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A COMPARATIVE STUDY OF JURY SELECTION SYSTEMS

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A COMPARATIVE STUDY OF JURY SELECTION SYSTEMS

An Empirical Analysis of First-Class versus Certified Mail for Service of Summons and Simultaneous versus Separate Delivery of Summons and Qualification Questionnaire

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ACQUISITIONS

This paper is a product of a study undertaken in furtherance of the Center's statutory mission to conduct and stimulate research and development on matters of judicial administration. The analyses, conclusions, and points of view are those of the author. This work has been subjected to staff review within the Center, and publication signifies that it is regarded as responsible and valuable. It should be emphasized, however, that on matters of policy the Center speaks only through its Board.

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I. INTRODUCTION

The study reported here was an effort to compare the effectiveness of four different systems of juror selection. The term "juror selection system" refers to the process that results in citizens appearing at the courthouse, available for service on grand or petit juries. It does not refer to the in-court selection of a panel of prospective jurors for voir dire, nor to the selection of a petit jury through voir dire. The term "jurors" is hereafter used interchangeably with "prospective jurors."

This report presents a summary description of the methods employed in the study and the principal results. The appendix offers a more complete description of the methodology and results.

The four juror selection methods investigated are simply the four possible combinations of two significant choices that can be made in designing a system that begins with a list of names and addresses from a source list (for example, a list of registered voters), then inquires into the qualifications of these persons, and ends with jury service on the part of a subset of the original group. The two options that define the four selection systems are: (1) The qualification and summoning of jurors can be done in separate steps or as a single step. (2) The summons can be delivered by certified mail or by regular (first-class) mail.

The present system used by United States district courts, and prescribed by the Jury Selection and Service Act of 1968 (28 U.S.C. §§ 1861-1869), is a two-step, certified-mail system. In the first step, names of prospective jurors are drawn at random from voter registration rolls, and qualification questionnaires are mailed (by regular mail) to the named jurors. Responses to the qualification questionnaire enable the court to place the juror in one of four categories: not qualified, exempt, excused, or qualified. For the purposes of this analysis, the not qualified, exempt, and excused categories can be lumped together into an unqualified category, which includes jurors who have been "filtered out" by the system and will no longer be considered for jury service. In the second step, summonses to appear for jury service are sent to qualified jurors by certified mail. Subsequently, some proportion of those summoned will appear for service.

Some state court systems are now using a one-step system (with regular or certified mail) that has come to be known as a "direct summoning" system. In this system, jurors selected at random from the source list are sent both a summons and a qualification questionnaire in a single mailing. Although there is some variation in the steps the juror is directed to take, we focus here on a system that directs the juror to complete and return the questionnaire and to appear at the courthouse on the date specified unless notified to the contrary. If, on receipt of the questionnaire, the court determines that the juror is

excused, exempt, or not qualified, it then sends a notice that the juror need not appear.

In all four of the systems to be compared, the filtering out of jurors is much more complex than is apparent from the descriptions given above. Because of the variation in and interaction of a number of filters, the effectiveness of the systems may differ. Moreover, since the nature of the filters varies from court to court, it is plausible that one system might be the most efficient in one court but the least efficient in another court.

II. ANALYSIS OF EFFICIENCY

The efficiency that we are principally concerned with is clerical efficiency. How much work is involved in producing one serving juror? The answer can be broken down into specific tasks, so that, for instance, producing one serving juror may require mailing four questionnaires, processing three returned questionnaires, mailing two summonses, and granting one postponement of service. These measures of efficiency can be determined directly for the two-step, certified-mail system by compiling data on the actual process in operation in district courts. Determining what the measures might be for a particular court if it were to adopt a different system, however, requires development of a reasonable basis for estimation. This study develops such a basis through straightforward mathematical models of the four selection systems. The rather intricate development, analysis, and application of these models is described in the appendix.

For present purposes, it is sufficient to note that the analysis began by identifying nine specific filters that occur in the present federal jury selection system. The filters include, for example, the percentage of qualification questionnaires that are returned by the post office as undeliverable, the percentage of returned questionnaires that result in unqualified jurors, and the percentage of summonses that are returned by the post office

as "unclaimed" or "refused." These nine filters define the current system in mathematical terms. Mathematical models for the three hypothetical systems were then developed by noting the differences in the filters that would be expected for one-step mailing or for use of regular-mail delivery. Finally, data on the current processes in operation in the courts under study, as well as data obtained from experimental comparisons of regular and certified mail, were used to estimate the values of the filters for the hypothetical systems. The models for all four systems were then used to estimate the number and type of specific tasks required, on the average, to obtain one serving juror.

An additional aspect of the study was the collection of estimates, from local jury clerks, of actual time consumed (or likely to be consumed) by each of these tasks. These estimates were combined with the estimates of numbers of tasks to produce final estimates of the number of man-hours consumed in obtaining one serving juror. These final estimates are presented in table 1. The more detailed estimates of number and type of tasks required per serving juror are shown in table 2.

TABLE 1

MAN-MINUTES CONSUMED IN OBTAINING ONE SERVING JUROR BY DISTRICT AND TYPE OF SELECTION SYSTEM

	Present System	Estimates for Alternative Systems		
District	Two-Step Certified Mail	Two-Step Regular Mail	One-Step Certified Mail	One-Step Regular Mail
D.D.C.	17	15	16	11
D. Colo.	17	16	20	19
E.D. Cal.	34	27	37	22
W.D. Wis.	21	18	21	22
N.D. Ill.	36	38	32	33
S.D. Fla.	80	78	56	56
M.D. Fla.	60	57	35	35
M.D.N.C.	21	18	20	17

NOTE: The reasons for variations in time consumed for the present system are both variations in local court estimates of the time required to do such tasks as processing a returned questionnaire and variations in the "yield" of jurors from a mailing of qualification questionnaires. It is the detailed analysis of the components of this yield, embodied in the mathematical models, that results in variations in the estimated consequences of adopting one of the alternative systems.

