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ABSTRACT

The widely held proposition that the racial composition of schools is a reflection of the racial composition of residential neighborhoods has been taken for granted. This paper tests the link made between these two by using a data set for selected school districts in California that links pupil enrollment data for public elementary schools to 1970 census data for the population resident in school attendance zones. The first analysis demonstrates a strong but imperfect association between residential segregation and school segregation among school districts that have not implemented extensive desegregation programs. The second analysis explores the complex question of the degree to which the level of ethnic residential segregation among school attendance zones reflects differentials in socioeconomic measures. The third analysis identifies a pattern of Anglo avoidance of minority school children through both outmigration and use of private schooling. The results call for a broader conceptual and empirical analysis of urban demographic change and its relation to schooling. (Author/AM)

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RESIDENTIAL AND SCHOOL SEGREGATION: SOME TESTS OF THEIR ASSOCIATION

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RESIDENTIAL AND SCHOOL SEGREGATION:

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by

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ABSTRACT

It is widely believed that the racial composition of schools is a simple reflection of the racial composition of residential neighborhoods, but no appropriate empirical test has been reported. This analysis utilizes a data set for selected school districts in California that links pupil enrollment data for public elementary schools to 1970 census data for the population resident in school attendance zones. The first analytic effort with this data set demonstrates a strong but imperfect association between residential segregation and school segregation among school districts that have not implemented extensive desegregation programs. The second analytic effort explores the complex question of the degree to which the level of tri-ethnic residential segregation among school attendance zones reflects differentials in socioeconomic measures. The third analytic effort, confined to data for the Los Angeles school district, identifies a pattern of Anglo avoidance of minority school children through both outmigration and utilization of private schooling. This evidence refers to a time period preceding the current school desegregation controversy. In conclusion, we call for a broader conceptual and empirical analysis of urban demographic change and its relation to schooling than has thus far characterized the participation of social scientists in the shrill public debate about "white flight."

RESIDENTIAL AND SCHOOL SEGREGATION:

SOME TESTS OF THEIR ASSOCIATION

Correspondence between the racial composition of schools and residential neighborhoods is widely accepted as factual, educationally sound, and morally proper. Two of these three beliefs have been the subject of much recent investigation and controversy. The history of "neighborhood schools," and their place in contemporary educational administration are being reexamined by educational researchers (Weinberg 1968, 1977). The propriety of allowing school racial segregation to be linked to residential racial segregation is reflected in the controversy over "de facto" vs. "de jure" school segregation, and has been examined and reexamined by legislative, executive, and judicial branches of government (see particularly United States Supreme Court, 1971, 1976a, b).

The factual character of the link between residential and school segregation has been taken for granted. It is a commonplace that the high levels of racial segregation observed in northern and western school districts (and in many southern districts after "desegregation") result from the residential separation of whites and minorities (Farley, 1975; Wolf, 1976). It seems tautological that if the attendance zones of schools are drawn to embrace contiguous areas surrounding the schools, school segregation will be a simple reflection of residential segregation. Because the relation seems obvious, it has been regarded as true without the benefit of careful conceptualization or systematic empirical testing. A search of the sociological literature reveals no study that through

logical argument or empirical results justifies the acceptance of this purported association as a sociological fact.

Empirical studies of racial residential segregation indicate persisting high levels of separation between whites and racial minorities in the nation's metropolitan areas (Sørensen, et al, 1974; de Leeuw, et al. 1976; Van Valey, et al. 1977). Empirical studies of racial school segregation report high levels of separation between white and minority pupils in those school districts that have not implemented extensive desegregation programs (Farley, 1976; Coleman, et al. 1975; Farley and Taeuber, 1974). The few studies that report on the association between residential and school segregation indicate that less than 50 percent of the variance is attributable to the correlation (Dye, 1968; Farley and Taeuber, 1974; Farley, 1975). A correlation of this magnitude does not justify the elaborate interpretive structure that has been built on the base of a direct one-to-one association of schools with neighborhood residents.

The magnitude of the correlation reported between residential and school segregation has been influenced by a number of methodological problems, some of which can be controlled more effectively. Indices of residential segregation in these studies were computed over the entire residential population rather than over persons of school age or persons enrolled in school. Because of racial differences in fertility, family composition, migration, and housing consumption patterns, the percentage black in the total population of a residential area often is well below the percentage black among school-age children (Farley, 1975:169-174). This should tend to depress the correlation. Among the large cities included in these studies, it is not always the case that a single city school district serves the entire city but no other territory. Municipal and school district boundaries often differ, and this should also tend to depress the

correlation between city residential segregation indices and school district pupil segregation indices. Still another distortion of the correlation arises from the use of residential indices calculated from decennial census data (for April 1) and school indices calculated from fall enrollment data for another year.

A fundamental weakness of these studies is the lack of coincidence between the neighborhood units over which indices of residential segregation have been computed and the attendance zones from which schools draw their pupils. Neither of the two areal systems readily available from decennial census data--census tracts and city blocks--corresponds to school attendance zones. It is a well-known property of residential segregation indices that their magnitude is affected by the size of the areal unit and the system used for determining areal unit boundaries. Failure to use school attendance zones for the measurement of residential segregation thus could be a major source of attenuation of the correlation.

If these methodological problems are overcome, a more readily interpreted correlation coefficient can be calculated to measure the association between school segregation and residential segregation. This is the first task we shall undertake, using a special set of data for selected school districts in California. The small number of districts included in this data set limits the generality of the analysis we can undertake, but the California locale provides the opportunity to pay attention to school and residential segregation patterns among three racial and ethnic groups rather than simply two.

Establishing the magnitude of the correlation between indices of school and residential segregation provides only a partial and indirect answer to the original question, is there a perfect correspondence between the racial composition of

residential neighborhoods and of schools? Three types of disturbances to the association may be identified, those having to do with school administration, those having to do with the utilization of public schooling by residents, and those having to do with residential responses.

School attendance policies in most school districts do not rely exclusively on one-to-one matching of residential locations and schools. Optional attendance zones, voluntary transfer programs, magnet schools, and special education programs all tend to loosen the link between residential location and school assignment. School desegregation litigation in both southern and northern districts has proven that administrative devices such as these have commonly been manipulated to enhance racial isolation in the schools. Indeed, the drawing and modification of school attendance zones, the selection of sites for new schools, and the designation of feeder-patterns from primary to secondary schools have been used directly for racial segregation. We do not provide evidence in this paper on such practices, but we shall refer to them later to indicate that the causal link between residential racial patterns and school racial patterns is not unidirectional.

