precise representations of each other (Krieger, Waterman, Chen, Soobader, & Carson, 2002). ZCTAs follow Census block boundaries and ZIP Codes facilitate mail delivery. Unlike ZCTAs, ZIP Codes change over time, as they are discontinued and added. We addressed the changes over time by matching similar periods.

Second, the college enrollment data were limited to students taking credit courses. In a sense, this restriction may give an analyst a distorted measure of a college service area because it can be argued that many noncredit students (i.e., those students whose enrollment consists entirely of noncredit courses) may be counted in a particular performance indicator. This will be true of the ARCC analysis in the immediate future as the state legislature recently added a requirement for performance indicators that cover noncredit enrollments. Furthermore, the background of noncredit students on campus can theoretically affect how a college operates and how it views its mission, especially if the proportion of noncredit enrollment is substantial. The students were treated equally, without any weighting to account for the different number of credits per semester. These are certainly considerations for developing subsequent indices.

Also of concern is the ecological fallacy that occurs when one makes conclusions about individuals based solely on aggregated information from groups (Hammond, 1973; Robinson, 1950). The aggregation of data to proxy individual characteristics is a concern in census-based research (Geronimus, Bound, & Neidert, 1996). It is important not to draw inferences about individual students at a college based on the calculated indices for that particular college as presented in our study.

The indices capture economic and educational characteristics tabulated from Census 2000, with data collected in 1999. Therefore, researchers should consider the data-aging factor when using this particular methodology. The indices might be outdated for studies that require more current data. Studies that will use future student cohorts may be able to avoid this potential aging bias. The American Community Survey (ACS), fully implemented by 2010, will replace the decennial census "long form." This continuous survey will purportedly provide more timely and accurate data on social, economic, and housing characteristics for index development (Torrieri, 2007; U.S. Census Bureau, 2005).

DISCUSSION

Our analysis indicated that the economic and educational conditions for the actual geographic area served by a community college, represented by service area indices, differ from those of the county where the college is located. The overall average value of each of the eight indices is lower than the value of its county-level counterpart. If we assume that the indices represent characteristics of the student population attending the colleges, then our results signal that community colleges serve students with lower economic and education status than the population of the counties in which the colleges are located. On the other hand, the indices might also characterize the environmental factors of the college service area. This may be relevant for an adjustment model because research indicates that community or neighborhood factors can have an effect on social and educational outcomes.

Three of the indices, Bachelor Plus, Per Capita Income and Household Income, had statistically significant relationships with four of the six outcome variables in our accountability report, ARCC (CCCCO, 2007). In order to validate the use of the indices, we compared the effect using county-level data as predictors in our regression modeling versus using the indices as predictors. The indices performed better, although not always statistically better, with the four outcome

variables. Therefore, we deemed the indices more appropriate than county-level data for creating comparison groups of colleges.

Analysts have traditionally resorted to the county-level data for the area surrounding a particular college or campus. However, the service area of a college or campus frequently does not match the political boundaries for a county or a city, making the data from political jurisdictions less precise than the indices for the measurement of service area variables. Incidentally, where a college may have a “territory” that coincides with an official area that also matches the levels of reported census data, the analyst may also use the indices to compare its actual service area characteristics to its official service area characteristics (i.e. politically defined). This analysis could indicate to college administrators the nature of a college’s “drawing power” in the market sense of the term, and this could help in the college’s strategic planning as well.

These indices, or others developed from different census variables, could help educational analysts and institutional researchers in a number of different ways. The indices can serve as predictor variables or adjustment variables for student background factors in statistical models for institutional performance. The indices can be especially helpful when researchers do not have data on background factors of each student. In these cases, the indices can act as college-level proxy measures for the student-level data when analyses focus upon the college-level factors (as in interinstitutional comparisons of student outcomes). In fact, the Bachelor Plus index may eventually serve this function in the ARCC project. The Bachelor Plus index may replace the Student Average Academic Preparation (SAAP) index that the California Community Colleges Chancellor’s Office created through a one-time collaboration with the state’s K-12 system (Bahr, Hom, & Perry, 2004). Even if a college administration has little interest in a statistical model of institutional performance, it may find the indices useful for forming peer groups that facilitate the search for best practices among similar colleges.

The above applications of the indices illustrate their potential to help in the analysis of certain institutional outcomes. However, in some situations, institutional researchers could use the indices as one kind of outcome measure in themselves. For example, if a college has a component in its strategic plan that specifies service to areas of low income or of low college-going history (as measured by the number of baccalaureate degree holders among an area’s residents), then these indices can actually serve as targets or goals for the college’s strategic plan. In some situations, officials may want to use the indices by themselves to evaluate the equity of service that a college

renders to a community. Analysts may compare a single college's indices over time to see if they indicate any trend in service delivery. Analysts could also compare the indices from a region's colleges to see which institution may need to emphasize its outreach efforts to meet a region's expectations for economic mobility and workforce preparation.

IMPLICATIONS FOR PRACTICE

More work with the Service Area Indices should follow to explore or test their validity for specific research situations. One research situation is the use of the indices when the census data for the population under study have "aged" a bit. Researchers who want to develop and use the indices for their region may need to test for data obsolescence. This could entail the comparison of how well the indices predict a specific performance indicator (or other dependent variable) in models that use different student cohorts. That is, as we progress in time with different student cohorts, do the indices change in their predictive power (presumably because the census data no longer reflect the community's recent status)? The aforementioned American Community Survey (ACS) may eventually mitigate this concern for studies of future student cohorts (especially if the ACS ZIP Code level data for a study match or exceed the reliability of the corresponding census data), but many studies will require student cohort background factors for periods that precede the collection of any ACS data.

A second research situation may be the explicit causal modeling of direct effects of student background variables (such as his/her parent's possession of a bachelor's degree or his/her family's income) upon student outcomes, in comparison to the indirect effects of the student's neighborhood (such as the neighborhood's percent of adults with a bachelor's degree or the neighborhood's median family income). Can the Service Area Indices help a researcher to test for such neighborhood effects?

The growth of distance education may pose another interesting situation. How does distance education affect the applicability of the indices? Distance education enables students to enroll in a community college course when they live and work much further away from the community college than the rest of the student body does. If a community college has an unusually large proportion of its enrollment in the form of distance education, it seems theoretically possible for the indices to be affected by the relative isolation or separation of its distance education students from the campus.

A fourth situation that many institutional researchers encounter involves enrollment projections. Can the indices assist them to make enrollment projections by helping to explain enrollment decisions of students? It may be enlightening to see if a statistical model of enrollment could improve its accuracy if it were to use the indices in some manner to model social change in a college's geographic service area.

These four situations capture some salient areas of interest in the Service Area Indices, but researchers will certainly envision additional questions to test with these indices. As institutional research attempts more complex statistical models and as data that represent certain constructs become more scarce (or more expensive to obtain), the indices strategy will grow in importance.

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