TABLE 2

NUMBER AND TYPE OF TASKS REQUIRED TO OBTAIN ONE SERVING JUROR BY DISTRICT AND TYPE OF SELECTION SYSTEM

District	Mail Ques. or Summons and Ques.	Process Returned Ques.	Mail Summons	Process Response to Summons	Mail Notice of Excuse or Postponement
D.D.C.					
2-step cert.	4.8	3.2	1.8	1.2	0.2
2-step reg.	4.5	3.1	1.7	1.2	0.2
1-step cert.	4.7	2.2	0	0	1.2
1-step reg.	3.3	2.2	0	0	1.2
D. Colo.					
2-step cert.	3.3	2.4	1.7	1.5	0.5
2-step reg.	3.4	2.4	1.7	1.5	0.5
1-step cert.	2.5	1.7	0	0	0.7
1-step reg.	2.8	1.7	0	0	0.7
E.D. Cal.					
2-step cert.	6.3	3.9	1.6	1.3	0.3
2-step reg.	6.0	3.7	1.6	1.3	0.3
1-step cert.	4.3	2.7	0	0	1.7
1-step reg.	4.4	2.7	0	0	1.7
W.D. Wis.					
2-step cert.	1.7	1.7	1.1	1.1	0.05
2-step reg.	1.8	1.8	1.2	1.1	0.05
1-step cert.	1.7	1.6	0	0	0.6
1-step reg.	1.7	1.6	0	0	0.6
N.D. Ill.					
2-step cert.	4.7	4.0	1.9	1.6	0.6
2-step reg.	5.1	4.4	2.1	1.6	0.6
1-step cert.	3.8	3.1	0	0	2.1
1-step reg.	3.9	3.1	0	0	2.1
S.D. Fla.					
2-step cert.	5.3	2.9	1.9	1.7	0.7
2-step reg.	5.3	2.9	1.9	1.7	0.7
1-step cert.	3.8	2.2	0	0	1.2
1-step reg.	3.9	2.2	0	0	1.2
M.D. Fla.					
2-step cert.	2.9	2.7	2.0	1.9	0.9
2-step reg.	2.8	2.6	1.9	1.9	0.9
1-step cert.	2.3	2.1	0	0	1.1
1-step reg.	2.3	2.1	0	0	1.1
M.D.N.C.					
2-step cert.	2.3	2.0	1.5	1.4	0.4
2-step reg.	2.2	1.9	1.5	1.4	0.4
1-step cert.	2.1	1.8	0	0	0.8
1-step reg.	2.1	1.8	0	0	0.8

III. DIFFERENTIAL EFFECTS OF FIRST-CLASS AND CERTIFIED MAIL

Effects on Efficiency

The experimental comparisons of regular and certified mail warrant special attention, since they provided information of importance to the design of jury selection systems in general. They were used in this project for two purposes: to generate data required for the models of selection systems and to assess the consequences of type of mail delivery for the race and sex composition of those responding to a mailing. The consequences for race and sex composition are discussed later in this chapter; here we focus on the consequences for efficiency.

Experiments were conducted in six of the federal courts under study. In each experiment, a fairly large group of prospective jurors was divided in half in a random fashion; one-half was sent a questionnaire or summons by certified mail and the other half was sent the material by regular mail. There were two important results relevant to the efficiency of the types of mail in reaching the addressees and in achieving responses.

First, in two of the four experiments for which we obtained information on race and sex of the respondents, there was a clear difference between the types of mail in the frequency with which respondents failed to indicate their race or sex. In both cases, certified mail resulted in a superior rate of response. In the

District of Columbia, 10 percent of the regular-mail respondents failed to indicate their race, but only 5 percent of the certified-mail respondents failed to do so. That experiment involved 2,000 questionnaires, so this result is very significant (.01 level of significance). The effect was the same in the Northern District of Illinois. There, 13 percent of the regular-mail respondents failed to indicate race, in contrast to 9 percent of the certified-mail respondents (.05 level). Although this may support the theory that prospective jurors more readily respect requirements communicated by certified mail, the second result of the experiments casts this interpretation in doubt. As we explain below, certified mail proved to be less effective in actually reaching the addressees, suggesting that the difference in failure to indicate race may be nothing more than a reflection of the difference between persons who receive certified mail and those who do not.

For each type of mail, we identified the percentage of questionnaires or summonses actually delivered by the post office as well as the percentage that were returned completed (in the case of questionnaires) or responded to (in the case of summonses). The results are shown in table 3.

In all but one district, regular mail achieved a rate of delivery superior to that of certified mail, the difference being quite dramatic in the District of Columbia. The net rates of return or response, however, did not differ as much, and the differences were of consequence in only two districts. The reason

TABLE 3

PERCENTAGES OF QUESTIONNAIRES OR SUMMONSES
DELIVERED AND RETURNED OR RESPONDED TO BY TYPE OF MAIL

	Delivered			Returned or Responded to		
District	Certified	Regular	Sig.*	Certified	Regular	Sig.*
E.D. Cal.	89%	94%	.01	--	--	--
D. Colo.	94	98	.05	91%	91%	nsd
D.D.C.	54	80	.01	45	54	.01
S.D. Fla.	93	96	.10	93	96	.10
N.D. Ill.	84	91	.01	78	76	nsd
W.D. Wis.	94	93	nsd	91	85	.05

NOTE: Questionnaires only were mailed in all districts except the Southern District of Florida, in which summonses only were mailed. All summonses delivered in this district, whether by regular mail or by certified mail, were responded to. Return data were not obtained for the Eastern District of California.

*Statistical significance level of the difference in results between regular and certified mail; "nsd" means no significant difference, .01 indicates a very significant difference, and .10 indicates a marginally significant difference.

is that certified mail generally results in higher response rates from those to whom it is delivered than does regular mail. The implication seems to be that although persons who receive certified mail respond more readily than do those who receive regular mail, regular mail is generally more effective in reaching the addressee and usually affords a net response rate as good as or better than that for certified mail. In light of the fact that certified mail demands greater effort on the part of court personnel and the postal service, the results suggest that regular mail should be an allowable, if not the preferred, method for delivery of juror summonses.

Effects on Race and Sex Composition

An important potential consequence of choosing any of the four jury selection systems studied is the effect the selection method will have on the representativeness of pools of potential jurors. A dominant goal of the Jury Selection and Service Act is to ensure that jurors are selected from a "fair cross section of the community." To monitor the representativeness of jury wheels, the juror qualification forms used by federal district courts ask the juror to indicate race and sex. This indication provided us with a means to assess the potential effects of a change in selection systems on the race and sex composition of the resultant jury pools. We obtained race and sex data in four of the six experimental mailings.

The only difference among the four jury selection systems that is particularly likely to affect representativeness is that between regular mail and certified mail for delivery of summonses. The two types of mail differ both in the mechanism by which they are delivered to the addressee and in the importance or official character they symbolize. Delivery of certified mail may be refused by one who expects it to convey "bad news." More important, if no one is available to accept certified mail when delivery is first attempted, the mail is generally not redelivered without action by the addressee. There is ample reason to suspect that the consequences of these differences vary among addressees of different races, insofar as race correlates with differences in socioeconomic factors. There is also reason to

suspect a correlation with the sex of the addressee, insofar as it is more likely that someone will be home to accept a certified letter at the residence of a female addressee than at that of a male addressee (for example, in the case of single parents). On the other hand, there is no apparent reason to believe that the difference between one-step and two-step qualification and summoning would have consequences that would differ according to race or sex. We therefore investigated the effects on race and sex composition of jury pools only for the two types of mail delivery.