Just as school administrators may be responsive to residential patterns, so may residents be responsive to school patterns. Residents with school-age children may choose not to use the assigned public school. Unless the district permits transfers to other schools, their alternatives are private schooling, moving elsewhere within the district, or moving to another district. Each of these choices entails social and economic considerations. We shall examine whether the racial composition of schools is associated with racial and ethnic disparities in socioeconomic characteristics.

Residential choice is affected by many considerations in addition to racial composition of neighborhood schools. Housing cost, location with respect to jobs

and amenities, many features of neighborhood quality, taxes, and numerous other factors enter into a household's choice of location. Some of these factors have a differential racial impact, and account in part for the prevailing racial residential segregation. In assessing the link between school racial composition and residential racial composition, it is appropriate to take into account these general residential determinants. With some of the determinants, particularly those most directly related to patterns of white avoidance of minority neighbors, there is a conceptual problem in identifying causality. The process of racial turnover in residential areas tends to occur simultaneously with racial turnover in the schools. White persons' perceptions of the inevitability of complete racial transition are affected by perceptions of the quality of public services (including educational services) and what happens to that quality during racial transition. The racial transition often proceeds more rapidly in local elementary schools than in housing, and this also contributes to the residential change. White utilization of private schooling for class, religious, or educational purposes is hard to disentangle completely from white flight from minority contact, particularly in changing neighborhoods. In any case, the greater the white withdrawal from public schools, for whatever reasons, the more likely that the public school racial transition will lead the neighborhood transition and become a contributing part of the self-fulfilling prophecy that culminates in nearly total racial separation. We cannot control fully for all of the determinants of housing location choice, nor can we resolve the conceptual complexities in the limited data analysis that follows. Our analysis should be regarded as illustrative and our interpretations shall be cautious.

Data

For selected California school districts, attendance zone boundaries for individual schools were plotted on census tract maps. Data from the 1970 census tapes for census tracts (fourth count) were then reassembled to provide estimated census characteristics for the attendance zones. Enrollment by race for each school was obtained from a tape report of the Fall, 1970, survey of public school enrollments conducted by the Office for Civil Rights (OCR) of the Department of Health, Education and Welfare. Thus it is possible to associate the racial composition of each public school with the racial, socioeconomic, and housing characteristics of the people residing within the school attendance zone.

For our analysis we utilize a maximum of nine urban school districts for which the special data are available and which contain substantial numbers of minority pupils. Summary data on the schools and the school attendance zones are presented in Table 1. The OCR survey identifies five racial and ethnic categories: American Indian, Oriental, Spanish Surnamed American, Negro, and Other. We use the last three categories and designate them as Hispanic, Black, and Anglo. From the census data we obtained roughly similar categories by selecting Negro and White. Subtracting from the White those of Spanish Heritage yields Hispanic and Anglo figures. The census definition of Spanish Heritage in California is "Persons of Spanish language or Spanish surname." OCR categories and procedures are not strictly comparable with Census categories and procedures, but we believe that in practice most children in the three categories we use were classified the same in both sources.

Elementary schools in all districts included grades K - 6. In Pasadena, under terms of a desegregation plan, elementary education was split into two systems,

Table 1. Characteristics of Elementary Schools and Attendance Zones for Selected School Districts: 1970

School District	Selected Characteristics of Schools				Selected Characteristics of School Attendance Zones				
	Enrollment				Population Age 5-13 Yrs.				
	Total	Percent Black	Percent Hispanic	Number of Schools	Total	Percent Black	Percent Hispanic	Percent Enrolled in Grades 1-8	Anglos Enrolled in Grades 1-8: Percent in Private Schools
Compton	18844	80.9	12.7	21	23831	76.2	13.5	89.5	7.5
Fresno	30724	9.5	22.0	51	38878	8.0	25.9	91.6	3.5
Long Beach	35163	10.1	7.1	51	47845	7.7	9.9	89.9	10.2
Los Angeles	341282	26.7	24.8	429	505568	23.7	27.2	88.7	13.5
Oakland	32266	61.9	8.9	57	41772	55.5	11.9	92.9	19.3
Pasadena	7906	38.0	10.1	14	21449	29.2	15.6	90.1	23.6
Pomona	12936	20.4	18.6	20	18154	16.8	19.5	86.6	9.6
San Jose	19721	1.6	26.2	31	24891	1.3	28.0	90.0	6.7
Santa Clara	11217	1.7	16.0	21	16325	0.5	20.3	91.9	6.8

one for grades K-3 and one for grades 4-6. We utilize the lower grade system for this analysis. Census data are presented for the age group 5-13 years. Not all children 5-13 on April 1, 1970, would be expected to be in school and in grades K-6 in Fall, 1970, but this is the closest match we could make. The count of children age 5-13 also exceeds the number of children enrolled in public schools in grades K-6 because the former includes private-school children, those in special education or not attending, and public school children in grades 7 and 8.

Residential and School Racial Segregation

Indices of racial segregation were calculated for three population groupings--the total population and the population age 5-13 years residing within attendance zones, and the population enrolled in public elementary schools. The index of dissimilarity is used to measure segregation (Farley and A. Taeuber, 1974). We seek to determine whether the magnitude of segregation observed for each paired comparison of blacks, Anglos, and Hispanics differs according to which population grouping is examined. Indices for the nine California school districts are exhibited in Table 2.

The residential and school indices for Pasadena, presented in Table 2, were lowered by the school desegregation program implemented in Fall, 1970. The effect on school indices is straightforward. Non-contiguous geographic attendance zones were drawn for each K-3 elementary school for the specific purpose of reducing black/Anglo and Hispanic/Anglo school segregation. The residential indices are also reduced far below what they otherwise would have been. Persons residing in each of the non-contiguous portions of a school attendance zone are treated (for the purpose of evaluating residential segregation) as residents of a single zone. Socially the only contact between, for example, Anglos resident on the east side of Pasadena and blacks and Hispanics resident in the central and southern

Table 2. Indices of Racial Segregation for Elementary Schools and Attendance Zones for Selected School Districts: 1970

School District	Blacks vs. Anglos			Hispanics vs. Anglos			Blacks vs. Hispanics		
	Residential		Schools	Residential		Schools	Residential		Schools
	Total	5-13 Yrs.		Total	5-13 Yrs.		Total	5-13 Yrs.	
Compton	67	67	71	49	56	55	44	41	52
Fresno	84	90	77	36	42	51	71	74	65
Long Beach	79	81	77	21	28	35	64	64	55
Los Angeles	89	93	92	53	60	65	82	83	80
Oakland	63	70	70	38	53	54	44	43	54
Pasadena	23	21	09	16	21	20	27	29	32
Pomona	67	72	72	28	37	44	53	58	60
San Jose	67	73	60	38	52	66	40	52	31
Santa Clara	56	56	47	24	24	31	48	50	60

parts of the city may occur through their children and at school functions. Nevertheless these persons are residents of the same attendance zone and for the purpose of our analysis they do represent the residential base population that is affected by that school.

