3-13-1993

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Supported by a grant from the Henry J. Kaiser Family Foundation and Grant Number CA 34847 from the National Cancer Institute.

Submitted to Statistics in Medicine

Abstract

There is considerable interest in community interventions for health promotion, where the community is the experimental unit. Because such interventions are expensive, the number of experimental units (communities) is usually very small. Because of the small number of communities involved, investigators often match treatment and control communities on demographic variables before randomization to minimize the possibility of a bad split. Unfortunately, matching has been shown to decrease the power of the design when the number of pairs is very small, unless the matching variable is very highly correlated with the outcome variable (in this case, with change in the health behavior). We used computer simulation to examine the performance of an approach in which communities were matched but an unmatched analysis was performed. If the appropriate matching variables are unknown, and there are fewer than ten pairs, an unmatched design and analysis has the most power. However, if a matched design is strongly preferred then for $N < 10$, power is increased by performing an unmatched analysis of the matched data. A variant of this procedure, in which an unmatched analysis is performed only if the matching "didn't work", is also discussed.

Introduction

A recent trend in health promotion is the development of interventions that target an entire community, such as community-based health promotion. Controlled evaluations of such interventions typically compare a group of intervention communities with a group of control communities in terms of reducing the prevalence of an unhealthy behavior, such as smoking. The number of communities has usually been small, for budgetary reasons: 6 for the Minnesota Heart Health Program (3 treatment and 3 control) [1], just 2 for North Karelia Project [2] and the Pawtucket Heart Health Program [3], and 3 and 5 for two studies at Stanford [4,5,6,7,8]. Community intervention studies are also described by Shea and Basch [9].

An important design issue in such evaluations is whether to use simple random allocation to form the comparison groups, or to form matched pairs of communities and then randomly assign the intervention to one community from each pair. Because the number of communities is small, a "bad" randomization, such as having all of the biggest communities in the treatment group, is likely to occur. This possibility often causes evaluators to choose a matched design, even in the absence of knowledge about appropriate matching variables.

The dependent variable of interest is usually change in some health behavior, such as change in the percent of residents who smoke cigarettes. It is common in the literature to find information on correlates of smoking behavior at the individual level; there is also some individual-level information about correlates of change in smoking.

There is, however, relatively little published information about correlations between community characteristics and smoking prevalence, and almost no information about the correlation between community characteristics and the change in smoking prevalence. Even if such estimates were available they would usually be of poor quality, since the correlations would usually be based on a very small number of communities.

Unfortunately, the situation where the number of pairs is small and the appropriate matching variables are unknown is exactly where a matched test can be shown to have lower power than an unmatched test [10]. This occurs because of the low number of degrees of freedom for the matched design. Since power is already low due to the small number of communities, the issue of whether to use a matched versus an unmatched design is clearly important.

This preference for matching, in a situation where power is reduced by matching, suggests a hybrid design in which one would match, but then analyze the data as though the matching had not occurred. As will be illustrated below, breaking matches is usually conservative, in that it makes it harder to reject the null hypothesis [11,12]. However, when the number of experimental units is very small, such a procedure may be worth considering. The goal of this paper is to examine the situation in which communities are matched, prior to randomization, on a variable, X, which has correlation ρ_{xy} with the outcome variable, Y (e.g., change in smoking rates). We then compare the power for the correct matched analysis to two variants in which matched data receive an unmatched analysis all or some of the time. The power of a completely unmatched design is also compared to that of the three matched designs.

This problem is not analytically tractable because the distribution of the unmatched t statistic calculated from matched data does not reduce to the usual ratio of a normal variate over the square root of an independent chi-square variate. (Normality holds, but the chi-square and independence assumptions fail). For this reason we conducted a computer simulation to estimate the power of different approaches for various numbers of pairs, values of ρ_{xy}, and effect sizes.

Background

<u>Review of Matched and Unmatched t-tests</u>

Table 1 shows hypothetical data for 2 groups, with 4 observations per group. We assume that $\sigma_1 = \sigma_2$. If the design was unmatched, the t-statistic would be

$$t_{unmatched} = \frac{\overline{Y}_1 - \overline{Y}_2}{\sqrt{\frac{s_1^2}{N} + \frac{s_2^2}{N}}} = \frac{\overline{d}}{S_u} = 2.56$$

and if matched it would be

$$t_{matched} = \frac{\overline{d}}{\frac{s_d}{\sqrt{N}}} = \frac{\overline{d}}{S_m} = 2.51$$

where $\overline{y}$ and $\overline{d}$ are sample means, and s is the sample standard deviation. In the unmatched test we would reject if $t_u > 2.4$ (6 degrees of freedom) and in the matched test we would reject if $t_m > 3.18$ (3 df). For the data of Table 1, the unmatched test rejects the null hypothesis but the matched test does not.

[Table 1 about here]

Two different correlation coefficients are relevant: r_{xy} and r_{yy}. The first is the correlation between X, the matching variable, and Y, the dependent variable (for example, the correlation between community size and change in smoking prevalence). The second, r_{yy}, is the correlation on the outcome variable between the members of a pair (Y_1 and Y_2). If the match is perfect (the value of X is identical for both members of the pair), then $r^2_{xy} = r_{yy}$.

To give some insight into the performance of the matched and unmatched t-tests when N is small, consider the rejection region for the tests:

Unmatched: reject if $\bar{d} > 2.45\ S_u$

and

Matched: reject if $\bar{d} > 3.18\ S_m$

If $2.45\ S_u = 3.18\ S_m$, then the tests are equivalent; otherwise, one requires a bigger values of $\bar{d}$ than the other. An alternative way of expressing S_m is

$$S^2{}_m = \frac{s_1{}^2}{N} + \frac{s_2{}^2}{N} - \frac{2r_{yy}s_1s_2}{N}$$

If s_1 in the sample is approximately equal to s_2, then S^2_m is approximately equal to $S^2_u (1-r_{yy})$. In this case, 2.45 S_u is equal to 3.18 S_m when

$$(2.45)^2 \; S^2_u = (3.18)^2 \; S^2_u \; (1-r_{yy}),$$

or

$$r_{yy} = 1 - (2.45/3.18)^2 = .406.$$

That is, the matched test is more likely to reject the null hypothesis than the unmatched test if r_{yy} is larger than .406. Otherwise the unmatched test is more likely to reject. More generally, if s_1 is about equal to s_2, the matched and unmatched tests are about the same if

$$r_{yy} = 1 - (CV(u)/CV(m))^2$$

where CV(u) and CV(m) represent the unmatched and matched critical values, respectively. Table 2 shows some critical values, and the value of the correlation at which we would be indifferent between the matched and the unmatched tests. For example, for 2 pairs, the two critical values are 12.7 and 4.3, and the tests would be the same if $r_{xy} = .94$, or equivalently, if $r_{yy} = .88$. Clearly, r_{xy} would have to be very high before we would choose a matched test for smaller samples only to improve power.

[Table 2 about here]

Martin [10] computed the break-even correlation based on population parameters, ρ_{xy} or ρ_{yy}, which similarly showed that matched tests were less powerful than unmatched tests for very small numbers of pairs unless ρ_{xy} was extremely high.

<u>Design Strategies</u>

and In community interventions there are thus good reasons for and against matching, both intensified by the small number of communities available. Is it possible to have a matched design without losing power? Table 3 shows four possible strategies, depending on whether the <u>design</u> is matched or unmatched, and whether the <u>analysis</u> is matched or unmatched. The first strategy, labelled "**UU**", has an unmatched design and an unmatched analysis, and is the usual unmatched t-test. The second, **MM**, is the usual matched t-test. The third design, **MU**, represents a matched design with an unmatched analysis. The fourth, **MUT** (matched/unmatched with testing), is a variant in which the matched data are first tested to see whether r_{yy} is significantly greater than zero (one-tailed, α=.05). If r_{yy} is significant, a matched analysis is performed; otherwise an unmatched analysis is used.

