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# CROSS-SECTIONAL JURY REPRESENTATION OR SYSTEMATIC JURY REPRESENTATION? SIMPLE RANDOM AND CLUSTER SAMPLING STRATEGIES IN JURY SELECTION

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## ABSTRACT

*This article presents a technical comparison of two methods of selecting juries. The research site was the Long Beach Superior Court in California. LISREL and computer-generated graphics were the analytic methods used. The analysis demonstrates that, if a representative list of prospective jurors is to be obtained, court officials must recognize the effects of racial and socioeconomic factors on residential segregation, and the selection procedure must take these factors into account. Minority and ethnic groups are unequally distributed within the jurisdiction studied. Traditional methods of jury selection, which are based on simple random sampling, are inadequate because they generate unrepresentative juror pools. In contrast, a cluster sampling method with the probability proportionate to size (PPS) incorporates residential segregation and generates a pool of jurors that reflects the cross-section of the community. Two test statistics, chi-square and Z, substantiated that cluster sampling is clearly superior to the currently employed simple random-selection method. Assurance of a cross-sectional representation of potential jurors is congruent with the requirement established by the Federal Jury Selection and Service Act of 1968. At the state level, as in California, the basic notion of this cross-sectionality is also congruent with the California Code of Civil Procedure of 1981.*

## INTRODUCTION

The Federal Jury Selection and Service Act was passed in 1968 to guarantee that "all litigants in Federal courts entitled to trial by jury shall have the right to grand and petit juries selected at random from a fair cross-section of the community" (U.S. 1968, Section 1861).[1] Current federal law attempts to ensure this goal by specifying two key requirements for forming the jury venire. During panel selection procedures, there must be (1)

"a random" selection of jurors and (2) selection from an area that includes special geographic districts in which a particular court convenes (U.S. 1968, Section 1861).[2] At the state level, a similar standard applies.[3] However, jury research has thrown doubt on the ability of these procedures alone to produce representative juries (*Hernandez* v. *Texas*, 1954; *United States* v. *Fernandez*, 1973).[4] Despite the requirement that the jury be composed of a fair cross-section of the community, racial and ethnic minorities have been consistently underrepresented in the vast majority of both federal and state courts (Carp, 1982; Brady, 1983; Hastie et al., 1983; Fukurai, 1985; Hans and Vidmar, 1986; Wishman, 1986; Wrightsman, 1987; Kassin and Wrightsman, 1988). This is so in spite of the fact that the U.S. Supreme Court has given gender, race, and socioeconomic factors "cognizable" status for protection against discrimination in jury selection. Geographical living areas are also given the status of cognizable classes, which should serve as further protection, since racial and economic groups often live together in neighborhoods.

Explaining racially imbalanced juries has been the focus of many recent studies by criminologists, psychologists, and sociologists. In the late 1970s and early 1980s, sociologists and criminologists argued that "human capital" factors such as race, socioeconomic origins, educational achievement, and occupational standings of individual jurors generated differences in jury representation (Kairys, 1972; Staples, 1975; Alker et al., 1976; Heyns, 1979; Diamond, 1980; Carp, 1982; Brady, 1983). For intance, potential jurors with specific human capital factors, such as higher income, higher education, and white racial background, were more likely to be represented on juries because they were more inclined to register to vote and could afford to take time off from work to serve on juries (Hastie et al., 1983; Starr and McCormick, 1985; Fukurai et al., 1990b). Psychologists have argued further that microdimensions of individuals influence jury composition. For example, legal scholars have argued that the inherent criminality of some groups and impaired intelligence of some potential jurors generally results in voluntary self-exclusion or being screened out by the selection processes (*The Yale Law Journal*, 1970). Scholars also have indicated that authoritarian personalities of some of those responsible for jury composition and decisions also contribute to selectivity in jury composition (Benokraitis and Griffin-Keene, 1982; Hans and Vidmar, 1986; Nietzel and Dillehay, 1986; Wishman, 1986). There are a number of additional factors that determine the ultimate composition of the jury, once a pool of jurors has been selected, including the peremptory challenges by prosecution and defense lawyers in voir dire. Nevertheless, the goal of guaranteeing defendants a trial by a jury of a cross-section of the community begins with a randomly selected jury pool. If the initial pool is biased or skewed, the principle on which jury trial is based is violated at the outset (see *Avery* v. *Georgia*, 1953; *Akins* v. *Texas*, 1954; *Carter* v. *Jury Commission of Greene County*, 1970).

## RESIDENTIAL FACTORS AND JURY SELECTION

In addition to the impact of socioeconomic and demographic characteristics of individual jurors, research has indicated that the presence of residential segregation also affects individuals' chances of being selected for jury service (Fukurai, 1985; Fukurai et al., 1990a). Research has suggested further that in some cities the overrepresentation of white-dominant neighborhoods contributes to a substantially greater chance of whites serving on juries. Heyns (1979) and Fukurai (1985) substantiated that data on jury representativeness in eight superior courts in Los Angeles County between 1978 and 1985 showed similar jury composition and geographic distribution within the respective jurisdictions. This occurred despite the fact that the master list supposedly was created from the following two lists: (1) voter registration (ROV) and (2) motor-vehicle registration lists (DMV) (CA, 1980, Sections 17, 18).

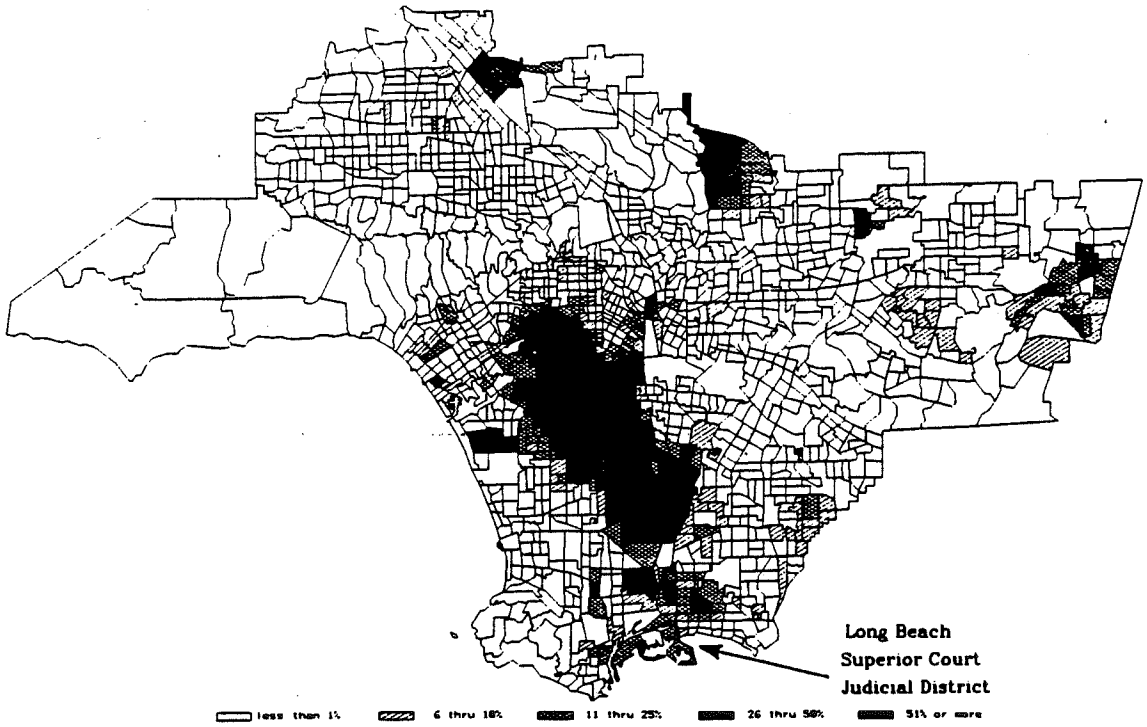
In order to obtain a truly representative list of prospective jurors, the jury selection method

