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ABSTRACT

A number of policy studies on school segregation are reviewed in this article, intended for school district administrators and policy makers who must assess the segregative effects of their own school systems' policies and practices. Two types of studies are considered, the first concerning the racial/ethnic mix of pupils, and the second concerning resource allocation among schools. The section on analyzing the racial/ethnic mix of pupils begins with a description of the kinds of data needed and presents analytical methods for describing racial/ethnic distribution for biracial and triracial/ethnic districts. The problems of defining a segregated school are then identified and discussed. These problems include setting realistic standards, designing a definition that fits the multiracial/ethnic character of many large urban systems, establishing desegregation priorities, and evaluating progress toward desegregation. The section on analyzing resource allocation begins with a description of data sources and stresses the importance of understanding the allocation mechanism. Several allocation criteria are reviewed, including legal principles regarding allocation and equity considerations. Expenditure per pupil, the allocation of teachers, and the distribution of teacher experience and training are then examined as ways of analyzing allocation outcomes. The review concludes with a discussion of problems encountered in removing resource disparities. (Author/GC)

DRAFT

For Discussion Purposes Only

THE RACIAL AND ETHNIC MIX OF PUPILS AND RESOURCE ALLOCATION

A REVIEW OF SOME METHODS OF ANALYSIS

August, 1980

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- The Allocation of Teachers
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This paper was developed for the ERIC Clearinghouse on Urban Education, under contract with the National Institute of Education, U.S. Department of Education.

I. POLICY ANALYSIS OF SCHOOL SEGREGATION

If you were the superintendent of a school district or a member of a board of education and wanted to know whether or not the policies and procedures of your school system were producing outcomes that could be alleged to be segregative, then how would you go about finding out the facts of the situation? What questions would you ask? What kinds of data and information would you collect? How would you analyze these to answer your questions? Across the country, school district managers and policy makers are seeking answers to questions like these, sometimes at their own initiative, but more often because the courts or Federal government are demanding answers or remedial action.

The intention of this article is to outline an agenda of policy studies that will provide answers to many questions about the segregative results of school district policies and practices. The studies are grouped into two major categories: the racial and ethnic mix of pupils and resource allocation among schools. In each case, questions that quantitative analysis can help answer are formulated, possible data sources are identified, and the analyses are described and illustrated with examples from real situations. While this agenda of policy studies is not a cookbook for documenting the existence of segregation, it should provide guidance for people interested in finding out if such outcomes do exist in a particular district, or in drawing up desegregation plans.

The examples of data analysis have been drawn from studies of Los Angeles and New York City, the two largest urban school systems in the country.

The purpose of the examples is to illustrate how the analyses can be done and the kinds of insights that can be obtained from an examination of just some quantitative aspects of the racial and ethnic mix of pupils and resource allocation. The purpose is not to review the situation in Los Angeles or New York City. In fact, the data used in the examples are quite out of date for making current policy decisions, but they are still very appropriate for illustrating the kinds of analyses that should be done.

The section on analyzing the racial and ethnic mix of pupils begins with a short description of the kinds of data that are needed. Then some analytical methods for describing the racial/ethnic mix of pupils are introduced for the case of a bi-racial district and a tri-racial/ethnic district. The problems of defining a segregated school are discussed at length: setting realistic standards; designing a definition that fits the multi-racial/ethnic character of many large, urban school systems; establishing desegregation priorities; and evaluating progress toward desegregation. A way of analyzing the dynamics of pupil racial/ethnic mixes is demonstrated and a few other policy oriented studies are briefly outlined.

The section on analyzing resource allocation also starts with a short description of data sources. Then the importance of understanding the resource allocation mechanism is stressed, especially if changes in allocation outcomes are desired. Several allocation criteria are reviewed -- legal principles governing resource allocation, equity considerations, and practical problems -- because they have to be incorporated into allocation procedures and practices in order to guide allocation results in the desired direction. Then ways of analyzing allocation outcomes are described. Expenditures per

pupil, the allocation of teachers, and distribution of teacher experience and training are major resources that are examined. A few problems of removing resource disparities are briefly mentioned at the conclusion of this review.

The analyses described in this review involve sorting through masses of data. Of necessity, computers will have to be used, and this opens up a vast range of possibilities for more sophisticated manipulations of the data. The tables shown here are basically descriptive statistics of the current situation. If this information were compiled for several years, a notion of trends of the past could be developed, and it would become possible to analyze changes in key variables. Once the past has been illuminated, there is the temptation to attempt forecasts of the future, which requires building mathematical models. With models, evaluation and prescription become more feasible. The analyst who travels up this hierarchy of information for policy analysis has to be closely guided by top managers of the school system, the ones who are asking the questions that motivated the analysis. Policy analysis of data involves art as well as craft, and technical skill must be guided by judgment about what the main policy issues are and which ones can be illuminated by the analysis of data. Top managers and analysts should keep in mind that the questions that can be answered by manipulating numbers are usually the easy ones, but answers to the easy questions form the basis for addressing the difficult ones.

II. THE RACIAL AND ETHNIC MIX OF PUPILS

The first and simplest way to determine if a district's schools are segregated is to find out what the racial and ethnic mix of pupils is in every school. Once this fairly straightforward exercise in data compilation and presentation has been completed, questions can be asked about how the mix has been changing and what the consequences of trying to achieve a particular mix or range of mixes in every school would be.

BASIC DATA: THE ANNUAL RACIAL AND ETHNIC SURVEY

The basic source of data on the racial and ethnic mix of pupils (and staff) in each school is the annual racial and ethnic survey taken in the fall. The U.S. Office for Civil Rights has established five categories of race or ethnicity: Native American, Hispanic, Black, Asian, and other. For some school districts these categories may not suffice. For example, the category "Hispanic" includes people from Puerto Rico, Mexico, Cuba, and different parts of the West Indies. Asians could be from China, Korea, Japan, the Philippines, Viet Nam or one of the other countries of Southeast Asia. A school district may want to know how many of each kind of students it has for educational reasons as well as for purposes of desegregation.

Once a decision has been made on the categories of race and ethnicity that make the most sense for the district, data should be collected using the classroom as the smallest unit of aggregation. Data for classrooms can be added up to obtain statistics for the grade, the school, groups of schools (administrative subdistricts or neighborhoods), schools by level (elementary,

junior high), and the school system as a whole. The data from each level of aggregation can be presented as raw head counts in each of the categories and as the percent distribution among the categories.

THE MIX OF PUPILS

How mixed is the pupil population? The analysis required to answer this questions is quite straightforward when just the two major racial or ethnic groups are represented in the pupil population. When there are more than two groups, the analysis is a little more complicated.

Two groups

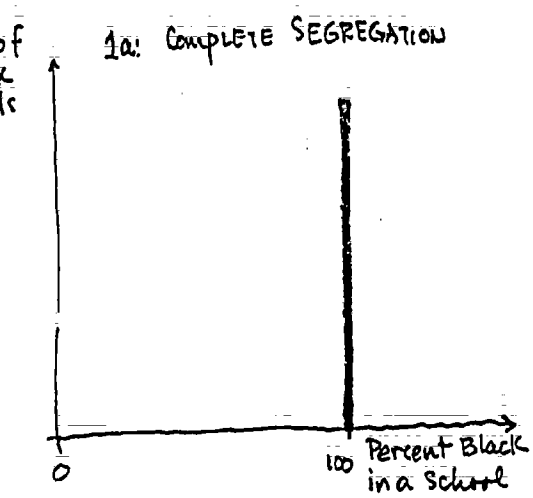
In the biracial/ethnic school district, Black and White, for example, a simple frequency distribution of Black pupils will summarize the situation. The horizontal axis of the frequency distribution should measure the percent of Black students in each school. The vertical axis should measure the number of Black students. The shape of the resulting frequency distribution will give a good indication of how mixed the pupil population is among schools.

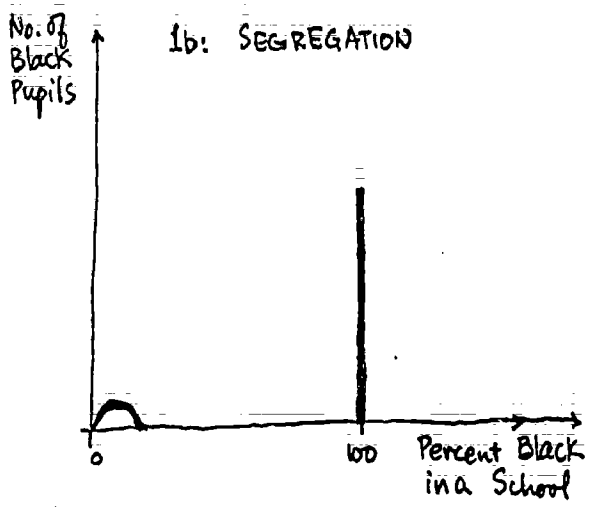
Some frequency distributions are drawn in Exhibit 1 to illustrate representative situations. A district whose schools are completely segregated would have a frequency distribution that was above the point "100 percent Black pupils" on the horizontal axis (see Exhibit 1a). These schools are either all White or all Black.

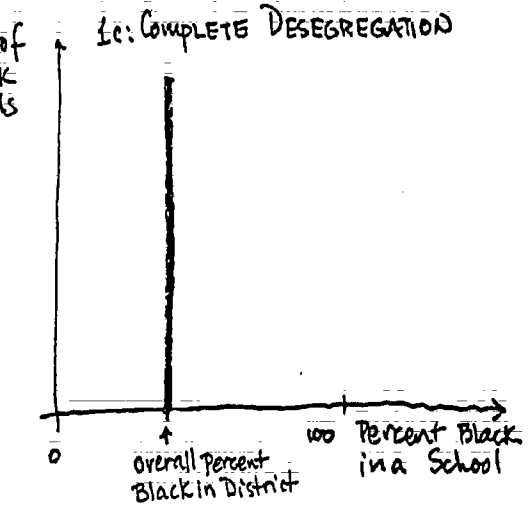
A more realistic segregated situation is illustrated in Exhibit 1b. Most Black pupils are in schools with no White pupils (the vertical line at the right of the distribution); there are no schools with a minority of White pupils; there are no schools where White pupils are a majority and there is

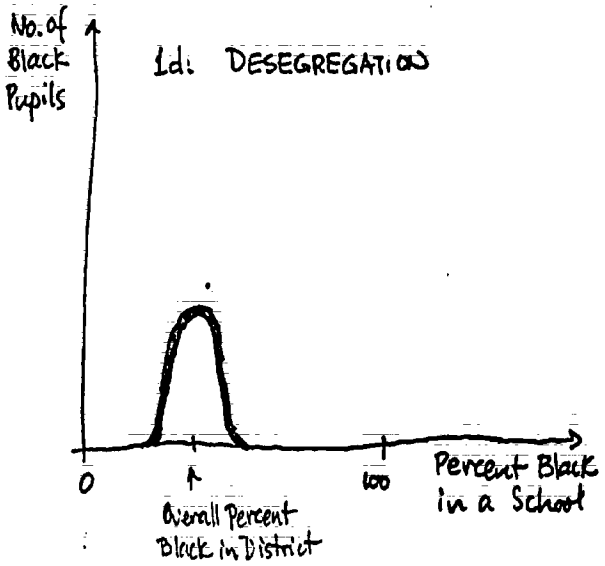
EXHIBIT 1.

PROTOTYPICAL PUPIL DISTRIBUTIONS IN A BI-RACIAL ~~[illegible]~~ SCHOOL DISTRICT









a "significant" percentage of Black pupils (schools between 50 and, say, 90 percent White); there are a few schools with a few Black pupils; and there are many schools with no Black pupils.

Complete desegregation is illustrated in Exhibit 1c, where the vertical line is above the overall average percentage of White pupils. In this ideal situation, every school has the same mix of Black and White pupils. A more realistic desegregated situation is illustrated in Exhibit 1d. There are no "all" or "almost all" White or Black schools. All schools have a mix that is within a limited range of the overall percentage of White pupils. In this situation, a crucial policy issue is the limits of the range. A wider range will give more flexibility and probably mean shifting fewer pupils. The danger with a wider range is that "too" many schools will be near the extremes of the range rather than being concentrated near the center. Thus, the shape of the distribution is as important as the limits.

Tables that contain the same information as the graphs can be drawn up easily. First, schools are classified according to the percent of minority or Black pupils in a school. The classification groups could be deciles or some other specially chosen intervals that fit the nature of the particular school district. For each group, the table would list the number and percent of schools, total pupils, minority pupils, and non-minority pupils.

Three groups

In a tri-racial/ethnic school district, the usual frequency distributions are not adequate for describing the situation. However, the triangle graph* shown in Exhibit 3 provides a concise way of representing the racial/ethnic compositions of schools when the system serves three groups, Black, Hispanic, and Other,** for example. Schools with pupils from only one of the racial/ethnic groups are located in one of the corners. For example, a 100 percent Black school would be represented by a dot in the upper corner of Exhibit 3. Bi-racial/ethnic schools would be located along one of the edges, and schools with some pupils from each of the three groups would be located somewhere in the interior of the triangle.

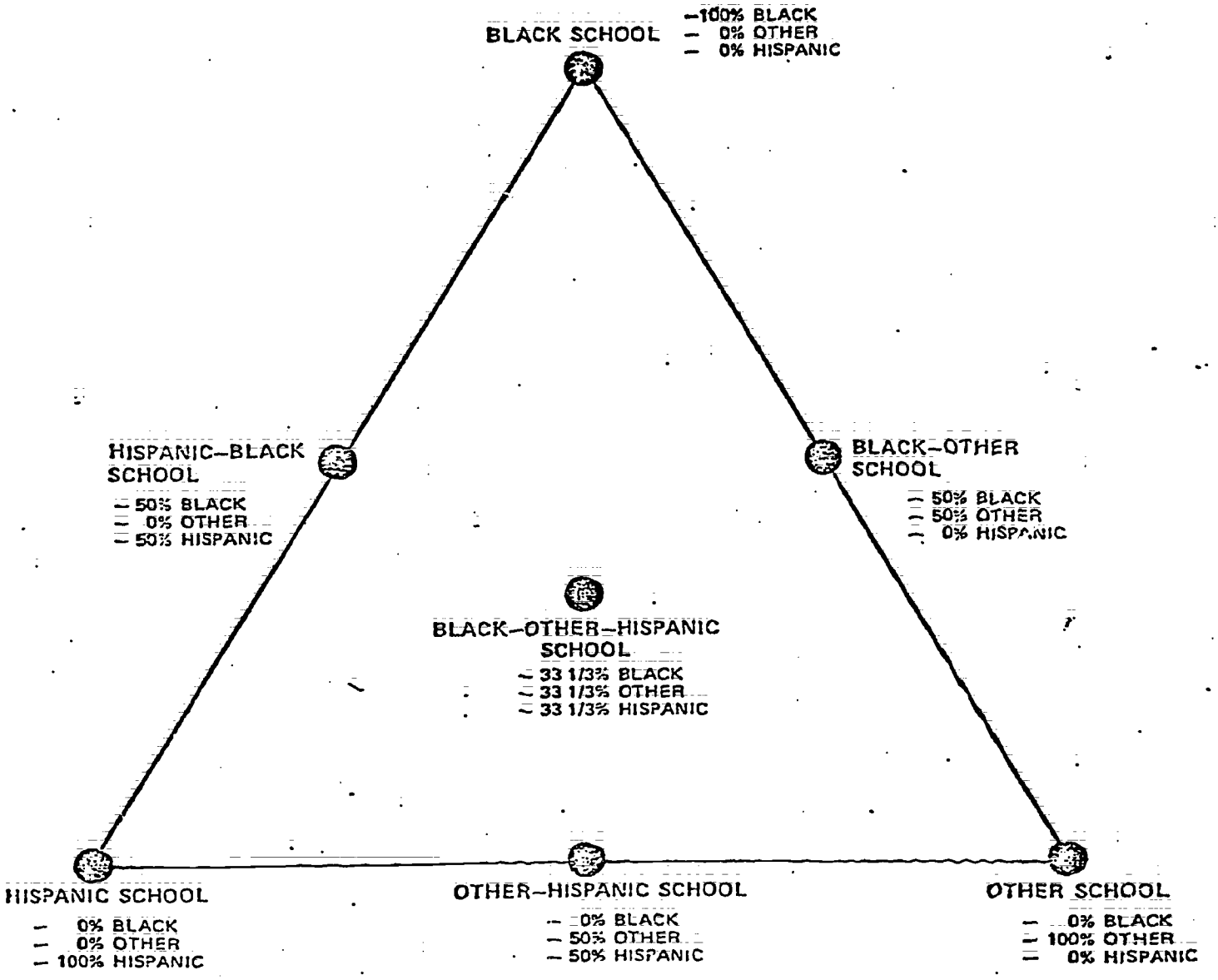
While it is perfectly possible to construct frequency plots with triangle graphs, the mechanics of actually drawing them are somewhat complicated since oblique renderings of three-dimensional figures would be necessary. To keep the illustrations simple, traditional scattergram techniques can be used that are very effective in helping the analyst determine whether or not a school district is segregated.

*The derivation of the triangle diagram is explained in the technical appendix to this article. A full discussion of the uses of the triangle diagram is found in Bernard R. Gifford and Ronald K.H. Choy, Towards a Workable Remedy: Maximizing Integrated Educational Settings and Equalizing Resource Allocation Policies in the Los Angeles Unified School District -- A Response to the Crawford Mandate, a report to Judge Paul Egly, Superior Court of Los Angeles County, November 1978, and a supplementary report, February 1979. These reports are also the source of the information on Los Angeles that will be presented in this article.

**When referring to a racial/ethnic group, the term "Other" is capitalized to avoid confusion. Included in the Other category are Asians and Native Americans.

Exhibit 3

A TRIANGULAR GRAPH OF A TRI-RACIAL/ETHNIC SCHOOL SYSTEM



To simplify transcribing data onto a table, the triangular space can be divided into zones, which is an effective way of classifying schools by the racial/ethnic compositions of their pupils. The appropriate number, size and shape of zones would depend on the distribution of schools within the triangle and on the purposes for classifying schools. To illustrate the notion of zones and as a basis for some of the analysis of Los Angeles that follows, the 13-zone system shown in Exhibit 4 is used. The corner zones include schools that are essentially uni-racial/ethnic. The side zones distinguish two types of bi-racial/ethnic schools: those with a clear majority of one group and those with roughly equal numbers from two groups. The center zone includes tri-racial/ethnic schools. While the 13 zone structure illustrated in Exhibit 4 fits the Los Angeles situation, it would be suitable for use in other school systems.

Exhibit 5 shows a scattergram of schools in the Los Angeles Unified School District when plotted on a triangular diagram and with the 13-zone system superimposed.* In the fall of 1977, the year before implementation of the system's desegregation plan,** most schools were primarily uni-racial/ethnic (located near one of the corners), only a handful of schools were tri-racial/ethnic (located near the center of the diagram), and many schools had Other-Hispanic mixes, but few schools had mixes of Blacks with Hispanics or Others.

A school is represented by a "" in Exhibit 4. If more than one school is located in the same spot, then the number of schools is indicated by the appropriate digit. A "9" indicates that nine or more schools are located at that spot.

**The Los Angeles public school system implemented a desegregation plan in the fall of 1978 in response to a 1976 California Supreme Court ruling, Crawford v. Board of Education of the City of Los Angeles, 17 Cal. 3d. 280 (1976), that the schools were segregated.