[Table 3 about here]

The goal of this paper is to evaluate the MU and MUT strategies. We are interested first in whether these procedures are legitimate (yield the correct α level when the null hypothesis is true), and second in whether they improve power. We performed a computer simulation to evaluate the α level and the power of these two methods.

METHODS

The statistical model assumed for the simulation is as follows: let X_i, e_{1i}, and e_{2i} be independent random variables chosen from a normal distribution with mean 0 and variance 1.

Let $$Y_{1i} = \rho_{xy} X_i + \sqrt{1-\rho^2_{xy}} \quad e_{1i} \qquad [1]$$

$$Y_{2i} = \Delta + \rho_{xy} X_i + \sqrt{1-\rho^2_{xy}} \quad e_{2i}$$

where Y_{1i} is the simulated outcome variable for the control member of pair i, Y_{2i} is the outcome for the treatment member, and Δ is the treatment effect size. Then

$$Y_1 \sim N(0, \rho^2_{xy} + 1 - \rho^2_{xy}) = N(0,1)$$

$$Y_2 \sim N(\Delta, 1)$$

and

$$\text{Corr}(X,Y) = \rho_{xy}$$

and

$$\text{Corr}(Y_1,Y_2) = \rho_{yy} = \rho^2_{xy} .$$

(The last relationship can be understood by noting that the proportion of variance in X explained by Y_1 is ρ^2_{xy}, and the proportion of the variation in Y_2 explained by X is also ρ^2_{xy}; the proportion of variability of Y_1 explained by Y_2 is thus $(\rho^2_{xy})^2$, or $(\rho_{yy})^2 = (\rho^2_{xy})^2$. Here, the match on X is perfect. If not, then $\rho_{yy} < \rho^2_{xy}$).

The simulation is based on standardized variables. For non-standardized variables, the effect size is

$$\Delta = (\mu_{y_1} - \mu_{y_2}) / \sigma_y . \qquad [2]$$

To estimate the power of the different t-tests, we first created a sample of N pairs, as above. For this sample we calculated t_{mm}, t_{mu}, and t_{mu*} and determined whether or not the null hypothesis was rejected by each method. We repeated this process 100,000 times, and counted the proportion of times the null hypothesis was rejected; this is an estimate of the power of the test. The simulations were done for parameter values N = 2 to 20, ρ_{xy} = 0 to .9, and Δ = effect size = 0 to 3. The power of UU is the same as the power of MU when $\rho_{xy} = 0$. With 100,000 iterations for each situation, the 95% confidence interval for power has width $\pm$ .001 when the true power is .05, and $\pm$ .003 when the true power is .50.

In preliminary runs, we found that the power of MUT when $\Delta = 0$ (that is, the estimated α level) was greater than .05. This is not surprising, since the method of analysis was chosen after peeking at the data. Without some correction, MUT is an inappropriate test, since it will reject too often when the null hypothesis is true. In order to study MUT further, we estimated the critical values necessary to give it $\alpha = .05$. This was done by generating 100,000 values of the MUT t-statistic, and using the 97.5th percentile of those data as an estimate of the critical value for the MUT distribution. The results presented below all use the estimated critical values.

RESULTS

The estimated critical values for the MUT distribution are presented. We then consider the power under two situations: the null hypothesis and the alternative hypothesis. Results for $\rho_{xy} = 0$, and $\rho_{xy} > 0$ are discussed separately.

MUT Critical Values

The estimated critical values for the MUT procedure are in Table 4. The MUT procedure was to calculate the matched t-statistic if r_{yy} is significantly greater than zero, the unmatched t-statistic otherwise, and to reject the null hypothesis if t_{mut} is greater than the number in Table 4.

[Table 4 about here]

<u>Null Hypothesis True</u>

Table 5 shows the estimated power when $\Delta = 0$ and $\rho_{xy} = 0$; that is, there is no treatment effect and the matching variable is completely uncorrelated with Y. In this null situation, power is the same as the α level, and the power of MM, UU, and MU are all .05. The power of MUT′ (the MUT analysis using the usual critical values) is always greater than .05, but the power of MUT, which uses the estimated critical values of Table 4 is appropriately about .05. MUT′ is not considered further.

[Table 5 about here]

The α levels of MM and UU are .05, by design. It may seem surprising that the α level of MU is also .05, since the analysis does not correspond to the design. However, when $\rho_{xy} = 0$, both MU and MM are appropriate because the matching had no effect. Equation {1}, above, shows that when $\rho_{xy}=0$, Y_{1i} and Y_{2i} are completely independent, and so can be considered to be unmatched. To understand further how both MU and MM can be appropriate, consider the following formulation of the two t-statistics.

$$t_{unmatched} = \frac{\bar{d}}{\sqrt{\frac{s_1^2}{N} + \frac{s_2^2}{N}}}, \quad df = 2(N-1)$$

and

$$t_{matched} = \frac{\overline{d}}{\sqrt{\frac{s_1^2}{N} + \frac{s_2^2}{N} - \frac{2 r_{yy} s_1 s_2}{N}}} \quad , \quad df = N-1$$

The two statistics differ only in the last term under the square root for t_m. Although $\rho_{yy} = 0$, and r_{yy} is 0 on average, r_{yy} is often very large when the number of pairs is small; for N = 2 pairs, for example, r_{yy} is always plus or minus 1. Both of the t-test denominators are the same, "on average", but S_m is more variable than S_u, because of the final term which has mean zero and adds no information. Both S_m and S_u (squared) can be shown to have a chi-squared distribution. Since S_m is more variable than S_u, the chi-square statistic based on S_m must have fewer degrees of freedom, and the corresponding t-test must also have fewer degrees of freedom.

Table 6 provides estimated α level (power) estimates when $\rho_{xy} > 0$ but $\Delta = 0$; that is, when the matching variable is correlated with the outcome variable, but there is no treatment effect. The α level of MM and UU remain at .05, as would be expected. The α level of MU decreases as ρ_{xy} increases, and also for larger N. This is why breaking matches is usually considered to be disadvantageous [11,12]. The α level of MU is considerably below .05 in some cases. The α level for MUT, however, is always close to .05. This is because MUT performs the matched analysis when r_{yy} is significantly different from zero. MUT is identical to MU for 2 pairs, since r_{xy} is always plus or minus 1, and can not be significantly different from zero. All of these methods are legitimate, since the α level is .05 or less in every case.

[Table 6 about here]

Null Hypothesis False

We next consider power when the treatment effect is not zero. Table 7 shows power estimates when the alternative hypothesis is true, for selected values of N, ρ_{xy} and Δ. Complete simulation results, for all values of parameters, are available elsewhere [13]. The estimated power of MM, UU, MU, and MUT are shown for each situation. As would be expected, power increases as Δ or N get larger for all strategies, and as ρ_{xy} increases for MM. Note that for N = 2 pairs, power is always very low. Even with an effect size of 3, power is less than .4. The power for N = 3 pairs is also quite low. For other values of N, if Δ is high, the power can be near to 1.

There are situations in which each method excels. For example, for 4 pairs, with ρ_{xy} = 0 and Δ = 1.0, MU and UU have higher power than MM and MUT. For ρ_{xy} = .80, and Δ= .5, however, MM and MUT are superior to MU and UU. For ρ_{xy} = .80, and Δ= 1.0, MM is superior to the other methods.

[Table 7 about here]

SUMMARY AND DISCUSSION

A reasonable summary recommendation is that, for 2 pairs, one should resist doing the experiment since power is very low. If it must be done, use UU or, if matching is avoidable, use MU. A matched analysis is always worst (but all methods have very low power). For 3-9 pairs, either UU or MU should be chosen. For 10 to 20 pairs, MM should be chosen, since it is usually as good as the other methods and will be best in the rare situation in which a very good correlate is available for matching. These recommendations do not, of course, cover every situation. Readers who need more detail should refer to Table 7, or to the more complete tables [13].