There are many comparisons that can be made among the rows and columns of Table 2, but only a few require emphasis. The residential segregation of children age 5-13 is usually greater than the residential segregation of the total population. Specifying school-age children thus seems to be a useful methodological strategy. But the school-age residential indices are not uniformly closer to the school indices than are the all-age residential indices.

The correlation coefficient between the school segregation index and the residential segregation index for children age 5-13 is .87 (for the black/Anglo comparison for eight districts, excluding Pasadena). This coefficient is considerably larger than the coefficients reported in previous literature, but the relationship between school and residential segregation is still imperfect. The explained variance (the square of the correlation coefficient) is 76 percent, and there may be other systematic factors that account for the remaining 24 percent. Of course this particular result is based on too few districts for us to give much weight to the specific measures of association, and we cannot know in what way this result is affected by being limited to black/Anglo segregation in California.

Information on residential and school segregation between Hispanics and Anglos and between blacks and Hispanics is also included in Table 2. The general pattern conforms to that observed in other studies (Taeuber and Taeuber, 1965; Grebler, Moore, and Guzman, 1970) of black/Anglo segregation being greatest, followed by black/Hispanic segregation, and a lower but still substantial

Hispanic/Anglo segregation. The intricacies of tri-ethnic segregation complicate the school desegregation process. Note that after desegregation Pasadena's remarkably low school segregation index for blacks/Anglos is accompanied by a low index for Hispanics/Anglos and a not-so-low index for blacks/Hispanics.

Socioeconomic Residential Segregation

Racial residential segregation in the United States tends to occur for reasons other than the sizable socioeconomic racial disparities (Taeuber and Taeuber, 1965; Taeuber, 1968; Erbe, 1975; Farley, 1977; Schnare, 1977). Between blacks and whites of the same income, occupation, or educational level, high levels of racial residential segregation occur. Thus racial segregation and class segregation are distinguishable phenomena, despite the frequency with which they are considered inseparable in discussions of metropolitan population redistribution or of the educational needs of the disadvantaged in central cities. In this section of our analysis we seek to assess whether the racial composition of school attendance zones is associated with racial and ethnic disparities in socioeconomic status.

The procedure employed is first to partition the total amount of race/ethnic residential variation in the population of a school district into components reflecting (1) within-attendance zone variability in racial composition; (2) racial differences in socioeconomic status; and (3) racial residential segregation within socioeconomic status levels. Let $T_{..}$, $T_{i.}$, and T_{ij} be the total population of the district, the i^{th} status level, and the i^{th} $(i=1,\ldots,k)$ status level within the j^{th} $(j=1,\ldots,n)$ attendance zone, respectively, and $P_{..}$, $P_{i.}$, and P_{ij} be the proportion of blacks (or Hispanics) in the total population

of the district, the i^{th} status level, and the i^{th} status level within the j^{th} attendance zone. Then:

$$T_{ss} = T..P..(1-P..)$$

$$B_{ss} = \{\sum_{i=1}^{k} \sum_{j=1}^{n} T_{ij}(P_{ij}-P_{..})^2\}/T_{ss}$$

$$W_{ss} = \{\sum_{i=1}^{k} \sum_{j=1}^{n} T_{ij} P_{ij}(1-P_{ij})\}/T_{ss}$$

T_{ss} is the total racial variation in the population of a district. B_{ss} is the proportion of total variation in race that can be attributed to residential and socioeconomic segregation. W_{ss} is the proportion of total variation in race that can be attributed to variation in racial composition within attendance zones and socioeconomic categories. Readers familiar with analysis of variance techniques will recognize T_{ss} as the total sums of squares, the numerator of B_{ss} as the between sums of squares, and the numerator of W_{ss} as the within sums of squares.

Our primary interest is in the residential-socioeconomic component (B_{ss}). This can be decomposed as follows:

$$B_{ss(i.)} = \{\sum_{i=1}^{k} T_{i.}(P_{i.} - P_{..})^2\}/T_{ss}$$

$$B_{ss(ij)} = \{\sum_{i=1}^{k} \sum_{j=1}^{n} T_{ij}(P_{ij} - P_{i.})^2\}/T_{ss}$$

$B_{ss(i.)}$ is the proportion of total variation in race that can be attributed to racial differences in socioeconomic status levels. $B_{ss(ij)}$ is the proportion of total variation in race that can be attributed to racial residential segregation within socioeconomic status levels.

These three components may be computed for any socioeconomic characteristic that is included in the special census data tabulated by school attendance zones. We have prepared illustrative results using four characteristics, income (15 categories), poverty ratio (8 categories), occupation (10 categories), and education (10 categories). Three districts within the Los Angeles metropolitan area were chosen for presentation in Table 3. For each district, the decomposition was performed separately for each of the three pairwise racial/ethnic comparisons.

For Los Angeles, the first three columns of the first row of Table 3 assess the distribution of blacks and Anglos among elementary school attendance zones, using income as the socioeconomic characteristic. The first figure, .827 (computed from the formula for B_{ss}), indicates that 83 percent of the total racial variation in Los Angeles can be attributed to differing racial proportions in the various income categories and attendance zones. This is the total residential and socioeconomic component. It can be divided into two additive components. The component representing racial inequality in income (computed from the formula for $B_{ss(i.)}$) is rather small (.079). The component representing racial residential segregation within income levels (computed from the formula for $B_{ss(ij)}$) is much larger (.748). Thus income differences between blacks and Anglos account for only a small proportion of the total, and residential segregation between blacks and Anglos at each income level accounts for most of the racial differentiation among school attendance zones. Similar results obtain for Los Angeles for each of the socioeconomic characteristics and for each of the racial/ethnic comparisons. The total component is lower for Hispanics vs. Anglos than for the other comparisons; this is in a sense an alternative indication of the residential segregation pattern revealed in Table 2.