Exhibit 4

A 13 ZONE SYSTEM

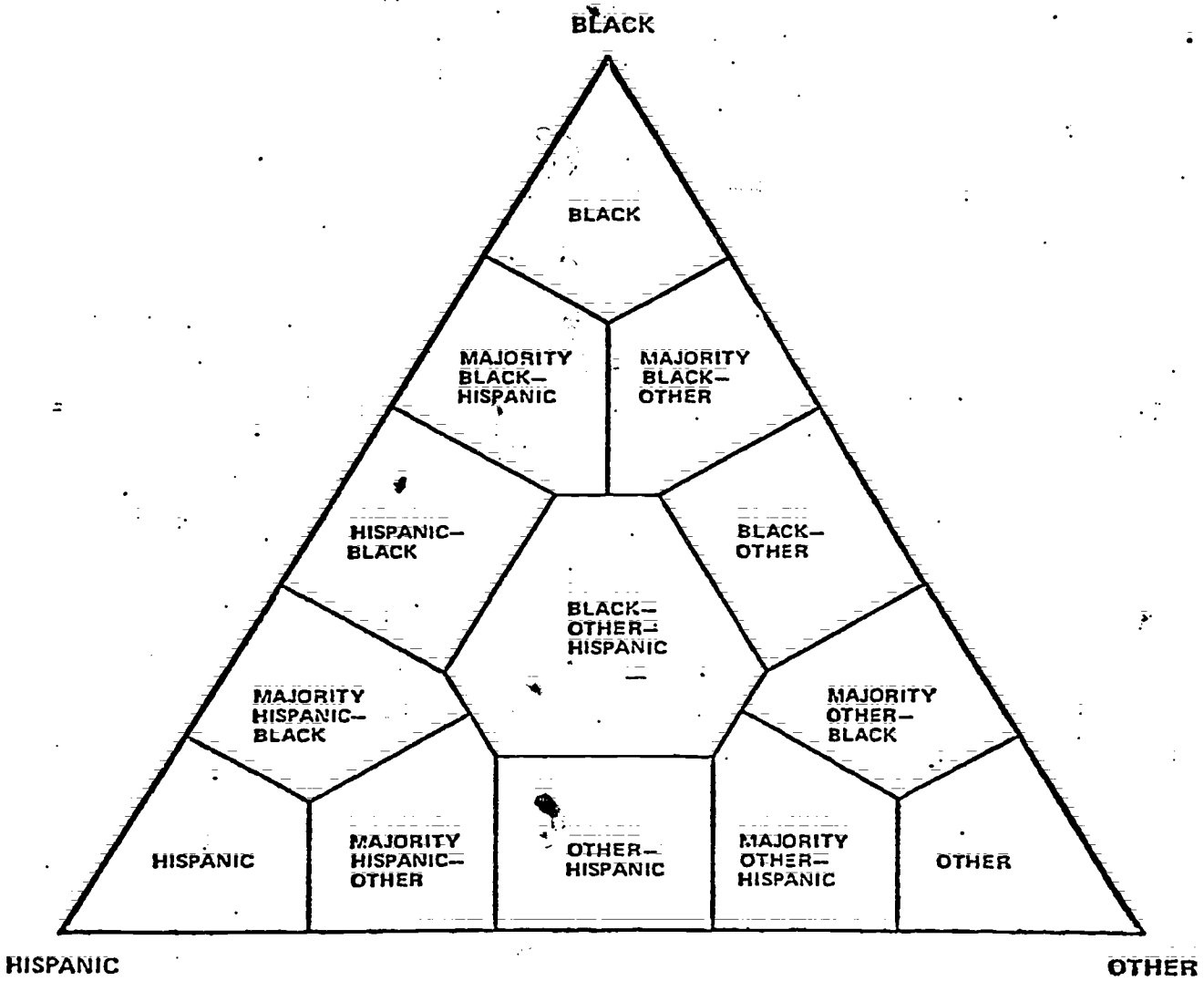
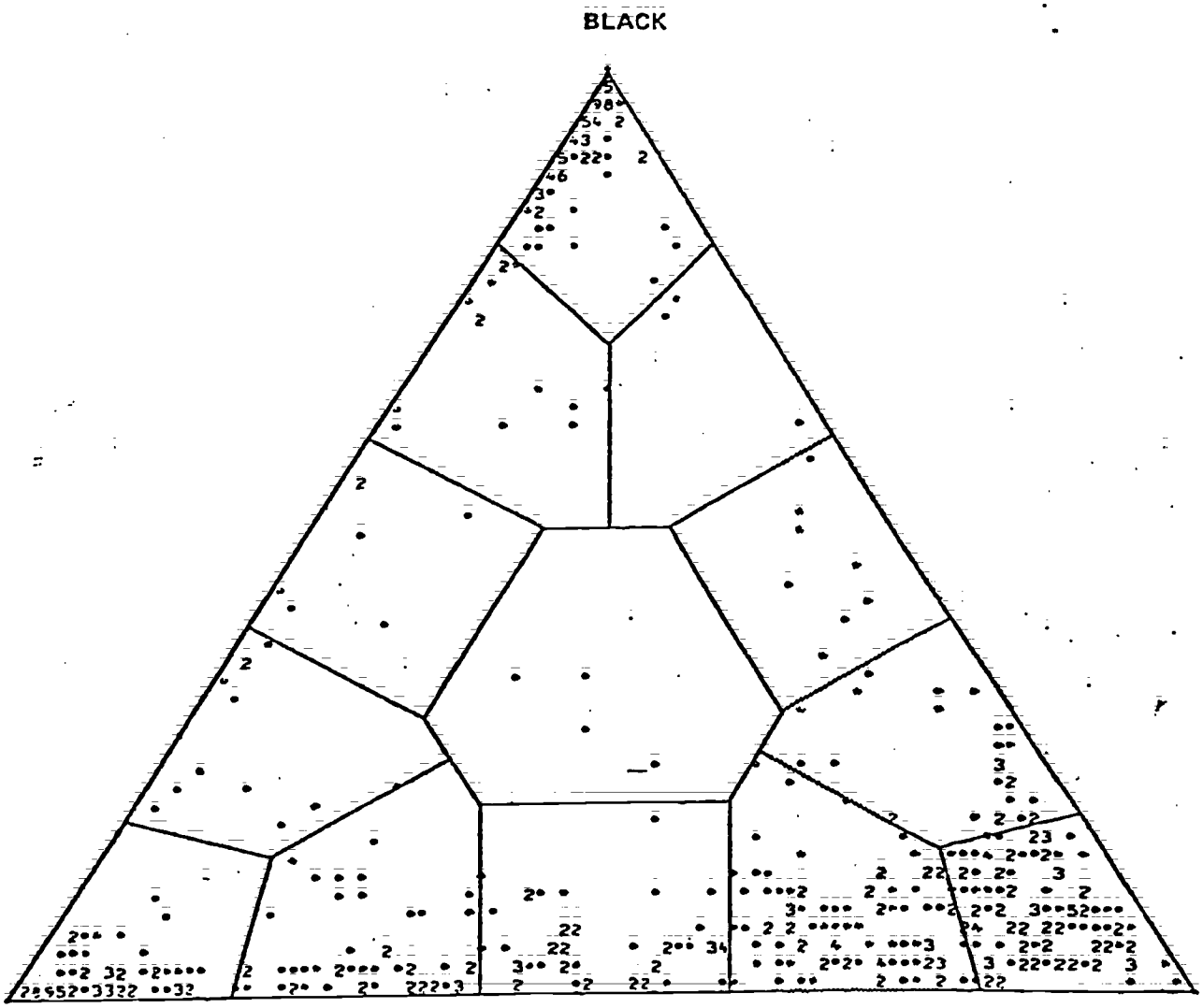


Exhibit 5

PUPIL RACIAL/ETHNIC COMPOSITION OF SCHOOLS
13 ZONE SYSTEM
LOS ANGELES UNIFIED SCHOOL DISTRICT
FALL 1977



The distribution of pupils (as opposed to schools) among the 13 zones in the fall of 1977 is tabulated in Exhibit 6. In Los Angeles, over one-half of all pupils (52 percent) were enrolled in uni-racial/ethnic schools. Another 38 percent of all pupils were in schools where one racial/ethnic group was a majority, and only 10 percent of all pupils were in schools where no one group had a majority. Looking at the distribution of pupils from each racial/ethnic group, the data in Exhibit 6 show the extent of racial/ethnic concentration and isolation that existed in the fall of 1977. Nearly 70 percent of all Black pupils were enrolled in schools with primarily Black pupil populations. Over 78 percent of all Other pupils were in primarily Other schools, and nearly 65 percent of all Hispanic pupils were in primarily Hispanic schools.

Exhibit 6

DISTRIBUTION OF BLACK, OTHER AND HISPANIC PUPILS AMONG SCHOOLS GROUPED BY PUPIL RACIAL/ETHNIC COMPOSITION ACCORDING TO 13 ZONE TRIANGLE SYSTEM
ALL SCHOOLS, FALL 1977

Pupil Racial/Ethnic Composition: 13 Zone System	ALL PUPILS		BLACK		OTHER*		HISPANIC	
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
Black	95,026	16.6	87,699	63.0	1,707	0.7	5,620	2.8
Majority Blk.-Other	4,724	0.8	3,089	2.2	994	0.4	641	0.3
Black-Other	8,069	1.4	3,592	2.6	3,692	1.6	785	0.4
Majority Other-Blk.	34,242	6.0	8,466	6.1	22,920	9.9	2,856	1.4
Other	117,094	20.5	9,332	6.7	97,286	42.0	10,476	5.2
Majority Other-Hisp.	93,390	16.3	6,675	4.8	61,360	26.5	25,355	12.6
Other-Hispanic	38,546	6.7	1,982	1.4	17,936	7.7	18,628	9.3
Majority Hisp.-Other	59,572	10.4	2,502	1.8	17,146	7.4	39,924	19.9
Hispanic	86,931	15.2	1,296	0.9	5,388	2.3	80,247	39.9
Majority Hispanic-Blk.	13,972	2.4	3,846	2.8	684	0.3	9,442	4.7
Hispanic-Black	5,514	1.0	2,716	2.0	200	0.1	2,598	1.3
Majority Black-Hisp.	9,378	1.6	6,341	4.6	511	0.2	2,526	1.3
Black-Other-Hispanic	5,269	0.9	1,705	1.2	1,689	0.7	1,875	0.9
Totals	571,727	100.0	139,241	100.0	231,513	100.0	200,973	100.0
Percent of All Pupils	(100.0%)		(24.4%)		(40.5%)		(35.1%)	

Source: October 1977 Racial and Ethnic Survey.
Note: "Percent of Total" may not add to 100.0 percent due to rounding.
*"Other" includes White, Asian and American Indian.

What is a segregated school? What is a desegregated school? The courts have steadfastly refused to provide concrete guidelines for a working definition of a segregated or desegregated school. Instead, they have ruled out defining segregated schools in terms of specific racial and ethnic percentages; held that the constitution does not require a school board to achieve a particular or identical racial mix or balance in each school; noted that past experience has taught that the task of integration is an extremely complex one that entails much more than the assignment of specified percentages of pupils of different races or ethnic groups to the same schools; and warned that the fastest path to desegregation does not always achieve this objective, but instead result in resegregation. In short, devising a workable definition of a segregated or desegregated school involves much more than just technical matters of selecting a particular racial and ethnic mix and then shifting pupils around. Even the apparently simple matter of selecting a numerical mix, which is just one part of a desegregation remedy, is not a simple decision.

The usual definition of a segregated or desegregated school involves numbers, the overall percentage mix or "ideal" standard mix. Often this absolute dividing line is widened into a zone of acceptable mixes within which schools are considered desegregated and outside of which schools are considered segregated. What are some of the other problems of defining a segregated school?

Realistic standards

The numbers in the definition should be realistic in terms of the actual racial and ethnic composition of the student body and in terms of

achieving the desegregation objective. For example, if the entire student body of the school district were 60 percent Black and 40 percent White, but the elementary level were 70:30, the junior high level were 60:40, and the senior high level were 50:50, then a 60:40 standard would be realistic for only the junior high schools. If 70:30 were selected for the elementary schools, then one could reasonably wonder if a school with an enrollment that was 70 percent Black and 30 percent White were truly desegregated. If the enrollments of all elementary schools were 70:30, then would the system be desegregated? Or would all schools be segregated, some less than before and others more than before? Would achieving the 70:30 standard in every school merely "segregate" previously 'desegregated" schools?

Instead of just a dividing line between segregated and desegregated, suppose a zone of acceptable mixes were established. How wide should such a zone be? A range that is too wide would lose much of its meaning. A range that is too narrow becomes too hard to achieve, too rigid to allow for reasonable contingencies and slippages.

The Los Angeles definition

The definition selected by the Los Angeles Unified School District (LAUSD) illustrates the potential problems of a zone that is probably too wide. The definition is clear and simple: a segregated school is one whose percentage of either combined minority or other White pupils is 70 percent or more.* In other words, a school with over 70 percent of minority students is

*The term combined minority refers to the following four racial and ethnic groups: American Indian or Alaskan native; Black or Negro, not of Hispanic origin; Asian or Pacific Islander; and Hispanic. The term other White refers to the group: Caucasian or White, not of Hispanic origin. These five groups were established by the U.S. Office for Civil Rights for its racial and ethnic surveys.

segregated, and a school with over 70 percent of White students is also segregated. Conversely, a school is labeled desegregated when the percentages of minority and White are both between 30 and 70 percent. When imposed on the triangle diagram, the Los Angeles definition is illustrated in Exhibit 7.

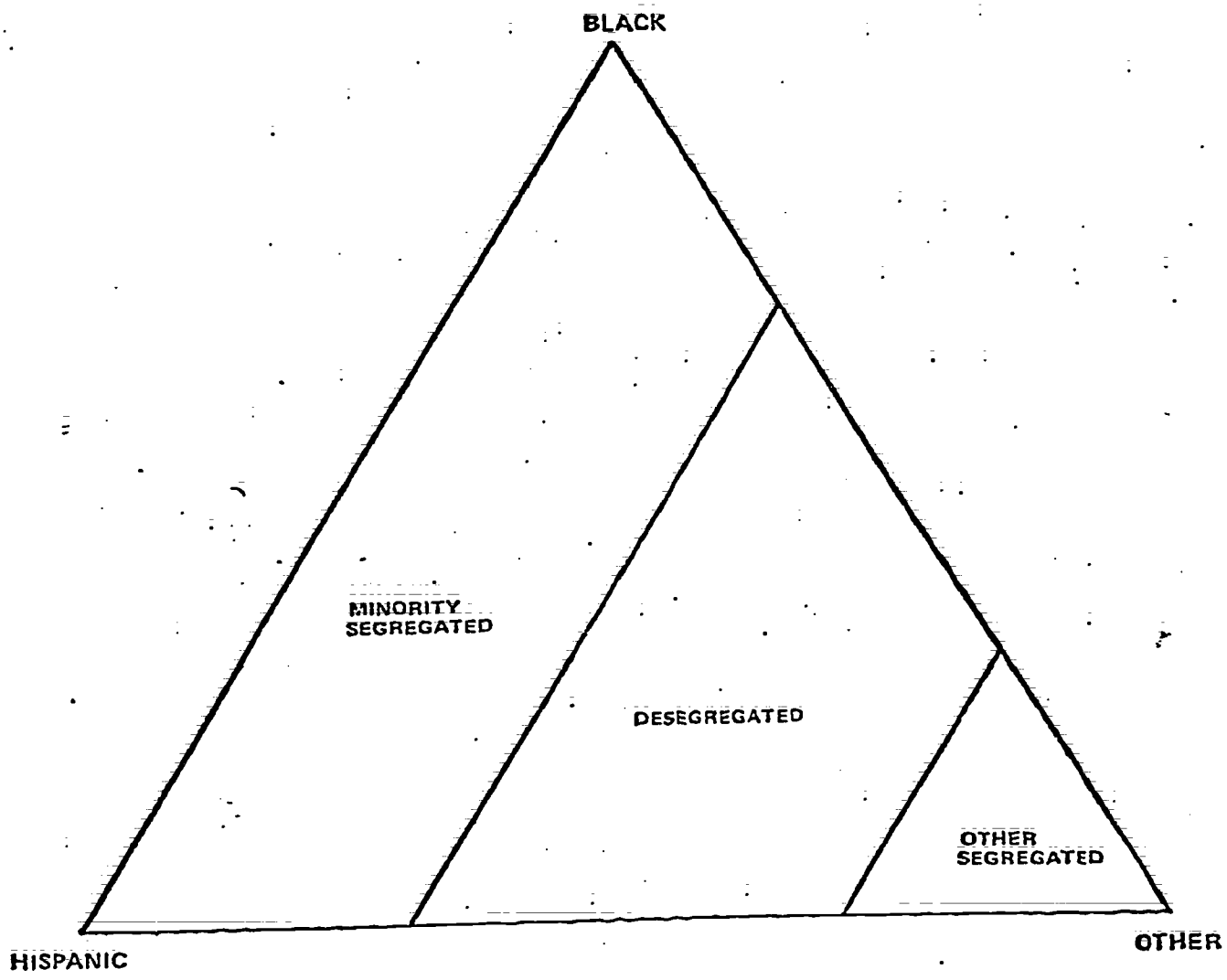
A school that is 69 percent white and 31 percent minority would probably qualify as desegregated, but would a school that is 69 percent minority also be desegregated? Maybe, but most probably not. A mix of 60:40 would be more acceptable, while a 50:50 mix would probably pass scrutiny. One problem, then, with the Los Angeles definition is its symmetry, which is not necessary and could potentially produce ineffective outcomes. There are other problems with this definition.

In a multi-racial/ethnic situation, such as Los Angeles, with three, if not four, major racial and ethnic groups represented in the community and the school system, is a bi-racial/ethnic definition adequate? Los Angeles is not like the typical southern school system with just Blacks and Whites. The term "combined minority" is uncharacteristic of Los Angeles, and combining all minorities into one, big, undifferentiated group oversimplifies a situation and problem that are much more complex than simply "them and us."

Treating all minorities as an undifferentiated group for purposes of desegregation also flies in the face of sound educational policy and common sense. For example, one implication of the Los Angeles definition is that a school where four or five groups were equally represented (one of which was White) would be designated as segregated, when common sense tells

Exhibit 7

THE LAUSD 70/30 DEFINITION



us that the school could not be more desegregated. Also to the extent that certain groups are segregated, each one could and perhaps should be desegregated in different ways.

A multi-racial/ethnic definition

A definition that attempts to deal with the multi-racial/ethnic realities of Los Angeles is the following: a segregated school is one where the number of pupils in any single minority group exceeds the number of Whites;* an ideal desegregated school would be multi-racial/ethnic with Whites constituting an insignificant plurality by being only slightly more numerous than the next largest racial or ethnic group; and a desegregated bi-racial/ethnic school would be between 50 and 65 percent White.** This multi-part definition divides the triangle diagram into three zones: minority segregated, desegregated, and Other segregated (see Exhibit 8). The desegregated zone is relatively narrow, which presents some practical problems. It would not be easy to fine tune the enrollments of schools so that they end up in the desegregated zone; maintaining a desegregated status, especially in a period of rapid, city-wide racial and ethnic shifts, could require annual reassignment of pupils.