The results were mixed, suggesting that type of mail can indeed have an effect on the race and sex composition of juror pools. But such effects do not always occur, nor do they predictably result in an increase or decrease in representativeness. In the Southern District of Florida, a mailing of 400 summonses, half by each type of mail, showed a modest (.10 level of significance) difference in race composition of those responding but no difference in sex composition. The apparent consequence is difficult to evaluate, however. Certified mail resulted in a modest overrepresentation of nonwhites among those responding (17 percent versus 12 percent in the population according to the 1970 census), whereas regular mail resulted in an underrepresentation of nonwhites (10 percent versus 12 percent). In no other district was there evidence that race composition was influenced by type of mail.

In the Western District of Wisconsin, an experimental mail-

ing of 400 questionnaires (200 by each type of mail) evidenced a clear influence of type of mail on the sex composition of respondents (.05 significance level). Again, neither type of mail produced an obviously superior level of representativeness. Certified mail produced an underrepresentation of females (46 percent as opposed to the 52 percent in the population), while regular mail produced an overrepresentation of females (60 percent versus 52 percent). There was no evidence that sex composition was influenced by type of mail in any of the other experiments.

Race and sex data were also obtained from the experiments conducted in the District of Columbia and the Northern District of Illinois. In neither district was there a significant difference in race or sex composition among those who indicated their race and sex. As we noted earlier, however, there were significant levels of nonresponse to the race and sex questions in these districts. Since those failing to indicate race or sex may be overrepresentative of one race or sex, we cannot be certain that type of mail does not affect the race or sex composition of jury pools in these districts.

IV. CONCLUSION AND RECOMMENDATION

Inspection of tables 1 and 2 suggests that none of the four selection systems studied would be the most efficient method for all courts. On the other hand, each of the three hypothetical systems promises significant time savings for some courts, with savings of 30 to 40 percent projected for three of the eight courts studied. From table 1, we can calculate that the average amount of clerical time devoted to obtaining one serving juror is approximately forty minutes. If each of the eight courts adopted the system that promised it the greatest efficiency, and if the time estimates were realized in actual implementation, the average amount of clerical time would be reduced to twenty-eight minutes. Projecting this figure over the estimated 168,000 individuals serving as federal jurors per year reveals a potential savings of 33,000 hours of clerical time per year. If the actual cost of employing clerical personnel is $20,000 per annum, the potential dollar savings is roughly $350,000 per year. Although this estimate is both crude and conservative--conservative because it is the larger courts, which use more jurors, that would realize the greater economies, and crude because actual implementation of an alternative system might yield greater or lesser savings than those estimated--it seems unlikely that the actual savings would exceed $1 million. Although this is a modest sum

for a nationwide effort, there appears to be no compelling reason to forgo the opportunity of realizing such savings.

Based on the results of this study, we recommend that courts be permitted to use a one-step procedure for qualification and summoning of jurors and regular mail for service of the summons. The only disadvantage of the one-step system is that in small courts it might cause a modest increase in the difficulty of predicting how many jurors will actually appear from a particular summons mailing. Nor is there any net disadvantage to the use of regular mail for delivery of the summons. Although a change from certified to regular mail might alter the race and sex representativeness of serving jurors, the change could be either beneficial or detrimental. It is sufficient, in this respect, that the districts be aware of this effect, and measure it to ensure that any change is not adverse. Moreover, it appears that regular mail will usually, though not always, result in a rate of response to the summons that equals or surpasses that achieved by certified mail. Although we cannot say that regular mail ought always to be the preferred method for service of summonses, it seems clear that it ought to be an allowable method. Once given statutory authority to do so, districts wanting to change to regular mail are advised to compare the two types of mail, by experiments conducted in the normal course of their juror summons activity, to ascertain which is most suited to their circumstances. Any court that chooses to employ regular mail for service of summonses may want to use certified mail for resum-

moning of persons who fail to respond to the initial service, thus preserving the ability to sanction such failure.

Because these two innovations promise benefits for some courts, with no apparent systematic adverse effects, we recommend that the Jury Selection and Service Act be amended to allow both service of summonses by regular mail and a one-step qualification and summons procedure at the option of individual district courts.

APPENDIX

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Methodology

There were several distinct components to the data collection and analysis performed for this project. First, data were collected on the quantitative details of the filtering out of jurors in the selection process as actually conducted in each of the eight participant courts. This information permitted us to model the selection system as it existed at the time the study was conducted. Second, experimental mailings of summonses or qualification questionnaires were conducted in six of the participating courts. In each experiment, two groups of jurors were selected at random from either the master jury wheel or the qualified wheel. Members of one group were sent a questionnaire or summons by certified mail, while members of the other group were sent a questionnaire or summons by regular mail. The experiments served two functions. First, they provided quantitative details of filtering as it differed according to the type of mail delivery, which permitted construction of models of the performance of the three hypothetical selection systems. These models, in turn, yielded estimates of the filtering process that would occur with each system. Second, the experiments that involved juror qualification questionnaires yielded data on the race and sex composition of responding and qualified jurors, which permitted inference of the effects of type of mail on the representativeness of the jury wheels thus obtained. Finally, the personnel of each court estimated the time required to perform specific clerical tasks associated with juror selection.

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This allowed us to make predictions for each of the four models of actual clerical time required to obtain one serving juror, which was used as the ultimate measure of the efficiency of each selection system.

The eight courts participating in the study were selected to be representative of United States district courts in general. First, each federal judicial district was assigned to one of three groups according to size of the district as measured by juror service days consumed per year. Ten districts were then selected at random from each group, and questionnaires were sent to the thirty selected courts to ascertain whether their records of jury selection processes were capable of revealing the required data about the filtering out of jurors at each stage of the selection process. From among those courts that could provide the necessary data, three were then randomly selected from each group to participate in the study. In one of the three "large" courts, critical data were eventually lost because of the resignation of the lead jury clerk, so that court was omitted from the study. The eight courts studied were the District of Columbia and Northern Illinois, representing the large courts; Eastern California, Colorado, and Southern Florida, representing the medium courts; and Middle Florida, Middle North Carolina, and Western Wisconsin, representing the small courts. Although the court selection process avoided selectivity that might lead to systematic bias in the study results, the small number of courts involved makes it impossible to assume that the results suggested for these courts would be realized in others.