must recognize the existence of racial and socioeconomic factors affecting residential segregation, and the selection procedure must take these factors into account. Traditional methods of jury selection, which are based on simple random sampling, are inadequate because minority and ethnic groups are unequally distributed within a jurisdiction. Random sampling therefore generates unrepresentative juror pools. Map 1 shows residential segregation in Los Angeles County, where Black residents are highly concentrated in certain areas. With simple random sampling, there is no guarantee that areas with a concentration of Blacks will be sampled and therefore no guarantee that the list of potential jurors drawn will reflect the racial composition of the county.

It is our contention that *cluster sampling with the probability proportionate to size* (PPS) minimizes the effect of spatial biases on jury representativeness. This study examined cluster sampling of prospective jurors, which incorporates racial and socioeconomic factors affecting residential segregation and generates a pool of jurors that better reflects the cross-section of the community. This research, thus, had the following three specific objectives: (1) to evaluate jury representation based on simple random sampling, (2) to show how an alternative cluster sampling strategy effectively can create an egalitarian system of juror representation, and (3) to show the extent to which the cluster sampling method can help ensure racially balanced jury venires.

## CLUSTER SAMPLING WITH THE PROBABILITY PROPORTIONATE TO SIZE (PPS)

The cluster sampling method with the probability proportionate to size (PPS) results in selection of prospective jurors within a jurisdiction in accordance with an equal-probability basis. First utilized in surveys by Kish in 1965, the probability proportionate to size (PPS) is a special and efficient method for obtaining multistage cluster sampling. Whenever the clusters sampled are of greatly differing sizes and compositions, it is appropriate to use PPS. Cluster sampling with PPS assumes that each cluster is given a chance




Map 1: Residential segregation—Black residents—1980—

for selection proportionate to its size. For example, each geographical unit, such as a census tract, has different eligible potential jurors. A fixed number of eligible jurors is selected, say, five jurors. Cluster sampling with PPS ensures that the selection procedure results in each juror having the same probability of selection overall. Further, this results in the selection of a fair cross-section of the community population.

The cluster sampling of prospective jurors consists of two steps and is carried out in the following manner. At the first stage, geographical units from which jurors are to be drawn are randomly selected. At the second stage, prospective jurors are randomly selected within the chosen geographical units. The computerized procedure of the cluster sampling method is carried out in the following manner. For the first stage, each census tract within the jurisdiction is given a unique number. Then, a series of random numbers is generated, corresponding to the fixed number of census tracts. This process is repeated according to the number of jury panels to be assembled. Then, the frequency for each tract is computed. The frequencies become equivalent to the numbers of jurors expected from corresponding census tracts. At the second stage, potential jurors are randomly selected from individual census tracts. Stratifying the jury selection by geographical units eliminates any potential selection biases from the residential segregation. Further, it enhances the probability of assembling a more representative jury pool.

For example, consider the following situation. The judicial district has 1,000 census tracts and 1,000,000 eligible potential jurors in the jurisdiction. When 1,000 jurors are to be assembled for jury duty, each juror has a 1,000/1,000,000 or a .001 chance of selection. This can be modeled by first choosing 500 census tracts identified by random selection (*the first stage*). Each census tract has approximately two eligible jurors to be selected because of random selection of the tract. Consider a census tract containing 1,000 eligible potential jurors. The tract has a probability of selection equal to:

$$\frac{500 \text{ (tracts identified by random selection)}}{1{,}000{,}000 \text{ (eligible jurors in the district)}} \times \frac{1{,}000 \text{ (eligible jurors in the tract)}}{} = .5. \quad (1)$$

If this tract is represented, each eligible potential juror has a *second-stage* probability of selection equal to:

$$\frac{2 \text{ (to be selected in the tract)}}{1{,}000 \text{ (eligible potential jurors in the tract)}} = .002 \quad (2)$$

Multiplying .5 times .002 yields an overall probability of selection equal to .001, as required. Now consider a census tract with only 200 eligible potential jurors in it. The tract's chance of selection is only 500 X 200/1,000,000 or .10, much less than the earlier example. If this tract is selected, each eligible potential juror has a chance of 2/200 or .01 of selection in the second stage. Overall, each potential juror in this tract has a probability of selection of .10 times .01, or .001: the same as the earlier case and as demanded by the overall sampling design. The only difference between the two examples is *the number of eligible jurors in the tracts*, but that number appears in both numerator and denominator, thus cancelling itself out. No matter what the population size, then, the overall probability of an eligible potential juror being selected will be equal to 500 times 2/1,000,000 or .001.

The advantage of cluster sampling with PPS is that it selects relatively few eligible potential jurors in each census tract. Since the heterogeneity of the clusters (i.e., tracts) increases sampling variability, the large number of clusters is called for to reduce sampling errors (Sudman, 1976). Thus, the cluster sampling design with the small cluster size and the large number of clusters is particularly important since residential characteristics and racial representativeness are likely to

be homogeneous and affect sampling variability. For instance, the cluster size of 5 usually is considered sufficient in the context of a large cluster sample (Babbie, 1989: 198) because the ratio of cluster to simple random sampling error remains minimal (Sudman, 1976: 77). Obviously, a large number of eligible potential jurors in a single tract would improve the description of the census tract slightly, but the description of the judicial district as a whole would be improved more by adding tracts to the sample rather than adding eligible jurors on fewer tracts. Given that the court only needs 1,000 impaneled jurors altogether, it would be better to select two jurors each on 500 census tracts than to select 20 each on 50 tracts. In addition to guarding against specific dangers, the cluster sampling with PPS is an efficient use of limited sources.

## MODEL OF JURY REPRESENTATION

We utilized the following model of jury representation to evaluate the extent to which the cluster sampling method can create a more egalitarian pool of potential jurors than simple random jury selection. The model was also used to examine the extent to which racial segregation affects the jury pool. In order to assess the influence of spatial biases on jury representation, the model included four characteristics. These were: (1) gender, (2) race, (3) socioeconomic position, and (4) distance to the courthouse. Distance to the courthouse was included because discrimination in jury representation takes place in many jurisdictions based on the distance and/or time it takes to travel to the courthouse. These variables served as the important criteria to evaluate the effectiveness of the two different sampling methods. The evaluative model of jury representation is shown in figure 1.