An alternative definition of segregation and desegregation can be based on the 13-zone triangle diagram illustrated in Exhibit 4. The multi-racial/ethnic composition of the community and public school student body are incorporated into the definition, and 13 different types of

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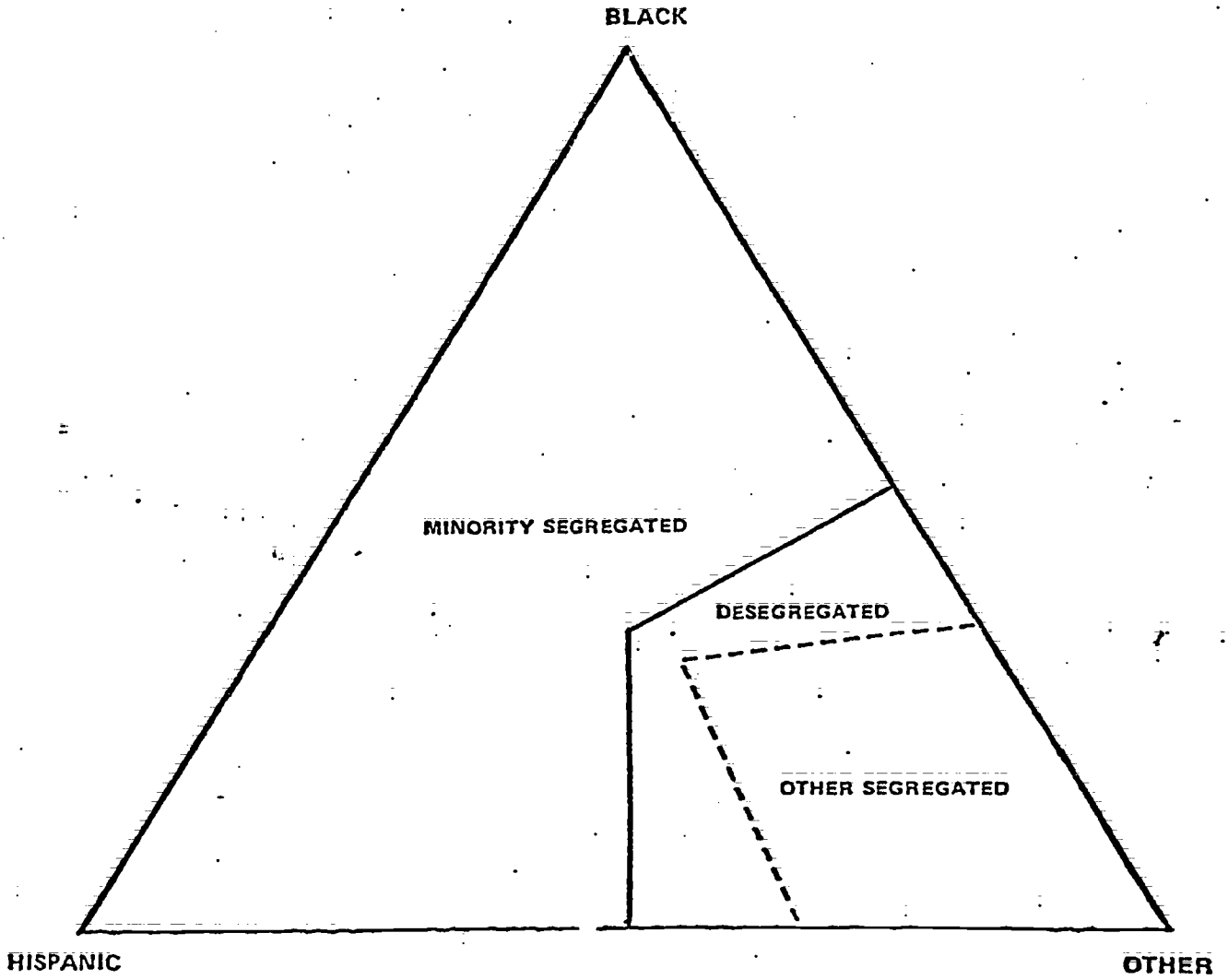
*This "no plurality of a minority" definition of desegregation was proposed by John Caughey in a series of amicus curiae briefs for Crawford, 1977.

**These additions to Caughey's definitions were proposed by Thomas Pettigrew, Report to the Honorable Judge Paul Egly in Response to the Minute Order of February 7, 1978, November 1978, p. 51.

Exhibit 8

NO PLURALITY OF A MINORITY AND A SLIGHT PLURALITY OF WHITES



schools are distinguished, rather than just two or three. This finer classification of schools by the racial/ethnic mix of their enrollments permits a more diverse range of policies to be developed that more closely fit the particular circumstances of different schools. Three types of uni-racial/ethnic schools are identified. Nine types of bi-racial/ethnic schools are identified. Nine types of bi-racial/ethnic schools are distinguished by the particular racial/ethnic pairs that predominate and by the relative balance between groups in the respective pairs. Finally, tri-racial/ethnic schools are explicitly recognized.

Desegregation priorities

This tri-racial/ethnic, 13-zone classification system is useful as an analytical tool, and it is also valuable as an abstract framework for thinking about practical desegregation problems. One question that has to be answered is: should any schools be permitted to remain in any of the corner zones? Should every corner be considered segregated; i.e., are Other schools segregated and therefore subject to remedial actions in the same way as Black or Hispanic schools? If white "segregated" schools are part of the problem rather than part of the solution, then they will compete against minority segregated schools, which definitely are part of the problem, for priority and resources. Desegregation planners could legitimately ask the question: should White segregated schools be desegregated before, after or at the same time as minority segregated schools? In Los Angeles, White segregated schools were defined to be part of the problem and they were given first priority. The result was predictable. White segregated schools have been virtually eliminated (see

Exhibit 9), and most of these newly desegregated schools are in the White half of the desegregation zone.* Minority segregated schools are just as numerous as before the desegregation plan was implemented, but now there are few White segregated schools left that could serve as potential sources of the White students needed to desegregate these minority segregated schools. If Los Angeles had reversed its priorities, it would have been able to desegregate every minority segregated junior and senior high school (every school between 70 and 30 percent minority), and almost every elementary school, while at the same time eliminating every White segregated school.**

Progress toward desegregation

Another question that must be answered for each school and for the system of all schools is: How much desegregation is enough? Enough desegregation can be defined as making significant progress toward desegregation and as actually achieving a desegregated status. The characteristics of progress toward desegregation are the direction, path, and speed of changes in the racial/ethnic composition of the student body. In terms of the triangle diagram, movement in the direction of desegregation would be toward the "center" of the diagram. But a uni-racial/ethnic school could reach the center via several paths. It could move along the side of the triangle diagram, becoming bi-racial/ethnic before moving away

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*John Caughey, Brief Amicus Curiae for Crawford, October 1979, p. 23.

**This ability is theoretical only. Practical problems and the requirements of educational programs would undoubtedly prevent the achievement of the theoretical limit of complete desegregation. The demonstration of this theoretical ability was done by Gifford and Choy, Towards a Workable Remedy, pp. 35-55.

Exhibit 9: Desegregation Status of Los Angeles Schools: 1977 and 1978

Desegregation Status	Elementary 1977	Elementary 1978	Junior High 1977	Junior High 1978	Senior High 1977	Senior High 1978	Total 1977	Total 1978
Minority Segregated	213	212	34	35	24	25	271	272
Other Segregated	96	17	10	1	13	11	119	29
Desegregated	128	208	31	39	19	20	178	267
Total	437	437	75	75	56	56	568	568

Source: Los Angeles School Monitoring Committee, LAUSD Desegregation Performance: Racially Isolated Schools, 1977-1978, Twelfth Report, December 1979, Table 1.

from the edge toward the interior, or it could take a more direct route to the center. These alternative strategies raise another question: In a multi-racial/ethnic school system and community, is a bi-racial/ethnic school desegregated enough or should more racial/ethnic groups be included? The speed of change must be fast enough to give assurance that a desegregated status will actually be achieved within a reasonable time frame, but change that is too rapid might also be too disruptive and might ultimately result in resegregation. Resegregation could also be the result of "natural" socio-economic changes in the community that are pretty much independent of any desegregation actions taken or contemplated by the school board. In a situation where suburbanization of the middle class, White and nonwhite, is a fact, schools should be desegregated enough so that there is a built-in cushion against slippage for at least a few years. The alternative to a cushion is substantial annual transfers of pupils just for the sake of maintaining some given racial/ethnic mix. Both strategies have their respective advantages and drawbacks, and neither is inherently superior so that the better strategy may depend on the particular circumstances of individual schools or groups of schools.

What if it is clearly impossible to desegregate meaningfully every school? For example, Detroit, with 85 percent of its students Black, can desegregate only some schools. How are these schools to be chosen, and what kind of remedies can be applied to the others? Perhaps extremely segregated schools should be left segregated and be given lots of resources instead so that if they must be separate, they can at least be better. The schools that are almost desegregated could be given assistance so that they

are gently pushed in the desired direction. Any desegregated schools might best be left alone but strongly supported. An alternative might be to rotate students on a predetermined schedule so that everyone has a chance to be in a desegregated school at least part of the time.

The notion of progress toward a desegregation status incorporates the idea of degrees of segregation or desegregation. Rather than thinking of desegregation and segregation as being separated by a sharp dividing line (a school is on one side or the other), the possibility of being more desegregated, and therefore less segregated, is a better description of a school's actual situation. It then is easier to set priorities for desegregation and to draw up schedules for achieving desegregation milestones or benchmarks. Even if it were a practical possibility that every school could be moved into the most desegregated zone, this situation may not be the most desirable or even necessary in order to desegregate the school system. When some schools must be left in the more segregated zones, then the desegregation planners face a very complicated situation that will require many difficult tradeoffs and result in what could appear to be only partial solutions. A carefully thought out definition of segregation and desegregation that is fair, realistic, and workable should have a decent chance of passing the court's scrutiny and of actually achieving the goal of removing the evils of segregation.

THE DYNAMICS OF PUPIL RACIAL/ETHNIC MIXES

Changes in the racial/ethnic mix of a school are important information to have when an appropriate desegregation remedy is being designed for it. Common sense tells us that a stable Black-White school should not be disrupted, if possible, when a rapidly changing Black-White school might be a candidate for several possible remedies depending on individual circumstances. For example, is the school already majority Black or still majority White? What is happening to the racial/ethnic mix of the neighborhood? Are nearby schools undergoing the same kind of transition?

A study of the dynamics of pupil racial/ethnic mixes in the Los Angeles public schools will be summarized here as an example of the kind of analysis that can be done and the insights that can be obtained.* The data for this study of dynamics are the racial/ethnic mixes of each elementary school for the years 1966 through 1977 (an example of these data is listed in Exhibit 10.) Only schools open in 1977 are included. The methodology of the analysis uses the triangle diagram and a 7-zone system, which is a simplification of the 13-zone system introduced previously.** For each school, the zone for each year is determined (see Exhibit 10). Examining the sequence of zone locations over the course of the time period under study, which was 12 years in the case of the Los Angeles example, the stability of a school's racial/ethnic mix is quickly obvious. If a school was in transition, then the path and

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*Gifford and Choy, Towards a Workable Remedy, November 1978.

**See technical appendix for description of 7-zone system.

Exhibit 10

DATA FOR BALDWIN HILLS ELEMENTARY SCHOOL, LOS ANGELES,

SHOWING DYNAMICS OF PUPIL RACIAL/ETHNIC MIX: 1966 & -1977

Indicator	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Percent Black	16.0	18.9	27.4	38.3	56.6	71.2	79.3	86.1	89.7	93.0	92.8	91.5
Percent Hispanic	5.2	6.5	6.4	7.8	4.9	3.1	1.4	1.6	2.0	1.2	1.9	4.7
Percent Other	78.7	74.4	66.0	53.8	38.3	25.6	19.2	12.1	8.2	5.7	5.1	3.6
Change in Percent												
Black	--	2.9	8.5	10.9	18.3	14.6	8.1	6.8	3.6	3.3	-0.2	-1.3
Hispanic	--	1.3	-0.1	1.4	-2.9	-1.8	-1.7	0.2	0.4	-0.8	0.7	2.8
Other	--	-4.3	-8.4	-12.2	-15.5	-12.7	-6.4	-7.1	-3.9	-2.5	-0.6	-1.5
Sum of Percents												
Black + Other	94.7	93.3	93.4	92.1	94.9	96.8	98.5	98.2	97.9	98.7	97.9	95.1
Hispanic + Other	83.9	80.9	72.4	61.6	43.2	28.7	20.6	13.7	10.2	6.9	7.0	8.3
Black + Hispanic	21.2	25.4	33.8	46.1	61.5	74.3	80.7	87.7	91.7	94.2	94.7	96.2
Change in Number												
Black	--	31	92	116	198	186	79	5	-58	41	-44	-87
Hispanic	--	13	2	16	-28	-17	-19	1	2	-7	5	20
Other	--	-23	-52	-108	-148	-118	-71	-86	-47	-21	-8	-16
Enrollment	922	945	986	1009	1032	1082	1071	992	887	900	854	771
Triangle Zone	0	0	B-0	B-0	B-0	B	B	B	B	B	B	B

Note: ~~See Appendix C for a complete listing of Recovery Schools~~ Percents and totals may not add due to rounding.

Key to Triangle Zones: B = Black, O = Other, B-O = Black-Other.

speed of change are also easily determined.

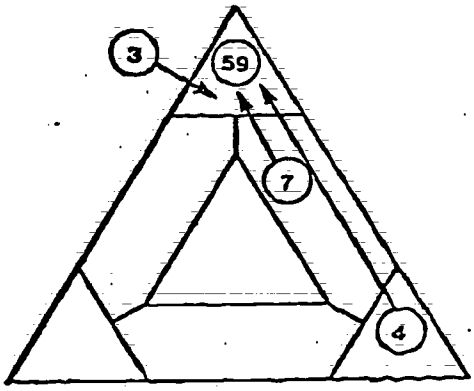
To obtain a picture of the movement of the school system as a whole, schools with identical zone-to-zone paths of change must be grouped together and then each group sorted by the speed of change. Diagrams can then be constructed showing the main corridors of transition. Schools with identical paths of change can be located geographically on a map of the district, and an analysis of geographic patterns of change will add a spatial dimension to the analysis of aspatial zone changes.

Paths and directions of change.

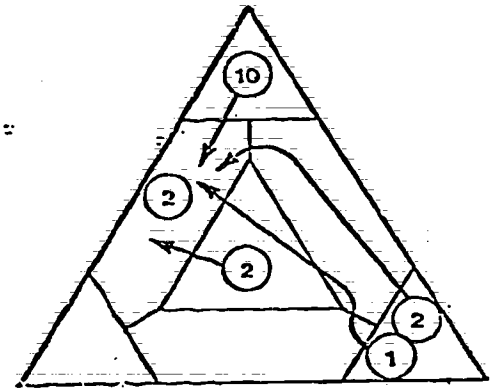
The zone-to-zone changes of Los Angeles elementary schools between 1976 and 1977 are diagrammed in Exhibits 11 and 12. These diagrams answer different questions: Where did the schools come from, and where did they go? In Exhibit 11, schools are grouped by the 1977 zone, and the paths from their "origin" zones are marked. For example, the top diagram shows that of the 73 elementary schools in the Black zone in 1977, 59 schools had been in this zone for the entire 12-year period, 3 schools opened sometime during the period, 7 schools moved from the Black-Other zone to the Black zone, and 4 schools moved from the Other zone to the Black zone. In Exhibit 12, schools are grouped by the 1966 zone, and the paths to their "destination" zones are marked. For example, the top diagram shows that of the 70 schools in the Black zone in 1966, 59 schools remained in the zone for the entire 12-year period, 10 schools moved to the Hispanic-Black zone, and one school moved to the Hispanic zone.