The simulation results would be more helpful if reasonable estimates of ρ_{xy} and Δ were available. Unfortunately, there is little information available about which community-level variables are correlated with change over time in health behaviors for that community. We computed the correlation of six community characteristics (percent of residents who were male, white, black, asian, high school graduate, or low income), with changes over two years in two health behaviors (smoking prevalence and mean percent calories from fat) for 13 communities in the Henry J Kaiser Family Foundation Community Health Promotion Grants Program (CHPGP) [14]. The largest correlation, between percent black and change in smoking prevalence, was only .59, with a 95% confidence interval from .058 to .862. This provides scant evidence of large community correlations, especially if one adjusts for multiple comparisons. Since most community programs have small numbers of communities, other estimates of correlations are likely to be equally unsatisfying.

It is also difficult to estimate how large Δ, the effect size, will be. If Y is the change in a health behavior (e.g., the change in smoking prevalence), then σ_y from equation [2] has two components: variation among communities in the true rate, and a sampling error which is small if very large samples are taken in each community. In the CHPGP data set we found that the standard deviation of change in smoking prevalence was about 3.5 percentage points for 13 communities [14]. An effect size of $\Delta = 1$ would thus require a treatment to decrease smoking prevalence by about 3.5 percentage points, from a baseline average prevalence of about 24%, while the control group did not change. (Or, that the treatment group changed 3.5 percentage points more than the control group). This would require an unusually vigorous community intervention. The values for $\Delta = 2$ or 3 (requiring 7 and 10.5 percentage point decreases respectively) seem fanciful.

In most situations, it is unlikely that we are lucky enough to match on a good variable, and it is further unlikely that the effect size is bigger than 1. Restricting attention to results for $\rho_{xy} < .6$ and $\Delta \leq 1$, Table 7 shows that it doesn't matter very much what rule is used.

These results generalize to matching on more than one covariate. In this case multiple R plays the role of r_{xy}.

There are some limitations to this research. It was restricted to the situation where $\sigma_1 = \sigma_2$, and to normally distributed data. These assumptions are common for power studies. We briefly considered a log normal distribution for X. Preliminary results were similar to those already shown. Perhaps the most notable finding was that the α level was .05 for MM and UU, in spite of the skewed distribution and the small number of pairs. This robustness of the t-statistic to departures from normality is not always fully appreciated. We have not explored this aspect fully since there is little guidance on how best to model changes over time in community behaviors.

The performance of the MUT approach may be better than we have shown. We defined a "helpful" match as one in which r_{yy} was significantly greater than zero. Other definitions, such as $r_{yy} > .5$ or using a lower

α would have had different power results. Ideally, MUT would look like UU for low values of ρ_{yy} and like MM for high values of ρ_{xy}. The estimated critical values for MUT may have been a little high, since power in Table 5 is always slightly below .05; this would understate the power of MUT somewhat. MUT is less attractive than other methods, however, since it can not use the usual tabled critical values.

Results were presented in terms of ρ_{xy} because it is easier to obtain estimates of ρ_{xy} than of ρ_{yy}. However, the tabled results are correct only if we are able to achieve a perfect match on X, which is unlikely in real practice. If matches are imperfect, the correspondence between ρ^2_{xy} and ρ_{yy} is not exact, and ρ_{xy} will have to be even larger than the tabled value. The tables remain correct if the label ρ_{xy} is replaced by $(\rho_{yy})^{.5}$.

These findings are valuable because important studies must sometimes be done using very small numbers of experimental units. It is distressing to find conflicting guidelines for how those few units should be allocated. It is encouraging to find that a "common sense" solution to a problem, such as the MU approach, is also reasonable from a statistical perspective.

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Table 1
Review of a t-test

	Y_{1i}	Y_{2i}	d_i
	6	3	3
	11	4	7
	10	5	5
	6	6	0
mean	8.25	4.5	3.75
sd	2.63	1.29	2.99
n	4	4	4

Table 2

Critical Values and Breakpoint Sample Correlations for Matched an Unmatched t-tests*

N	MATCHED		UNMATCHED		r_{yy}	r_{xy}
	df	cv(m)	df	cv(u)		
2	1	12.7	2	4.3	.88	.94
3	2	4.3	4	2.8	.58	.76
4	3	3.2	6	2.4	.41	.66
5	4	2.8	8	2.3	.32	.57
10	9	2.3	18	2.1	.17	.41
20	19	2.1	38	2.02	.07	.27
∞	∞	1.96	∞	1.96	0	0

* The breakpoint correlation is the value of r for which the matched and unmatched t-tests are the same (assuming s_1 approximately equal to s_2 for this particular sample.

Table 3

Four Strategies for Design and Analysis

DESIGN	ANALYSIS	COMMENTS
U	U	Standard Unmatched t-test
M	M	Standard Matched t-test
M	U	Matched data, perform unmatched t-test
M	UT	Matched data, test whether r_{yy} is significantly greater than zero, perform unmatched t-test unless r_{yy} is significant.

Table 4

Estimated Critical values for MUT*

N of Pairs	Critical Value
2	4.3027
3	3.6460
4	2.8180
5	2.5463
6	2.3813
7	2.3429
8	2.2473
9	2.2045
10	2.1991
11	2.1552
12	2.1564
13	2.1149
14	2.0989
15	2.1018
16	2.1172
17	2.0867
18	2.0732
19	2.0508
20	2.0586

* Each critical is the 97.5th percentile of 100,000 t-statistics generated at random from the MUT′ distribution.

Table 5

α Level or Power when the effect is zero and $\rho_{xy} = 0$

N of Pairs	ρ_{xy}	UU	MM	MU	MUT	MUT′
2.00	.00	.051	.051	.051	.051	.051
3.00	.00	.050	.049	.050	.045	.070
4.00	.00	.049	.050	.049	.046	.065
5.00	.00	.052	.051	.052	.047	.065
6.00	.00	.050	.050	.050	.048	.061
8.00	.00	.049	.050	.049	.048	.058
10.00	.00	.049	.049	.049	.046	.056
15.00	.00	.050	.050	.050	.048	.055
20.00	.00	.051	.050	.051	.050	.055

MUT′ is the power of the test with unadjusted critical values. MUT uses the critical values from Table 4.

Table 6
α Level or Power when Effect Size is zero and $\rho_{xy} > 0$

N of Pairs	ρ_{xy}	UU	MM	MU	MUT
2.00	.20	.051	.050	.047	.047
3.00	.20	.050	.050	.047	.044
4.00	.20	.049	.050	.047	.045
5.00	.20	.052	.050	.046	.045
6.00	.20	.050	.050	.047	.047
8.00	.20	.049	.050	.047	.047
10.00	.20	.049	.050	.047	.045
15.00	.20	.050	.049	.045	.045
20.00	.20	.051	.050	.047	.047
2.00	.40	.051	.049	.043	.043
3.00	.40	.050	.051	.040	.044
4.00	.40	.049	.050	.037	.042
5.00	.40	.052	.050	.036	.042
6.00	.40	.050	.050	.035	.043
8.00	.40	.049	.050	.036	.042
10.00	.40	.049	.049	.034	.039
15.00	.40	.050	.051	.034	.040
20.00	.40	.051	.050	.034	.041
2.00	.60	.051	.050	.035	.035
3.00	.60	.050	.050	.029	.046
4.00	.60	.049	.050	.024	.043
5.00	.60	.052	.051	.022	.041
6.00	.60	.050	.049	.020	.041
8.00	.60	.049	.050	.019	.039
10.00	.60	.049	.050	.018	.038
15.00	.60	.050	.050	.017	.040
20.00	.60	.051	.049	.016	.040
2.00	.80	.051	.051	.024	.024
3.00	.80	.050	.049	.014	.049
4.00	.80	.049	.049	.010	.047
5.00	.80	.052	.049	.007	.047
6.00	.80	.050	.050	.007	.049
8.00	.80	.049	.050	.005	.049
10.00	.80	.049	.049	.003	.048
15.00	.80	.050	.049	.002	.050
20.00	.80	.051	.050	.002	.052