If residential segregation affects jury representation, the four coefficients ($\beta_1$, $\beta_2$, $\beta_3$, and $\beta_4$) should be large and statistically significant. Nonsignificant paths, however, would indicate that residential segregation does not influence jury representation. Examination of the model allows evaluation of the extent of possible discrimination and anomalies of simple random jury selection. It also enables evaluation of the alternative, cluster sampling model. If individuals' areas of residence affect their chances of serving on juries, the significant path would show the extent of discrimination in jury representation.

## DATA

Two data sets were linked to serve as the foundation for examining the current jury representation model and the new cluster sampling strategy. These were (1) jury impanelment lists for a retrial of a particular court case[5] and (2) 1980 U.S. Census Bureau data. Ten jury impanelment lists, covering a period of ten weeks, were obtained to identify the neighborhoods (census tracts) from which jurors were being drawn to the Long Beach Superior Court in Los Angeles County, California. These lists could be compared with county demographic data to determine whether or not the panels represented a fair cross-section of the community in this court district. Census tract information was used to compare the characteristics of jurors on impanelment lists with sociodemographic characteristics of the population residing in the Long Beach Superior Court district. How to determine the sociodemographic characteristics of the judicial district quantitatively has been an important issue. In the past social scientists relied on census tracts to evaluate jury representativeness and to examine the extent to which the racial composition of neighborhoods contributed to poor representation of minority jurors. Kairys (1972), for instance, illustrated the practicality of utilizing census tracts to generate a statistical index (chi-squares) and examined the areal representation within a district. In California, as in most states, census tracts are used to evaluate judicial representation (*People* v. *Harris*, 1984). For this analysis, therefore, census tracts were used as a basis for delineating the judicial

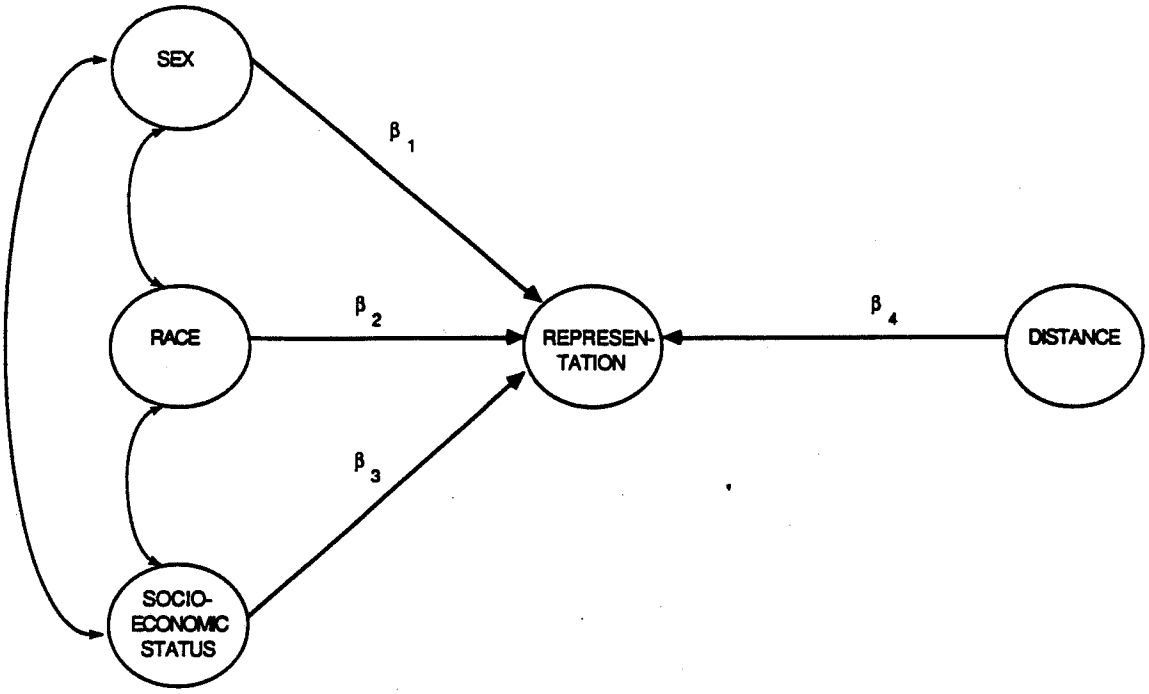



Figure 1. The evaluative model of jury representation

district. Jury impanelment lists enabled identification of the census tracts in which jurors resided.

The impanelment from which the lists used in this analysis came lasted from 4 April 1985 through 12 June 1985. Hispanic jurors in the impanelment lists were identified through surname lists provided by the Census Bureau. Census tracts also provided information on (1) the frequency of juror representation from each census tract and (2) racial and ethnic compositions of the neighborhoods where potential jurors resided. There were 1,250 impaneled jurors during the ten-week period of the impanelment. The ten panels drawn were typical, based on panel data available for other time periods. Population and housing data were used to determine if there were disparities between the population composition and jurors at the jury impanelment stage.

## METHODS

### *The Covariance Structure Analysis*

Recently developed covariance structures and LISREL maximum-likelihood estimations were utilized to assess the jury representation model. The overall goodness-of-fit test of the model was examined. The likelihood-ratio, chi-square statistic, and the likelihood-ratio indices, delta and rho, were employed in comparing fits in order to control for sample size (Bentler and Bonett, 1980; Bollen, 1989:271–76). While failure to reject the null hypothesis may be taken as an indication that the model is consistent with the data, it is important to bear in mind that alternative models also may be consistent with the data (Joreskog and Sorbom, 1985). Moreover, because the chi-square test is affected by sample size, it follows that (1) given a sufficiently large sample, an overidentified model may be rejected even when it fits the data well, and (2) when the sample size is small, the null hypothesis might not be rejected even when the model fits the data poorly (Long, 1983; Matsueda and Bielby, 1986). Therefore, a general null model based on modified independence among variables also was used to provide an additional reference point for the cluster evaluation of covariance structure models.[6]

Eight variables from the 1980 U.S. Census were selected to represent the five latent constructs and to examine the jury representation model. Gender composition was represented by the proportion of male eligible potential

jurors in a given census tract. Race was measured by the proportions of Black and Hispanic eligible potential jurors in the neighborhood. A socioeconomic factor was based on two measurements: (1) a proportion of prospective jurors with college education and (2) a proportion of households under poverty. Distance was the absolute distance between the courthouse and respective census tracts. Two variables represented the latent construct for jury representation: the number of times that the census tract was chosen and the number of jurors living in the census tract who were called to serve on juries.

*Computer-Generated Graphics Analysis*

The analysis also included computer-generated graphics. Covariance structure analysis did not delineate the importance of particular spatial units such as residences. Computer-generated graphics highlight the specific geographical locations and accurately reflect the impact of residential segregation on jury representation. Two statistical indices, chi-square and $Z$ scores, were computed to evaluate the jury representation model. Those additional analyses assisted evaluation of the cluster sampling method.