Table 3. Indices of Racial Socioeconomic Residential Segregation For Three School Districts

Socioeconomic Characteristic and District	Blacks vs. Anglos			Hispanics vs. Anglos			Blacks vs. Hispanics		
	Total Residential-Socioeconomic Segregation	Racial Inequality in Socioeconomic Status	Racial Residential Segregation Within Status Levels	Total Residential-Socioeconomic Segregation	Racial Inequality in Socioeconomic Status	Racial Residential Segregation Within Status Levels	Total Residential-Socioeconomic Segregation	Racial Inequality in Socioeconomic Status	Racial Residential Segregation Within Status Levels
INCOME									
Los Angeles	.827	.079	.748	.412	.062	.349	.752	.008	.745
Long Beach	.355	.020	.335	.071	.066	.004	.544	.059	.485
Pasadena	.162	.069	.093	.061	.015	.045	.207	.030	.177
OCCUPATION									
Los Angeles	.816	.080	.735	.385	.103	.282	.739	.045	.694
Long Beach	.365	.022	.344	.057	.005	.052	.524	.062	.461
Pasadena	.186	.105	.081	.101	.034	.066	.222	.058	.164
EDUCATION									
Los Angeles	.768	.032	.736	.365	.128	.237	.727	.058	.669
Long Beach	.294	.007	.286	.054	.009	.045	.521	.019	.512
Pasadena	.111	.040	.071	.058	.035	.023	.159	.020	.139
POVERTY RATIO									
Los Angeles	.825	.104	.721	.406	.096	.311	.741	.007	.734
Long Beach	.350	.029	.321	.057	.027	.029	.158	.022	.136
Pasadena	.180	.104	.076	.057	.027	.030	.158	.022	.136

Even for these groups, though, the residential segregation component is much greater than the socioeconomic inequality component.

The components for Pasadena in Table 3 reveal the substantial racial/ethnic and socioeconomic homogenization of attendance zones that was effected by the delineation of non-contiguous zones. The components for Long Beach are considerably lower than those for Los Angeles. Long Beach has a very low degree of socioeconomic differentiation among its racial/ethnic groups, and this may reflect its niche as an old industrial enclave within the densely settled part of the urbanized area.

The general finding that school attendance zones in these districts display a substantial degree of racial/ethnic segregation beyond that attributable to socioeconomic differentiation prompts us to undertake a further specification. Within socioeconomic categories, there is pronounced racial/ethnic segregation, but is that segregation greater at one end of the status scale than at the other? Are high-status blacks and Anglos more or less segregated from one another than are low-status blacks and Anglos? To perform a further decomposition of the $B_{ss(ij)}$ component requires a large data set, and we present in Table 4 the results of one illustrative computation, for Los Angeles, using income levels. Ignoring the highest income categories which include very small numbers of families, racial/ethnic residential segregation within school attendance zones is an increasing function of income level. This extension of our decomposition technique is an alternate methodological approach to the calculation of indices of dissimilarity for each income level (Taeuber, 1968; Farley, 1977). Neither technique has received much use, yet the specification of socioeconomic status differentials in racial/ethnic residential segregation seems from these few examples to be a promising topic for further analysis.

Table 4. The Decomposition of Racial Residential Segregation Within Income Levels, Los Angeles, 1970.

Income Level	Blacks vs. Anglos	Hispanics vs. Whites	Blacks vs. Hispanics
Under $1,000	3.98	4.14	4.31
$ 1,000- 1,999	4.11	3.90	4.14
$ 2,000- 2,999	6.09	5.82	5.72
$ 3,000- 3,999	6.64	6.47	6.62
$ 4,000- 4,999	6.71	7.30	7.01
$ 5,000- 5,999	7.11	7.83	7.46
$ 6,000- 6,999	7.46	8.42	7.72
$ 7,000- 7,999	7.68	8.54	8.16
$ 8,000- 8,999	7.28	7.02	7.35
$ 9,000- 9,999	6.44	7.91	6.51
$10,000-11,999	11.85	11.98	11.43
$12,000-14,999	11.95	10.36	11.02
$15,000-24,999	11.07	9.05	10.68
$25,000-49,999	1.46	1.02	1.56
$50,000 and over	0.22	0.28	0.30
Total	100% (.748)	100% (.349)	100% (.745)

White Avoidance

In this section of our analysis we examine directly the relationship between characteristics of the population residing in a school's attendance zone and the racial composition of the school. The analyses in previous sections were more indirect. Segregation indices summarize features of the residential distribution and features of the school distribution. The correlation between residential and school segregation indices thus relates aggregate measures, and provides a test of similarities in patterns. The assessment of socioeconomic and residential segregation also utilized summary measures (of the variation of distributions). The regression models to which we now turn evaluate the zone-by-zone correspondence between residential and school composition.

The "white flight" notion may be translated into a hypothesis that the greater the percentage black among the pupils in a public school, the greater the tendency of white parents in the attendance zone to place their children in private schools or to move out of the zone. The current controversy revolves around the existence, magnitude, and consequences of such white flight when the racial composition of schools is altered as a result of deliberate desegregation programs. Desegregation programs are of recent vintage, and many large cities have not yet undertaken them; nevertheless, as emphasized in our introductory discussion, the issues of racial turnover in schools and neighborhoods have been with us for decades.

One way to search for evidence on the residence/school link in the more general process of white "avoidance" of racially mixed housing and schools is to analyze school systems that have not undergone extensive school desegregation. What evidence can we find in such districts of the influence of racial minorities on the utilization of public schools by white Anglos?

An elementary model of the determinants of Anglo presence in public schools is portrayed in Figure 1. This model is simply a step toward a more complex analysis. The basic relationship is between the percent that blacks compose of the school-age population of an attendance zone and the percent that Anglo pupils compose of the enrollment in a public elementary school.

In the 8 California districts (Pasadena is excluded) for which we will evaluate this model, the presence of Hispanic residents and pupils and a small number of persons of other racial/ethnic groups confounds the simple white-avoidance-of-blacks model. We include a measure of ethnic diversity in the model. The index is computed as follows (Theil, 1972:6). Let there be k minority groups, each of which represents a certain proportion (P_i) of the minority population of a school or attendance area; then

$$H = \left[\sum_{i=1}^{k} (P_i) \text{ Log } (1/P_i) \right] /k$$

This index measures the concentration of members of three racial/ethnic categories (blacks, Hispanics, and other nonwhite races) in attendance zones. If only one of these groups resides in an attendance zone, the index value is zero; if all three groups are equally represented, the index value is 1. Our hypothesis is that greater diversity among the racial/ethnic population is conducive to Anglos utilizing the public school. Anglo numerical and social dominance is presumably less threatened by a melange of minority persons than by an equivalent number all from one group. We also include the size of the school-age population in the zone, and expect that a larger Anglo group of children will be less likely to withdraw from a particular percentage of blacks than would a smaller group.