Table 7
Estimated Power for Selected Parameter Values

		Δ (EFFECT SIZE)															
		.5				1.0				2.0				3.0			
N	ρ_{xy}	UU	MM	MU	MUT	UU	MM	MU	MUT	UU	MM	MU	MUT	UU	MM	MU	MUT
2	.00	.06	.06	.06	.06	.10	.07	.10	.10	.22	.13	.22	.22	.39	.19	.39	.39
3	.00	.08	.07	.08	.06	.16	.12	.16	.12	.47	.29	.47	.32	.78	.51	.78	.61
4	.00	.09	.08	.09	.08	.22	.17	.22	.18	.65	.49	.65	.56	.94	.80	.94	.89
5	.00	.11	.10	.11	.10	.29	.23	.29	.25	.79	.66	.79	.73	.98	.94	.98	.97
6	.00	.12	.11	.12	.11	.35	.29	.35	.32	.88	.79	.88	.85	.99	.98	.99	.99
8	.00	.16	.14	.16	.14	.47	.41	.47	.44	.96	.93	.96	.95	.99	.99	.99	.99
10	.00	.18	.17	.18	.17	.56	.51	.56	.53	.99	.98	.99	.99	.99	.99	.99	.99
15	.00	.26	.25	.26	.25	.75	.72	.75	.74	.99	.99	.99	.99	.99	.99	.99	.99
20	.00	.34	.33	.34	.33	.87	.85	.87	.87	.99	.99	.99	.99	.99	.99	.99	.99
2	.20	.06	.06	.06	.06	.10	.07	.09	.09	.22	.13	.22	.22	.39	.19	.39	.39
3	.20	.08	.07	.07	.06	.16	.12	.16	.11	.47	.30	.46	.32	.78	.52	.79	.61
4	.20	.09	.08	.09	.08	.22	.18	.22	.18	.65	.51	.66	.57	.94	.81	.94	.89
5	.20	.11	.10	.10	.09	.29	.24	.28	.25	.79	.68	.79	.74	.98	.94	.99	.98
6	.20	.12	.11	.12	.11	.35	.30	.34	.32	.88	.80	.88	.85	.99	.99	.99	.99
8	.20	.16	.14	.15	.14	.47	.42	.46	.44	.96	.94	.96	.96	.99	.99	.99	.99
10	.20	.18	.18	.18	.17	.56	.53	.56	.54	.99	.98	.99	.99	.99	.99	.99	.99
15	.20	.26	.26	.26	.25	.75	.74	.76	.75	.99	.99	.99	.99	.99	.99	.99	.99
20	.20	.34	.34	.34	.34	.87	.86	.87	.87	.99	.99	.99	.99	.99	.99	.99	.99
2	.40	.06	.06	.06	.06	.10	.08	.09	.09	.22	.14	.22	.22	.39	.20	.39	.39
3	.40	.08	.07	.07	.06	.16	.13	.15	.12	.47	.33	.46	.33	.78	.57	.79	.62
4	.40	.09	.09	.08	.08	.22	.20	.21	.18	.65	.55	.67	.58	.94	.86	.95	.91
5	.40	.11	.10	.09	.09	.29	.27	.27	.25	.79	.73	.81	.76	.98	.97	.99	.98
6	.40	.12	.12	.11	.11	.35	.34	.34	.32	.88	.85	.89	.87	.99	.99	.99	.99
8	.40	.16	.16	.14	.14	.47	.47	.46	.45	.96	.96	.97	.96	.99	.99	.99	.99
10	.40	.18	.19	.16	.17	.56	.58	.56	.55	.99	.99	.99	.99	.99	.99	.99	.99
15	.40	.26	.29	.25	.26	.75	.80	.77	.77	.99	.99	.99	.99	.99	.99	.99	.99
20	.40	.34	.37	.32	.34	.87	.91	.89	.89	.99	.99	.99	.99	.99	.99	.99	.99
2	.60	.06	.06	.05	.05	.10	.08	.08	.08	.22	.16	.22	.22	.39	.23	.40	.40
3	.60	.08	.08	.05	.07	.16	.15	.14	.13	.47	.40	.47	.36	.78	.66	.81	.66
4	.60	.09	.10	.06	.08	.22	.24	.20	.20	.65	.66	.68	.62	.94	.92	.96	.93
5	.60	.11	.12	.07	.10	.29	.33	.26	.27	.79	.83	.83	.80	.98	.99	.99	.99
6	.60	.12	.14	.09	.12	.35	.42	.33	.36	.88	.93	.91	.91	.99	.99	.99	.99
8	.60	.16	.19	.11	.15	.47	.58	.46	.50	.96	.99	.98	.98	.99	.99	.99	.99
10	.60	.18	.24	.14	.19	.56	.71	.58	.62	.99	.99	.99	.99	.99	.99	.99	.99
15	.60	.26	.36	.22	.30	.75	.89	.80	.84	.99	.99	.99	.99	.99	.99	.99	.99
20	.60	.34	.47	.31	.41	.87	.96	.92	.94	.99	.99	.99	.99	.99	.99	.99	.99
2	.80	.06	.07	.04	.04	.10	.11	.09	.09	.22	.21	.24	.24	.39	.31	.44	.44
3	.80	.08	.10	.04	.09	.16	.22	.13	.18	.47	.58	.49	.46	.78	.85	.82	.74
4	.80	.09	.13	.04	.11	.22	.37	.18	.28	.65	.87	.71	.72	.94	.99	.97	.96
5	.80	.11	.18	.05	.15	.29	.52	.25	.40	.79	.97	.86	.89	.98	.99	.99	.99
6	.80	.12	.22	.06	.19	.35	.64	.31	.52	.88	.99	.94	.97	.99	.99	.99	.99
8	.80	.16	.30	.07	.26	.47	.81	.46	.71	.96	.99	.99	.99	.99	.99	.99	.99
10	.80	.18	.39	.09	.34	.56	.91	.60	.84	.99	.99	.99	.99	.99	.99	.99	.99
15	.80	.26	.57	.17	.54	.75	.99	.85	.98	.99	.99	.99	.99	.99	.99	.99	.99
20	.80	.34	.71	.26	.70	.87	.99	.96	.99	.99	.99	.99	.99	.99	.99	.99	.99

Appendix 1

Complete Simulation Results

5-3-93
cutoff for MUT based on 100,000 calculations

POWER FOR 2 PAIRS

ρ_{xy}	METHOD	.0	.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
		EFFECT SIZE									
.00	MM	.051	.056	.074	.097	.126	.157	.187	.217	.247	.277
.00	MU	.051	.062	.096	.150	.220	.301	.388	.478	.566	.646
.00	MUT	.051	.062	.096	.150	.220	.301	.388	.478	.566	.646
.00	UU	.051	.062	.096	.150	.220	.301	.388	.478	.566	.646
.10	MM	.050	.056	.073	.097	.126	.156	.187	.218	.247	.277
.10	MU	.050	.062	.095	.149	.218	.299	.387	.476	.564	.646
.10	MUT	.050	.062	.095	.149	.218	.299	.387	.476	.564	.646
.20	MM	.050	.056	.074	.099	.127	.158	.189	.220	.250	.280
.20	MU	.047	.058	.092	.146	.216	.298	.385	.474	.561	.645
.20	MUT	.047	.058	.092	.146	.216	.298	.385	.474	.561	.645
.30	MM	.050	.056	.075	.101	.132	.164	.196	.228	.259	.290
.30	MU	.047	.059	.093	.146	.217	.299	.389	.480	.567	.648
.30	MUT	.047	.059	.093	.146	.217	.299	.389	.480	.567	.648
.40	MM	.049	.056	.076	.104	.136	.170	.203	.236	.268	.300
.40	MU	.043	.055	.090	.145	.217	.301	.389	.479	.569	.650
.40	MUT	.043	.055	.090	.145	.217	.301	.389	.479	.569	.650
.50	MM	.049	.057	.079	.109	.142	.178	.213	.248	.281	.315
.50	MU	.038	.050	.086	.143	.215	.300	.390	.484	.573	.656
.50	MUT	.038	.050	.086	.143	.215	.300	.390	.484	.573	.656
.60	MM	.050	.058	.084	.118	.156	.194	.231	.268	.306	.341
.60	MU	.035	.048	.084	.144	.218	.306	.400	.493	.582	.662
.60	MUT	.035	.048	.084	.144	.218	.306	.400	.493	.582	.662
.70	MM	.050	.061	.091	.130	.171	.214	.256	.299	.339	.378
.70	MU	.030	.044	.084	.147	.227	.318	.414	.508	.596	.674
.70	MUT	.030	.044	.084	.147	.227	.318	.414	.508	.596	.674
.80	MM	.051	.067	.108	.156	.208	.259	.307	.354	.400	.444
.80	MU	.024	.040	.086	.155	.241	.337	.435	.527	.611	.685
.80	MUT	.024	.040	.086	.155	.241	.337	.435	.527	.611	.685
.90	MM	.050	.080	.143	.212	.280	.346	.410	.471	.527	.581
.90	MU	.017	.038	.096	.181	.280	.380	.476	.561	.636	.700
.90	MUT	.017	.038	.096	.181	.280	.380	.476	.561	.636	.700