Construction of the Mathematical Models

This section describes the central and most complicated aspect of the study, the derivation of abstract mathematical models of each of the four jury selection systems and the derivation of practical estimates for the values of variables in these models from the data described above. The modeling approach is complex because of its extensive attention to details rather than because of any sophistication of the mathematics involved. The approach was first to look very carefully at each of the nine distinct ways in which prospective jurors (whose names are obtained from a master jury wheel) are eliminated in the process that ultimately results in persons reporting to the courthouse for jury service. These filters were identified through simple logical analysis and were not dependent on collected data. The second step, also purely logical, was to construct the mathematical formulas by which these filters relate the number of persons in the master jury wheel to the number that can actually be obtained for jury service. This was done for each of the four selection systems under study. The third step, again purely logical, was to determine how each filter could be measured from data on the processes actually operating in the courts and from the experiments comparing regular and certified mail. Finally, the fully defined models were combined with collected data to produce estimates of the clerical burden each selection system would require if employed in one of the eight participant courts.

Since the final results of the models are based on data that represent only a limited sample of the very large population of

prospective jurors, they are subject to the random error associated with any measurement based on sampling. Because of the complexity of the models, as well as the exploratory purpose of the study, no attempt has been made to determine the statistical reliability of the ultimate estimates of efficiency. Nevertheless, the samples employed are generally quite large, and we do not expect that the data are a source of significant error in the predicted results, particularly when these results are viewed in total as suggestive of what might or might not be gained by any court that changes from one selection system to another. This is in fact the only way the results of the models should be viewed, since the varying practices of individual jury clerks make it virtually impossible to define a model that would be precisely applicable to the operations of more than a few courts. The models must be viewed as no more than reasonable attempts to characterize juror selection systems in a way that facilitates prediction of the consequences of particular changes.

Terminology employed in the models. The models developed below are formulas for measuring efficiency. Each formula is a simple product of proportions, with each proportion variable representing the proportion of jurors who are filtered out by one of the filters that occurs in one of the four selection systems (or the complementary proportion who are not filtered out). For instance, the number of questionnaires completed and returned in a mailing of qualification questionnaires is simply the product of (1) the number mailed out, (2) the proportion of those mailed

that were successfully delivered, and (3) the proportion of those delivered that were completed and returned. The variables involved in the model of one system are usually very similar to the variables involved in the models of the other three systems. However, as one sees in the analysis of the models, these similar variables have slight differences that result in different formulas for estimating their values. For these reasons, it is helpful to refer to the specific variables with a terminology that denotes a general variable along with its specific variations.

A general variable is represented by a capital letter (for example, "A"), and variations are represented by lowercase letters in parentheses (for example, "(rq)"). The two together define a specific variable (for example, "A(rq)"). The general variables are defined using a complementary notation, such that for any variable X, X' = 1 - X (thus (X')' = X). The general variables are defined by their complements as follows:

A' = proportion of undeliverable questionnaires or summonses in a mailing (for example, addressee not at the address or deceased).

B' = proportion of nondeliveries among deliverable summonses in a mailing (this applies only to certified mail and occurs when the addressee refuses to accept the mail or does not otherwise receive the mail).

C' = proportion of persons receiving a mailing who fail to respond to it (for example, fail to return the qualification questionnaire).

D' = proportion of those responding to a mailing who are disqualified.

E' = proportion of those receiving summonses and qualifying as jurors who obtain postponements of service.

The variations are defined as follows:

r = regular-mail delivery.

c = certified-mail delivery.

q = item mailed is a qualification questionnaire.

s = item mailed is a summons.

sq = item mailed includes both a summons and a questionnaire.

Note that the variations which define the item mailed also define the category of jurors to whom the items are mailed; q and sq denote a mailing to master wheel jurors, while s denotes a mailing to previously qualified jurors.

We can now introduce the terminology with a sample model for S, the number of jurors serving as a result of the mailing of N qualification questionnaires under the current two-step, certified-mail system. Note that the use of the variations in brackets with S serves to define the selection system: S[rq,cs] = A(rq)C(rq)D(rq)A(cs)B(cs)C(cs)D(cs)E(cs)N. (There are nine variables on the right side of the equation, including N, all of which are multiplied together to determine S.)

Before we explain the derivation of this model, and present the models for measuring efficiency, we must first define the measures of efficiency to be used. All are measures of the "cost" of obtaining one juror for service, primarily in terms of the number of items that must be prepared and mailed by the court or the number of items received by the court that must be read and somehow acted upon. The measures are defined as follows:

NI = the number of initial mailings required per juror serving (an initial mailing is either a questionnaire or a combined summons-questionnaire).

NRQ = the number of returned questionnaires per juror serving.

NSM = the number of second mailings (a summons or a notice to disregard the summons, depending on the selection system).

NRS = the number of responses to second mailings (summons response cards).

NT = the number of third mailings (for example, notice of postponement).

The models. By using the general-variable-with-variations terminology, the models are fairly easy to understand. The complexities of the models reside in the variations and are discussed in the next section on analysis of the models. Here we derive the set of models for one selection system only and then present the models for the other systems without discussing their very similar derivations.

The model presented above for S[rq,cs] is a useful starting point. We start with N, the number of qualification questionnaires mailed, and note that some proportion (A') of these will be undeliverable. The number delivered is thus A(rq)N (the proportion of deliverable questionnaires in a mailing by regular mail, multiplied by the number of questionnaires mailed). Of these delivered questionnaires, a proportion (C') will not be returned. The number returned is C(rq) of those delivered, or C(rq)A(rq)N questionnaires. Of these returned questionnaires, a proportion (D') will be disqualified. The number of qualified jurors left is D(rq)C(rq)A(rq)N. We assume that summonses are

sent to all qualified jurors. Some proportion of the summonses will be undeliverable because of the addressee's death or relocation during the interim between completion of the qualification questionnaire and mailing of the summons (an interim that can be as long as four years). We are left with A(cs)D(rq)C(rq)A(rq)N deliverable summonses. Of these deliverable summonses, a proportion (B') will not be delivered because the addressee refused to accept the mailing or because the addressee was not home when the mailman attempted delivery and did not appear at the post office to pick up the mailing. The number of summonses actually delivered is B(cs)A(cs)D(rq)C(rq)A(rq)N. After those who fail to respond to the summons have filtered themselves out, we are left with C(cs)B(cs)A(cs)D(rq)C(rq)A(rq)N jurors responding to the summons. Of those responding, a proportion will have become disqualified in the interim (most likely by a change in employment or the birth of a child). We multiply the number responding by D(cs) to determine the number still qualified. Finally, we account for the number of postponements* by multiplying by E(cs). The resulting number of persons actually serving (or at least available to serve) is given by

E(cs)D(cs)C(cs)B(cs)A(cs)D(rq)C(rq)A(rq)N,

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*We consider postponement to be a filter despite the fact that a postponed juror will presumably be called to serve at a later date. The reason is that we assume that at any time, a constant proportion of qualified jurors will obtain postponements. The constant proportion of postponements throughout the life of a qualified juror wheel is equivalent to the loss of that proportion of the wheel at its inception.

which is merely a rearrangement of the expression for S[rq,cs] given above.