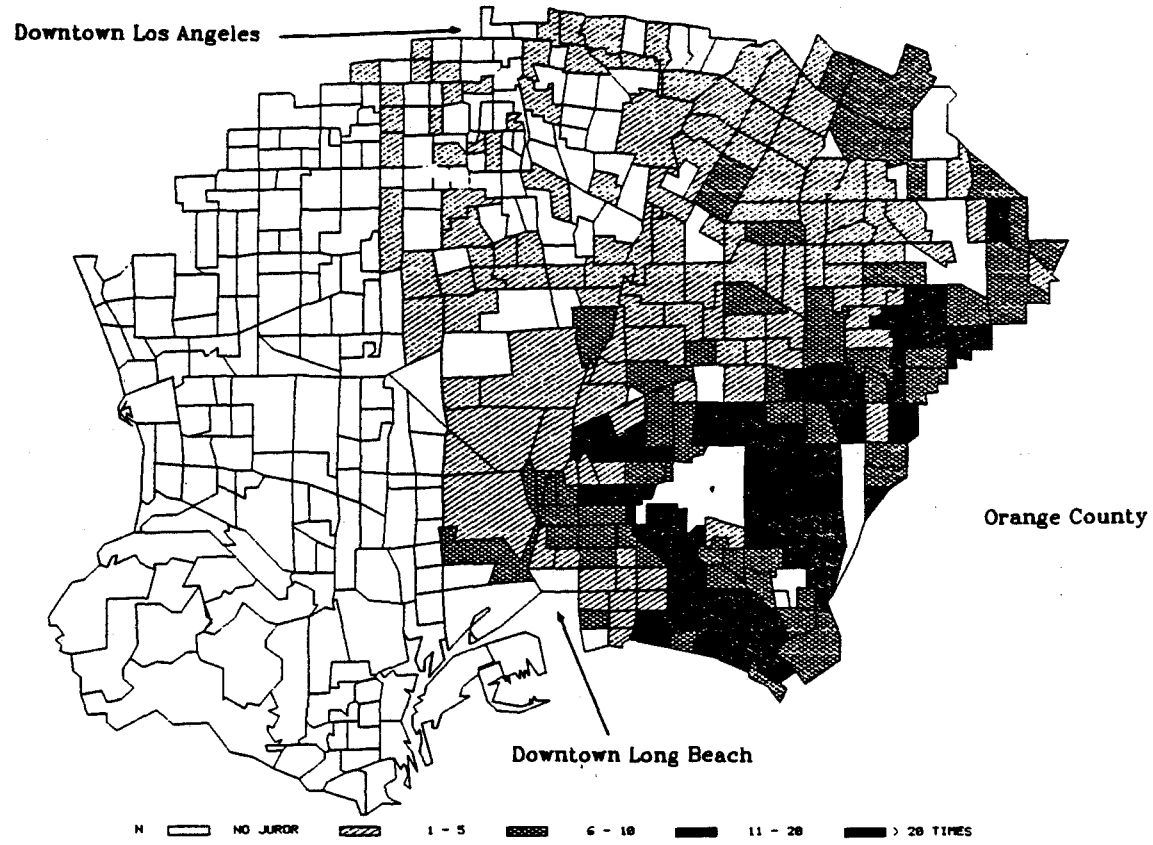
We hypothesized that residential characteristics affect jury composition most when simple random selection is used. That is, severe underrepresentation of racial minorities will be observed when potential jurors are selected with simple random sampling. We further hypothesized that cluster sampling would reduce the effect of residential segregation on jury representation because every census tract would have an equal probability to be selected. We also expected that cluster sampling with the probability proportionate to size (PPS) would ensure a more egalitarian pool of jury panels based on community populations.

## RESULTS

First, simple random sampling was examined, and the relationship between residential characteristics and jury representativeness was evaluated. Map 2 shows the observed jury representation under the simple random sampling method which is currently used by the court. Social and racial compositions of the neighborhoods were associated with the opportunity to serve on juries. Note that the neighborhoods adjacent to economically prosperous Orange County had far greater chances of having their residents selected to serve on panels. Orange County, according to the 1980 U.S. Census, had a population that was 1.14 percent Black and 12.50 percent Hispanic. The residents were predominantly white, with middle-class level or higher incomes. The Long Beach judicial district in Los Angeles County, on the other hand, had 16.4 percent eligible Blacks and 20.8 percent Hispanics.

Some areas in the judicial district had no jurors on the panel, as would be expected in a random sampling. However, nonrepresented areas included downtown Los Angeles and Long Beach, areas with the highest concentrations of racial minorities. The analysis further suggests disproportionality of representativeness within the impaneled neighborhoods (see Table 1). One census tract was represented by potential jurors twenty-two times, while 117 census tracts were represented four or fewer times and 319 tracts had no representation. About half of the potential jurors (47.1 percent) came from thirty-nine census tracts out of 538 tracts (7.2 percent) in the judicial district. The proportion of Black and Hispanic potential jurors in the nonrepresented areas (319) was higher than in the Long Beach judicial district as a whole. Further, the census tract with the highest representation had only 0.2 percent Black and 5.9 percent Hispanic residents, far below the average in the jurisdiction.

The neighborhoods that had below average jury service representation had far greater proportions of minority residents than the average for the judicial district (19.3 and 26.6 percent, respectively, for Black and Hispanic residents). Since jury representation was highly skewed, the median gives more meaningful information than the average. Identification of the neighborhood with median representation substantiated that jury representation was highly disproportional. For instance, 26.1




Map 2: Simple random jury selection

percent of the residents in neighborhoods with below median jury representation were Black, in contrast to 6.0 percent of the residents in neighborhoods with representation above the median. The same disproportionality was found for Hispanics (28.4 percent in neighborhoods with representation below the median and 18.0 percent in neighborhoods with representation above the median.

The significance of this point can be illustrated by alternative statistical explanations. For example, do underrepresented census tracts have significantly lower percentages of qualified jurors? Juror qualification criteria, such as U.S. citizenship, language proficiency, residency requirements, and no prior felony conviction, are more likely to eliminate racial minorities, and they may affect the overall representation on jury impanelment lists. Disqualification of certain jurors, however, did not explain the geographical biases found here. For instance, while 19.0 percent of the total potential jurors in the entire judicial district (538 census tracts) were qualified after a screening process, an approximately equal number, 19.8 percent, of potential jurors who resided in the impaneled neighborhoods (212 tracts) were also qualified. Juror qualifications thus did not explain the true extent of racially demarcated representation.