POWER FOR 3 PAIRS

ρ_{xy}	METHOD	EFFECT SIZE .0	.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
.00	MM	.049	.068	.119	.196	.294	.400	.509	.614	.707	.785
.00	MU	.050	.077	.160	.296	.465	.638	.782	.886	.948	.979
.00	MUT	.045	.063	.115	.201	.320	.462	.606	.733	.835	.908
.00	UU	.050	.077	.160	.296	.465	.638	.782	.886	.948	.979
.10	MM	.051	.069	.118	.198	.295	.401	.512	.616	.708	.787
.10	MU	.050	.078	.159	.294	.463	.636	.783	.886	.949	.979
.10	MUT	.046	.063	.115	.201	.321	.461	.605	.735	.836	.909
.20	MM	.050	.068	.120	.201	.300	.409	.519	.623	.716	.794
.20	MU	.047	.074	.156	.291	.462	.637	.786	.889	.950	.981
.20	MUT	.044	.062	.114	.201	.322	.462	.607	.738	.841	.912
.30	MM	.050	.069	.124	.207	.314	.426	.539	.645	.737	.814
.30	MU	.044	.070	.154	.291	.463	.640	.789	.891	.952	.981
.30	MUT	.045	.062	.115	.206	.328	.470	.613	.743	.844	.914
.40	MM	.051	.071	.128	.219	.329	.450	.567	.673	.764	.837
.40	MU	.040	.067	.150	.286	.462	.641	.791	.894	.954	.983
.40	MUT	.044	.063	.117	.209	.330	.475	.621	.749	.850	.918
.50	MM	.051	.072	.137	.235	.356	.482	.605	.713	.803	.870
.50	MU	.034	.059	.140	.282	.465	.648	.798	.900	.957	.983
.50	MUT	.045	.063	.119	.214	.342	.489	.636	.764	.860	.925
.60	MM	.050	.078	.153	.265	.397	.534	.660	.766	.848	.907
.60	MU	.029	.054	.139	.283	.472	.656	.806	.903	.958	.984
.60	MUT	.046	.067	.130	.231	.362	.512	.657	.780	.872	.930
.70	MM	.051	.082	.176	.312	.465	.612	.740	.837	.905	.948
.70	MU	.021	.047	.133	.285	.482	.669	.815	.909	.960	.984
.70	MUT	.047	.073	.148	.257	.397	.549	.691	.805	.887	.939
.80	MM	.049	.095	.224	.398	.578	.733	.846	.921	.963	.984
.80	MU	.014	.039	.130	.294	.494	.681	.821	.911	.960	.984
.80	MUT	.049	.086	.183	.312	.461	.610	.739	.837	.905	.949
.90	MM	.050	.139	.354	.601	.798	.917	.970	.992	.998	1.000
.90	MU	.007	.035	.139	.318	.518	.694	.826	.910	.958	.982
.90	MUT	.056	.132	.291	.454	.599	.722	.818	.889	.938	.966

POWER FOR 4 PAIRS

		EFFECT SIZE									
ρ_{xy}	METHOD	.0	.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
.00	MM	.050	.080	.171	.314	.487	.657	.796	.892	.950	.980
.00	MU	.049	.092	.223	.426	.654	.835	.940	.983	.996	.999
.00	MUT	.046	.078	.179	.351	.559	.754	.891	.961	.989	.997
.00	UU	.049	.092	.223	.426	.654	.835	.940	.983	.996	.999
.10	MM	.050	.081	.173	.317	.492	.661	.798	.893	.949	.979
.10	MU	.050	.091	.221	.428	.656	.836	.938	.982	.996	.999
.10	MUT	.046	.078	.178	.350	.563	.755	.890	.959	.988	.997
.20	MM	.050	.083	.179	.329	.507	.676	.812	.904	.956	.982
.20	MU	.047	.089	.224	.431	.659	.840	.941	.984	.997	1.000
.20	MUT	.045	.079	.182	.357	.567	.760	.894	.962	.989	.998
.30	MM	.050	.083	.184	.338	.520	.694	.828	.915	.962	.986
.30	MU	.044	.084	.214	.426	.661	.843	.943	.985	.997	1.000
.30	MUT	.044	.076	.179	.353	.568	.765	.897	.964	.990	.998
.40	MM	.050	.087	.196	.362	.553	.727	.856	.933	.973	.991
.40	MU	.037	.079	.210	.429	.669	.852	.948	.987	.997	1.000
.40	MUT	.042	.075	.181	.362	.581	.777	.905	.969	.992	.998
.50	MM	.050	.090	.212	.396	.598	.771	.888	.953	.983	.995
.50	MU	.030	.070	.205	.427	.672	.856	.952	.988	.998	1.000
.50	MUT	.042	.076	.186	.371	.594	.788	.913	.971	.993	.998
.60	MM	.050	.097	.240	.447	.658	.823	.924	.973	.992	.998
.60	MU	.024	.064	.199	.430	.682	.865	.958	.990	.998	1.000
.60	MUT	.043	.079	.198	.390	.617	.808	.925	.977	.994	.999
.70	MM	.051	.110	.283	.525	.747	.893	.964	.990	.998	1.000
.70	MU	.017	.053	.189	.433	.696	.876	.962	.991	.998	1.000
.70	MUT	.044	.088	.221	.427	.657	.836	.940	.982	.996	.999
.80	MM	.049	.134	.371	.660	.866	.962	.993	.999	1.000	1.000
.80	MU	.010	.042	.181	.438	.708	.887	.966	.992	.999	1.000
.80	MUT	.047	.112	.280	.502	.721	.879	.959	.989	.998	1.000
.90	MM	.050	.210	.592	.885	.983	.999	1.000	1.000	1.000	1.000
.90	MU	.004	.033	.183	.461	.731	.897	.969	.993	.999	1.000
.90	MUT	.056	.194	.457	.682	.850	.946	.985	.997	1.000	1.000