Exhibit 11

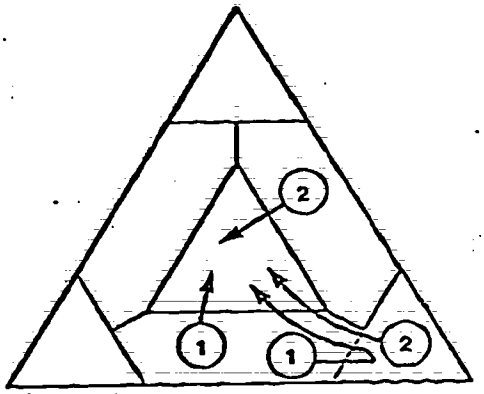
ORIGINS OF 1977 ELEMENTARY SCHOOLS



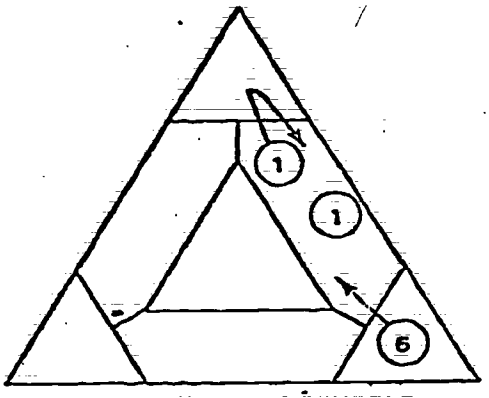
73 BLACK SCHOOLS



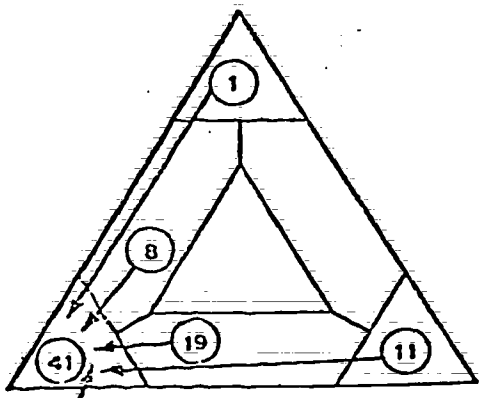
17 HISPANIC–BLACK SCHOOLS



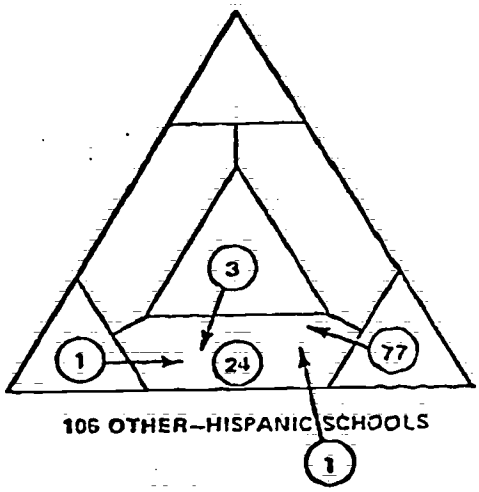
6 BLACK–OTHER–HISPANIC SCHOOLS



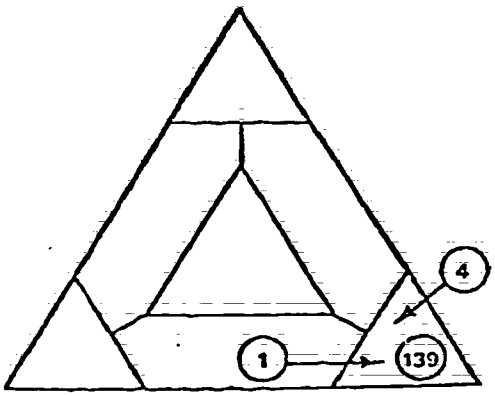
8 BLACK–OTHER SCHOOLS



81 HISPANIC SCHOOLS



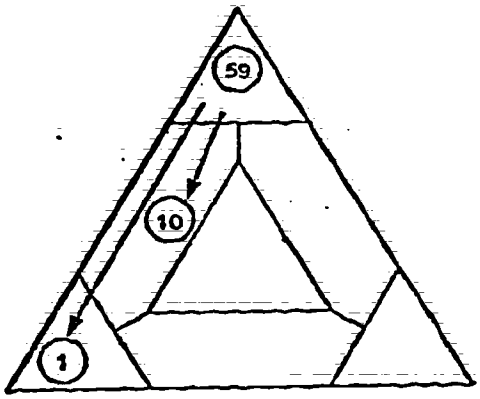
106 OTHER–HISPANIC SCHOOLS



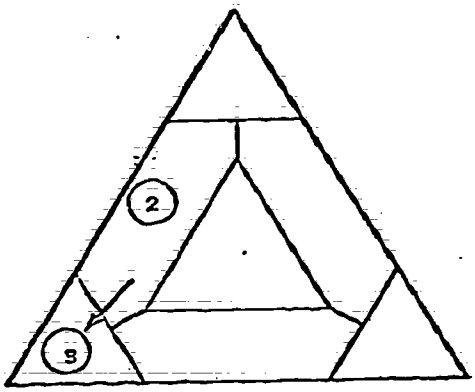
144 OTHER SCHOOLS

Exhibit 12

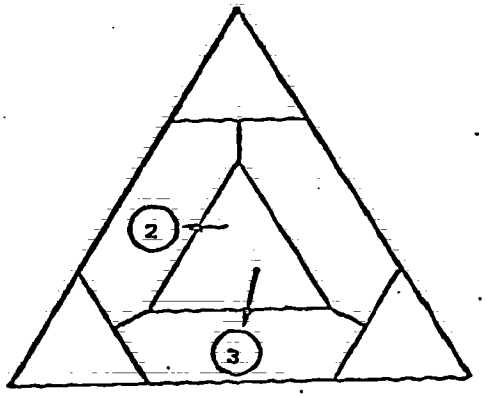
DESTINATIONS OF 1966 ELEMENTARY SCHOOLS



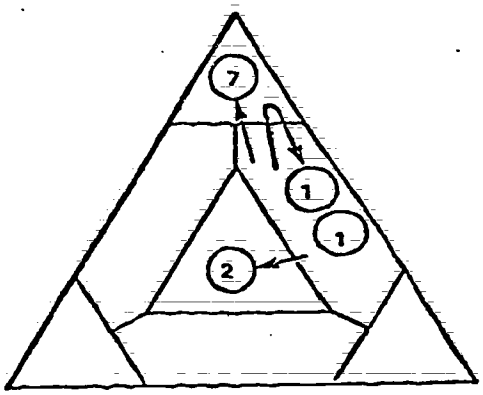
70 BLACK SCHOOLS



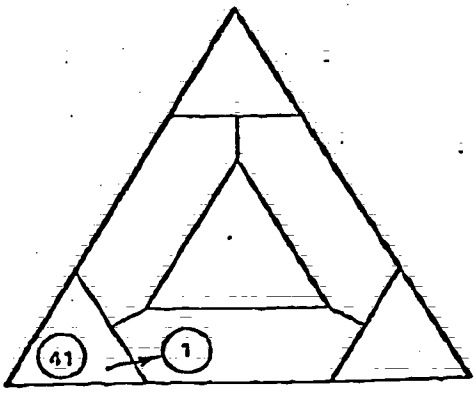
10 HISPANIC–BLACK SCHOOLS



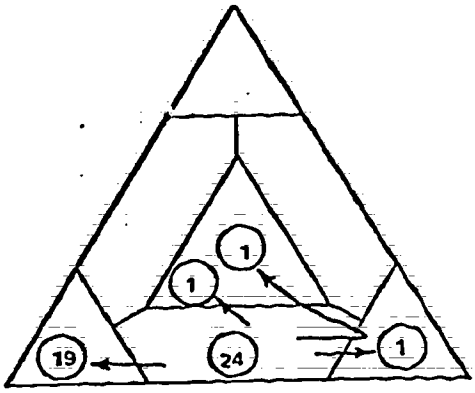
5 BLACK–OTHER–HISPANIC SCHOOLS



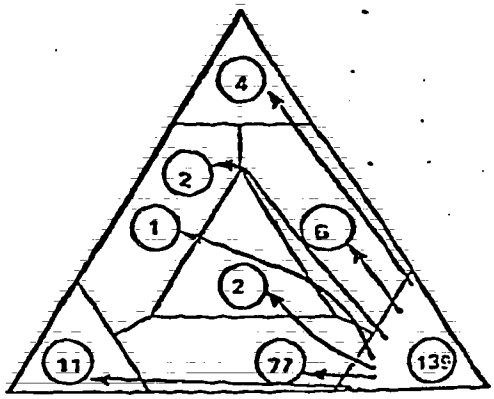
11 BLACK–OTHER SCHOOLS



42 HISPANIC SCHOOLS



46 OTHER–HISPANIC SCHOOLS



242 OTHER SCHOOLS

A tabular summary of the zone changes would show for each zone: the number of schools in the zone in 1966, the number that left the zone, the number of new schools that opened during the period, the number of schools that remained in the same zone for the entire period, the number that entered the zone, the resulting number in the zone in 1977, and, finally, the number of schools that passed through the zone (see Exhibit 13). If a stable school is defined as one that does not change zones during the time period under study, then Hispanic and Black schools were the most stable since all but one of the 42 Hispanic schools in 1966 were still in the Hispanic zone in 1977, and 59 of the 70 Black schools remained in the Black zone. About 60% of the Other schools were stable, about half of the Other-Hispanic schools were stable -- but most

Exhibit 13

SUMMARY OF ZONE CHANGES - 1966 TO 1977
LAUSD ELEMENTARY SCHOOLS:

Zone	1966	Went	New	Same	Came	1977	Passed Thru
Black	70	11	3	62	11	73	1
Other	242	103	4	143	1	144	1
Hispanic	42	1	1	42	39	81	0
Black-Other	11	9	0	2	6	8	8
Other-Hispanic	46	22	1	25	81	106	14
Hispanic-Black	10	8	0	2	15	17	1
Black-Hispanic -Other	5	5	0	0	6	6	1
Total	426	159	9	276	159	435	26

were slowly moving from majority Other to majority Hispanic status -- and there were two stable Black-Other and Hispanic-Black schools. No tri-racial/ethnic schools were stable.

Over one-third of the Los Angeles elementary schools experienced significant changes in the racial/ethnic mix of their pupils. The major corridor of racial/ethnic change was from Other to Hispanic, which is not surprising since the population of the city as a whole is undergoing the same change. In the 12 years covered by the study, 107 elementary schools started or completed this transition, and 11 of them made the complete move from the Other zone to the Hispanic zone. The other two major corridors of transition were from Black to Hispanic (19 schools) and from Other to Black (17 schools). The remaining 16 schools travelled 11 different paths. Compared to the three main corridors of change, these diverse paths are anomalies. Even though some of these paths were in the direction of more desegregation rather than more segregation, there are not enough of them to identify a systematic, widespread trend.

A general conclusion about the Los Angeles schools in transition is that they are moving along well defined corridors between the corners of the triangle diagram. This reinforces the segregated nature of the system. Most of the schools are in the corners of the diagram, indicating the highly segregated nature of the school system; and most of the movement is from corner to corner, which merely perpetuates the segregation. If changes in the racial/ethnic mix of schools are to result in less segregation and more desegregation, then there must be more movement toward the center of the diagram and less movement toward the corners, where "center" is

broadly defined to include bi-racial/ethnic schools as well as tri-racial/ethnic ones.

The geography of racial/ethnic change. When the aspatial movements of schools are mapped, the transition process takes on a geographical dimension, and further insights are gained from an analysis of the spatial patterns of racial/ethnic change. In Los Angeles, the spatial process of transition from Other to Hispanic is successional and matches the aspatial movement of schools along the bottom corridor of the triangle diagram. Almost all of the schools in the Hispanic triangle zone are located in one big area. Around part of this core of Hispanic schools is a band of Other-Hispanic schools. Beyond this band, the schools are strictly Other. Over time, the band moves outward. Other schools became Other-Hispanic, and Other-Hispanic schools became Hispanic. This successional process repeats itself as the Hispanic core continues to spread outward into the Other areas.

The core of the Hispanic schools is adjacent to the core of Black schools. Along their common border is a very narrow band of Black-Hispanic schools. The transition of a school from Black to Hispanic is quite rapid, and takes place in several neighboring schools at the same time, and occurs in spurts. One set of schools makes the change in a couple of years, then no school change for a few years, then another set rapidly switch from Black to Hispanic.

Almost all of the Los Angeles schools that were in transition from Other to Black were at the shifting edge of the core area of Black schools. In a few instances, the transition was very fast, with these

schools completely reversing their racial/ethnic mix in just a couple of years (e.g., see the data for Baldwin Hills in Exhibit 10). In most of the other cases, the transition proceeded at a more normal rate.

Once clear conclusion from this brief summary of the geography of racial/ethnic change in Los Angeles is that almost all of the transition is a result of an orderly process of expanding or shifting core areas of Black or Hispanic schools. Thus, like the aspatial movement of schools along corner-to-corner corridors in the triangle diagram, much of the geographic movement is not desegregation, but the expansion or shifting of one uni-racial/ethnic area into another, which merely perpetuates segregation.

OTHER POLICY ORIENTED STUDIES

Drawing up a plan that is workable and has a chance of being effective requires posing and solving many detailed problems. Many factual questions have to be answered in order just to have a working familiarity with the scope, let alone the complexity, of the desegregation task. The triangle diagram is a first step toward quantifying the situation. Just knowing how many schools are now in each zone immediately lays out the order of magnitude of the problem. However, the task of designing appropriate remedies for individual schools requires that these gross groupings be more finely sorted by considering factors other than just racial/ethnic mix. A series of policy oriented studies should be completed so that appropriate ways can be found to incorporate these factors into the design of remedies. A minimum agenda of policy analysis would include the following studies.

Dynamics: slow versus fast transition. The rate at which schools move along the corridors of the triangle diagram is a critical factor in determining the difficulty of desegregating a given school. A slowly moving school will probably be easier to guide toward desegregation than one that is rapidly moving from one corner to another. Indeed, it may be a waste of limited resources to try to slow down or redirect a rapidly moving school. Alternatively, since such a school is already experiencing large turnovers in its student body, this may present an opportunity to channel its racial/ethnic mix toward desegregation. However, before the appropriate remedies can be devised, schools have to be identified at the rate at which their racial/ethnic mix is changing.

This means that some way of making adequately reliable predictions must be devised.

There are several ways to model the racial/ethnic transitions of schools. Each way has its advantages and disadvantages, usefulness and limitations. While it would be sheer luck if every method gave identical predictions for every school (or sheer disaster if every method gave totally contradictory predictions for every school), apriori there should be enough commonality in the results that the predictions given by different methods would be close enough together for most schools. Two methods are noted here.

Discrete-state Markov models can be used to study the racial/ethnic transition of schools. There is an extensive literature on the application of this kind of social model to heterogeneous populations.* The key features of the phenomenom that suggest the use of Markov models to establish a baseline for projections are: a specified list of system states (the racial/ethnic group of students); the availability of repeated observations on the changes in the student population in each racial/ethnic grouping; and an interest in the dynamics of the transition process.

The triangle diagram is the basis for an entirely novel way to study the racial/ethnic transition of schools. The dynamics of racial/ethnic changes in a school are analogous to those of phase equilibria, a topic of physical chemistry. There is a well developed body of theory and mathematics

*For example, see Burton Singer and Seymour Spilerman, "Social Mobility Models for Heterogeneous Populations," in Herbert L. Costner (ed.), Sociological Methodology, 1973-1974 (San Francisco: Jossey-Bass, Inc., 1974).

dealing with phase diagrams, and these could be adapted to analyze racial/ethnic dynamics of schools. For example, the conventional wisdom says that when the racial/ethnic mix of a school reaches some particular proportions, the school will suddenly takeoff away from the Other corner. If this tipping point could be identified, then appropriate remedies might be devised that would steer a school around or through this critical racial/ethnic mix so that avoidable flight (whether white, black, or Hispanic) would not contribute to the resegregation of the school system. Using the techniques of phase analysis, this tipping point can be found, if it exists.*

No matter which method is used, the purpose of a detailed analysis of racial/ethnic dynamics is to categorize individual schools in terms of their paths and speeds of change. This information will be extremely useful in establishing the desegregation priority of individual schools.

Geographic location. The geographic location of a particular school is related to three separate considerations. First, its spatial location with respect to other schools is closely connected to its past and future racial/ethnic change. Thus, if it is determined that a particular school should be desegregated or its present desegregated status maintained, then it may be necessary to apply appropriate remedies to surrounding schools as well.

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*Other techniques have been developed by Thomas C. Shelling, "Dynamic Models of Segregation," Journal of Mathematical Sociology, Vol. 1 (1971), pp. 143-86; and Micromotives and Macrobehavior (New York: Norton, 1978), pp. 137-66.

Second, the social class of students in a school is closely connected to its geographic location. A social class determination might be needed in order to establish priority rankings so that limited desegregation resources could be rationed more effectively. For example, not all Hispnaics (and Asians) need to be protected from the negative impacts of segregation. A social class assessment might be an effective and efficient way to sort and rank schools so that Hispanic pupils with greater need for protection have a significantly greater chance of actually receiving the help.

Third, travel time and distance between schools depend on geographic location with respect to major routes. If an upper limit were placed on travel times, then the number of potential feeder schools to any given school might also have to be limited. Flexibility might be introduced if tradeoffs between achieving less segregation (more desegregation) at the cost of more travel were allowed. As travel times lengthened, the incremental gain in desegregation would have to increase at least in proportion to the increasingly larger incremental cost of longer and longer trips. In other words, five more minutes added to a forty minute ride would have to result in much more desegregation than five more minutes added to a ten minute ride. A "subjective" decision would have to be made on the schedule of acceptable minimum "exchange rates" between less segregation and more travel. Then for a given school, if extending travel times to or from it resulted in less segregation (more desegregation) than the minimum exchange rate, then there will be more flexibility in devising remedies for that school.

Baseline projections. Since there are likely to be several alternative remedies that would be effective in desegregating any given school, selecting the best alternative, or even a good alternative, requires that ways be developed to identify them. This involves being able to simulate accurately the impact of a proposed remedy and then to compute a desegregation effectiveness "score." Simulating alternative remedies would be an extension of the work on predicting the path and speed of a school's racial/ethnic change. A "baseline" projections would have to be made to establish what the racial/ethnic mix of individual schools and the system as a whole would have been if no desegregation plan had been implemented. This is the only way to separate the impacts of deliberate change from "natural" change. If the overall desegregation plan called for phasing in remedies each year, then successive annual baseline projections would have to be made so that the impact of each succeeding year's actions could be estimated.

Effectiveness scores. Desegregation effectiveness scores would have to be developed that could measure the overall progress of the system as a whole. In terms of the triangle diagram, the school system would be more desegregated and less segregated if the pattern of dots changed so that more schools were closer to the center rather than corner zones and if the dots were more evenly spread out rather than densely clustered in a few zones. Closeness to the center zone is also the criterion for evaluating the progress of an individual school. The clustering of dots would be an indication that something systematic was going on that caused

many schools to have roughly the same racial/ethnic mix. All systematic behavior need not be detrimental, but obvious clustering should be investigated to find out why it occurred. If a remedy is deemed appropriate, then it should be applied.

The desegregation score for nearness to the center of the triangle diagram could be an average of the changes in the distance of individual schools from the center, where the center could defined in a number of ways; for example, the nearest edge of the center zone or zones; the point representing the overall racial/ethnic mix of the entire school system; or the center point of the triangle diagram -- one-third each of Black, Hispanic and Other. In computing the average change in distance to the center, schools might be weighted by their enrollment.

Devising a desegregation score for the spread or concentration of schools among the zones of the triangle diagram presents many conceptual and methodological problems. Solving these problems could prove to be a difficult and time consuming task, and it may make more sense to rely on intuitive, subjective judgement. A panel of individuals who independently studied two triangle diagrams side-by-side (before and after alternative A versus B) would probably be able to agree on which one looked more desegregated. While this procedure would not produce a numerical score, it would result in an ordinal ranking of alternatives.

III. RESOURCE ALLOCATION

The distribution of resources among schools with respect to the racial and ethnic composition of their pupil population is one indication of the extent of segregation in a school system. Before assembling and analyzing data on resource allocation, the notion of resources has to be defined explicitly. In order to put the analytical results into the proper context, the policies and procedures used by a school system to allocate resources must be thoroughly understood, especially if changes in the allocation results are desired. The many alternative criteria for establishing equitable allocations of resources sometimes conflict with each other so that formulating fair and effective allocation formulas requires choosing among those criteria that solve the particular problems faced by the individual school system. There are no definitive rules for selecting the best set of criteria. However, the selection will be more enlightened after a thorough analysis of actual patterns of spending per pupil, the allocation of teachers, and the distribution of teacher qualities.

DATA ON RESOURCES

What are a school system's resources? There is a budget, but resources are more than just money. Revenue is a form of money that is cash in the bank or credit. Budgets are appropriations of income and authorizations to spend. Expenditures are the actual purchases of goods and services needed to operate the school system's programs.

Resources can also be the inputs that are bought. Teachers are the most important input -- it is hard to conceive of a school system

without teachers, and teacher services account for the greatest proportion of expenditures. The pupil-teacher ratio is an overall measure of the number of teachers a school has. A lower ratio enables a school to have smaller classes, tutorials, specialists who can deal with the special educational needs of individual children, and extra instructional programs.

The notions of teachers as a resource involves much more than just a body count. While the number of teachers a school has is a major measure of its resources, for many purposes not all teachers are equivalent. Individual differences in education, training, experience and stability are reflected in a teacher's classroom performance, and the way these teacher qualities are distributed among schools is a factor affecting the equitable distribution of all resources.

An analysis of resource allocation among schools should concentrate on those resources that are actually used or controlled by schools in the direct provision of educational services. Thus, personnel working in schools would be of interest while central office staff would not. Expenditures for food services, pupil transportation, employee support (pensions and fringe benefits), and debt service are typically managed centrally without regard to their distribution among individual schools so these expenditures could be properly excluded. Major capital expenditures for new schools or extensive rennovations could also be excluded and analyzed separately. The main concern should be those expenditures and inputs for direct instructional programs and for the operation of individual schools. Personnel, supplies, equipment, operation and maintenance, and

services are items that merit analysis.

Information on these items, by school, can be obtained from standard expenditure reports and payrolls that no school system can function without. The data exist, but the difficulty is obtaining them. These data are collected for administrative purposes, not for the convenience of policy analysts. They are usually stored in computer readable form, and the reports generated from them make sense only if one knows the codes and abbreviations that identify the numbers. Since these reports are for people interested in financial control, not segregation, it will almost certainly be necessary to generate special reports from the same data, and this will require specially written computer programs. All of this may be obvious and straightforward, but the difficulties of actually reaching the point where it is possible to generate information about resource allocation among schools classified by the racial/ethnic mix of their pupils should not be underestimated.

Before plunging ahead with data analysis, one must design a plan of analysis that will indicate the specific data items needed. This list can be drawn up after a thorough study of the allocation policies, criteria, and procedures used by the school system.

THE ALLOCATION MECHANISM

How are resources allocated among schools? Every school district has general policies and explicit procedures for allocating resources. Policies are often written down, but just as often they are

implicit in the actual procedures and criteria used, which are documented in official bulletins on standard procedures, memoranda issued to personnel who carry out the procedures, and contractual agreements with employees. It is the rare school district that has all of these documents collected in a single place and that has prepared an explanation in layman's language. This explanation is particularly important since it is almost a certainty that each document will be written for the technical people who know what all the other documents say. Preparing such an explanation involves a lot of detective work and is like making a puzzle. The pieces have to be found before they can be fitted together, with the uncertainty that there might still be some missing pieces, but knowing that the pieces that have been found must fit together in some logical way.

Any explanation of a school system's resource allocation would include the distribution of funds and staff to schools, the teacher contract, and the assignment of professional personnel. An idea of what to look for in the documents that deal with these components is presented below. These items cover the major parts of the allocation machinery, and the remaining parts will certainly be uncovered in the course of any investigation.

Distribution of funds and staff. Every school district uses some systematic procedure to allocate funds among its schools. Some allocate dollars that principals can use to purchase different inputs, such as teachers, other staff, and supplies. Some districts allocate staff positions, usually on the basis of a pupil-staff ratio for each type of

position, and then allocate dollars for supplies. No matter what method is used, it can be reduced to a formula or some set of formulas.

For example, a very common way to allocate teachers is by a pupil-teacher ratio, say, one teacher for every 30 pupils. A school with 300 pupils receives 10 teacher positions. The problem of which individuals will fill these positions is solved by different procedures. Other professional staff positions are usually also allocated among schools by pupil-staff ratios. Principals are almost always allocated on the basis of one to a school. Assistant principals are typically allocated on the basis of the size of schools (measured by the school's enrollment). Instructional aides and office staff could be allocated by dollars or by hours (these staff are usually paid by the hour). Supplies and equipment are usually allocated by dollars per pupil. Operation and maintenance staff and supplies are usually allocated by square feet of area --inside and outside-- possibly with allowance for differences in heating costs.

The items listed above are standard inputs that just about every school uses. These standard items are paid for with revenues from local taxes and general State aid. There are also special funds for specific programs, such as Federal Title I, that are allocated according to special formulas as varied as the sponsoring agencies. A complete investigation of resource allocation would include the distribution of these categorical funds because they are a significant source of program support in some schools.