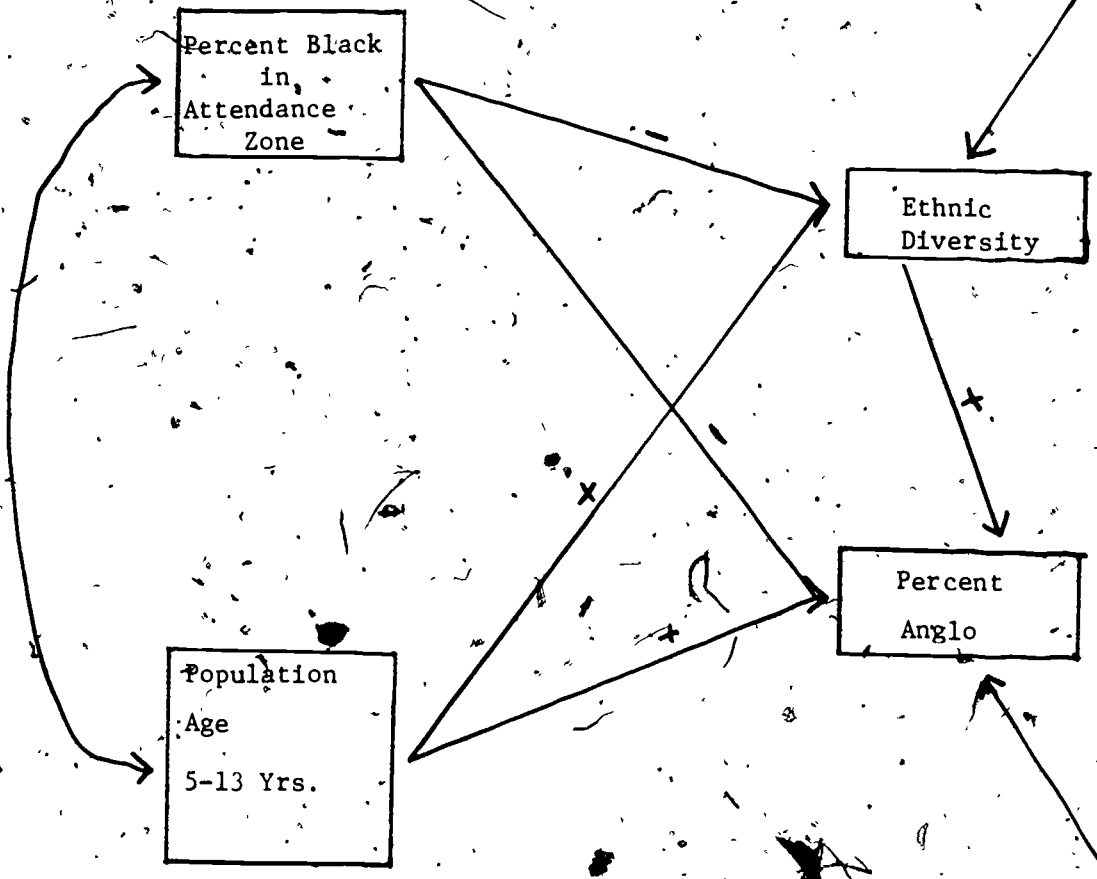

Figure 1. Determinants of the Representation of Anglos in Public Elementary Schools (with Expected Signs for Each Path).

Standardized regression coefficients for the three direct paths in this model are presented in Table 5. For each of the eight school districts the coefficient for percent black among school age population in the attendance zone is negative, as expected. The coefficient for the size of the school-age population has the expected positive sign for seven of the districts, but the magnitude of the coefficients is small. The coefficients for the index of racial diversity are varied in sign and magnitude. To the difficulty in obtaining

Table 5. Standardized Regression Coefficients Indicating the Effects of Selected Variables on the Percent of Public Elementary School Pupils Who are Anglo.

Variables	Compton	Fresno	Long Beach	Los Angeles	Oakland	Pomona	San Jose	Santa Clara
Percent Black among School-Age Pop. in Attendance Zone	-.900*	-.705*	-.900*	-.538*	-.994*	-.786*	-.450*	-.317
Total School-Age Pop. in Attendance Zone (Log)	.087	.170*	.030	.064	-.006	.019	.036	.198
Index of Racial Diversity	-.151	-.336*	-.039	.377*	-.112	.093	.493*	.553*
School Percent Anglo								
Mean	4.98	66.35	82.65	51.68	35.89	63.20	69.05	79.69
Standard Deviation	9.52	29.30	20.39	38.11	32.28	29.30	28.71	14.88
Intercept	27.40	-38.10	82.85	-5.48	84.65	61.60	34.05	18.95
R^2 (adjusted for d.f.)	.609	.729	.789	.579	.800	.626	.525	.243
Number of Observations	23	51	51	429	57	20	31	21

*Indicates that the regression coefficient is at least twice the size of its standard error.

a clear conceptual understanding of this index we can now add a difficulty in understanding the empirical outcome.

The results obtained evaluating the elementary model are consistent with the hypothesis of Anglo avoidance of public schools in black and racially mixed neighborhoods. There is also an inescapable tautological element to this finding. In a two-race universe and looking solely at zone residents (or at school pupils), the percent black is a linear complement of the percent white. Because our data refer to a multi-ethnic situation and we are relating percentage black among zone residents to percentage Anglo among school pupils, the strict tautology is removed but only bizarre patterns could obviate a strong positive association between the two percentages.

A revised and elaborated model of the association between attendance zone population and Anglo school utilization is portrayed in Figure 2. If many Anglo parents seek to avoid sending their children to schools in which the potential for contact with black pupils is great (or which are perceived to be poor schools because of the presence of black pupils), then we should find evidence of one or both of the following: (1) enhanced Anglo enrollment in private schools; (2) enhanced rates of outmigration of Anglo families with school-age children from the affected attendance zones. These are the direct indicia of white avoidance, and the school racial composition affects and is affected by these behaviors.