POWER FOR 5 PAIRS

ρ_{xy}	METHOD	EFFECT SIZE .0	.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
.00	MM	.051	.095	.231	.439	.660	.832	.935	.980	.995	.999
.00	MU	.052	.108	.286	.548	.788	.931	.984	.997	1.000	1.000
.00	MUT	.047	.095	.247	.486	.731	.899	.973	.995	.999	1.000
.00	UU	.052	.108	.286	.548	.788	.931	.984	.997	1.000	1.000
.10	MM	.048	.095	.234	.446	.666	.839	.938	.982	.996	.999
.10	MU	.048	.105	.286	.550	.793	.934	.986	.998	1.000	1.000
.10	MUT	.045	.093	.246	.488	.736	.902	.974	.995	.999	1.000
.20	MM	.050	.098	.238	.454	.679	.848	.944	.984	.996	.999
.20	MU	.046	.104	.281	.548	.794	.935	.986	.998	1.000	1.000
.20	MUT	.045	.094	.247	.488	.737	.904	.975	.996	.999	1.000
.30	MM	.050	.099	.249	.474	.699	.865	.953	.987	.997	1.000
.30	MU	.042	.099	.278	.550	.797	.938	.987	.998	1.000	1.000
.30	MUT	.044	.092	.245	.494	.745	.908	.978	.996	1.000	1.000
.40	MM	.050	.103	.266	.502	.733	.889	.965	.991	.998	1.000
.40	MU	.036	.091	.273	.552	.805	.942	.989	.999	1.000	1.000
.40	MUT	.042	.090	.249	.502	.755	.915	.980	.997	1.000	1.000
.50	MM	.050	.110	.290	.548	.780	.921	.978	.995	.999	1.000
.50	MU	.030	.083	.269	.558	.815	.950	.991	.999	1.000	1.000
.50	MUT	.041	.093	.258	.520	.773	.927	.984	.998	1.000	1.000
.60	MM	.051	.119	.327	.609	.834	.950	.990	.999	1.000	1.000
.60	MU	.022	.074	.260	.564	.827	.956	.993	.999	1.000	1.000
.60	MUT	.041	.095	.270	.543	.796	.940	.989	.999	1.000	1.000
.70	MM	.049	.138	.398	.705	.906	.980	.997	1.000	1.000	1.000
.70	MU	.014	.062	.253	.572	.842	.964	.995	.999	1.000	1.000
.70	MUT	.043	.110	.309	.592	.835	.957	.993	.999	1.000	1.000
.80	MM	.049	.176	.519	.838	.971	.997	1.000	1.000	1.000	1.000
.80	MU	.007	.049	.245	.585	.857	.971	.996	1.000	1.000	1.000
.80	MUT	.047	.147	.402	.689	.893	.978	.997	1.000	1.000	1.000
.90	MM	.049	.285	.774	.976	.999	1.000	1.000	1.000	1.000	1.000
.90	MU	.002	.035	.238	.604	.874	.976	.997	1.000	1.000	1.000
.90	MUT	.056	.272	.642	.869	.972	.997	1.000	1.000	1.000	1.000

POWER FOR 6 PAIRS

ρ_{xy}	METHOD	EFFECT SIZE .0	.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
.00	MM	.050	.110	.292	.554	.789	.929	.983	.997	1.000	1.000
.00	MU	.050	.123	.350	.650	.878	.974	.996	1.000	1.000	1.000
.00	MUT	.048	.114	.319	.611	.850	.964	.995	1.000	1.000	1.000
.00	UU	.050	.123	.350	.650	.878	.974	.996	1.000	1.000	1.000
.10	MM	.050	.110	.294	.557	.793	.931	.984	.997	1.000	1.000
.10	MU	.049	.122	.348	.651	.878	.973	.997	1.000	1.000	1.000
.10	MUT	.048	.113	.320	.613	.851	.963	.995	1.000	1.000	1.000
.20	MM	.050	.111	.300	.570	.804	.937	.986	.998	1.000	1.000
.20	MU	.047	.118	.343	.651	.880	.975	.997	1.000	1.000	1.000
.20	MUT	.047	.111	.318	.615	.854	.965	.995	1.000	1.000	1.000
.30	MM	.050	.116	.316	.590	.823	.946	.989	.998	1.000	1.000
.30	MU	.042	.113	.342	.654	.884	.977	.998	1.000	1.000	1.000
.30	MUT	.045	.111	.321	.620	.859	.968	.996	1.000	1.000	1.000
.40	MM	.050	.120	.335	.624	.851	.960	.993	.999	1.000	1.000
.40	MU	.035	.105	.336	.658	.893	.980	.998	1.000	1.000	1.000
.40	MUT	.043	.108	.323	.630	.872	.973	.996	1.000	1.000	1.000
.50	MM	.049	.129	.368	.672	.887	.975	.996	1.000	1.000	1.000
.50	MU	.028	.094	.331	.667	.902	.984	.998	1.000	1.000	1.000
.50	MUT	.041	.109	.333	.650	.885	.979	.998	1.000	1.000	1.000
.60	MM	.049	.144	.416	.738	.928	.989	.999	1.000	1.000	1.000
.60	MU	.020	.086	.328	.677	.913	.988	.999	1.000	1.000	1.000
.60	MUT	.041	.118	.357	.681	.907	.985	.999	1.000	1.000	1.000
.70	MM	.050	.168	.499	.826	.968	.997	1.000	1.000	1.000	1.000
.70	MU	.013	.073	.321	.689	.926	.991	.999	1.000	1.000	1.000
.70	MUT	.044	.136	.409	.733	.934	.992	.999	1.000	1.000	1.000
.80	MM	.050	.217	.638	.927	.994	1.000	1.000	1.000	1.000	1.000
.80	MU	.007	.056	.311	.709	.941	.994	1.000	1.000	1.000	1.000
.80	MUT	.049	.188	.519	.828	.969	.997	1.000	1.000	1.000	1.000
.90	MM	.049	.364	.884	.996	1.000	1.000	1.000	1.000	1.000	1.000
.90	MU	.001	.038	.304	.734	.952	.996	1.000	1.000	1.000	1.000
.90	MUT	.058	.357	.789	.962	.997	1.000	1.000	1.000	1.000	1.000

POWER FOR 7 PAIRS

ρ_{xy}	METHOD	.0	.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
		EFFECT SIZE									
.00	MM	.050	.123	.349	.646	.874	.971	.996	1.000	1.000	1.000
.00	MU	.049	.139	.401	.729	.929	.990	.999	1.000	1.000	1.000
.00	MUT	.046	.123	.363	.686	.908	.985	.999	1.000	1.000	1.000
.00	UU	.049	.139	.401	.729	.929	.990	.999	1.000	1.000	1.000
.10	MM	.050	.125	.353	.652	.876	.972	.996	1.000	1.000	1.000
.10	MU	.048	.137	.403	.730	.930	.990	.999	1.000	1.000	1.000
.10	MUT	.045	.122	.365	.688	.909	.985	.999	1.000	1.000	1.000
.20	MM	.051	.125	.361	.665	.885	.975	.996	1.000	1.000	1.000
.20	MU	.046	.132	.402	.733	.931	.990	.999	1.000	1.000	1.000
.20	MUT	.045	.120	.365	.692	.911	.985	.999	1.000	1.000	1.000
.30	MM	.051	.131	.374	.688	.901	.981	.998	1.000	1.000	1.000
.30	MU	.042	.127	.399	.737	.937	.991	.999	1.000	1.000	1.000
.30	MUT	.043	.119	.367	.699	.918	.987	.999	1.000	1.000	1.000
.40	MM	.049	.138	.404	.724	.922	.987	.998	1.000	1.000	1.000
.40	MU	.035	.122	.399	.746	.944	.993	1.000	1.000	1.000	1.000
.40	MUT	.039	.119	.377	.714	.927	.990	.999	1.000	1.000	1.000
.50	MM	.050	.152	.444	.770	.947	.993	.999	1.000	1.000	1.000
.50	MU	.028	.113	.398	.759	.951	.995	1.000	1.000	1.000	1.000
.50	MUT	.038	.123	.392	.735	.939	.993	1.000	1.000	1.000	1.000
.60	MM	.049	.167	.498	.830	.971	.998	1.000	1.000	1.000	1.000
.60	MU	.021	.097	.390	.766	.958	.997	1.000	1.000	1.000	1.000
.60	MUT	.038	.128	.414	.763	.953	.996	1.000	1.000	1.000	1.000
.70	MM	.049	.200	.593	.903	.990	1.000	1.000	1.000	1.000	1.000
.70	MU	.012	.083	.388	.789	.968	.998	1.000	1.000	1.000	1.000
.70	MUT	.041	.154	.478	.823	.973	.998	1.000	1.000	1.000	1.000
.80	MM	.049	.261	.737	.971	.999	1.000	1.000	1.000	1.000	1.000
.80	MU	.005	.064	.382	.810	.977	.999	1.000	1.000	1.000	1.000
.80	MUT	.047	.219	.612	.906	.991	1.000	1.000	1.000	1.000	1.000
.90	MM	.050	.439	.944	1.000	1.000	1.000	1.000	1.000	1.000	1.000
.90	MU	.001	.042	.381	.839	.986	1.000	1.000	1.000	1.000	1.000
.90	MUT	.055	.422	.879	.989	1.000	1.000	1.000	1.000	1.000	1.000