Teacher contract. Many school districts have contracts with

their teachers, and if not, there are bulletins that contain most of the elements that typically end up in such agreements. The parts of the contract that are important for resource allocation include more than just salary schedules. The criteria for receiving salary increases are important teacher resources because they are closely related to the quality of teaching services an individual can provide. Formal education, career development training, and years of service are the usual measures of teacher quality on which salaries are based. Permanent, full-time teachers usually receive higher salaries than long-term and daily substitutes.

The length of the school year and the working day define the annual number of hours of service for a teacher. A teacher's work-load depends on the class size (maximum or average), the number of teaching periods per week or day, allowances for preparation time, and administrative assignments. These factors are usually considered to be aspects of the working conditions of teachers, which they are, but they also have a major influence on the allocation of resources among schools. They define the minimum number of teachers a school needs in order to comply with the terms of the contract. If class sizes were decreased, for example, the teacher's working conditions might be less strenuous, but more teachers would be required to provide the same number of teacher-pupil contact hours. In ways like this, the teacher contract is a resource allocation mechanism.

Provisions in the contract that govern transfers of teachers between schools also affect the allocation of teacher resources among the schools. If the possibility of transferring is determined by seniority,

then schools that are the more desirable assignments will tend to have older teachers, who may be better in some sense because they have more experience and usually more training. Even if experience and training were not strongly related to quality of teaching performance, these older teachers certainly would be paid more because of their greater experience and training, so that the spending per pupil for teachers in these schools would be higher than in schools with younger teachers.

The contracts of other types of personnel (principals, assistant principals, deans, department chairmen, counselors, teacher aides, office staff and maintenance staff), should be examined for their resource allocation consequences. An allocation mechanism is sure to be there, disguised as salary systems, working conditions, and workload factors.

Assignment of professional staff. Procedures for assigning professional staff, such as teachers, principals, assitant principals and counselors, involve much more than transfers. Assigning newly hired teachers, filling vacancies, the use of daily and long-term substitutes, retirements, and leaves all have important resource allocation consequences for individual schools and groups of schools. A school that has trouble filling teaching positions with permanent staff will have to rely on substitutes, who are theoretically inferior to regular teachers. This school is also likely to have trouble retaining trained teachers, which results in a high turnover rate and a staff of teachers who have less experience and training. These factors combine to result in lower than average level of spending per pupil for teachers. Re-

source allocation consequences such as these are the result of the normal workings of standard personnel practices used by many school districts.

ALLOCATION CRITERIA

The second most important policy decision made by school officials is how to allocate the school district's considerable resources in an equitable and effective manner (the first and most important policy decision is the content of the educational program). How should resources be allocated? What restrictions have to be met and imposed? A school district's resource allocation policies must be consistent with general statewide rules, meet the educational needs of all students, and be fair. To determine whether a district's policies meet and pass all these tests is one objective of an investigation of resource allocation outcomes. The task is difficult, and the determination cannot be definitive because many aspects of the tests are admittedly subjective and depend on values as much as facts.

The kinds of criteria that should be considered include legal mandates and general equity considerations. There are also a host of practical problems that must be solved when devising objective, equitable, and effective resource allocation formulas.

Legal principles governing resource allocation. The main precedent for possible legal action against disparities in the allocation of resources, especially teachers, is the 1967 Hobson v. Hansen case*

*269 F. Supp. 401 (1967).

in Washington, D.C., which eventually resulted in a ruling requiring substantial equalization of per pupil outlays for teachers in all the district's public schools. That decision originally prescribed equalization of all educational services among schools, but was subsequently limited to teachers because of measurement difficulties associated with other resources and service components.

Judge Skelly Wright, in his decision on Hobson v. Hansen, articulated a concern that resource allocation policies be equitable:

> Orthodox equal protection doctrine can be encapsulated in a single rule: government action which without justification imposes unequal burdens or awards unequal benefits is unconstitutional. The complaint that analytically no violation of equal protection vests unless the inequalities stem from a deliberately discriminatory plan is simply false. Whatever the law was once, it is a testament to our maturing concept of equality that, with the help of Supreme Court decisions in the last decade, we now firmly recognize that the arbitrary quality of thoughtlessness can be as disastrous and unfair to private rights and the public interest as the perversity of a willful scheme.

In Green v. County School Board of New Kent County, Virginia,* the U.S. Supreme Court defined a segregated school system with respect to factors other than student segregation. If schools could be racially identified by reference to differences in inputs and services (faculty, facilities, curriculum), then a dual school system existed. These kinds of invidious racial distinctions had to be totally eliminated in order to have a unitary school system.

In Swann v. Charlotte-Mecklenburg Board of Education,** the court

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*391 U.S. 430, 88 S. Ct. 1689 (1968).
**402 U.S. 1, 91 S. Ct. 1267 (1971).

considered racially identifiable resource differences so important that their presence was a prima facie case of violation of the equal protection clause of the Constitution. Furthermore, it was the responsibility and duty of school officials to eliminate these distinctions.

In Lau v. Nichols,* a precedent was set for suits demanding services to meet basic educational needs. It is not enough to have equal inputs. The inputs must be effective in producing some minimal educational outcome, which may require unequal distribution of inputs. This focus on outputs will require using allocation criteria that are very different from those required by a focus on inputs.

Equity considerations. In developing objective formulas for allocating funds to its schools, a district must follow Federal and State laws that prohibit discrimination against any student, regardless of sex, race, ethnicity, or place of residence. In short, the formulas adopted by a district must be consistent with the idea of promoting equal educational opportunity for all youth. However, there are at least three measures that can be used to define educational opportunity: dollars, resources and outcomes. The allocation strategies consistent with each definition are different and somtimes conflict. The best strategy for a school district will depend on the individual circumstances of the system.

Allocation formulas that give equal dollars per pupil follow an input equalization strategy. There is no conceptual problem in defining what is meant by an equal input of dollars. All that is needed to verify equality is proper accounting. An equal dollars input strategy would also minimize the influence of non-objective criteria in establishing allocation

*414 U.S. 563 (1974).

formulas. However, an equal dollars per pupil strategy would be consistent with equal educational opportunity only if equal dollars could purchase equal services in every school in a district. This usually is not the case.

An allocation strategy that attempts to compensate for differences in the purchasing power of the educational dollar among the schools is a resource equalization strategy. The term "resources" means the value of all human and non-human inputs into education -- services of teachers, administrators, and support staff; materials and supplies, types of facilities; and so forth. In order to insure equal educational opportunity, each school would have to be given enough money to purchase the same mix or package of resources per pupil. The problem is that equal dollars do not buy equal resources everywhere. For a variety of reasons (e.g., differences in teacher salaries and in required pupil-teacher ratios), schools vary both in ease of access to resources and in the prices they must pay for resources of a given quality and quantity. Since input costs are variable, schools cannot be said to be providing equal programs or equal educational opportunity when their levels of spending are the same. A resource equalization strategy requires that dollars be allocated unequally to compensate for interschool variations in cost. This means that cost levels in each school must be measured in such a way that the necessary adjustments in purchasing power per dollar can be computed.

Allocation formulas based on an educational outcome equalization strategy are a relatively new idea. They can be considered by-products of studies, such as the Coleman report, showing the importance of non-school factors, including racial discrimination and socioeconomic status, in deter-

mining educational results. From these studies it is clear that even if resources were distributed with perfect equality and all schools were equally well managed there would still be wide disparities in pupil achievement because of differences in their pupil populations. To bring achievement in all schools up to an agreed-upon standard (equal educational outcome), it would be necessary to allocate resources to compensate for differences in the difficulty of educating diverse pupil populations. Stated differently, it would be necessary to allocate resources in proportion to educational need, where "need" refers to the amount of resources per pupil, relative to the amount required in an average school, to produce a given level of educational achievement. Both relative need and relative cost would have to be considered in distributing funds to schools.

Some practical problems. A problem inherent in all school systems is finding an equitable and educationally rational method to distribute available resources among the schools. Intertwined with that issue is the problem of how resources should be allocated among individual schools when there are potentially large differences in the mixes of educational needs of pupils enrolled in these schools. The central issue in both problems is how differences in relative educational needs of pupils and relative costs of school inputs should be taken into account when allocating resources.

The problem of resource allocation among schools has certain special characteristics. First, most districts do not allocate lump-sum budgets to the schools for use at their discretion, but rather earmark funds for specific categories of resources and severely limit substitution among them. These restrictions are required, in many cases, by contracts with employee

unions and state education laws and regulations. Second, a district's schools do not have the same freedom as fully independent local districts to determine program content, resource composition, and resource use. For example, collective bargaining is conducted centrally, which means there is little room for differential policymaking on, say, personnel utilization of the kind that one would expect to see among neighboring independent districts. Thus, a comprehensive study of resource allocation in the typical school district could not be confined to an examination of alternative formulas for distributing a given dollar budget among the schools. Instead, one would have to think in terms of separate formulas for allocating each major kind of resource, such as teachers, administrators, other instructional personnel, and supporting services. Also, one would have to give considerable attention to the effects of existing centrally imposed constraints, including provisions of collective bargaining agreements that restrict resource substitution and resource use.

The most difficult and most important problem is that of allocating teachers among schools. Agreement might be obtained on the principle that the teacher allotment to a school should increase with some measure of educational need, such as incidence of poverty or low test scores, but it is difficult to implement this principle. There is considerable controversy about how the teacher allotment of a school should be measured or, more specifically, over how teacher quality should be taken into account. Suppose, for example, that two schools had the same number of pupils and that their pupil populations had the same educational needs. Besides the two schools simply having the same number of teachers, how should the number

be weighted by teacher experience, training, or other attributes supposedly related to performance? How should the total teacher salary expenses in the two schools be equalized? Clearly, there are many distributional alternatives to be considered.

The issue is also complicated by the availability of Federal and State funds earmarked for certain schools and intended to compensate for differences in educational needs. Logically, one would want to consider the total allocation of teachers (and other resources) to each school and category of pupils. However, present accounting systems, which separate the categorical Federal and State funds from regular funds, make this difficult to do. Also, Federal program provisions having to do with targeting of funds and comparability may rule out some otherwise reasonable solutions and complicate the formula design problem.

A question closely related to the problem of allocation according to educational need is whether differences in teacher costs among different schools should be taken into account. This is an especially difficult problem to deal with in most school systems because cost differences are masked by a single systemwide salary schedule. Assuming that some schools are more attractive than others to teachers and that teachers have some freedom to choose their locations, it would be necessary for less attractive schools (e.g., schools with more "difficult" children) to offer greater inducements than other schools to obtain as good a choice of teacher applicants. But that sort of differentiation, at least with respect to salaries, is not permitted by most contracts with teacher unions. Other forms of differentiation could exist, for example, with

respect to working conditions (class size, teaching periods per day) and availability of supporting services (instructional aides, materials, training). There should be a systematic analysis of the effectiveness of these differentials and of additional possibilities for offering extra inducments where needs are great.

In the typical school system, the pattern of distribution of teachers among schools is largely determined by the combined effects of teacher turnover, contractual provisions governing transfers, any teacher integration plan, and any bilingual education programs. Schools that provide favorable work environments tend both to retain their existing staffs and to attract high-seniority transferees when vacancies appear. The effect is to create large interschool variations in average teacher training and experience, especially between middle-class and heavily minority-attended or poverty-area schools. When the relationship between experience and training and teacher pay is taken into account, these differences can translate into large disparities in the average amount spent per pupil for teacher services (exclusive, that is, of categorically funded programs, which are supposed to be extra).

An analysis of variations in outlays per pupil would be a first step toward determining how the pattern would be modified under alternative allocation rules. The distribution of teacher qualities -- experience, training and education, for example -- that are incorporated into the salary system should also be studied. A plan to analyze alternative approaches to intrasystem resource allocation should include the technical capability of simulating the effects of alternative allocation formulas. To do this, it

would be necessary to assemble a fairly detailed set of data on the characteristics of each school and also on different categories of schools. A small computer model would have to be built for determining the resource and fiscal impacts of various allocation schemes. However, the first important and challenging part of this effort would be not the quantitative analysis itself, but rather the process of designing alternatives that reconcile criteria of educational rationality and distributional equity with the rather severe constraints imposed by central directives and centrally negotiated contracts.

EXPENDITURE PER PUPIL

The level of spending per pupil is the simplest, although not necessarily the best, way to measure input inequality. An examination of actual spending per pupil in individual schools should be the starting point for an analysis of resource allocation. The expenditures included should be for those inputs used directly by schools: administrators, teachers, support staff, supplies, and everyday school operations. Excluded from this analysis should be spending for central administration and centrally managed services (pensions, fringe benefirts, school lunch, pupil transportation, etc.), and for capital projects. A distinction should be made between spending from regular funds and special funds. The expenditure of special funds (e.g., federal Title I) must meet guidelines imposed by the State or Federal agency that provided the grant. Regular funds are spent entirely at the discretion of the local school district and support the basic educational program provided to all students.

Are there racial/ethnic disparities in the per pupil spending

levels of schools? To answer this question, all schools must first be classified according to the racial and ethnic mix of their pupils. The triangle diagram, which was developed in the previous section, is one classification method. Schools can be grouped into 13 groups that correspond to the zones shown in Exhibit 4. Then expenditure information of all schools in each group can be summarized in tables. To illustrate the kinds of tables that might be informative, results of a study of resource allocation among the elementary schools of the Los Angeles Unified School District (LAUSD) are presented in the following exhibits.*

Regular and special funds. The total, direct, school-based, current expenditures per pupil by the Los Angeles elementary schools in 1976-77 are summarized in Exhibit 14 by regular and special funds and by pupil racial/ethnic composition according to the 13-zone triangle system. The average per pupil expenditure for all 432 schools was $897. Spending from regular funds accounted for $744, and $153 was from special funds. The percent of spending levels for each group of schools from those overall averages can be measured by a disparity ratio. A positive disparity ratio indicates above average spending, and a negative ratio indicates below average spending.

The 66 elementary schools that were predominantly Black averaged $709 from regular funds (5 percent below average) and $260 from special funds for a total of $969 per pupil. Spending levels of the 64 predominantly Hispanic schools were similar to those of the Black schools. The 106 predominantly Other schools had higher levels of spending from regular funds

*Gifford and Choy, Towards a Workable Remedy, supplementary report, February 1979. Results for junior and senior high schools are included in the report.

(6 percent above average) and very much lower spending from special funds so that the average total spending was $825, which was lower than for Black or Hispanic schools. While the overall spending per pupil was higher in Black and Hispanic schools, this was the result of spending special funds for State and Federal categorical programs. Since special funds are supposed to supplement rather than supplant local, regular funds, the equality of spending per pupil is best measured by comparing expenditures from regular funds, the allocation of which is controlled by the local school district. On this basis, there was a marked disparity in spending that was strongly related to the racial/ethnic composition of schools. Pupils in schools with predominantly minority enrollments had lower levels of spending than Other schools.

The fact that per pupil spending from special funds was so high for Black and Hispanic schools is not surprising since most of these schools had compensatory education projects. The relatively low spending from regular funds suggests that a significant portion of special funds might have been misused -- used to substitute for local funds. However, the annual comparability reports filed by Los Angeles show complete compliance with the rules of the federal Title I program. At least the same level of resources for basic educational programs is supposed to be allocated to all students whether or not they receive additional special funds. The compensating differences in spending from regular and special funds appear to violate the spirit of Title I. The findings of this study add weight to the widespread belief that the Title I comparability requirements are too slack, that the spirit of the program can be violated even though the rules are followed.

Exhibit 14

DIRECT, SCHOOL-BASED, CURRENT EXPENDITURES PER PUPIL FOR REGULAR DAY SCHOOL PROGRAM BY TYPE OF FUNDS AND PUPIL RACIAL/ETHNIC COMPOSITION ACCORDING TO 13 ZONE TRIANGLE SYSTEM LAUSD ELEMENTARY SCHOOLS, 1976-1977

Pupil Racial/Ethnic Composition: 13 Zone System	Number of Schools	TOTAL		REGULAR FUNDS		SPECIAL FUNDS	
		Amount	Disparity Ratio	Amount	Disparity Ratio	Amount	Disparity Ratio
Black	66	$ 969	8	$ 709	-5	$ 260	70
Majority Black-Other*	3	841	-6	775	4	66	-57
Black-Other	3	943	5	856	15	87	-43
Majority Other-Black	12	872	-3	796	7	76	-50
Other	106	825	-8	789	6	36	-76
Majority Other-Hisp.	70	827	-8	778	5	49	-68
Other-Hispanic	43	822	-8	769	3	53	-65
Majority Hisp.-Other	38	884	-1	726	-2	158	3
Hispanic	64	968	8	700	-6	268	75
Majority Hisp.-Black	9	998	11	708	-5	290	90
Hispanic-Black	7	1,036	15	748	1	288	88
Majority Black-Hisp.	8	936	4	743	-0.1	193	26
Black-Other-Hispanic	3	832	-7	818	10	14	-91
Total/Overall Mean	432	$ 897	--	$ 744	--	$ 153	--
Percent of Total		(100.0%)		(82.9%)		(17.1%)	

Source: 1976-1977 expenditures.
Note: Schools are grouped by their 1977 zones.
*"Other" includes White, Asian and American Indian.

Expenditure of regular funds. The judicial ruling that the Los Angeles school system was segregated* is supported by the racial/ethnic disparity in per pupil spending from regular funds. These disparities in spending funds controlled by the local school district had to be due to disparities in spending for one or more of the following major categories of expenditure: school administrators, teachers, support staff, supplies, and operations. Information on the average spending by elementary schools for each of these categories shows that spending for teachers ($603 per pupil), which accounted for 81 percent of regular funds, was the primary source of the disparity (see Exhibit 15). The average amounts spent for teachers by the predominantly Black and Hispanic schools, $565 and $559 per pupil, respectively, were below the overall mean while spending in Other schools, $646 per pupil, was above the mean.

The spending levels for schools administrators do not show strong or obvious racial/ethnic disparities. If anything, spending in primarily Black schools tended to be marginally higher than spending in Hispanic or Other schools.

Spending per pupil for instructional support staff (counselors, librarians, instructional aides) fluctuated widely, with Black and Hispanic schools tending to spend less than Other schools. This result is consistent with the distribution of special funds. Most of the Black and Hispanic schools had lots of special funds, and about 40 percent of special funds were spent for instructional support staff, so less regular funds were used for these personnel.

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*Crawford v. Board of Education of the City of Los Angeles, 17 Cal. 2d. 280 (1976).

Exhibit 15

DIRECT, SCHOOL BASED, CURRENT EXPENDITURES PER PUPIL FROM REGULAR FUNDS FOR REGULAR DAY SCHOOL PROGRAM
LAUSD ELEMENTARY SCHOOLS, 1976-1977

Pupil Racial/Ethnic Composition: 13 Zone System	Number Of Schools	TOTAL Amount	TOTAL Disparity Ratio	ADMINISTRATORS Amount	ADMINISTRATORS Disparity Ratio	TEACHERS Amount	TEACHERS Disparity Ratio	SUPPORT STAFF Amount	SUPPORT STAFF Disparity Ratio	SUPPLIES Amount	SUPPLIES Disparity Ratio	OPERATIONS Amount	OPERATIONS Disparity Ratio
Black	66	$ 709	-5	$ 53	6	$ 565	-6	$ 13	-13	$ 26	4	$ 52	2
Majority Black-Oth.*	3	775	4	55	10	617	2	8	-47	24	-4	71	39
Black-Other	3	856	15	58	16	662	10	29	93	25	0	82	61
Majority Oth.-Blk.	12	796	7	56	12	624	3	36	140	25	0	55	8
Other	106	789	6	49	-2	646	7	16	7	24	-4	54	6
Majority Oth.-Hisp.	70	778	5	49	-2	641	6	17	13	24	-4	47	-8
Other-Hispanic	43	769	3	48	-4	632	5	12	-20	24	-4	53	4
Majority Hisp.-Oth.	38	726	-2	50	0	588	-2	13	-13	23	-8	52	2
Hispanic	64	700	-6	49	-2	559	-7	17	13	25	0	50	-2
Majority Hisp.-Blk.	9	708	-5	51	2	577	-4	11	-27	23	-8	46	-10
Hispanic-Black	7	748	1	52	4	591	-2	14	-7	29	16	62	22
Majority Blk.-Hisp.	8	743	-0.1	61	22	590	-2	11	-27	28	12	53	4
Blk.-Oth.-Hisp.	3	818	10	50	0	669	11	10	-33	28	12	61	20
Total/Overall Mean	432	$ 744	--	$ 50	--	$ 603	--	$ 15	--	$ 25	--	$ 51	--
Percent of Total		(100.0%)		(6.7%)		(81.0%)		(2.0%)		(3.4%)		(6.9%)	

Source: 1976-1977 expenditures.
Note: Schools are grouped by their 1977 zones.
*"Other" includes White, Asian and American Indian.