We now model the measures of efficiency. NI[rq,cs] is simply N/S[rq,cs], so that NI[rq,cs] = 1/[A(rq)C(rq)D(rq)A(cs)B(cs)C(cs)D(cs)E(cs)]. NRQ is the number of questionnaires returned (given above as C(rq)A(rq)N) divided by S, so that NRQ[rq,cs] = 1/[D(rq)A(cs)B(cs)C(cs)D(cs)E(cs)]. NSM is the number of qualified jurors obtained from the mailing of questionnaires divided by S, or [D(rq)C(rq)A(rq)N]/S, which yields NSM[rq,cs] = 1/[A(cs)B(cs)C(cs)D(cs)E(cs)]. NRS is the number of returned summonses, C(cs)B(cs)A(cs)D(rq)C(rq)A(rq)N, divided by S, or NRS[rq,cs] = 1/[D(cs)E(cs)]. Since a notice of postponement or disqualification will go to all jurors returning a summons except those who are available for service, NT = NRS - 1, or NT[rq,cs] = 1/[D(cs)E(cs)] - 1.

For the other three systems, the models are as follows:

NI[rq,rs] = 1/[A(rq)C(rq)D(rq)A(rs)C(rs)D(rs)E(rs)].
NRQ[rq,rs] = 1/[D(rq)A(rs)C(rs)D(rs)E(rs)].
NSM[rq,rs] = 1/[A(rs)C(rs)D(rs)E(rs)].
NRS[rq,rs] = 1[D(rs)E(rs)].
NT[rq,rs] = NRS - 1.

NI[csq] = 1/[A(csq)B(csq)C(csq)D(csq)E(csq)].
NRQ[csq] = 1/[D(csq)E(csq)].
NSM[csq] = NRQ - 1.
NRS[csq] = 0.
NT[csq] = 0.

NI[rsq] = 1/[A(rsq)C(rsq)D(rsq)E(rsq)].
NRQ[rsq] = 1/[D(rsq)E(rsq)].
NSM[rsq] = NRQ - 1.
NRS[rsq] = 0.
NT[rsq] = 0.

Analysis of the Models

Analysis of the models requires estimation of the values of the specific variables that define them. Since, as noted earlier, the values can be expected to vary from court to court, their estimation must be based on data that relate to each court included in the project. Since each court currently operates with the [rq,cs] system, we can directly measure the values of certain of the specific variables. We can assume that we have reliable measures of A(rq), C(rq), D(rq), C(cs), D(cs), and E(cs). Moreover, in some courts, we can measure A(cs) and B(cs) separately, while in others we can only measure their product, A(cs)B(cs).

In addition, we have certain estimates based on experiments comparing certified and regular (first-class) mail. In most participant courts, qualification questionnaires were mailed to two groups of jurors randomly selected from the master jury wheel. The questionnaires were sent to group X by certified mail and to group Y by regular mail. By monitoring the return of these questionnaires, we obtained independent measures of certain parameters, which can be defined in our general-variable-with-variations scheme as AX(cq), BX(cq), CX(cq), DX(cq), AY(rq), CY(rq), and DY(rq).

In other participant courts, the experiments involved the mailing of actual summonses.* Two groups of jurors randomly

*The service of summonses by regular mail is not permitted by the Jury Selection and Service Act. Thus, the summonses sent

selected from the qualified jury wheel, groups X and Y, were sent summonses by certified or regular mail, respectively. These experiments provided measures that can be defined as AX(cs), BX(cs), CX(cs), DX(cs), AY(rs), CY(rs), and DY(rs).

With the measurable variables and the experimentally measured parameters in mind, we now turn to the heart of the analysis, the estimation of values for the unknown variables. We proceed through each of the three system constructs other than [rq,cs], which is known, and derive estimates for all unknown variables. Given estimates for all necessary variables, we can predict the performance of a system by using the models. For some variables, there is more than one plausible estimate, resulting in a number of predictive models.

We introduce the question mark to denote an estimated value for a variable, with multiple question marks indicating different estimates of the same variable. Thus, $A(rs)_?$ is an estimate of A(rs), and $A(rs)_{??}$ is another estimate of A(rs).

For some variables in some courts, we are unable to propose a "fair" estimate of the variable because of inadequate data (for example, inability to measure A(cs) and B(cs) separately). In such situations, we propose "worst-case" estimates, denoting these with an exclamation point instead of a question mark. This worst-case assumption is an appropriately conservative approach to the ultimate purpose of this project, which is to determine

by regular mail are not, technically, "served." This conflict with the statute was rectified by personal service of a duplicate summons upon the juror's arrival at the courthouse.

whether any of the hypothetical selection systems offers sufficient efficiency to justify amendments to the Jury Selection and Service Act that might result in substantial nonuniformity of practices among federal district courts.

The [rq,rs] system. The models for [rq,rs] involve four variables of unknown value: A(rs), C(rs), D(rs), and E(rs).

A(rs), the percentage of deliverable summonses in a mailing by regular mail, should equal A(cs). The only consideration that lends doubt is that since certified mail requires an attempt at hand-to-hand delivery, the postman may encounter some cases of undeliverable mail that would, in regular-mail delivery, appear as nonresponses (and thus be accounted for in C(rs)). The present experiments, however, offer a test of this phenomenon, since its presence should cause a difference between AX(cq) and AY(rq) (or AX(cs) and AY(rs)). We thus propose two estimates of A(rs). The preferred one is $A(rs)_{?} = A(cs)[AY(rq)/AX(cq)]$ or $A(rs)_{??} = A(cs)[AY(rs)/AX(cs)]$. The other estimate is $A(rs)_{???} = A(cs)$. Note that we cannot estimate A(rs) directly by A(rq) or any other mailing to master wheel jurors, since the master wheel is likely to be older than the qualified wheel. Since A is primarily determined by changes of address and deaths in a once-valid address list, it is expected to decrease constantly over time.