POWER FOR 8 PAIRS

ρ_{xy}	METHOD	.0	.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
		EFFECT SIZE									
.00	MM	.050	.140	.411	.733	.927	.989	.999	1.000	1.000	1.000
.00	MU	.049	.155	.465	.798	.960	.996	1.000	1.000	1.000	1.000
.00	MUT	.048	.145	.440	.775	.952	.995	1.000	1.000	1.000	1.000
.00	UU	.049	.155	.465	.798	.960	.996	1.000	1.000	1.000	1.000
.10	MM	.051	.140	.410	.733	.928	.989	.999	1.000	1.000	1.000
.10	MU	.050	.153	.460	.796	.960	.996	1.000	1.000	1.000	1.000
.10	MUT	.048	.144	.435	.774	.952	.995	1.000	1.000	1.000	1.000
.20	MM	.050	.144	.422	.744	.936	.991	.999	1.000	1.000	1.000
.20	MU	.047	.150	.461	.797	.963	.997	1.000	1.000	1.000	1.000
.20	MUT	.047	.143	.440	.775	.955	.996	1.000	1.000	1.000	1.000
.30	MM	.049	.149	.440	.768	.947	.994	1.000	1.000	1.000	1.000
.30	MU	.041	.143	.459	.806	.966	.997	1.000	1.000	1.000	1.000
.30	MUT	.043	.140	.441	.787	.959	.997	1.000	1.000	1.000	1.000
.40	MM	.050	.157	.468	.799	.960	.996	1.000	1.000	1.000	1.000
.40	MU	.036	.136	.458	.812	.969	.998	1.000	1.000	1.000	1.000
.40	MUT	.042	.139	.449	.798	.963	.997	1.000	1.000	1.000	1.000
.50	MM	.051	.171	.511	.843	.975	.998	1.000	1.000	1.000	1.000
.50	MU	.027	.123	.458	.825	.975	.999	1.000	1.000	1.000	1.000
.50	MUT	.040	.141	.463	.818	.972	.998	1.000	1.000	1.000	1.000
.60	MM	.050	.194	.578	.892	.989	1.000	1.000	1.000	1.000	1.000
.60	MU	.019	.114	.457	.840	.982	.999	1.000	1.000	1.000	1.000
.60	MUT	.039	.153	.498	.847	.981	.999	1.000	1.000	1.000	1.000
.70	MM	.050	.229	.673	.948	.997	1.000	1.000	1.000	1.000	1.000
.70	MU	.011	.094	.458	.859	.987	1.000	1.000	1.000	1.000	1.000
.70	MUT	.043	.179	.564	.894	.991	1.000	1.000	1.000	1.000	1.000
.80	MM	.050	.301	.814	.988	1.000	1.000	1.000	1.000	1.000	1.000
.80	MU	.005	.073	.458	.882	.992	1.000	1.000	1.000	1.000	1.000
.80	MUT	.049	.258	.706	.955	.998	1.000	1.000	1.000	1.000	1.000
.90	MM	.050	.507	.973	1.000	1.000	1.000	1.000	1.000	1.000	1.000
.90	MU	.001	.048	.462	.910	.997	1.000	1.000	1.000	1.000	1.000
.90	MUT	.057	.500	.935	.998	1.000	1.000	1.000	1.000	1.000	1.000

POWER FOR 9 PAIRS

ρ_{xy}	METHOD	EFFECT SIZE .0	.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
.00	MM	.051	.158	.465	.796	.959	.996	1.000	1.000	1.000	1.000
.00	MU	.051	.172	.515	.847	.978	.999	1.000	1.000	1.000	1.000
.00	MUT	.050	.164	.496	.831	.974	.998	1.000	1.000	1.000	1.000
.00	UU	.051	.172	.515	.847	.978	.999	1.000	1.000	1.000	1.000
.10	MM	.050	.156	.463	.800	.960	.996	1.000	1.000	1.000	1.000
.10	MU	.050	.169	.512	.849	.979	.999	1.000	1.000	1.000	1.000
.10	MUT	.048	.161	.492	.833	.975	.998	1.000	1.000	1.000	1.000
.20	MM	.050	.159	.480	.811	.963	.996	1.000	1.000	1.000	1.000
.20	MU	.046	.164	.515	.851	.979	.999	1.000	1.000	1.000	1.000
.20	MUT	.047	.158	.497	.836	.976	.998	1.000	1.000	1.000	1.000
.30	MM	.050	.167	.498	.832	.972	.998	1.000	1.000	1.000	1.000
.30	MU	.042	.160	.516	.859	.982	.999	1.000	1.000	1.000	1.000
.30	MUT	.045	.158	.501	.846	.979	.999	1.000	1.000	1.000	1.000
.40	MM	.050	.174	.530	.860	.981	.999	1.000	1.000	1.000	1.000
.40	MU	.035	.150	.514	.867	.986	.999	1.000	1.000	1.000	1.000
.40	MUT	.041	.156	.509	.859	.983	.999	1.000	1.000	1.000	1.000
.50	MM	.051	.192	.575	.894	.989	1.000	1.000	1.000	1.000	1.000
.50	MU	.027	.140	.516	.876	.988	1.000	1.000	1.000	1.000	1.000
.50	MUT	.039	.161	.526	.874	.987	1.000	1.000	1.000	1.000	1.000
.60	MM	.049	.214	.642	.935	.996	1.000	1.000	1.000	1.000	1.000
.60	MU	.018	.125	.518	.891	.992	1.000	1.000	1.000	1.000	1.000
.60	MUT	.038	.170	.564	.902	.993	1.000	1.000	1.000	1.000	1.000
.70	MM	.051	.260	.740	.972	.999	1.000	1.000	1.000	1.000	1.000
.70	MU	.010	.107	.524	.909	.995	1.000	1.000	1.000	1.000	1.000
.70	MUT	.044	.208	.641	.939	.997	1.000	1.000	1.000	1.000	1.000
.80	MM	.051	.344	.871	.996	1.000	1.000	1.000	1.000	1.000	1.000
.80	MU	.004	.085	.530	.929	.998	1.000	1.000	1.000	1.000	1.000
.80	MUT	.051	.303	.787	.981	1.000	1.000	1.000	1.000	1.000	1.000
.90	MM	.051	.569	.988	1.000	1.000	1.000	1.000	1.000	1.000	1.000
.90	MU	.000	.054	.539	.955	.999	1.000	1.000	1.000	1.000	1.000
.90	MUT	.058	.568	.969	1.000	1.000	1.000	1.000	1.000	1.000	1.000