Spending for supplies was relatively even across all groups of schools, probably because the allocation criteria is a per pupil amount applied uniformly to all schools. Per pupil spending for school operations (custodians, utilities, etc.) fluctuated widely, and a detailed analysis of the allocation formulas would be needed to determine why this was the case.

Spending for teachers. Expenditures for teachers can be broken down into spending for classroom teachers, daily substitutes, and sabbatical leaves. The great bulk of spending for teachers goes toward salaries of regular classroom teachers. However, the amounts spent for daily substitutes and sabbaticals are indicators of how other types of teacher resources are allocated. Above average spending for daily substitutes is the result of above average absences by the permanent classroom teachers, and the use of substitutes results in a decline in the overall quality of teaching. Substitutes are theoretically "inferior" to permanent teachers because they are temporary and might be less well qualified. The inevitable break in continuity of instruction slows down progress. Excessive absences by permanent teachers also indicate low morale, which can only hurt the overall quality of teaching in a school. Above average spending for sabbatical leaves is the result of having teachers with many years of service, and the leaves are supposed to result in better teachers. Are there racial/ethnic disparities in each category of spending for teachers? The average amounts spent by each group of Los Angeles elementary schools are listed in Exhibit 16. Spending for classroom teachers, the largest component, was the main source of the disparity in spending for teachers. Black and Hispanic schools

Exhibit 16

DIRECT, SCHOOL BASED EXPENDITURES FOR TEACHERS FROM REGULAR FUNDS BY PUPIL RACIAL/ETHNIC COMPOSITION ACCORDING TO 13 ZONE TRIANGLE SYSTEM
LAUSD ELEMENTARY SCHOOLS, 1976-1977

Pupil Racial/Ethnic Composition: 13 Zone System	Number of Schools	TOTAL Amount	TOTAL Disparity Ratio	CLASSROOM Amount	CLASSROOM Disparity Ratio	SUBSTITUTES Amount	SUBSTITUTES Disparity Ratio	SABBATICAL Amount	SABBATICAL Disparity Ratio
Black	66	$ 565	-6	$ 519	-8	$ 39	34	$ 7	0
Majority Black-Other*	3	617	2	572	1	36	24	9	29
Black-Other	3	662	10	617	9	27	-7	18	159
Majority Other-Black	12	624	3	587	4	27	-7	10	43
Other	106	646	7	614	8	24	-17	8	14
Majority Other-Hisp.	70	641	6	608	7	26	-10	7	0
Other-Hispanic	43	632	5	599	6	26	-10	7	0
Majority Hisp.-Other	38	588	-2	554	-1	26	-10	8	14
Hispanic	64	559	-7	527	-7	26	-10	6	-14
Majority Hisp.-Black	9	577	-4	541	-5	34	17	2	-71
Hispanic-Black	7	591	-2	552	-3	31	7	8	14
Majority Black-Hisp.	8	590	-2	549	-3	33	14	8	14
Black-Other-Hispanic	3	669	11	640	13	29	0	**	**
Total/Overall Mean	432	$ 603	--	$ 567	--	$ 29	--	$ 7	--
Percent of Total		(100.0%)		(94.0%)		(4.8%)		(1.2%)	

Source: 1976-1977 Expenditures.
Note: Schools are grouped by their 1977 zones.
*"Other" includes White, Asian and American Indian.
**Less than $0.50 per pupil; almost absolute (negative) disparity.

spent less than average and Other schools spent more than average for classroom teachers, the most basic resource of a school's educational program.

Per pupil spending for daily substitute teachers was way above average in primarily Black schools and below average in Hispanic and Other schools. This indicates that Black schools as a group have had to deal with the especially heavy burdens caused by absent teachers. Spending for sabbaticals involved relatively small amounts, and no clear pattern is discernable.

Differences among schools in per pupil spending for teachers have two possible sources: variations in the average teacher salary and in the pupil-teacher ratio. These factors are related as follows:

$$\text{PER PUPIL SPENDING FOR TEACHERS} = \frac{\text{AVERAGE TEACHER SALARY} \times \text{NUMBER OF TEACHERS}}{\text{NUMBER OF PUPILS}}$$

$$= \frac{\text{AVERAGE TEACHER SALARY}}{\text{PUPIL-TEACHER RATIO}}$$

Spending for teachers by a school is equal to the average salary of all teachers in the school multiplied by the number of teachers. Dividing this aggregate dollar amount by the number of pupils in the school gives the per pupil spending for teachers. This is the same as saying that per pupil spending for teachers is equal to the average teacher salary divided by the pupil-teacher ratio. To determine which factor causes the observed disparities in per pupil spending for teachers, the pupil-teacher ratio

and the average teacher salary must be examined separately.

THE ALLOCATION OF TEACHERS

The allocation of teachers to schools is one of the most important and powerful policy decisions that a school board must make. Any analysis of the allocation of teachers should begin with a thorough review, explanation, and critique of a school system's methods of distributing teachers among schools. This background information on allocation criteria and procedures will help the analyst and policy maker understand better the allocation results revealed by the analysis of budgetary and payroll data.

Pupil-teacher ratio. Many school systems, Los Angeles included, use a straightforward pupil-teacher ratio to allocate the great bulk of teacher positions among schools. For every "x" number of pupils, a school is allocated one teacher position. This formula covers teachers supported by regular funds and usually provides the basic teaching staff of every school. Since this "norm" allocation standard is applied uniformly to every school, all schools should have nearly the same overall pupil-teacher ratio based on teachers paid from regular funds, and Exhibit 17 shows this to be the case for the Los Angeles elementary schools. The pupil-teacher ratio of schools grouped by race/ethnicity varied very little from the overall mean of 27.1 pupils per teacher (the norm was 31.0). Special funds, however, had a significant impact, lowering the overall pupil-teacher ratio in Black and Hispanic schools substantially below the average of Other schools. Since there were no significant racial/ethnic disparities in the pupil-teacher ratios from regular fund teachers, the

Exhibit 17

DISTRIBUTION OF PUPIL-TEACHER RATIOS AMONG SCHOOLS
GROUPED BY PUPIL RACIAL/ETHNIC COMPOSITION ACCORDING TO THE 13 ZONE TRIANGLE SYSTEM
LAUSD ELEMENTARY SCHOOLS
FALL 1977

l Racial/Ethnic mposition: Zone System	Number of Schools	PUPILS		PUPIL-TEACHER RATIO			
				Regular Funds		All Funds	
		Number	Percent of Total	Pupil-Teacher Ratio	Disparity Ratio	Pupil-Teacher Ratio	Disparity Ratio
k	66	52,682	17.2	26.1	4	21.9	10
rity Black-Other*	3	1,340	0.4	27.3	-1	26.3	-8
k-Other	3	1,358	0.4	26.6	2	23.4	3
rity Other-Black	12	5,635	1.8	28.3	-4	26.3	-8
r	106	56,285	18.3	27.5	-1	26.8	-10
rity Other-Hispanic	70	42,509	13.9	27.4	-1	26.1	-8
r-Hispanic	43	28,884	9.4	27.9	-3	26.0	-7
rity Hispanic-Other	38	32,785	10.7	27.6	-2	24.5	-2
anic	64	62,121	20.2	27.1	0	22.4	8
rity Hispanic-Black	9	9,528	3.1	24.9	9	21.4	13
anic-Black	7	5,514	1.8	26.6	2	21.3	13
rity Black-Hispanic	8	6,570	2.1	27.7	-2	23.5	3
k-Other-Hispanic	3	1,670	0.5	29.8	-9	27.8	-13
l/Overall Mean ent Above Norm**	432	306,881	100.0	27.1 (14.4%)	--	24.1 (28.6%)	--

Source: October 1977 payroll.
Note: "Percent of Total" may not add to 100.0 percent due to rounding.
*"Other" includes White, Asian and American Indian.
**Elementary norm is 31.0 pupils per teacher.

source of the disparities in per pupil spending for teachers by Los Angeles elementary schools must have been due to differences in the average teacher salary. Before proceeding to analyze salaries, other aspects of teacher allocations should be mentioned.

Schools with vacant teacher positions. It is one thing to allocate a teacher position to a school, but it is an entirely different matter actually to fill that position with a properly qualified teacher. In the course of scanning pupil-teacher ratios for individual schools, one would find some schools to have unusually high ratios, sometimes even higher than the norm standard, which is supposed to be an upper limit. By definition, unnecessarily high pupil-teacher ratios exist because of budgeted but unfilled teacher positions. If a school district's personnel control system worked perfectly, then there would never be schools with vacancies or schools that were "over teachered" (a term describing a school with more teachers on the payroll than there are positions budgeted). However, no personnel system works perfectly, so some schools could have one or two vacancies and some could be over teachered by one or two at the most. Correcting over teachered situations is relatively easy to do, and most personnel control systems probably perform this task well. However, standard procedures for filling vacancies somtimes do not work for some schools.

Before appropriate remedies can be developed, the dimensions of the problem have to be determined. Which schools have many vacancies, and how many do they have? Is this the usual situation or a temporary condition? Why are some schools plagued by this problem, and what common characteristics

do they have? Finding schools that have excessive vacancies should be fairly easy to do by matching budgetary, payroll and personnel information. Besides looking for schools that continually have vacancies, the analyst should be alert for schools that appear to have solved this problem. The actions of these "successful" schools should be documented and studied to determine if they can be replicated.

Armed with a list of schools that have excessive vacancies, the analyst must find out why these schools are plagued by this problem while other schools are not. What common characteristics do these troubled schools have? The list of possible causes -- racial/ethnic mix of their pupils, the rate and direction of change in the mix, geographical location, social class of the students, scholastic achievement levels, style of principal -- should be developed carefully because the remedies ideally would solve the problem by removing the causes. Identifying causes that are beyond the control of school officials would be almost useless. If there are enough schools and enough proposed remedies, it might be possible to conduct controlled experiments to find out which remedies work best for which kinds of schools. A monitoring procedure should also be set up to spot schools that appear to be heading for trouble and to keep track of the progress made by schools that have problems now.

The distribution of teachers above the norm. Teachers above the number determined by the norm allocation are critically important resources because they represent discretionary funds. Every school must receive the equivalent number (in terms of pupil-teacher ratios) of norm teachers to support their basic instructional program, but teachers above the norm

number are for special educational needs.

A school's allocation of teachers above the norm should depend on its educational needs relative to those of other schools, on the overall amount of resources set aside for all schools to meet particular educational needs, and on the criteria used to allocate these resources among the schools that have those needs. Since the total resources required to meet adequately a particular kind of educational need will most likely far outstrip the amount set aside to meet that need, the limited resources could be allocated in two ways: thinly spread the resources so that every school receives some; or establish an adequate per pupil amount, rank schools in descending order of need (which could be in terms of intensity of need rather than just number of pupils), and then allocate resources until the supply is exhausted. The most appropriate strategy would depend on factors such as the gap between total need and available resources and the possible requirement for a critical mass of either students or resources in order to make it worthwhile to allocate any resources at all to a particular school.

The first task in a study of teachers above the norm should be to compile a complete inventory of every educational program that allocates these resources. Besides general administrative and budgetary information (program director, size of budget, etc.), each inventory should include a statement of the aims and purposes of the program. The allocation criteria, rationale and allocation formulas should be explained in great detail. Finally, the results of the allocation should be presented.

The next task should be an analysis and critique of the allocation

results to determine who did and did not receive these discretionary resources. Did those pupils with the greatest educational need receive the benefit of the resources? Did those with a greater need receive greater benefit? Could the match between need and benefit be improved by modifying the allocation formulas? Besides describing the intended results (Did the actual allocation fulfill the aims of the allocation formulas?), the analyst should be on the look out for unintended results. Were there systematic racial/ethnic disparities? Were there systematic relationships with social class variables?* If relationships such as these are found, then school officials may want to reconsider the allocation of resources for these programs.

Teacher turnover. The stability of a school's faculty is important to the quality of education provided by the school. When a teacher leaves, the school loses the return from the training invested in that person, and another investment must be made in the replacement teacher. It is also likely that the better teachers are attracted away to other schools.

The conventional wisdom is that teachers transfer to better schools, and in the context of the focus on racial segregation, this usually means transferring to a school with a small percentage of minority pupils. Another factor known to be related to the propensity to transfer is years of service. Newer teachers are more likely to transfer in search of the "right" school, while older teachers usually have settled down at a school.

*A study of the Oakland, California, public schools showed an inverted "U" shaped relationship between the pupil-teacher ratio (regular funds only) and income of pupils. Schools with pupils from the highest and lowest income brackets had lower pupil-teacher ratios than schools with pupils from middle income families. Frank S. Levy, Arnold J. Meltsner and Aaron Wildavsky, Urban Outcomes: Schools, Streets and Libraries (Berkeley: University of California Press, 1974).

Analyzing teacher turnover involves compiling data from payrolls on the movement of individual teachers over a period of time. Such a study was done for the New York City public school system, and the findings are summarized here to illustrate what can be found.*

Between May and November of 1974, over 12 percent of teachers left their schools (see Exhibit 18): 4 percent transferred, and over 8 percent left active status. Newer teachers with fewer than 5 years of service had the greatest turnover: 23 percent versus 8 percent for older teachers. The quit rate of newer teachers was 15 percent, three times the rate for teachers with 5 to 10 years of service. The transfer rate of newer teachers was 8 percent; it is 4 percent for teachers with 5 to 10 years of service, and 2 percent for older teachers.

Instability rates were relatively even across groups of schools as the percentage of minority pupils increased, except for schools that were 90 to 100 percent minority, which had noticeably higher transfer rates, especially among teachers with more than 5 years of service. One-half of all transfers were to schools with roughly the same proportions of minority pupils (see Exhibit 19), 30 percent were to schools with lower proportions, and 20 percent were to schools with higher proportions. The net flow was out from schools with more than 75 percent minority pupils.

These results for New York City suggest that faculty turnover can significantly affect the quality of a school's staff, especially if

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*Bernard R. Gifford, Ronald K.H. Choy, and Richard Guttenberg, Race, Ethnicity, and Equal Employment Opportunity: An Investigation of Access to Employment and Assignment of Professional Personnel in New York City's Public Schools, Board of Education of the City of New York, June 1977, pp. 269-74.

EXHIBIT 18

TEACHER TURBULENCE RATES, EXPERIENCE AND PERCENT OF MINORITY PUPILS PER SCHOOL NEW YORK CITY, MAY TO NOVEMBER 1974

YEARS OF EXPERIENCE AND TYPE OF TURBULENCE	PERCENT OF MINORITY PUPILS PER SCHOOL 0%- 9.9%	10%- 24.9%	25%- 49.9%	50%- 74.9%	75%- 89.9%	90% +	TOTAL
Under 5 Years							
Transfer	8.0%	7.5	10.7	6.7	6.8	7.9	8.0
Quit	18.9	15.8	16.0	14.8	14.5	15.3	15.5
Total Turnover	26.9%	23.3	26.7	21.5	21.3	23.2	23.5
5 - 9.9 Years							
Transfer	3.2%	3.6	3.3	2.5	2.1	4.0	3.5
Quit	3.3	3.8	3.6	3.4	4.3	5.3	4.6
Total Turnover	6.5%	7.4	6.9	5.9	6.4	9.3	8.1
10 + Years							
Transfer	1.0%	1.3	1.3	1.5	1.5	2.5	1.8
Quit	5.8	6.4	7.4	6.6	7.3	6.4	6.7
Total Turnover	6.8%	7.7	8.7	8.1	8.8	8.9	8.5
TOTAL							
Transfer	3.2%	3.4	3.9	3.3	3.3	4.9	4.2
Quit	7.9	7.8	8.3	7.9	8.4	9.0	8.5
Total Turnover	11.1%	11.2	12.2	11.2	11.7	13.9	12.7

EXHIBIT 19
AGGREGATE FLOW OF TEACHER TRANSFERS
NEW YORK CITY, MAY TO NOVEMBER 1974

DIRECTION OF TRANSFER	NUMBER OF TEACHERS
To Schools with the "Same" Proportions of Minority Pupils	1,113
To Schools with Lower Proportions of Minority Pupils	661
To Schools with Higher Proportions of Minority Pupils	452
Total Transfers	2,226

the school has disproportionately more of the least experienced teachers. The results also suggest that the conventional wisdom that teachers transfer to schools with fewer minority pupils is correct, but for less than one-third of the transfers. A substantial proportion of transfers (20 percent) were in the "wrong" direction, and one-half is no direction.

THE DISTRIBUTION OF TEACHER QUALITIES AND SALARIES

Teacher resources encompass more than just the number of positions allocated to schools. There are qualitative dimensions to teachers that are as important as the quantitative aspects. Teacher experience, training, and education are three qualities that just about every school system in the country pays for. These qualities have been incorporated into teacher salary systems so that teachers with more experience, training, and education receive higher salaries. Thus, if the average teacher salary varies among schools, it is because the distribution of these teacher qualities varies.

There are other teacher qualities, related to average salary levels, that could make a difference to the quality of instruction provided by a school's faculty. Stability of the faculty is one of these. The results of the New York City study of teacher turnover indicate that schools with disproportionately more younger teachers and therefore lower salaries, can expect to have high turnover rates, which adversely affect teacher quality. The use of substitute teachers, who are paid less than permanent teachers, is another factor that affects teacher quality adversely. The racial/ethnic composition of the faculty is also a teacher quality that matters to the quality of instruction. There is a correlation between the

racial/ethnic composition of a school's faculty and the average teacher salary because Black and Hispanic teachers as a group are relatively newcomers compared to White teachers. Thus, schools with disproportionately more minority teachers tend to have lower average salaries than schools with more White teachers.

Rudiments of the teacher salary system. Since there is such a close connection between teacher qualities and salaries, the groundwork for an analysis of the distribution of teacher qualities and salaries should be layed by understanding at least the rudiments of the teacher salary scale used by the school system. In most systems, a teacher's salary depends on experience and training. Within specified limits, more experience and more training result in a higher salary. The basic salary rate structure is usually presented in a tabular format. Each column of the table is a separate salary schedule, where a teacher advances to a higher schedule after meeting specific training requirements. Each row of the salary table is a salary step, to which a teacher advances after meeting specific experience requirements. Thus a teacher's salary is identified by a particular schedule and step.

Teacher training can be measured by salary point credits that are usually equivalent to a university semester unit. Since the objective of the point system is staff development, credits can be earned in numerous ways ranging from formal graduate level course to independent projects. Starting at zero credits, a teacher advances to the next highest salary schedule after earning the required number of points. These increases are usually automatic, since a teacher who qualifies for them must receive the increase.

Teacher experience is measured by years of service, and under

certain conditions, different types of experience can be equated to additional years of teaching service. For each additional year of service, a teacher usually advances one step at the beginning of the school year until the top step is reached. Like the schedule advances, the step advances are usually automatic.

In addition to a basic salary determined by the step and schedule requirements, a teacher can receive salary differentials if certain qualifications are met, such as earning a graduate degree, prolonged years of service, additional assignments, additional responsibility, special work location, or temporary assignment of different duties. Most of these differentials are received by only a few teachers and do not require examining, but others, such as graduate degrees and prolonged years of service, are received by a substantial proportion of teachers and can be important sources of differences in average salaries among schools.