In a cross-section model with a delimited set of variables, we cannot specify fully the temporal processes. We can include several factors that describe the residential area; most of these factors tend to change only slowly, even in the face of outmigration and population turnover. The outmigration itself is to be inferred in this model from a smaller-than-expected percentage of school-age

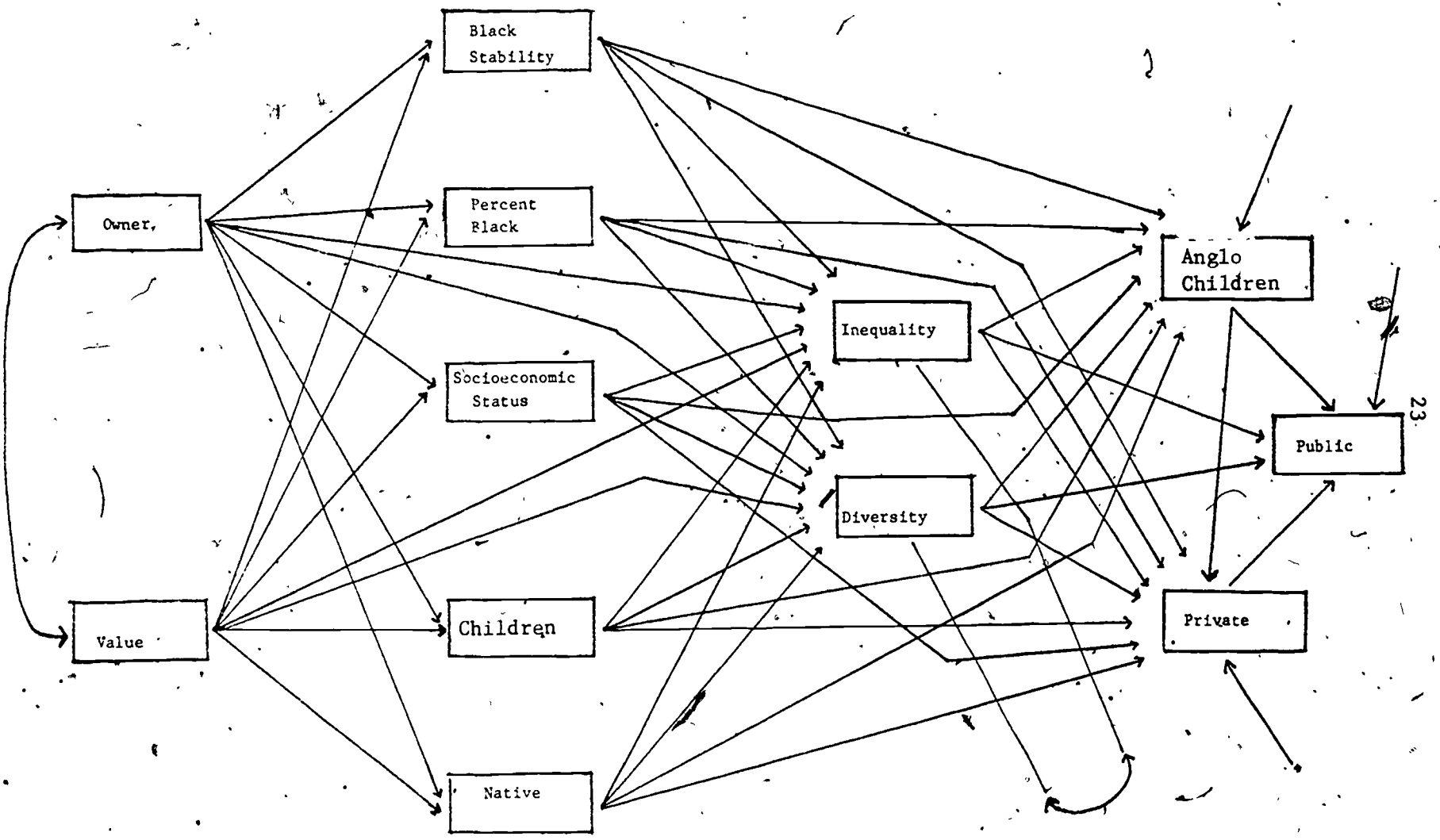

Figure 2. Revised Model of the Representation of Anglos in Public Elementary Schools.

children in the Anglo population. If outmigration leads to racial residential turnover, there is a further confounding of causal paths. We include measures of housing type and price to control partially for the attractiveness of the residential area to black families (see Aldrich, 1975). A measure of the residential stability of black families living in the area in 1970 is included to identify areas of rapid black influx.

The model portrayed in Figure 2 treats Anglo outmigration, Anglo utilization of private schooling, and the percent Anglo in the public school as endogenous variables affected by the racial, social, economic, and housing characteristics of the population living within the attendance zone. The variables appearing in Figure 2 are defined in Table 6; note that three variables (education, occupation, and income) are used to measure socioeconomic status. Some of the directional arrows have been omitted from Figure 2 because the model is already complex. We do not seek to evaluate the full model, but to estimate the parameters of the following equations for the three primary endogenous variables:

Table 6. Definition of Variables in Figure 2 and Equations (1)-(3).

Anglo Children	Percent of the Anglo population that are age 5-13 years.
Private	Percent of Anglo elementary school children that are enrolled in private schools.
Public	Percent of pupils in the public elementary school that are white.
Inequality	Gini index of the similarity of the income distributions of black and white families.
Diversity	Index of racial diversity (defined in text).
Black Stability	Percent of 1970 black population living in same house in 1965.
Percent Black	Percent of population age 5-13 years that are black.
Education	Percent of Anglo population with at least one year of college.
Occupation	Percent of Anglo employed population in white collar occupations.
Income	Log of median family income of Anglo population.
Children	Log of the total attendance zone population age 5-13 years.
Native	Percent of Anglo population native of native parentage.
Owner	Percent of housing units that are owner-occupied.

$$\text{Anglo Children} = B_1(\text{Owner}) + B_2(\text{Value}) + B_3(\text{Black Stability}) + B_4(\text{Percent Black}) + B_5(\text{Education}) + B_6(\text{Occupation}) + B_7(\text{Income}) + B_8(\text{Children}) + B_9(\text{Native}) + B_{10}(\text{Inequality}) + B_{11}(\text{Diversity}) + e_1 \quad (1)$$

$$\text{Private} = B_1(\text{Owner}) + B_2(\text{Value}) + B_3(\text{Black Stability}) + B_4(\text{Percent Black}) + B_5(\text{Education}) + B_6(\text{Occupation}) + B_7(\text{Income}) + B_8(\text{Children}) + B_9(\text{Native}) + B_{10}(\text{Inequality}) + B_{11}(\text{Diversity}) + B_{12}(\text{Anglo Children}) + e_2 \quad (2)$$

$$\text{Public} = B_1(\text{Owner}) + B_2(\text{Value}) + B_3(\text{Black Stability}) + B_4(\text{Percent Black}) + B_5(\text{Education}) + B_6(\text{Occupation}) + B_7(\text{Income}) + B_8(\text{Children}) + B_9(\text{Native}) + B_{10}(\text{Inequality}) + B_{11}(\text{Diversity}) + B_{12}(\text{Anglo Children}) + B_{13}(\text{Private}) + e_3 \quad (3)$$

Equations (1), (2), and (3) were estimated with data for the Los Angeles school district. The number of schools and attendance zones in the other California districts is too small to permit useful estimation of these equations. The standardized regression coefficients are presented in Table 7.