To assess whether place of residence influenced an individual's chances of being included in the juror pool, the current jury representation model was put to the test. Coefficients of correlation were generated and examined (see Table 2). Two sets of the correlation matrix are reported: the overall judicial district (538 tracts) and the impaneled tracts (212).[7] The overall goodness-of-fit of the model for the entire judicial district reflects the extent that residence impacted an individual's chance of representation on a jury. The goodness-of-fit for impaneled tracts reflects the effect of racial segregation only for selected jurors. Thus, the similarity and the difference between these two samples show

TABLE 1

CENSUS TRACTS' REPRESENTATION ON TEN PANELS: THE LONG BEACH JUDICIAL DISTRICT

| *Number of Times Census Tracts Represented* | *Frequency* | *Percent*[a] | *Cumulative Percent* | *Minority Composition* | |
|---|---|---|---|---|---|
| | | | | *Black Percent* | *Hispanic Percent* |
| | | | | 16.4 | 20.9 |
| 0 | 326 | — | — | 16.6 | 35.0 |
| 1 | 53 | 24.2 | 24.2 | 31.7 | 35.7 |
| 2 | 25 | 11.4 | 35.6 | 34.8 | 21.1 |
| 3 | 21 | 9.6 | 45.2 | 19.5 | 29.0 |
| 4 | 18 | 8.2 | 53.4 | 7.7 | 20.8 |
| 5 | 14 | 6.4 | 59.8 | 5.1 | 28.5 |
| 6 | 17 | 7.8 | 67.6 | 10.6 | 28.8 |
| 7 | 14 | 6.4 | 74.0 | 5.6 | 23.1 |
| 8 | 9 | 4.1 | 78.1 | 5.0 | 11.1 |
| 9 | 9 | 4.1 | 82.2 | 11.8 | 17.1 |
| 10 | 1 | 0.5 | 82.6 | 0.6 | 8.1 |
| 11 | 3 | 1.4 | 84.0 | 3.6 | 9.6 |
| 12 | 6 | 2.7 | 86.8 | 5.6 | 10.8 |
| 13 | 3 | 1.4 | 88.1 | 0.9 | 3.9 |
| 14 | 4 | 1.8 | 90.0 | 4.2 | 9.0 |
| 15 | 5 | 2.3 | 92.2 | 0.9 | 12.7 |
| 16 | 5 | 2.3 | 94.5 | 2.2 | 6.9 |
| 17 | 6 | 2.7 | 97.3 | 4.8 | 10.2 |
| 19 | 2 | 0.9 | 98.2 | 6.8 | 9.2 |
| 20 | 1 | 0.5 | 98.6 | 0.3 | 3.6 |
| 21 | 2 | 0.9 | 99.5 | 4.5 | 13.5 |
| 22 | 1 | 0.5 | 100.0 | 0.2 | 5.9 |

Medium = 4.
Mean = 10.28.
[a]Percent was computed by the represented census tracts.

the overall goodness-of-fit for the jury representation model with simple random jury selection.

The standardized parameter estimates for both overall and impaneled districts are shown in Table 3. All path coefficients for the four factors (gender, race, socioeconomic status, and distance) were significant, indicating that residential characteristics influenced jury representation. As previous analyses have suggested, race had a statistically significant negative impact upon the chance to serve. That is, the greater the proportion of Black and Hispanic residents in a given neighborhood, the less chance for residents in that neighborhood to participate in jury service. The distance from the courthouse also indicated significantly negative impacts on representation, suggesting that the impaneled neighborhoods were mostly located in the area close to the courthouse. Note, however, that many minority neighborhoods immediately adjacent to the courthouse were not represented (see Map 2).

## CLUSTER SAMPLING METHODS

### *The First Stage*

The analyses reported here substantiated that simple random jury selection failed to control

TABLE 2

SIMPLE RANDOM SELECTION: COEFFICIENTS OF CORRELATION AMONG CAUSAL VARIABLES IN REPRESENTED (ABOVE DIAGONAL) AND TOTAL CENSUS TRACTS (BELOW DIAGONAL)

| *Variables* | *Male X1* | *Black X2* | *Spanish X3* | *College X4* | *Poverty X5* | *Distance X6* | *Number of People Y1* | *Number of Panel Y2* | *Mean* | *S.D.* |
|---|---|---|---|---|---|---|---|---|---|---|
| X1 | | −.435 | .241 | .113 | −.339 | −.063 | .132 | .150 | .475 | .055 |
| X2 | −.294 | | −.187 | −.253 | .643 | .168 | −.362 | −.405 | .185 | .309 |
| X3 | .109 | −.263 | | −.631 | .267 | .341 | −.350 | −.335 | .278 | .177 |
| X4 | .189 | −.227 | −.653 | | −.585 | −.389 | .606 | .588 | .318 | .177 |
| X5 | −.153 | .598 | .316 | −.621 | | .068 | −.403 | −.403 | .146 | .121 |
| X6 | −.049 | .177 | .272 | −.206 | .152 | | −.386 | −.432 | 12.94 | 4.95 |
| Y1 | .015 | −.175 | −.263 | .296 | −.233 | −.470 | | .927 | 2.32 | 4.31 |
| Y2 | .013 | −.174 | −.265 | .266 | −.220 | −.505 | .956 | | 1.49 | 2.44 |
| Mean | .474 | .176 | .208 | .355 | .132 | 10.28 | 5.90 | 3.80 | | |
| S.D. | .026 | .291 | .183 | .154 | .110 | 4.96 | 5.11 | 2.53 | | |

Represented, $N = 212$.
Total, $N = 538$.