Average teacher salary. Teacher salaries in the Los Angeles school system for 1976-77 ranged between $10,650 and $21,970. Because of difference in the mix of individual salary rates, the average teacher salary varied from school to school, but over a smaller range than the individual rates. The average salaries of Los Angeles schools grouped by race/ethnicity are listed in Exhibit 20. The average in Black and Hispanic schools were substantially lower than in Other schools at all levels. The pattern of positive and negative disparity ratios for the elementary schools is very much like the pattern for per pupil spending for teachers (see Exhibit 16). The analytical framework developed for analyzing per pupil spending for teachers identified variations in pupil-teacher ratios or average teacher salaries as the sources

Exhibit 20

DISTRIBUTION OF THE AVERAGE TEACHER SALARY AMONG SCHOOLS GROUPED BY PUPIL RACIAL/ETHNIC COMPOSITION ACCORDING TO THE 13 ZONE TRIANGLE SYSTEM
ALL LAUSD Schools, 1966-77 (ESTIMATED)

PUPIL RACIAL/ETHNIC COMPOSITION: 13 ZONE SYSTEM	ELEMENTARY Average Salary	ELEMENTARY Amount from Mean	ELEMENTARY Dis-Parity Ratio	JUNIOR HIGH Average Salary	JUNIOR HIGH Amount from Mean	JUNIOR HIGH Dis-parity Ratio	SENIOR HIGH Average Salary	SENIOR HIGH Amount from Mean	SENIOR HIGH Dis-parity Ratio
Black	$ 13,545	$-1,820	-13	$ 15,010	$-1,130	-8	$ 16,995	$ -670	-4
Majority Blk.-Oth.*	15,615	250	2	--	--	--	19,270	1,605	9
Black-Other	16,410	1,045	7	16,545	405	3	16,140	1,525	-9
Majority Other-Black	16,610	1,245	8	16,855	715	4	18,660	995	6
Other	16,885	1,520	10	16,785	645	4	16,475	810	5
Majority Oth.-Hisp.	16,660	1,295	8	16,185	45	0.3	18,035	370	2
Other-Hispanic	16,710	1,345	9	17,330	1,190	7	16,300	-1,365	-8
Majority Hisp.-Oth.	15,290	-75	-0.5	15,880	-260	-2	17,270	-395	-2
Hispanic	14,280	-1,085	-8	16,135	-5	-0.03	16,820	-845	-5
Majority Hisp.-Blk.	13,470	-1,895	-14	13,760	-2,380	-17	16,420	-1,245	-8
Hispanic-Black	14,685	-680	-5	--	--	--	--	--	--
Majority Blk.-Hisp.	15,205	-160	-1	15,290	-850	-6	--	--	--
Blk.-Oth.-Hisp.	19,080	3,715	24	--	--	--	16,625	-1,040	-6
Overall Mean	$ 15,365	$ 0	--	$ 16,140	$ 0	--	$ 17,665	$ -0	--

Source: Calculated from 1976-1977 expenditure data using the following equation: average teacher salary = per pupil spending for teachers X pupil-teacher ratio.
*"Other" includes White, Asian and American Indian.

of variations in spending per pupil. Data in Exhibit 17 showed that differences in pupil-teacher ratios (regular funds only) did not cause the observed pattern of spending differences, and now data on the average salaries confirms that differences in teacher salaries were the cause.

Experience and training. The years of experience and the level of training of a teacher are highly correlated. Since it takes time to accumulate the required training, teachers who are highly trained must also have a fair amount of experience. (However, the reverse relationship is less strong. Teachers who have lots of experience are not necessarily the ones with the most training.) Because of the very close relationship between step and schedule advances, the two qualities they represent, experience and training, can be combined into one in the case of Los Angeles. Exhibit 21 shows the distribution of teachers with the least and most experience and training. Black schools had 18 percent of all teachers, but had disproportionately more of the teachers with the least experience (23 percent) and less of those with the most (8 percent). The distribution of experience and training of teachers in the predominantly Hispanic schools followed a similar pattern. The situation in Other schools was reversed. With 20 percent of all teachers, they had only 14 percent of those with the least experience and training and 32 percent of those with the most.

A similar analysis can be done for a quality like formal education. The distribution of teachers with only a bachelor's degree or its equivalent could be compared to the distribution of all teachers to

Exhibit 21

DISTRIBUTION OF TEACHER EXPERIENCE AND TRAINING AMONG SCHOOLS GROUPED BY PUPIL RACIAL/ETHNIC COMPOSITION ACCORDING TO THE 13 ZONE TRIANGLE SYSTEM
ALL SCHOOLS, FALL 1977

Racial/Ethnic Composition: Zone System	ALL TEACHERS Number	ALL TEACHERS Percent of Total	LEAST EXPERIENCE AND TRAINING† Number	LEAST EXPERIENCE AND TRAINING† Percent of Total	LEAST EXPERIENCE AND TRAINING† Dis-parity Ratio	MOST EXPERIENCE AND TRAINING†† Number	MOST EXPERIENCE AND TRAINING†† Percent of Total	MOST EXPERIENCE AND TRAINING†† Dis-parity Ratio
	3,876	17.5	655	22.6	29	418	8.4	-109
ity Blk.-Oth.*	181	0.8	28	1.0	18	32	0.6	-27
-Other	355	1.6	54	1.9	16	100	2.0	25
ity Other-Black	1,401	6.3	172	5.9	-7	455	9.1	44
	4,339	19.6	401	13.8	-42	1,571	31.6	61
ity Oth.-Hisp.	3,630	16.4	335	11.5	-42	1,064	21.4	30
-Hispanic	1,375	6.2	140	4.8	-29	320	6.4	3
ity Hisp.-Oth.	2,264	10.2	359	12.4	21	373	7.5	-37
nic	3,384	15.3	559	19.3	26	431	8.7	-77
ity Hisp.-Blk.	560	2.5	85	2.9	16	75	1.5	-68
nic-Black	212	1.0	21	0.7	-32	38	0.8	-25
ity Blk.-Hisp.	359	1.6	58	2.0	23	55	1.1	-47
th.-Hisp.	198	0.9	36	1.2	30	46	0.9	3
	22,134	100.0	2,903	100.0	--	4,978	100.0	--
t of All hers	(100.0%)		(13.1%)			(22.5%)		

Source: December 1977 payroll.
Note: "Percent of Total" may not add to 100.0 percent due to rounding.
* "Other" includes White, Asian and American Indian.
† Three lowest salary schedules.
†† Top step of the top schedule.

determine if any disparity exists. The same can be done for teachers with master's degrees or doctorates. However, it is likely that the major source of differences in average teacher salaries among groups of schools is due to differences in experience and training, differences in the distribution of teachers across the steps, and schedules of the basic salary table, rather than differences in the distribution of formal education.

Use of substitutes. When a school cannot hire a permanent teacher to fill a vacancy, a teacher with substitute status is employed for an extended period. Teachers holding long-term substitute status are theoretically inferior to those holding permanent status. They generally have not met all the requirements for full certification and thus, are paid less than permanent teachers, which would lower the average teacher salary of a school. Exhibit 22 shows that Black and Hispanic schools in Los Angeles had disproportionately more long-term substitute teachers (21 perce ubstitutes compared to 18 and 16 percent of all teachers, re vely), while Other schools had disproportionately fewer (14 percent versus 19 percent). These data are for the beginning of the school year, and attrition rises dramatically at the end of the school year, especially in those schools that are considered "undesirable" assignments. One would guess that schools with lots of long-term substitutes initially are probably "undesirable" assignments.

Racial composition of the staff. The racial composition of a school's faculty is significant because this quality matters to the quality of the education provided by the school and because disparities in the racial mix of teachers affect the average salaries. As a group, White

Exhibit 22

DISTRIBUTION OF PERMANENT AND SUBSTITUTE TEACHERS AMONG SCHOOLS GROUPED BY PUPIL RACIAL/ETHNIC COMPOSITION ACCORDING TO THE 13 ZONE TRIANGLE SYSTEM
ALL SCHOOLS, FALL 1977
LAUSD

Pupil Racial/Ethnic Composition: 13 Zone System	ALL TEACHERS Number	ALL TEACHERS Percent of Total	PERMANENT Number	PERMANENT Percent of Total	PERMANENT Disparity Ratio	SUBSTITUTES Number	SUBSTITUTES Percent of Total	SUBSTITUTES Disparity Ratio
Black	4,200	17.7	3,462	17.1	-4	738	21.3	20
Majority Black-Other*	181	0.8	161	0.8	4	20	0.6	-33
Black-Other	359	1.5	313	1.6	2	46	1.3	-15
Majority Other-Black	1,396	5.9	1,250	6.2	5	146	4.2	-40
Other	4,467	18.8	3,979	19.7	4	488	14.0	-34
Majority Other-Hispanic	3,714	15.7	3,346	16.5	6	368	10.6	-48
Other-Hispanic	1,514	6.4	1,289	6.4	-0.2	225	6.5	1
Majority Hispanic-Other	2,482	10.5	2,046	10.1	-4	436	12.5	20
Hispanic	3,873	16.3	3,141	15.5	-5	732	21.0	29
Majority Hispanic-Black	643	2.7	506	2.5	-8	137	3.9	45
Hispanic-Black	259	1.1	217	1.1	-2	42	1.2	10
Majority Black-Hispanic	407	1.7	345	1.7	-1	62	1.8	4
Black-Other-Hispanic	206	0.9	170	0.8	-3	36	1.0	19
Totals	23,701	100.0	20,225	100.0	--	3,476	100.0	--
Percent of All Teachers	(100.0%)		(85.3%)			(14.7%)		

Source: October 1977 payroll.
Note: "Percent of Total" may not add to 100.0 percent due to rounding.
*"Other" includes White, Asian and American Indian.

teachers have been working more years in the Los Angeles schools than have minority teachers so that White teachers have had more time to make step advances, accumulate training points, and earn graduate degrees. Thus, they have generally higher than average salaries, and schools with disporportionately more White teachers also would be expected to have higher than average salaries. The correlation between the distribution of White teachers and average teacher salaries is shown in Exhibit 23 for Los Angeles. The pattern of negative and positive disparity ratios for these two variables are similar. Black and Hispanic schools had fewer White teachers and lower average salaries than Other schools. If the distribution of average teacher salaries is related to the distribution of White teachers, then the distributions of teacher experience and training also must be related. This is just one more reason for vigorously pursuing a teacher integration plan.* Achieving the goal of racially heterogeneous teaching staffs will help even out the distributions of teacher experience and training. Of course, faculty integration will not guarantee that these teacher quality resources will be equitably distributed. The goal of equitable resource allocation must be pursued by other means as an end in its own right.

REMOVING RESOURCE DISPARITIES

The illustrative analysis of resource allocation among the schools of Los Angeles revealed a strong connection between the racial/ethnic compositions of the schools and the relative amounts of resources allocated to

*Since 1976, the Los Angeles school system has been implementing a teacher integration plan aimed at evening out the distribution of minority and nonminority teachers among the schools. While a great deal of progress has been made, there were still noticeable disparities in the racial/ethnic distribution of teachers.

Exhibit 23

DISTRIBUTION OF WHITE TEACHERS AND AVERAGE SALARY AMONG SCHOOLS GROUPED BY PUPIL RACIAL/ETHNIC COMPOSITION ACCORDING TO THE 13 ZONE TRIANGLE SYSTEM
ALL SCHOOLS, FALL 1977
LAUSD

Pupil Racial/Ethnic Composition: 13 Zone System	ALL TEACHERS Number	ALL TEACHERS Percent of Total	WHITE TEACHERS Number	WHITE TEACHERS Percent of Total	WHITE TEACHERS Disparity Ratio	AVERAGE SALARY Est. 1976-77 Amount	AVERAGE SALARY Disparity Ratio
Black	3,569	18.3	1,966	14.5	-26	$ 16,085	-6
Majority Blk.-Oth.*	155	0.8	87	0.6	-24	19,380	14
Balck-Other	297	1.5	214	1.6	4	17,050	0.4
Majority Oth.-Blk.	1,119	5.7	872	6.4	12	17,895	5
Other	3,577	18.4	2,891	21.3	16	18,130	7
Majority Oth.-Hisp.	3,075	15.8	2,385	17.6	12	17,670	4
Other-Hispanic	1,226	6.3	912	6.7	7	17,340	2
Majority Hisp.-Oth.	2,050	10.5	1,441	10.6	1	16,490	-3
Hispanic	3,172	16.3	2,006	14.8	-10	15,935	-7
Majority Hisp.-Blk.	520	2.7	333	2.5	-9	15,435	-10
Hispanic-Black	207	1.1	110	0.8	-31	16,525	-3
Majority Blk.-Hisp.	332	1.7	203	1.5	-14	16,380	-14
Blk.-Oth.-Hisp.	175	0.9	125	0.9	3	17,970	6
Totals/Mean	19,474	100.0	13,545	100.0	--	$ 16,980	--
Percent of All Teachers	(100.0%)		(69.6%)				

Source: October 1977 Racial and Ethnic Survey. Average salary estimates were calculated the same way as in Exhibit ~~[illegible]~~ 16 using regular and special fund teachers and expenses.
Note: "Percent of Total" may not add to 100.0 percent due to rounding.
*"Other" includes White, Asian and American Indian.

them. Schools with predominantly Black or Hispanic pupils received less resources -- lower per pupil expenditures of regular funds, teachers with less experience and training, and faculties with more minority teachers and substitutes -- than did schools with predominantly Other (White) pupils. This situation existed the year before the school district implemented its pupil desegregation plan, and there is no reason to believe that these disparities have been eliminated because few Black or Hispanic schools participated in the plan.

While unfortunate, the lack of concern with racially related resource disparities is understandable. The distribution of resources is less visible than the distribution of racial/ethnic groups of pupils. Couched in budgetary jargon and jealously guarded by school officials, information about allocation policies, procedures and criteria are hard to come by and to decipher, and allocation results are even harder to examine because masses of data must be sorted through computers. In contrast, demonstrating that Blacks are concentrated in some schools and isolated from Whites is a relatively simple analytical exercise.

If the issue of racially biased resource disparities had been introduced early in the Crawford litigation as a major part of the case, then the need to correct this aspect of the system's segregation might had been given priority on a par with the need to shift pupils among schools. As is typical in school desegregation rulings, resource disparities were mentioned only briefly in the Crawford decision, and school officials have taken this cue and not been very concerned with formulating remedies in this area.

If Los Angeles school officials had moved to equalize the distribution of resources among the schools at the same time (or even before) they implemented a program to shift pupils among schools, they might have met less resistance to requiring pupils to transfer to predominantly Black or Hispanic schools. Why should any pupil be willing to be transferred to a school with demonstrably less resources? As the situation now stands, very few White pupils have been transferred to predominantly Black or Hispanic schools. These schools are still segregated, and they still have less resources.

What kinds of remedies should school officials consider? The lysis of Los Angeles suggests two basic approaches: Allocate more dollars to schools with low spending levels so they can buy more inputs; and shift teachers around to even out the distributions of teacher experience and training to reduce differences in the agerage teacher salary and per pupil spending. Both approaches would have to be used to eliminate the resource disparities.

Politically, allocating more dollars would probably require new funds rather than reallocating funds fr ther schools. With additional resources, the schools could hire more classroom staff, either teachers or teacher aides, and thus lower their pupil-staff ratio, which would help compensate for the generally lower experience and training levels of their teaching staff. Shifting teachers among schools or controlling transfers and assignments so out the distributions of teacher experience and training would ifferences in average teacher salaries and per pupil spending. However, reallocating existing teacher resources in-

evitably brings strong resistance from the teachers.

The removal of other resource disparities would be more difficult. The Los Angeles school system has been implementing a teacher integration plan for several years, and substantial progress has been made, but much remains to be done. The inability of some predominantly black or Hispanic schools to recruit and retain teachers is a serious problem that has yet to be solved. However, its solution probably holds the best hope for reducing resource disparities. If the right teachers could be recruited, trained and retained, then they would generate benefits in the forms of no vacancies or need for long-term substitutes, accumulated experience and training, and stable faculty. With these kinds of good qualities in its teaching staff, a school at least has a chance to offer a decent education to its pupils.

The analysis described above was narrowly focused on racially related resource disparities. Given the findings, it is likely that resource disparities related to other criteria exist. What would an analysis of resource allocation with respect to income or social class show? Do the poor receive the most? Or do the rich receive more than average? Who receives the least? The same kinds of questions could be asked about achievement. Whatever the distinguishing variable, school officials should take a hard look at the distribution of resources among schools and among classes of pupils to see if they are living up to their policy of providing to all pupils an equal opportunity for a decent education.

The burden is on school officials to justify the resource disparities or to eliminate them. The justification would have to be on the

basis of adequately meeting the educational needs of all students and providing an equal opportunity to all students to receive at least the same decent education. This analysis side-stepped the cost-quality, input-output controversy because it was concerned with equality of inputs as an end in and of itself. This most basic issue of fair treatment must be resolved before one can go on to more complex, higher order issues of equalizing educational outcomes.

TECHNICAL APPENDIX

A GRAPHICAL DESCRIPTION OF MULTI-RACIAL/ETHNIC SCHOOLS

The purpose of this technical appendix is to explain the derivation of the triangle diagram. Starting with a simple two-group situation, basic principles and concepts are defined. These are then generalized to the case where there are three groups and then four groups.

The graphical technique described here can be applied to phenomenon other than the pupil racial/ethnic composition of schools.* It can be used to describe phenomenon where many subsets have been formed by grouping individual units of observation (pupils assigned to schools; survey respondents grouped by, say, age, city, or occupation) and where each and every unit of observation must assume one of a finite number of mutually exclusive and exhaustive states (racial/ethnic groups or response to a question).

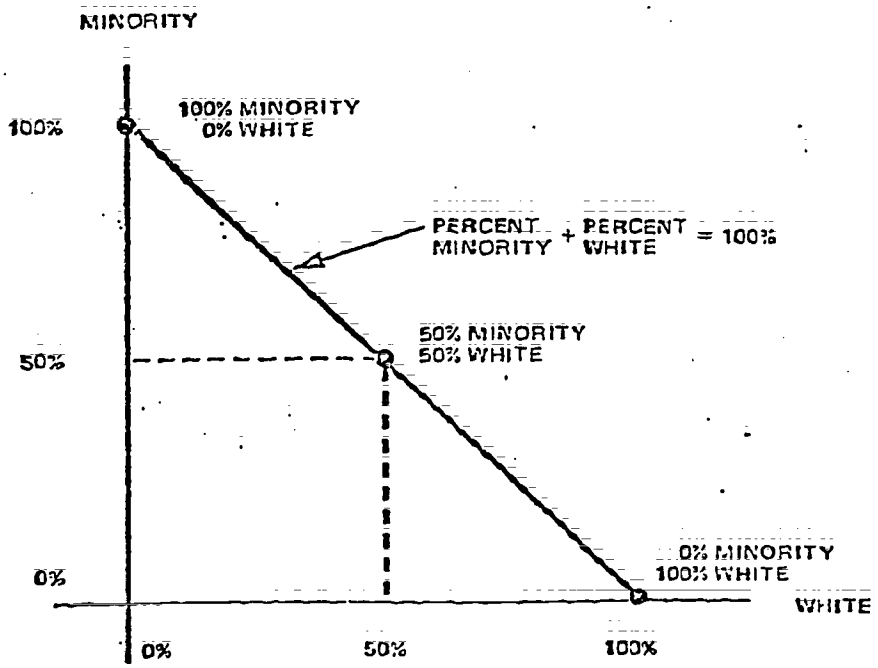
*We had known that triangular graphs were widely used in physical chemistry to study phase equilibria. The technique is so common that triangular coordinate graph paper is available commercially. However, we were not familiar with any application to social behavior. After we developed this graphical technique, it was brought to our attention by Seymour Spilerman that James S. Coleman had used the same technique in his book The Adolescent Society (New York: The Free Press, 1961). In a footnote on page 29, Coleman thanks James Davis and Jacob Feldman for suggesting the use of triangular graphs. James Davis published two studies that used triangle diagrams: Great Aspirations: The Graduate School Plans of America's College Seniors (NORC Monographs in Social Research Series, No. 1, 1964) and Undergraduate Career Decisions: Correlates of Occupational Choice (NORC Monographs in Social Research Series, No. 2, 1965). We later serendipitously found triangular graphs described by Herman J. Loether and Donald G. McTavish in their book, Descriptive Statistics for Sociologists (Boston: Allyn and Bacon, 1974). Using data from Gallup polls and an example from Coleman's book, they explain (pp 102-110) how to construct and interpret triangular graphs.