C(rs) can be estimated by C(cs), C(rq), CX(cq), CY(rq), or CY(rs). Where CY(rs) is available, it is obviously preferred. However, it may not be a valid direct estimate, since some of the

nonresponses to regular mail are likely to be attributable to deliveries to addresses from which the addressee has moved. Since this amount of the variable is dependent on the age of the qualified jury wheel, the best estimate is obtained by treating the experimental data as an adjustment to C(cs): $C(rs)_{?} = C(cs) - [CXC(cs) - CY(rs)]$. Where CY(rs) is not available, the estimate is more problematic. We can assume that C(rs) is not greater than C(cs), since certified mail presumably commands more responses than does regular mail. We cannot assume a relationship between C(rs) and CX(cq) or between C(rs) and C(rq), however, because the basic difference between the summons and the questionnaire is that the summons commands a more active response. It can be argued that the greater command of the summons thus decreases the juror's perception that he can get away with ignoring the command but at the same time increases his motivation to ignore it. The second-best estimate is probably the analogy to the best one: $C(rs)_{??} = C(cs) - [CX(cq) - CY(rq)]$. We also have a limiting estimate: $C(rs)_{???} \leq C(cs)$.

It can be argued that D(rs) and E(rs) differ systematically from D(cs) and E(cs). The argument is based on the hypothesis that the group that receives summonses delivered by regular mail differs systematically from the group that receives summonses delivered by certified mail (that is, the former group includes those who fail to claim or refuse delivery of certified mail). It is not clear, however, how such differences would affect the relationships between D(rs) and D(cs) and between E(rs) and

E(cs), nor does it seem likely that the effects would be large. Thus, the only viable estimates for D(rs) and E(rs) are ones that appear reliable: $D(rs)_? = D(cs)$ and $E(rs)_? = E(cs)$.

When the experimental mailing involves summonses, therefore, the optimal model of the [rq,rs] system is $S[rq,rs]_? =$ A(rq)C(rq)D(rq)A(cs)[AY(rs)/AX(cs)][C(cs)-CX(cs)+CY(rs)]D(cs)E(cs). And when the experimental mailing involves questionnaires, the basic model is $S[rq,rs]_? =$ A(rq)C(rq)D(rq)A(cs)[AY(rq)/AX(cq)][C(cs)-CX(cq)+CY(rq)]D(cs)E(cs).

The [csq] system. All five variables in the [csq] models are of unknown value.

A(csq), the percentage of undeliverable items in a certified mailing of both summonses and questionnaires, is best estimated on the basis of AX(cq). Here again, however, we must make an adjustment to account for age differences between jury wheels. Since our comparisons among selection systems are based principally on data from the actual operation of [rq,cs] systems with master and qualified jury wheels of particular ages, we must scale estimates to avoid potential bias from comparing measures based on wheels of different ages. Our experimental data may measure wheels of different ages from those measured by data from the systems in actual operation. Thus the difference between AX(cq) and AY(rq) is used as an age-independent measure of the difference in delivery rates, which adjusts A(rq) to yield an estimate of A(csq): $A(csq)_? = A(rq) - [AY(rq) - AX(cq)]$. Where AX(cq) is unavailable, the best estimate of A(csq) is constructed

by analogy to $A(csq)_?$: $A(csq)_{??} = A(rq) - [AY(rs) - AX(cs)]$. Note that this estimate is considerably weaker than that based on AX(cq), since it is based on the differential delivery rates of certified- and regular-mail summonses, which are sent to a systematically different group than are the combined summons-questionnaires.

B(csq) can be estimated directly by BX(cq). There is no need for wheel-age adjustment, since the proportion of source list jurors failing to claim or refusing certified mail should be constant and therefore unaffected by the age of the wheel. Thus, $B(csq)_? = BX(cq)$. Where BX(cq) is unavailable, the only available bases of estimate are B(cs) and BX(cs). Since these two bases are both estimates of the same variable, it is appropriate to consider their average a better estimate; thus, $B(csq)_{??} = [B(cs) + BX(cs)]/2$. Where B(cs) is unavailable separately, and appears only in the product A(cs)B(cs), the estimate must be reduced to $B(csq)_{???} = BX(cs)$. Finally, note that where AX(cq) and BX(cq) are unavailable, any estimate of the combined measure A(csq)B(csq) is likely to be a significant overestimate. This is because the estimates of A(csq) and B(csq) are principally based on the delivery success of summonses, which are mailed to qualified wheel jurors. The measure A(csq)B(csq), however, is a measure of the delivery success of certified mail to master wheel jurors. Since the master wheel is likely to be older than the qualified wheel and thus contain a higher proportion of old addresses, and since certified mail is not forwardable (even to a

known forwarding address), the actual delivery success of certified summons-questionnaires is likely to be poorer than any of the estimates. It is therefore advisable that our final analysis of the [csq] system rely primarily on the models for districts from which AX(cq) and BX(cq) are available.

C(csq), the proportion of delivered summons-questionnaires that are responded to, is probably best estimated on the basis of CX(cq), C(rq), or C(cs). Here, however, we do not posit a direct estimate, but one based on inequalities. First, note that C(csq) is probably less than C(cs). Both variables represent response to certified deliveries of summonses; the critical difference is in the addressee population. For C(csq), the population is master wheel jurors, but for C(cs) it is qualified wheel jurors. Since qualified wheel jurors have already shown responsiveness to a qualification questionnaire, presumably with the understanding that they may be called for jury service, it is expected that they will be more responsive to summonses than the more general population of master wheel jurors. Second, both CX(cq) and C(rq) should be less than C(csq). The difference between CX(cq) and C(csq) is that the latter pertains to the combined summons-questionnaires, while the former pertains to simple questionnaires. Since the summons is more readily recognized as commanding a response, we can assume that C(csq) will be no less than CX(cq). Since C(rq) measures response to a mailing that is less commanding in both the type of delivery (regular mail) and the nature of the item mailed (as for CX(cq)), C(rq) should also

be less than C(csq). Given no more than limiting conditions for C(csq), we posit estimates based on the midpoint (that is, average) of the closest limits. Where CX(cq) is available, $C(csq)_{?}$ = [C(cs) + CX(cq)]/2. Otherwise, $C(csq)_{??}$ = [C(cs) + C(rq)]/2. We also define a worst-case estimate as $C(csq)_{!}$ = Lesser of C(rq) and CX(cq).

D(csq), the proportion of respondents receiving summons-questionnaires who are qualified, is also estimated on the basis of limits. The limits are based on D(rq) and D(cs). D(rq) measures qualification based exclusively on responses to particular questions on the qualification questionnaire. D(cs) is determined both by special hardship excuses (which are not normally elicited by the qualification questionnaire) and by responses to some (but usually not all) of the same questions on the qualification questionnaire. If the disqualifications occurring in response to the summons were the same as those occurring in response to the questionnaire, we could estimate D(csq) directly by D(rq), on the theory that a constant proportion of the master jury wheel is eligible for or desirous of disqualification at any given time. Since D(cs) measures disqualification bases that arise in the interval between the questionnaire and the summons, and since those disqualifications are presumably balanced by loss of grounds for disqualification among those eliminated at the questionnaire stage, we can view D(cs) as a liability peculiar to the two-step selection systems that would be obviated in a single-step system. If, on the other hand, the disqualifications

measured by D(cs) were entirely distinct from those measured by D(rq), we would assume that a single-step system would provide the same bases of excuse but would identify all of them at a single stage, and we would thus estimate D(csq) as the product of D(rq) and D(cs). The reality, however, is that D(cs) accounts for some disqualifications that are distinct from, and others that are identical to, those accounted for by D(rq). Thus we can assume that D(csq) lies between D(rq) and the product D(rq)D(cs). The estimates are defined in the same way as those for C(csq): $D(csq)_{?} = [D(rq) + D(rq)D(cs)]/2$ and $D(csq)_{!} = D(rq)D(cs)$.