TABLE 3

SIMPLE RANDOM SELECTION: STANDARDIZED PARAMETER ESTIMATES FOR THE STRUCTURAL MODEL

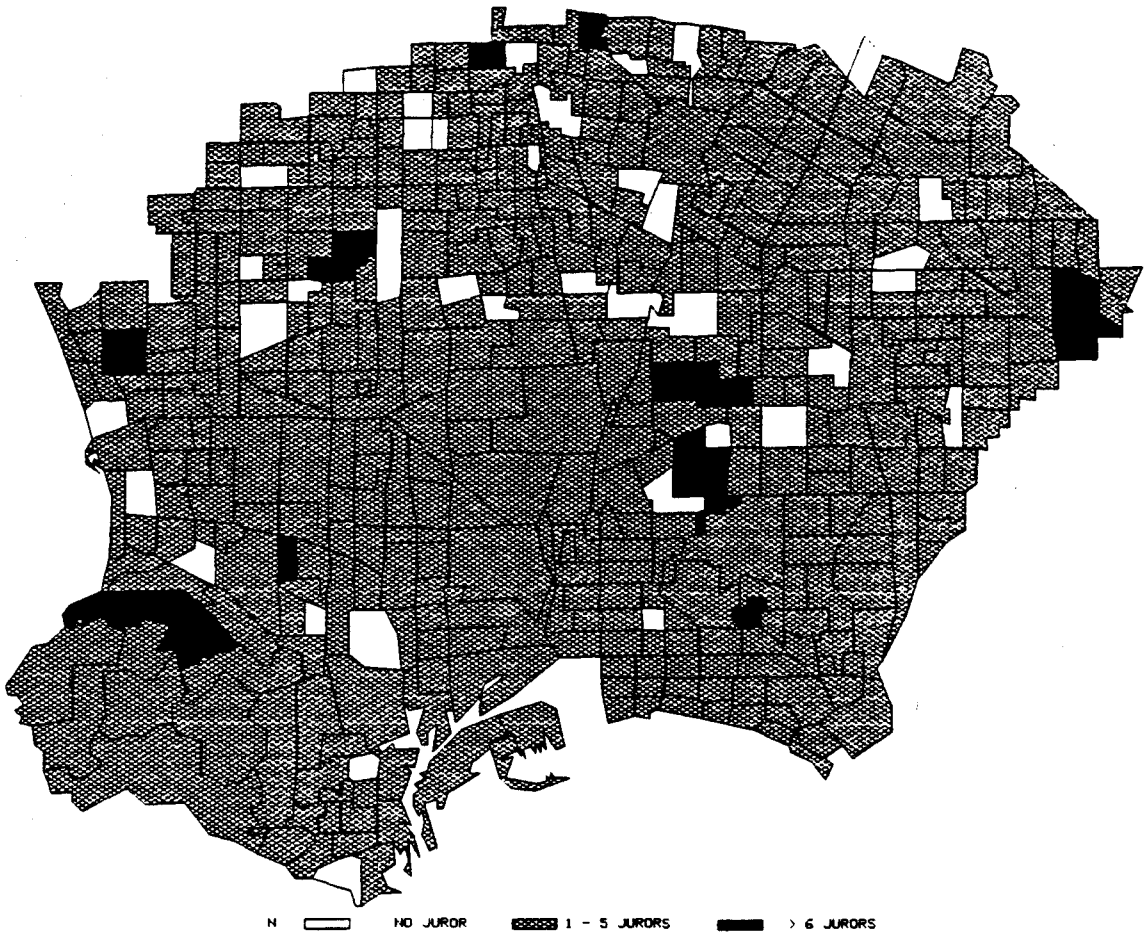
| | *Total Areas (N = 538)* | | | *Represented Areas (N = 212)* | | |
|---|---|---|---|---|---|---|
| *Factors and Variables* | *Factor Loadings* | *Standard Error* | *Critical Ratio* | *Factor Loadings* | *Standard Error* | *Critical Ratio* |
| Factor correlations | | | | | | |
| *R* sex-race | −.18 | .03 | 5.80 | −.24 | .05 | 4.61 |
| *R* sex-SES | .30 | .02 | 13.04 | .47 | .04 | 10.93 |
| *R* sex-distance | −.09 | .02 | 3.33 | −.12 | .04 | 2.85 |
| *R* race-SES | −.94 | .03 | 27.67 | −.96 | .05 | 18.82 |
| *R* race-distance | .53 | .03 | 15.14 | .61 | .05 | 10.89 |
| *R* SES-distance | −.32 | .03 | 10.32 | −.30 | .05 | 5.76 |
| Regression weights | | | | | | |
| B sex-representation | −.25 | .00 | 45.45 | −.36 | .02 | 6.42 |
| B race-representation | −.23 | .01 | 12.77 | −.27 | .04 | 5.86 |
| B SES-representation | .25 | .04 | 11.01 | .54 | .05 | 9.63 |
| B distance-representation | −.87 | .04 | 19.77 | −.47 | .06 | 6.86 |
| Residual variables representation | .78 | .04 | 19.12 | .72 | .04 | 14.79 |

for spatial biases related to residential segregation. As a result, the jury panel showed racially disproportionate representation and did not reflect the overall characteristics of the judicial district.

The first stage of cluster sample selection assumes that one person is randomly selected from each identified census tract for a jury panel. Generating 125 random numbers can identify 125 prospective jurors for the panel from 125 census tracts. We performed this procedure ten times, since there were ten lists to be impanelled. Then, the frequency was computed for every selected tract. Thus, using the cluster sampling procedure, we recreated a pool of jurors ($N$ = 1,250).[8] The geographical distribution of jurors selected by cluster sampling is shown in Map 3. The difference between the sample random selection and cluster sampling is clear. The latter method pulls jurors from the entire judicial district, creating a pool of potential jurors that appears to reflect the overall population of the area (compare Map 2).

The next question was, Do residential factors significantly impact individuals' chances for jury representation, thus creating imbalanced juries? Again, the goodness-of-fit of the jury representation model was put to the test. The jury representation model explained 98.5 and 99.8 percent of total chi-square values for the overall district. After the degrees of freedom were controlled, similarly, 99.3 and 93.6 percent of total chi-square values for the impaneled neighborhoods were explained. Out of 538 census tracts in the jurisdiction, 492 (91 percent) were chosen by cluster sampling. Note that only 212 census tracts were represented by simple random jury selection.

We examined whether an individual's area of residence affected his or her chance of being selected for jury service. The standardized parameters of the cluster sampling model are shown in Table 4. The set of four structural factors, gender, race, SES, and distance, did not influence juror representativeness. This finding shows that socioeconomic (SES) or




Map 3: Cluster sampling jury selection—the first stage

racial factors would not affect the representativeness of juror pools if cluster sampling were used. Thus, every juror in the district would have a more or less equal chance of being included in jury panels.

*The Second Stage*

The analyses above demonstrate that a cluster sampling strategy would be superior to the simple random selection method in two ways: (1) racially segregated residential patterns would have no bearing on the potential for jury representation, that is, there would be no "systematic selection" of neighborhoods based on residential characteristics, and (2) a cluster sampling method would ensure the equal probability of juror representation within the defined boundary of the jurisdiction.

To examine the second stage of the cluster sampling method, once the census tracts were identified, selection of eligible jurors with the probability proportionate to size was carried out within individual census tracts. Evaluation of the ability of the cluster sampling method to produce a representative jury focused on two questions. First, does the cluster sampling method accurately reflect the racial and socioeconomic compositions of *each* geographical unit (i.e., a census tract)? Second, does the method yield a more egalitarian pool of prospective jurors for the *entire* judicial district (i.e., the jurisdiction)?

For the first question, of individual juror representation, a *Z*-test statistic examined the jury representativeness *within* each census tract. The *Z* score tests whether the characteristics of a sample are consistent with the population from which it is drawn. That is, if the sample (e.g., jury panels) contains a

TABLE 4

CLUSTER SAMPLING SELECTION: STANDARDIZED PARAMETER ESTIMATES FOR THE STRUCTURAL MODEL

| | *Total Areas (N = 538)* | | | *Represented Areas (N = 492)* | | |
|---|---|---|---|---|---|---|
| *Factors and Variables* | *Factor Loadings* | *Standard Error* | *Critical Ratio* | *Factor Loadings* | *Standard Error* | *Critical Ratio* |
| Factor correlations | | | | | | |
| *R* sex-race | −.19 | .03 | 6.33 | −.59 | .03 | 18.54 |
| *R* sex-SES | .29 | .02 | 13.18 | .37 | .02 | 14.06 |
| *R* sex-distance | −.10 | .02 | 3.70 | −.15 | .02 | 5.83 |
| *R* race-SES | −.91 | .03 | 26.00 | −.95 | .03 | 30.44 |
| *R* race-distance | .50 | .03 | 14.28 | .71 | .03 | 20.71 |
| *R* SES-distance | −.31 | .03 | 10.00 | −.45 | .03 | 14.14 |
| Regression weights | | | | | | |
| B sex-representation | −.03 | .00 | 6.00 | −.00 | .01 | .11 |
| B race-representation | −.09 | .01 | 5.00 | −.00 | .02 | .03 |
| B SES-representation | .05 | .04 | 2.20 | .00 | .03 | .17 |
| B distance-representation | −.01 | .04 | 0.22 | −.00 | .04 | .19 |
| Residual variances representation | .91 | .04 | 22.19 | .99 | .02 | 34.13 |

fair cross-section, the proportion of Hispanics selected in it will be similar to the proportion of Hispanics in a given tract (see Ott et al., 1987:257–58, for a further discussion of the *Z* score and a binomial distribution).