TWO GROUPS: BASIC CONCEPTS

To start, think in terms of a school system with two racial/ethnic groups of pupils: White and minority. Thus, the racial/ethnic mix of a school can be expressed in terms of percent White and percent minority, the two numbers adding up to 100 percent. Given the two racial/ethnic percents, the racial/ethnic mix of a school can be graphed as shown in Exhibit A. In a two dimensional space (one dimension for each racial/ethnic group), all schools can be analytically located along a line, which is a one dimensional space.

Exhibit A

2 GROUPS: A LINE



Notice that with two racial/ethnic groups, all schools are located somewhere in a one dimensional space. With two groups, if one of the percentages is known, the other one is automatically determined because they must add to 100 percent. In technical terms, this is known as having only one "degree of freedom." Even though there are two percents, only one is needed to locate a school on the line. For example, if a school is 50 percent White, it must also be 50 percent minority, and there is only one place on the line where every 50 percent White school must be located.

To lay the groundwork for generalizing this relationship between the number of racial/ethnic groups and the number of dimensions of the descriptive space, let the letter "n" stand for the number of racial/ethnic groups. In the example of two groups, n=2. The number of dimensions of the descriptive space for n groups is equal to n-1, one fewer than the number of groups. In the two group example, the descriptive space has one dimension (2-1=1), which is a line.

GENERALIZATION TO THREE OR MORE GROUPS

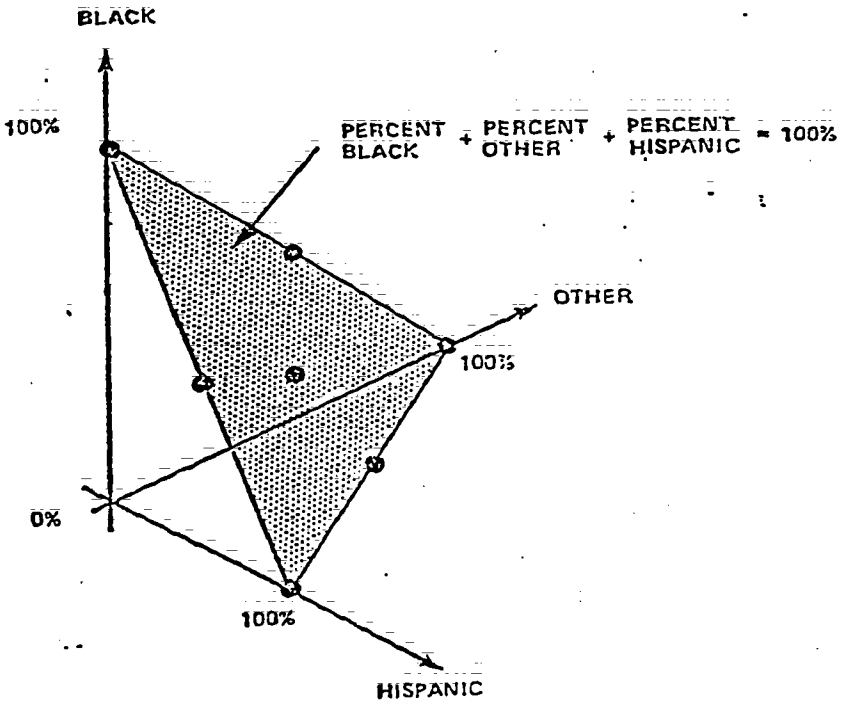
Consider now the situation of three racial/ethnic groups of pupils in the school system: Black, Hispanic, and Other pupils. A school's racial/ethnic mix can be expressed in terms of three percentages: percent Black, percent Hispanic, and percent Other. In technical terms, n=3.

Since the three percents must add up to 100 percent, if any two of them are known, then the third is determined. Thus, there are only

two degrees of freedom (3-1=2), and starting from a three dimensional space (one dimension for each racial/ethnic group), all schools can be analytically located in a two dimensional space, which is a triangular plane as shown in Exhibit B.

Exhibit B

3 GROUPS: A TRIANGULAR PLANE

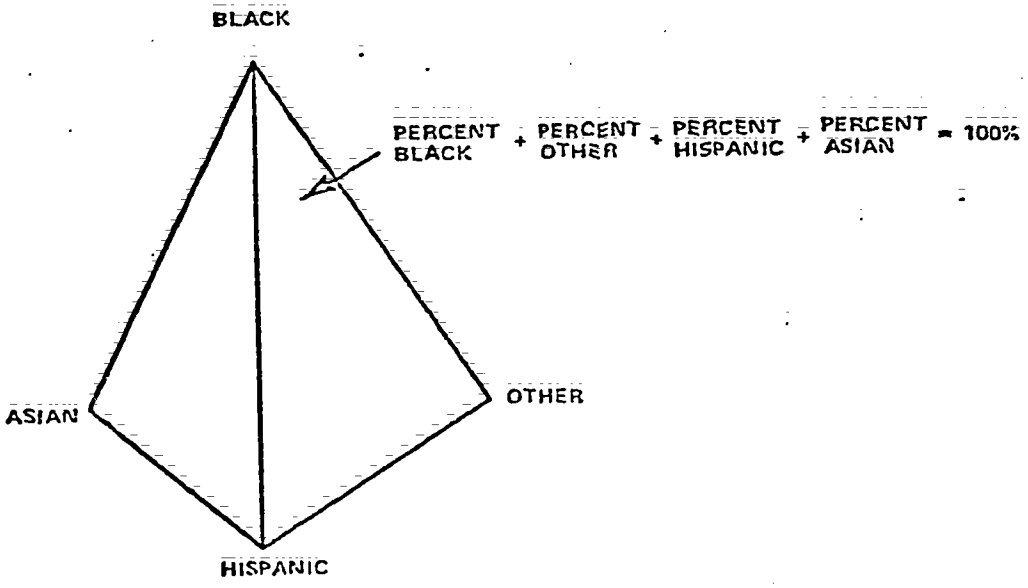


If one imagines standing above the triangular plane and looking perpendicular to its surface, then the view will be as shown in Exhibit 2: an equilateral triangle with the dots marking the location of hypothetical schools on the three corners and mid-points of the edges and in the center.

Generalizing one step further to four racial/ethnic groups (Black, Hispanic, Asian and Other, n=4), all schools can be analytically located in a three dimensional space, which is an equilateral tetrahedron such as in Exhibit C (only the resulting three dimensional descriptive space can be drawn and not the derivation from the four dimensional space).

Exhibit C

4 GROUPS: A TETRAHEDRON



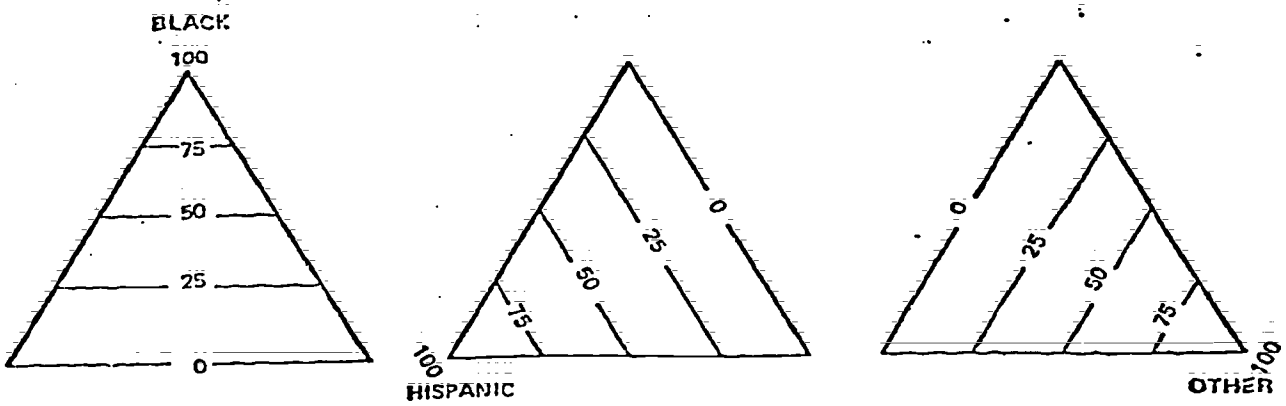
For a school system with more than four racial/ethnic groups, each school could be located in a space that had one fewer dimension than the number of groups. A picture of the descriptive space cannot be drawn when there are more than four racial/ethnic groups, but the mathematics and the logic would still apply.

TRIANGULAR COORDINATES

Returning to the case of three racial/ethnic groups, Exhibit D shows how a coordinate system can be imposed on the triangle so that schools can actually be located on the plane according to their percentages of Black, Hispanic, and Other pupils. Each racial/ethnic group is arbitrarily assigned a corner. In Exhibit D and throughout this article, the top corner is labeled Black, the right corner is Other, and the left corner is Hispanic.

Exhibit D

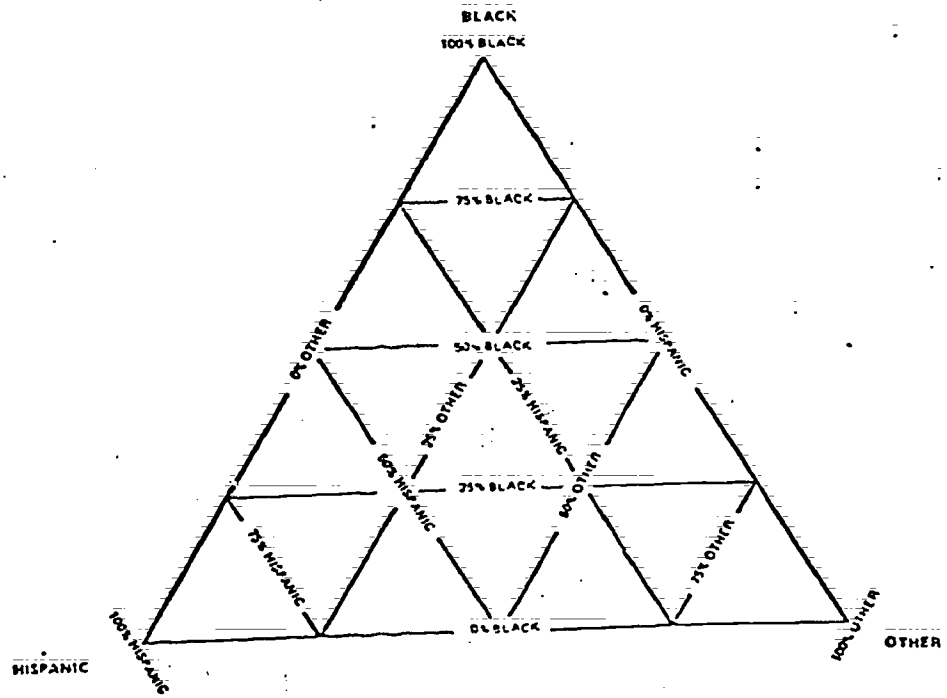
3 COMPONENTS OF TRIANGULAR GRID SYSTEM



The grid for the percent Black is a system of parallel, horizontal lines starting at the bottom of the triangle and going up to the top corner. The grid for the percent Hispanic is a system of lines parallel to the right side of the triangle and going to the left corner. Similarly, the grid for the percent Other is a system of lines parallel to the left side of the triangle and going to the right corner. When these three grid systems are superimposed upon each other, the result is a complete triangular coordinate system like the one shown in Exhibit E.

Exhibit E

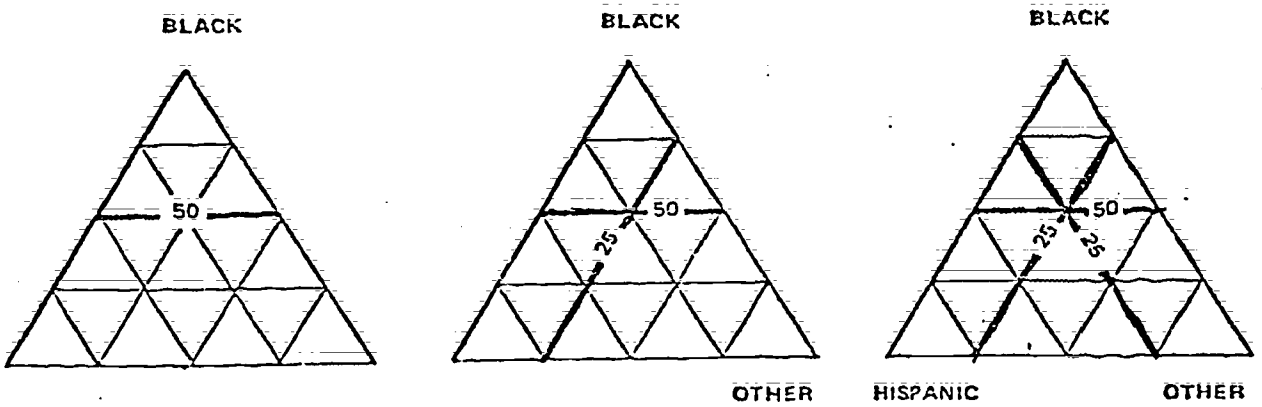
TRIANGULAR COORDINATES



A school can be located on the triangle graph without going back to the original three dimensional derivation space. For example, to locate a hypothetical school that is 50 percent Black, 25 percent Other, and, naturally, 25 percent Hispanic, start with any of the three numbers, say, with the 50 percent Black. The left diagram in Exhibit F shows the 50 percent Black line singled out. The hypothetical school must be located somewhere along this line. The center diagram singles out the 25 percent Other line. The point where these two lines cross is the location of the school. The right diagram singles out the final 25 percent Hispanic line.

Exhibit F

LOCATING A SCHOOL THAT IS 50% BLACK, 25% OTHER AND 25% HISPANIC

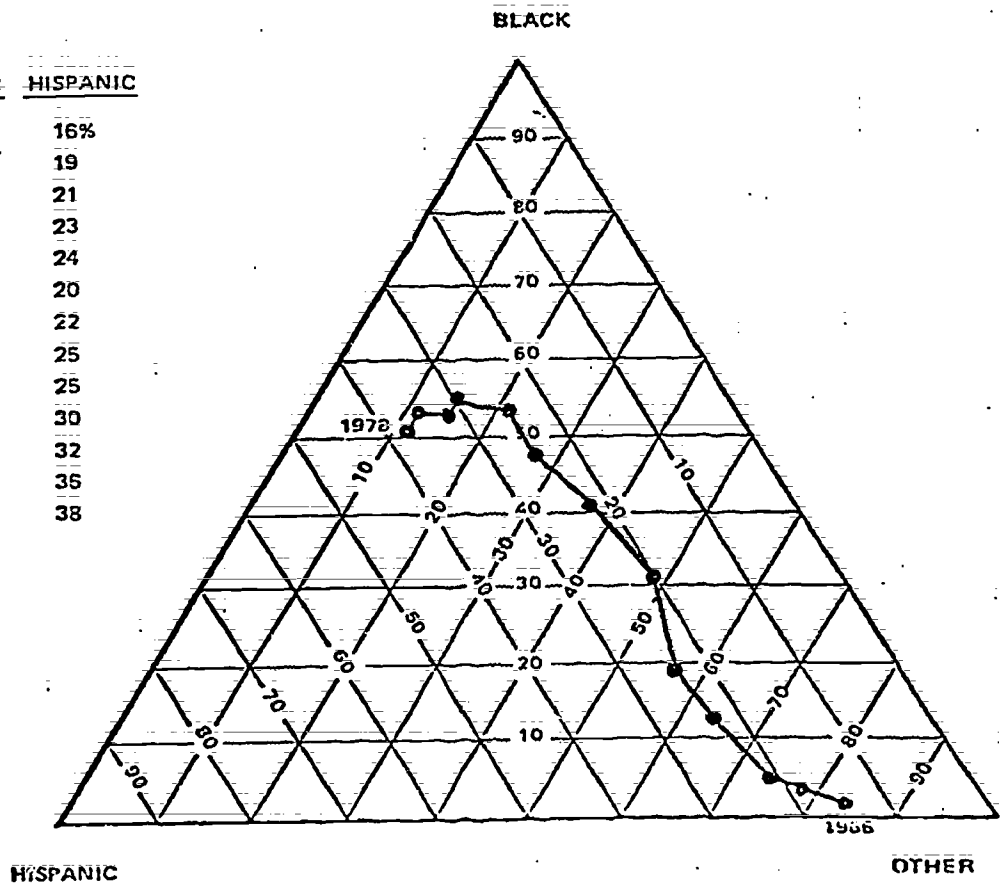


The locations of the 135 Street Elementary School between 1966 and 1978 are shown in Exhibit G. The data for each year are included so that the reader can practice locating the school on the diagram and confirm his understanding of how to read triangle graphs and locate schools.

Exhibit G

135 STREET ELEMENTARY SCHOOL: 1966-1978

	BLACK	OTHER	HISPANIC
1966	1%	83%	16%
1967	3	78	19
1968	6	73	21
1969	13	64	23
1970	19	57	24
1971	31	49	20
1972	41	37	22
1973	47	28	25
1974	54	21	25
1975	56	14	30
1976	53	15	32
1977	53	11	35
1978	51	11	38



ZONE SYSTEMS

The triangular descriptive space can be arbitrarily divided up into zones. A 7-zone system is used to study the dynamics of racial/ethnic mixes, and a 13-zone system is proposed as a basis for formulating desegregation policy and drawing up desegregaton plans. Exhibits H and I show these two zone systems superimposed on the triangular grid system so that the zone boundaries can be quantitatively identified.

EXHIBIT H

TRIANGULAR COORDINATES OF 7 ZONE SYSTEM

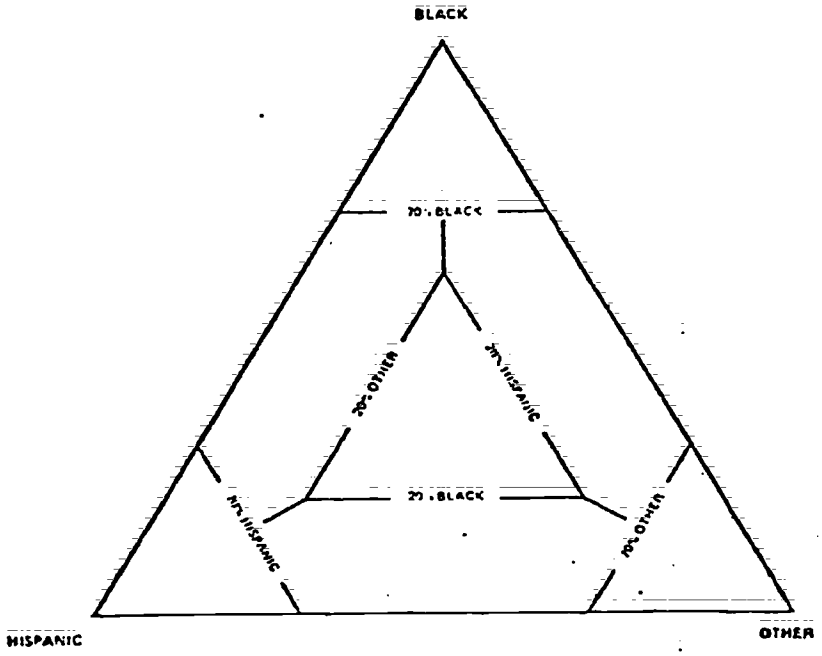


EXHIBIT I

TRIANGULAR COORDINATES OF 13 ZONE SYSTEM