In Equation (1) the dependent variable indicates the ratio of children to total zone residents for the Anglo population. This variable is intended to represent recent outmigration of Anglo families with school-age children. Seven of the eleven explanatory variables in the equation have large standardized regression coefficients (at least twice the standard error; see Table 7). All seven

Table 7. Standardized Regression Coefficients Indicating the Effects of Variables on Measures of Anglo Migration and Schooling, Los Angeles, 1970.

Variables[1/]	Equation (1) Dependent Variable: Anglo Children	Equation (2) Dependent Variable: Private	Equation (3) Dependent Variable: Public
Owner	.676*	.308*	.097*
Value	.141*	.001	.116*
Black Stability	-.032	.019	-.047*
Percent Black	-.390*	.215*	-.639*
Occupation	-.269*	.186*	.034
Education	.003	.093	.021
Income	-.196*	-.137	.071
Children	.112*	.117*	.153*
Native	.067	.145*	-.047*
Inequality	.012	-.039	-.048*
Diversity	.151*	.050	.442*
Anglo Children	--	-.446*	.106*
Private	--	--	-.033
Intercept	22.71	17.38	-126.59
Dependent Variable Mean	12.76	18.02	51.68
Standard Deviation	7.37	22.53	38.11
R^2 (adjusted for d.f.)	.617	.239	.844
Number of Observations	429	429	429

* Indicates that the regression coefficient is twice the size of its standard error.

[1]Variables are defined in Table 6.

have the expected sign. An attendance zone's retention of Anglo children is positively associated with its proportion of owner-occupied housing and of high-priced housing, the total size of the child population, and racial diversity of the zone's non-Anglo residents. A zone's outmigration of Anglo children is associated with the percent black among its residents and higher occupational and income levels among Anglo residents. A summary interpretation of these coefficients is that attendance zones with expensive single-family homes attract Anglo families with children, but the presence of blacks repels them, and Anglo families of higher socioeconomic status are the quickest to move. No cross-sectional areal regression can fully sustain such interpretation, but this is the kind of pattern we hypothesized and the empirical results are not inconsistent with it.

The dependent variable for Equation (2) indicates the degree to which Anglo elementary school children attend private schools. Only six of the twelve variables have large standardized regression coefficients (Table 7). Greater recourse by Anglos to private schools occurs in public school attendance zones that have higher proportions of black residents, that have a lot of owner-occupied housing and an Anglo population of high socioeconomic status, that have a large number of school-age children, and that have fewer "white ethnics" among the Anglo population. The sign on this last variable (Native) surprises us, for we included it as an indicator of Catholic population and proclivity to attend parochial schools. The migration variable (Anglo children) that was the dependent variable of Equation (1) appears as a strong independent variable in Equation (2). Greater outmigration of Anglo families is associated with greater utilization of private schools by those Anglo families with children still residing in the zone. Although not all of the variables included in Equations (1) and (2) proved to be

empirically important, the general conclusion from both equations is that white Anglos in pre-desegregation Los Angeles avoided sending their children to public school with blacks by moving or using private schools.

The third equation for which results are presented in Table 7 is an elaborated version of the equation presented for several school districts in Table 5. The dependent variable is the percent Anglo among public school pupils, and we are still confronted with a degree of circularity because we use percent black among attendance zone residents as one of the independent variables. There are twelve other independent variables in Equation (3), and eight of them have large standardized regression coefficients. All of these coefficients have the sign expected from our avoidance hypothesis. Our interest centers on the coefficients for the final two variables in the list, the migration and private school measures that were dependent variables for Equations (1) and (2). The positive sign for Anglo children is expected; those attendance zones that have retained more Anglo children (lost fewer to outmigration) have public schools with greater proportions of Anglo pupils. In this final equation, the private school utilization measure does not have a sizable relationship to percent Anglo in the public school. A speculative interpretation of why the private school response emerges clearly in Equation (2) but not in Equation (3) centers on the presence of the migration variable in Equation (3). Many Anglo families may resort to private schools as a temporary response to black presence in the local public school, until they are financially able to move without sacrificing general residential amenities.

To assess further the effects of socioeconomic status on the white avoidance response, we estimated the three equations for subsets of Los Angeles zones, defining the subsets by average income levels. To simplify, we present only the

standardized partial regression coefficient for percent black from each equation (Table 8).

The coefficient for the effect of percent black in an attendance zone on the measure of migration of Anglo children is stronger for the low income zones than for the middle and higher income zones. Our prior assumption had been that the effect should be strongest for the middle income zones, for these persons are better able to afford to move than are lower income persons, but are less able to sustain continued annual costs of private schooling than are higher income persons. One factor contributing to the size of the coefficient for low income zones is evident from the last two columns of Table 8. Percent black has a much higher mean and variance in low income zones than in middle and high income zones. This same factor may be more important than income interpretations in explaining the coefficients for the other two dependent variables. In each case the coefficient for percent black is greatest in magnitude for the low income attendance zones.

Our analyses of selected California school districts were introduced as illustrative, and we have concluded the analysis section with an illustration of the complexities that the real world intrudes upon our schemes to array empirical proof of parsimonious hypotheses about white flight.

Discussion

We have been examining the factual character of the link between residential and school segregation. In this section of the paper we shall review the results of the three analytic sections and discuss some of the implications for research and policy. All three sections utilized a special data set that linked 1970 census data for the population resident in school attendance zones with racial/ethnic enrollment data for the corresponding public elementary schools. This data set

Table 8. Standardized Partial Regression Coefficients Indicating the Effect of Percent Black on Measures of Anglo Migration and Schooling, Los Angeles, 1970[1]

Average Anglo Income Level	Dependent Variables			Percent Black	
	Anglo Children	Private	Public	Mean	Standard Deviation
Less than $10,000	-.387*	.389*	-1.057*	36.87	41.17
$10,000-12,499	-.331*	.171	-.601*	8.66	23.55
$12,500 or more	-.119*	.093	-.821*	5.65	18.12

* Indicates that the regression coefficient is twice the size of its standard error.

[1] These estimates were obtained from equations which included all of the variables listed in Table 8

permits novel analyses, but it covers only a few school districts in California. Our analyses illustrate the potential of the approach taken without providing empirical results that can safely be generalized.

The first analytic effort was to secure an improved estimate of the association between residential racial/ethnic segregation and school racial/ethnic segregation. There is a strong but imperfect association. Using a more appropriate data base probably increased the correlations, with the major effect coming from the use of school attendance zones and little benefit apparent from use of school-age population.