E(csq) is estimated directly by E(cs), on the theory that postponements requested (and granted) jurors otherwise willing to serve occur in constant proportion over time (ignoring seasonal fluctuations, which are irrelevant to this analysis). Thus, $E(csq)_{?} = E(cs)$.

The [rsq] system. At first glance, it would appear that A(rsq) could be directly estimated by A(rq). Again, however, we are advised to adjust this estimate to account for aging of the master jury wheel. Since the mailing of the combined summons-questionnaires is expected to coincide more closely in time to the mailing of summonses than to that of questionnaires, the appropriate measure of the incidence of deliverable items is given by the product A(rq)A(rs). Since A(rs) is of unknown value, we substitute for it the estimates posited in the discussion of the [rq,rs] system. Thus, $A(rsq)_{?} = A(rq)A(rs)_{?}$ and $A(rsq)_{??} = A(rq)A(rs)_{??}$.

By analogy to the discussion of C(csq), we can assume limits for C(rsq). C(rsq) should be less than both CY(rs) and C(cs) and should be greater than C(rq). The estimates are thus given by $C(rsq)_{?} = [CY(rs) + C(rq)]/2$, $C(rsq)_{??} = [C(cs) + C(rq)]/2$, and $C(rsq)_{!} = C(rq)$.

D(rsq) can be expected to approximate D(csq). The proportion qualified of those responding to the combined summons-questionnaire ought not to differ according to the type of mail delivery except as a product of systematic differences between the populations that receive certified and regular mail. Such systematic differences were discussed previously in the evaluation of D(rs) and were dismissed as of minor probable consequence. The same result is applied here. Thus, $D(rsq)_{?} = [D(rq) + D(rq)D(cs)]/2$ and $D(rsq)_{!} = D(rq)D(cs)$.

By analogy to the estimates for E(rs) and E(csq), we estimate E(rsq) by $E(rsq)_{?} = E(cs)$.

Results

The models were applied to data from each participant court by a FORTRAN computer program, which produced maximum (max), minimum (min), and optimum (optim) estimates for each measure of efficiency. Each estimated measure of efficiency (for example, NRQ[rsq]) was computed by employing a particular set of estimates for variables (for example, an estimate for D(rsq)) in the model posited for that measure of efficiency (for example, NRQ[rsq] = 1/[D(rsq)E(rsq)]). The maximum estimate was produced by selecting from the available estimates of each variable (including

worst-case and limiting estimates) that estimate which would maximize the value of the efficiency estimate. The minimum estimate was produced in analogous fashion. The optimal estimate employed the preferred estimate for each variable (or the best among those available for that court). Each set of estimates of efficiency was also combined with estimates provided by the clerks' offices regarding the amount of time each task typically required of the office staff. This produced a "weighted work" (WTD WORK) estimate of the man-minutes required to produce one serving juror.

The results are tabulated on the following pages, beginning with the input data.

INPUT DATA

	A(rq)	C(rq)	D(rq)	A(cs)	B(cs)	C(cs)	D(cs)	E(cs)
D.D.C.	0.76	0.90	0.54	0.95	0.78	0.93	0.92	0.90
D. Colo.	0.00	0.00	0.71	0.89	0.98	1.00	0.69	1.00
E.D. Cal.	0.73	0.84	0.42	0.99	0.97	0.83	0.78	0.99
W.D. Wis.	0.99	0.99	0.65	0.99	0.99	0.99	0.97	0.99
N.D. Ill.	0.92	0.93	0.47	0.91	0.98	0.95	0.82	0.76
S.D. Fla.	0.67	0.81	0.67	0.00	0.00	0.93	0.79	0.77
M.D. Fla.	0.94	0.98	0.73	0.99	0.98	0.98	0.71	0.75
M.D.N.C.	0.90	0.98	0.75	1.00	0.97	0.99	0.91	0.77

	AX(cq)	BX(cq)	CX(cq)	DX(cq)	AY(rq)	CY(rq)	DY(rq)
D.D.C.	0.81	0.67	0.83	0.57	0.80	0.68	0.53
D. Colo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E.D. Cal.	0.93	0.95	0.99	0.56	0.94	0.99	0.44
W.D. Wis.	0.95	0.99	0.97	0.63	0.93	0.91	0.65
N.D. Ill.	0.91	0.92	0.93	0.55	0.91	0.84	0.54
S.D. Fla.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
M.D. Fla.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
M.D.N.C.	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	AX(cs)	BX(cs)	CX(cs)	AY(rs)	CY(rs)	AB(cs)	AC(rq)
D.D.C.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Colo.	0.98	0.96	0.96	0.98	0.93	0.00	0.71
E.D. Cal.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W.D. Wis.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N.D. Ill.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S.D. Fla.	0.97	0.96	1.00	0.96	1.00	0.93	0.00
M.D. Fla.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
M.D.N.C.	0.00	0.00	0.00	0.00	0.00	0.00	0.00

EFFICIENCY ANALYSIS

D.D.C. System	NI	NRQ	NSM	NRS	NT	WTD WORK
(rq,cs)						
min	4.75	3.24	1.75	1.21	0.21	17.50
max	4.75	3.24	1.75	1.21	0.21	17.50
optim	4.75	3.24	1.75	1.21	0.21	17.50
(rq,rs)						
min	4.44	3.03	1.64	1.21	0.21	15.60
max	4.51	3.08	1.66	1.21	0.21	15.78
optim	4.51	3.08	1.66	1.21	0.21	15.78
(csq)						
min	4.69	2.15	1.15	0.00	0.00	16.26
max	5.18	2.24	1.24	0.00	0.00	17.54
optim	4.69	2.15	1.15	0.00	0.00	16.26
(rsq)						
min	3.26	2.15	1.15	0.00	0.00	11.30
max	3.51	2.24	1.24	0.00	0.00	11.95
optim	3.31	2.15	1.15	0.00	0.00	11.37