For the second question, of the overall representation of cognizable groups, a goodness-of-fit chi-square test examined the overall proportions of these groups. A chi-square goodness-of-fit test examines whether observed probabilities differ from expected probabilities. For example, consider observed and expected numbers of potential jurors of different race/ethnic groups in an *entire* judicial district. The expected probabilities for racial groups are calculated from the census population (Kairys, 1972). The chi-square, then, examines whether the observed probabilities for representation of individuals of various racial and ethnic backgrounds in chosen census tracts are consistent with the racial makeup of the judicial district as a whole. A significant chi-square test, for example, indicates that the observed racial composition of the panel is statistically different from the racial distribution for the whole district. Thus, there is systematic selection (see Ott et al., 1987:270–76, for a further discussion of one-sample goodness-of-fit chi-square tests).

The analysis of juror representation focused on Hispanic surnamed individuals and their chances of being included in jury impanelment lists. The Hispanic composition in the entire district and that of each individual census tract are the basis for assessing the extent of systematic exclusion of Hispanic jurors under the guidelines prescribed by the different selection methods. Thus, the relationship between chi-square and *Z* values shows the extent of such systematic discrimination against individual Hispanic jurors. First, a chi-square distribution of juror representation under the simple random selection method was computed and is illustrated in Table 5. The analysis indicates that areas adjacent to the downtown (the south part of

TABLE 5

CHI-SQUARE AND Z SCORE DISTRIBUTIONS FOR SIMPLE RANDOM SELECTION AND CLUSTER SAMPLING STRATEGIES

| *Statistical Index* | *Mean* | *Standard Deviation* | *Minimum* | *Maximum* |
|---|---|---|---|---|
| Simple random sampling[a] | | | | |
| Chi-square | 2.21 | 2.75 | 0.00 | 21.20 |
| *Z* score | −0.95 | 1.40 | −10.26 | 4.70 |
| Cluster sampling[b] | | | | |
| Chi-square[c] | 1.86[d] | 1.94 | 0.00 | 13.06 |
| *Z* score | −0.24 | 0.62 | −4.41 | 1.81 |

[a]The correlation coefficient between $X^2$ and $Z$ is $-0.781$.
[b]The correlation coefficient between $X^2$ and $Z$ is $-0.143$.
[c]$N = 421$.
[d]When the analysis included the expected Hispanic jurors, who were assumed to be zero for the given census tract, the mean and standard deviation for cluster sampling were reduced to 1.46 and 1.72, respectively.

the district) had the greatest concentration of large chi-square values, suggesting that there were greater disparities in Hispanic representation on jury panels. The *Z* test shows the strength and the direction of the disparity in Hispanic representation in the census tract. Comparing Hispanic compositions of the various census tracts shows that the areas with high chi-square values had the largest negative *Z* scores. Thus, given the number of Hispanic jurors selected for each individual census tract, those highly represented areas had statistically significant underrepresentation of Hispanic jurors.

In cluster sampling, a chi-square distribution is notably smaller than in simple random sampling. Similarly, the analysis suggests that *Z* scores were more equal over the entire judicial district. For instance, the average *Z* score for cluster samples was −0.24, in contrast to −0.95 for simple random samples. Similarly, the chi-square values were 1.86 an 2.21 for the respective sampling methods. Maximum and minimum values for those indices were also smaller for cluster samples.

We believe that the negative *Z* values, particularly for cluster sampling, are partly attributable to the underestimation of actual Hispanic jurors. In our analysis, Hispanic jurors were identified by means of the surname list provided by the Census Bureau, rather than the self-identification method. It has been shown that the Census surname list tends to undercount people of Hispanic origins (Bean and Tienda, 1987, Fukurai et al., 1990b). We believe that if we had used the self-identification method, the negative *Z* value would have been very close to zero. Nevertheless, the *Z* value for Hispanic representativeness was not statistically significant for the cluster jury selection method. This suggests that the mean of the estimated *Z* values is likely to be mere sampling fluctuations around a zero-population parameter, that is, no significant discrepancies in Hispanic representation between the census tract and the judicial district as a whole.

In sum, under the simple random sampling method, there is a statisticially significant underrepresentation of Hispanic jurors at two levels: (1) for the entire judicial district and (2) within each individual census tract. The greater chi-square values indicated statistically significant underrepresentation of Hispanic jurors for given census tracts under simple random sampling ($R = -0.781$). In the cluster sampling method, however, there would not be such systematic underrepresentation ($R = -0.143$).[9] Thus, the cluster sampling method is clearly superior to the simple random sampling procedure in reaching the goal of equal racial representation.

## DISCUSSION AND POLICY IMPLICATIONS

One question to consider, of course, is whether or not this cluster sampling is allowable under current federal and state statutes. The California Code of Civil Procedure does not spell out detailed jury selection methods between jury impanelment and jury panelment stages. Thus, it would be possible to use the proposed cluster selection method (see CA 1980, Sections 17, 18, and 19.). For federal courts also, it would be possible to use the cluster sampling method to generate more egalitarian jury pools. The federal and uniform jury selection statutes of 1968 state that "the jury commission or the clerk shall publicly draw at random from the qualified jury wheel such number of names of persons as may be required for assignment . . ." The statute *does not mandate the random selection of qualified jurors' names*. Rather, it emphasizes the number of jurors to be drawn for assignment to jury panels. Thus, it is possible for federal courts to incorporate the cluster sampling method with PPS, since our proposed jury selection technique provides more racially proportionate juries than ones currently used in Los Angeles County. Particularly for federal courts, which use registered voter rolls as a sole source list, our selection method should prepare more racially balanced jury venires than the ones currently used (see Carp, 1982).

There are, however, two types of argument that could be made against the proposed cluster jury selection process. First, since jury qualification varies by district, the numbers of qualified jurors vary in different neighborhoods, and such discrepancies might affect the cross-sectional representation of racial groups. However, our evaluation of the actual juror qualification for Los Angeles County compared with the Long Beach District (20-mile) showed that the qualification rate was virtually identical. Even if there had been some variation, such variation could be fit into the system since the cluster sampling technique with PPS is specifically designed to control for different numbers of qualified jurors in the census tract. The cluster selection method further guarantees that potential jurors in selected neighborhoods have the same probability in the panel and the overall population.

Second, the cluster jury selection process would increase the overall mileage driven by jurors. Any system that results in a fair cross-section will result in more aggregate miles driven because of the very fact that the jurors would come from all areas of the district rather than from concentrated neighborhoods. This is a necessary part of a system that results in the selection of a fair cross-section of the community—jurors must come from all parts of the community. The proposed system, then, does away with the idea of selecting only jurors from areas closest to the court and in fact requires just the opposite. That is, jurors are drawn from all areas of the district. However, the district still could remain within the 20-mile region mandated by state law for Los Angeles County. In Los Angeles County, a particular problem that also must be dealt with is the overlapping of judicial district boundaries. This problem is one amenable to statistical sampling methods. However, even if some overrepresentation should occur with use of the first stage of cluster jury selection, it would be substantially less than is now occuring.