The second analytic effort focused on the degree to which the level of racial/ethnic residential segregation among school attendance zones--and by implication, the level of racial/ethnic school segregation--reflects racial/ethnic differentials in socioeconomic measures. The empirical results for the California school districts demonstrate clearly that racial/ethnic socioeconomic inequalities do not account directly for residential (or school) segregation. A variance decomposition technique applied to data for Los Angeles seemed to be a promising means for uncovering the pattern of relationship between socioeconomic level and residential segregation. In this school district, racial/ethnic segregation was greater the higher the income.

The third analytic effort was to determine whether the presence of minority residents in school attendance zones invokes avoidance responses among Anglos, and to identify the two modes of avoidance, outmigration and private schooling. Evidence of both modes of avoidance was found for Los Angeles, using data that predate the current school desegregation controversy.

The linkage between residential and school segregation is indeed factual, but an unavoidable lesson from our illustrative analyses is that the character of the link is quite complex. There is no reason for demographic researchers to

pretend otherwise. Three varieties of complexity emerged from our work. First, we have to show that many variables affect the residence/school link, even in the absence of explicit school desegregation efforts. Many social scientists who have commented on the contemporary shrill public debate about "white flight" have called for a broader conceptual and empirical analysis of urban demographic change. On the basis of our work we repeat that call.

A second broadening lesson from these analyses is a fortuitous result of the accident that the necessary data source was available for selected California school districts. We were compelled to recognize a tri-ethnic situation, and even that is a simplification of the true multi-ethnic situation. The black-white terms of the public debate are too narrow to be adopted unquestioningly by researchers.

A third lesson for researchers is that the usual data sources and analytic techniques are inadequate. The continuing demographic trend in the United States toward racial separation into black cities and white suburbs has been the subject of much study, and ingenious analyses of traditional data (censuses and national surveys) continue to be informative. To examine the further questions that arise when that trend is to be related to the confusing implementation of school desegregation programs challenges the capacity of demographic research.

The implications of these analyses for the national debate over school desegregation policy are suggestive rather than prescriptive and are necessarily hedged by academic qualifications. We have not examined any evidence nor reached any conclusions on the role of racial and ethnic discrimination or other unconstitutional actions on school or residential patterns. Neither conceptually nor analytically were we able to disentangle the mutual causality underlying the association between housing segregation and school segregation. We are worried

that our use of the language of ordinary correlation and regression analysis and the terms "independent" and "dependent" variables will be taken as confirmation of the simplistic view that sees residential segregation as prior and school segregation as merely a reflection. The actual historical development of school segregation and housing segregation in each school district must be the subject of inquiry before specific conclusions are drawn for that district and before specific policy recommendations can be judiciously drawn. In one recent court case over school desegregation, the judge heard social science testimony about the school and housing linkages. Writing after the recent Supreme Court decisions calling for renewed caution in attributing responsibility to school officials (U.S. Supreme Court, 1976a, b), District Judge Duncan wrote (Penick v. Columbus Board of Education, 1977):

> "...School authorities do not control the housing segregation in Columbus, but the Court also finds that the actions of the school authorities have had a significant impact upon the housing patterns. The interaction of housing and the schools operates to promote segregation in each....I do not suggest that any reasonable action by the school authorities could have fully cured the evils of residential segregation....I do believe...that the Columbus defendants could and should have acted to break the segregation snowball created by their interaction with housing."

The multi-ethnic reality in many school districts has confused those who wish to devise school desegregation policy on the basis of the language of the original Brown decision of the U.S. Supreme Court (1954). We believe it is insufficient to generalize that decision simply by grouping together Negroes,

Hispanics, Chinese Americans, Native Americans, etc. into a single category. In the California districts we examined there are varying patterns of segregation in housing and schooling among Anglos, blacks, and Hispanics. Good policy could not be made on the basis of a consideration of "whites" versus "minorities." Nor can good policy consider Anglos and blacks without attention to the other citizens.

Socioeconomic aspects of segregation are of importance in understanding the causes and consequences of residential and school segregation, separately and in terms of their linkages. In our analyses, socioeconomic measures were available only for the residential population and not for the school pupils. Yet it is these unexamined socioeconomic and racial/ethnic linkages that pose one of the most difficult current issues in federal educational policy. What is the potential conflict in methods and aims between desegregation actions that seek to disperse pupils, educational assistance programs aimed at schools with concentrations of disadvantaged children, and programs designed to meet the special needs of non-English-speaking children and others of minority ethnic identification?

The United States has lacked a coherent population distribution policy, but federal, state, and local governments have many programs that affect distribution. Area redevelopment and urban renewal are obvious examples of programs with an intended distributional effect. Highway programs are recognized as having had a major impact on population distribution, even within urban areas, although that was not their explicit justification. Public housing programs, while nominally planned to serve existing local needs, have in reality exerted a strong racially segregative influence on metropolitan residential patterns.

To these examples (from a long list) a number of commentators have recently added school desegregation programs. Such programs have been cited as profoundly

influencing residential mobility within metropolitan America. We have already indicated our concern about the demographic narrowness of the empirical basis for such conclusions; more extensive criticisms have been published elsewhere (Taeuber and Wilson, 1978; see also Orfield, 1977). The conclusion we wish to stress here is the need for demographers to include more of the social institutional structure within their analytic domain. Traditional demographic research on migration and population distribution has taken many personal characteristics into account. Economic demographers have brought employment and earnings into the research domain, along with many other economic factors. From the human ecology tradition have come measures of community location in a hierarchical and functionally specialized system. From geography, an eclectic discipline, have come concerns with climate and with perceptions of amenities and distances. Schools are only occasionally mentioned in the extensive migration research literature, and then as an aspect of the perceived quality of neighborhood affecting in or out movement. The organization of schooling has not itself been brought directly into the domain. Historically, the organization of schooling has been neither static nor uniform throughout the nation, and it is time that more attention be given to assessing changing patterns of schooling on population distribution. To cite an example outside the purview of our analyses, consider the school district consolidation movement and its relationship to the population concentration process.

Our analyses lead us to suggest that the racial/ethnic organization of schooling has had a continuing and profound influence on population distribution. This influence predates the current school desegregation and busing controversies. The racial/ethnic organization of schooling has interacted with many other forces to create and sustain a pervasive pattern of residential and institutional racial/ethnic

segregation. The conceptual approach for which social demographers should strive in their efforts to study such complex social facts is captured in Myrdal's (1944, Appendix 3) "principle of cumulation." Our data resources and methodological tools may not be up to the task, but that is no excuse for conceptual slovenliness.

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