D. Colo. System	NI	NRQ	NSM	NRS	NT	WTD WORK
(rq,cs)						
min	3.37	2.36	1.67	1.45	0.45	17.21
max	3.37	2.36	1.67	1.45	0.45	17.21
optim	3.37	2.36	1.67	1.45	0.45	17.21
(rq,rs)						
min	3.40	2.39	1.69	1.45	0.45	15.63
max	3.40	2.39	1.69	1.45	0.45	15.63
optim	3.40	2.39	1.69	1.45	0.45	15.63
(csq)						
min	2.45	1.67	0.67	0.00	0.00	20.66
max	3.03	2.05	1.05	0.00	0.00	26.55
optim	2.45	1.67	0.67	0.00	0.00	20.66
(rsq)						
min	2.67	1.67	0.67	0.00	0.00	19.08
max	3.39	2.05	1.05	0.00	0.00	24.95
optim	2.77	1.67	0.67	0.00	0.00	19.48

E.D. Cal. System	NI	NRQ	NSM	NRS	NT	WTD WORK
(rq,cs)						
min	6.26	3.89	1.63	1.29	0.29	33.71
max	6.26	3.89	1.63	1.29	0.29	33.71
optim	6.26	3.89	1.63	1.29	0.29	33.71
(rq,rs)						
min	6.01	3.73	1.57	1.29	0.29	27.08
max	6.07	3.76	1.58	1.29	0.29	27.29
optim	6.01	3.73	1.57	1.29	0.29	27.08

E.D. Cal. System (csq)	NI	NRQ	NSM	NRS	NT	WTD WORK
min	4.30	2.70	1.70	0.00	0.00	37.72
max	5.26	3.07	2.07	0.00	0.00	45.37
optim	4.30	2.70	1.70	0.00	0.00	37.72
(rsq)						
min	4.37	2.70	1.70	0.00	0.00	22.78
max	5.07	3.07	2.07	0.00	0.00	26.65
optim	4.41	2.70	1.70	0.00	0.00	22.85

W.D. Wis. System	NI	NRQ	NSM	NRS	NT	WTD WORK
(rq,cs)						
min	1.69	1.66	1.07	1.05	0.05	20.50
max	1.69	1.66	1.07	1.05	0.05	20.50
optim	1.69	1.66	1.07	1.05	0.05	20.50
(rq,rs)						
min	1.79	1.75	1.13	1.05	0.05	17.11
max	1.83	1.80	1.16	1.05	0.05	17.55
optim	1.83	1.80	1.16	1.05	0.05	17.55
(csq)						
min	1.65	1.59	0.59	0.00	0.00	21.29
max	1.70	1.62	0.62	0.00	0.00	22.04
optim	1.65	1.59	0.59	0.00	0.00	21.29
(rsq)						
min	1.63	1.59	0.59	0.00	0.00	21.23
max	1.71	1.62	0.62	0.00	0.00	22.14
optim	1.68	1.59	0.59	0.00	0.00	21.50

N.D. Ill. System	NI	NRQ	NSM	NRS	NT	WTD WORK
(rq,cs)						
min	4.69	4.03	1.91	1.62	0.62	36.49
max	4.69	4.03	1.91	1.62	0.62	36.49
optim	4.69	4.03	1.91	1.62	0.62	36.49
(rq,rs)						
min	5.03	4.33	2.05	1.62	0.62	37.60
max	5.08	4.37	2.07	1.62	0.62	37.94
optim	5.08	4.37	2.07	1.62	0.62	37.94
(csq)						
min	3.83	3.07	2.07	0.00	0.00	32.82
max	4.31	3.42	2.42	0.00	0.00	37.08
optim	3.83	3.07	2.07	0.00	0.00	32.82
(rsq)						
min	3.87	3.07	2.07	0.00	0.00	32.90
max	4.38	3.42	2.42	0.00	0.00	37.26
optim	3.90	3.07	2.07	0.00	0.00	32.99

S.D. Fla. System (rq,cs)	NI	NRQ	NSM	NRS	NT	WTD WORK
min	5.31	2.88	1.93	1.65	0.65	80.01
max	5.31	2.88	1.93	1.65	0.65	80.01
optim	5.31	2.88	1.93	1.65	0.65	80.01
(rq,rs)						
min	5.25	2.85	1.91	1.65	0.65	77.59
max	5.25	2.85	1.91	1.65	0.65	77.59
optim	5.25	2.85	1.91	1.65	0.65	77.59
(csq)						
min	3.75	2.17	1.17	0.00	0.00	56.35
max	4.67	2.46	1.46	0.00	0.00	67.88
optim	3.75	2.17	1.17	0.00	0.00	56.35
(rsq)						
min	3.86	2.17	1.17	0.00	0.00	56.68
max	4.91	2.46	1.46	0.00	0.00	68.59
optim	3.86	2.17	1.17	0.00	0.00	56.68

M.D. Fla. System (rq,cs)	NI	NRQ	NSM	NRS	NT	WTD WORK
min	2.88	2.67	1.95	1.86	0.86	60.01
max	2.88	2.67	1.95	1.86	0.86	60.01
optim	2.88	2.67	1.95	1.86	0.86	60.01
(rq,rs)						
min	2.83	2.62	1.92	1.86	0.86	57.16
max	2.83	2.62	1.92	1.86	0.86	57.16
optim	2.83	2.62	1.92	1.86	0.86	57.16
(csq)						
min	2.30	2.11	1.11	0.00	0.00	34.56
max	2.79	2.54	1.54	0.00	0.00	42.69
optim	2.32	2.11	1.11	0.00	0.00	34.68
(rsq)						
min	2.30	2.11	1.11	0.00	0.00	34.49
max	2.76	2.54	1.54	0.00	0.00	42.51
optim	2.30	2.11	1.11	0.00	0.00	34.53

M.D.N.C. System (rq,cs)	NI	NRQ	NSM	NRS	NT	WTD WORK
min	2.27	2.00	1.49	1.43	0.43	21.37
max	2.27	2.00	1.49	1.43	0.43	21.37
optim	2.27	2.00	1.49	1.43	0.43	21.37
(rq,rs)						
min	2.21	1.94	1.45	1.43	0.43	18.83
max	2.21	1.94	1.45	1.43	0.43	18.83
optim	2.21	1.94	1.45	1.43	0.43	18.83
(csq)						
min	2.09	1.83	0.83	0.00	0.00	20.03
max	2.22	1.92	0.92	0.00	0.00	21.60
optim	2.11	1.83	0.83	0.00	0.00	20.09

M.D.N.C. System (rsq)	NI	NRQ	NSM	NRS	NT	WTD WORK
min	2.08	1.83	0.83	0.00	0.00	16.89
max	2.19	1.92	0.92	0.00	0.00	18.23
optim	2.08	1.83	0.83	0.00	0.00	16.89

END