Finally, the analysis presented here was for only part of a year and thus might be considered static. A dynamic jury selection process involves selecting jurors periodically. However, jurors also are qualified only periodically. Thus, a dynamic system of jury qualification could use the same technique described in the simulation section. That is, the jury qualification process could also be accomplished by the random selection of census tracts with periodic mailing of questionnaires throughout the year. Nevertheless, the cluster jury selection method can be applicable to any geographically bounded areas.

## CONCLUSIONS

Maintenance of the jury as an institution in the United States depends on commitment to

its democratic principles. The jury is the embodiment of the belief that only by gathering together persons from a cross-section of the community is it possible to ensure that all relevant perspectives have been considered and that the verdict represents the community's collective judgment on a controversial issue. Any other source for these decisions undermines their legitimacy in the eyes of citizens.

This article focused on the anomalies of simple random jury selection procedures and proposed the alternative sampling technique to obtain more egalitarian jury pools. Specifically, cluster and simple random jury selection methods were examined to determine their relative abilities to produce jury lists that reflect the racial and ethnic composition of the community. The racial composition of census tracts impaneled under the current simple random sampling indicates that (1) selected census tracts are clustered in regions with high concentrations of majority groups, and, (2) as a result, Hispanic and Black prospective jurors are systematically underrepresented. One possible explanation is that those highly and consistently represented neighborhoods had more qualified jurors than the excluded areas in the judicial district. The analysis presented here shows that this assumption is false. The jury representation model shows that under the current jury selection method each resident's geographic location and ethnic origin significantly influence his or her chance of being selected for jury service.

We suggested an alternative sampling strategy of cluster selection of jurors, which provides a representative list of geographic areas within a jurisdiction. We examined whether this sampling method creates a jury pool that reflects a cross-section of the population in the district. Two test statistics, chi-square and $Z$, substantiated that cluster sampling is superior to the currently employed selection method because potential minority jurors (indicated by Hispanics) have more equal chances of being represented on panels. The generalizability of our findings on random sampling to other communities is an empirical question. We believe, however, that cluster sampling would enhance any community's cross-sectional representation of potential jurors. The implementation of the cluster sampling method would be a significant step in reducing the representation bias of jury pools because the method is congruent with the requirements established by the 1968 Federal Jury Selection and Service Act. In California, the basic notion of this cross-sectionality is also congruent with the 1981 California Code of Civil Procedure.

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## NOTES

1. See U.S. 1968, section 1861 and House Report at 1801. For more information, see *Thiel* v. *Southern Pacific Co.*, 328 U.S. 217 (1946), *State* v. *Holstrom*, 43 Wis. 465, 168 N.W. 2d 574 (1969), and *State* v. *Cage*, 337 So. 2d 1123 (La. 1976). The Federal Act requires that selection procedures "ensure that each county, parish or similar political subdivision within the district or division is substantially proportionally represented in the master jury wheel for that judicial district, division, or combination of divisions" (U.S. 1968, Section 1863 (b)(3)).

2. In the U.S., the historic footing for a panel of jurors drawn from the community is known. The first provision for a jury trial in a vicinage can be found in Article III, Section 2 of the Constitution: The Trial of all Crimes, except in Cases of Impeachment, shall be by Jury; and such Trial shall be held in the State where the said Crimes shall have been committed; but when not committed within any State, the Trial shall be at such Place or Places as the Congress may by Law have directed.

3. For example, California law specifically states that persons listed for service in the court "shall be fairly representative of the population in the area served by the court and shall be selected upon a random basis" (Section 9,203). See *People* v. *White* 43 Cal. 3d 740, 1954; *People* v. *King* 49 Cal. Rptr. 562, 1966; *People* v. *Sirhan* 7 Cal. 3d 258, 1978; *People* v. *Wheeler* 148 Cal. Rptr. 890, 1978; *People* v. *Estrada* 155 Cal. Rptr. 731, 1979; *People* v. *Graham* 160 Cal. Rptr. 10, 1979;

*People* v. *Harris* 36 Cal. 3d 36, 201 Cal. Rprt. 782 679 P. 2d 433, 1984. For the U.S. Supreme Court, see *Alexander* v. *Louisiana* 405 U.S. 625, 1972; *Peters* v. *Kiff* 407 U.S. 493, 1972; *Taylor* v. *Louisiana* 419 U.S. 522, 1975; *Duren* v. *Missouri* 439 U.S. 357, 1979; *City of Mobile, Ala* v. *Bolden* 466 U.S. 55, 1980.

4. See *U.S. 90th Congress Senate Report No. 891*, 1967; *U.S. 90th Congress House Report No. 1076*, 1968; *The Yale Law Journal*, 1970; Kairys, 1972; De Cani, 1974; Chevigny, 1975; Alker, Hosticka, and Mitchell, 1976; Kairys, Kadane, and Lehoczky, 1977; Alker and Barnard, 1978; Heyns, 1979; Butler, 1980a; 1980b; and 1981; Benokraitis and Griffin-Keene, 1982; Fukurai, 1985; Fukurai et al., 1987b Fukurai et al., 1990b.

5. See *People* v. *Harris*, 36 Cal. 3d 36 201 Cal. Rptr. 782 679 P. 2d 433, 1984. Empirical analyses of *People* v. *Harris* were performed at the University of California, Riverside. In *People* v. *Harris*, the motion of respondent for leave to proceed in *forma pauperis* was granted; however, the *Writ of Certiorari* by the prosecution to the U.S. Supreme Court was denied on 29 October 1984, effectively requiring a retrial in California.

6. Two indices, delta and rho, are calculated in the following equations.

$$\text{Delta} = \frac{\text{chi-square (null)} - \text{chi-square (model)}}{\text{chi-square (null)}}$$

$$\text{Rho} = \frac{\dfrac{\text{chi-square (null)}}{df\text{ (null)}} - \dfrac{\text{chi-square (model)}}{df\text{ (model)}}}{\dfrac{\text{chi-square (null)}}{df\text{ (null)}} - 1.0}$$

7. The variables, $X1$ through $X5$, represent the proportions of those cognizable groups for given census tracts. Gender and racial variables are created by dividing those proportions by the total population. The percentage of college graduates is computed by the total number of college graduates divided by the population over 25 years of age. The proportion of poverty is judged by the number of poverty households divided by the total households for given census tracts.

8. Those ten individual simulations ($N$ = 1,250) were conducted to correspond to the actual ten impanelments as previously analyzed and used in the Harris retrial. This procedure assumed: (1) each juror had an equal probability of being selected and (2) an identification number corresponded to an assigned number of a particular census tract in the district.

9. The $R$ represents the correlation coefficient between the $Z$ score and a chi-square value. The coefficient is merely used as an index showing the relationship between the discrepancies in expected and observed Hispanic representation in the census tract and the direction of the Hispanic representativeness (over- and/or underrepresentation) in the jurisdiction. The coefficient, however, does not offer a test statistic.

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