POWER FOR 10 PAIRS

ρ_{xy}	METHOD	EFFECT SIZE .0	.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
.00	MM	.049	.169	.514	.847	.977	.998	1.000	1.000	1.000	1.000
.00	MU	.049	.183	.561	.888	.988	.999	1.000	1.000	1.000	1.000
.00	MUT	.046	.171	.534	.871	.985	.999	1.000	1.000	1.000	1.000
.00	UU	.049	.183	.561	.888	.988	.999	1.000	1.000	1.000	1.000
.10	MM	.050	.173	.518	.852	.978	.999	1.000	1.000	1.000	1.000
.10	MU	.049	.185	.562	.888	.989	1.000	1.000	1.000	1.000	1.000
.10	MUT	.046	.172	.536	.872	.986	.999	1.000	1.000	1.000	1.000
.20	MM	.050	.175	.528	.860	.982	.999	1.000	1.000	1.000	1.000
.20	MU	.047	.179	.562	.891	.990	1.000	1.000	1.000	1.000	1.000
.20	MUT	.045	.169	.537	.877	.987	.999	1.000	1.000	1.000	1.000
.30	MM	.049	.185	.556	.879	.986	.999	1.000	1.000	1.000	1.000
.30	MU	.040	.177	.568	.897	.991	1.000	1.000	1.000	1.000	1.000
.30	MUT	.041	.170	.548	.884	.989	1.000	1.000	1.000	1.000	1.000
.40	MM	.049	.192	.584	.902	.991	1.000	1.000	1.000	1.000	1.000
.40	MU	.034	.164	.565	.904	.993	1.000	1.000	1.000	1.000	1.000
.40	MUT	.039	.166	.552	.894	.991	1.000	1.000	1.000	1.000	1.000
.50	MM	.051	.210	.633	.930	.995	1.000	1.000	1.000	1.000	1.000
.50	MU	.027	.155	.571	.913	.994	1.000	1.000	1.000	1.000	1.000
.50	MUT	.039	.172	.575	.910	.994	1.000	1.000	1.000	1.000	1.000
.60	MM	.050	.241	.706	.962	.999	1.000	1.000	1.000	1.000	1.000
.60	MU	.018	.140	.580	.929	.997	1.000	1.000	1.000	1.000	1.000
.60	MUT	.038	.187	.621	.935	.997	1.000	1.000	1.000	1.000	1.000
.70	MM	.050	.288	.797	.986	1.000	1.000	1.000	1.000	1.000	1.000
.70	MU	.010	.121	.586	.944	.998	1.000	1.000	1.000	1.000	1.000
.70	MUT	.042	.231	.699	.965	.999	1.000	1.000	1.000	1.000	1.000
.80	MM	.049	.385	.912	.998	1.000	1.000	1.000	1.000	1.000	1.000
.80	MU	.003	.094	.600	.961	.999	1.000	1.000	1.000	1.000	1.000
.80	MUT	.048	.338	.840	.991	1.000	1.000	1.000	1.000	1.000	1.000
.90	MM	.049	.630	.995	1.000	1.000	1.000	1.000	1.000	1.000	1.000
.90	MU	.000	.063	.623	.980	1.000	1.000	1.000	1.000	1.000	1.000
.90	MUT	.054	.625	.986	1.000	1.000	1.000	1.000	1.000	1.000	1.000

POWER FOR 11 PAIRS

ρ_{xy}	METHOD	.0	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25
						EFFECT SIZE					
.00	MM	.050	.084	.187	.357	.564	.753	.887	.959	.988	.997
.00	MU	.049	.087	.202	.389	.608	.797	.918	.974	.994	.999
.00	MUT	.047	.084	.193	.375	.590	.782	.909	.971	.992	.999
.00	UU	.049	.087	.202	.389	.608	.797	.918	.974	.994	.999
.10	MM	.051	.086	.188	.359	.567	.756	.888	.959	.988	.997
.10	MU	.049	.087	.200	.389	.608	.796	.917	.974	.993	.999
.10	MUT	.048	.084	.192	.373	.591	.782	.908	.970	.992	.998
.20	MM	.050	.083	.191	.368	.581	.771	.898	.964	.990	.998
.20	MU	.045	.081	.195	.385	.610	.801	.921	.976	.994	.999
.20	MUT	.045	.080	.189	.373	.595	.787	.914	.973	.993	.999
.30	MM	.051	.086	.198	.384	.603	.792	.912	.972	.993	.998
.30	MU	.041	.076	.190	.382	.612	.805	.925	.978	.995	.999
.30	MUT	.044	.078	.187	.375	.600	.795	.919	.976	.995	.999
.40	MM	.048	.087	.211	.409	.635	.820	.932	.979	.996	.999
.40	MU	.034	.066	.181	.378	.616	.813	.931	.982	.996	.999
.40	MUT	.040	.073	.186	.378	.612	.807	.928	.980	.996	.999
.50	MM	.051	.095	.232	.448	.685	.860	.953	.989	.998	1.000
.50	MU	.027	.058	.169	.374	.622	.825	.940	.985	.998	1.000
.50	MUT	.039	.075	.191	.394	.634	.829	.941	.985	.997	1.000
.60	MM	.050	.103	.265	.512	.754	.909	.976	.996	1.000	1.000
.60	MU	.018	.047	.156	.367	.631	.843	.953	.990	.999	1.000
.60	MUT	.039	.079	.210	.430	.677	.865	.959	.992	.999	1.000
.70	MM	.050	.112	.316	.603	.839	.957	.992	.999	1.000	1.000
.70	MU	.009	.032	.133	.356	.643	.863	.965	.994	.999	1.000
.70	MUT	.042	.093	.258	.510	.758	.914	.980	.997	1.000	1.000
.80	MM	.051	.145	.423	.753	.940	.992	1.000	1.000	1.000	1.000
.80	MU	.003	.019	.108	.345	.662	.892	.979	.998	1.000	1.000
.80	MUT	.051	.137	.382	.683	.890	.975	.997	1.000	1.000	1.000
.90	MM	.050	.227	.679	.952	.998	1.000	1.000	1.000	1.000	1.000
.90	MU	.000	.006	.071	.320	.694	.927	.991	1.000	1.000	1.000
.90	MUT	.055	.239	.682	.941	.994	1.000	1.000	1.000	1.000	1.000

POWER FOR 12 PAIRS

ρ_{xy}	METHOD	EFFECT SIZE .0	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25
.00	MM	.050	.087	.202	.388	.605	.795	.916	.973	.994	.999
.00	MU	.050	.091	.215	.419	.649	.832	.939	.983	.996	.999
.00	MUT	.047	.085	.202	.399	.626	.815	.931	.980	.996	.999
.00	UU	.050	.091	.215	.419	.649	.832	.939	.983	.996	.999
.10	MM	.051	.087	.202	.389	.611	.798	.917	.974	.993	.999
.10	MU	.050	.088	.213	.418	.648	.832	.939	.983	.997	1.000
.10	MUT	.047	.083	.201	.398	.626	.815	.930	.980	.996	.999
.20	MM	.049	.088	.207	.401	.625	.814	.928	.978	.995	.999
.20	MU	.045	.085	.211	.415	.651	.841	.945	.985	.997	1.000
.20	MUT	.044	.081	.201	.398	.630	.825	.937	.982	.996	.999
.30	MM	.049	.089	.217	.420	.647	.831	.938	.983	.996	.999
.30	MU	.040	.079	.206	.415	.653	.843	.947	.987	.998	1.000
.30	MUT	.041	.079	.200	.402	.636	.830	.940	.985	.997	1.000
.40	MM	.050	.093	.231	.450	.682	.859	.954	.988	.998	1.000
.40	MU	.034	.071	.198	.414	.663	.852	.954	.989	.998	1.000
.40	MUT	.039	.076	.200	.410	.653	.843	.949	.988	.998	1.000
.50	MM	.050	.099	.251	.489	.729	.896	.971	.994	.999	1.000
.50	MU	.027	.062	.186	.409	.667	.862	.961	.992	.999	1.000
.50	MUT	.038	.076	.205	.425	.674	.863	.959	.992	.999	1.000
.60	MM	.050	.109	.289	.554	.796	.935	.986	.998	1.000	1.000
.60	MU	.018	.049	.172	.405	.681	.879	.969	.995	.999	1.000
.60	MUT	.037	.083	.228	.466	.721	.896	.973	.995	.999	1.000
.70	MM	.049	.120	.343	.647	.877	.974	.997	1.000	1.000	1.000
.70	MU	.009	.034	.148	.397	.694	.901	.980	.997	1.000	1.000
.70	MUT	.041	.099	.281	.554	.801	.942	.989	.999	1.000	1.000
.80	MM	.050	.154	.460	.793	.959	.996	1.000	1.000	1.000	1.000
.80	MU	.003	.020	.123	.389	.719	.926	.989	.999	1.000	1.000
.80	MUT	.049	.144	.418	.731	.920	.986	.999	1.000	1.000	1.000
.90	MM	.050	.251	.727	.970	.999	1.000	1.000	1.000	1.000	1.000
.90	MU	.000	.006	.083	.373	.762	.957	.997	1.000	1.000	1.000
.90	MUT	.054	.259	.725	.962	.997	1.000	1.000	1.000	1.000	1.000

POWER FOR 13 PAIRS

ρ_{xy}	METHOD	EFFECT SIZE .0	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25
.00	MM	.049	.090	.216	.419	.647	.832	.939	.983	.997	.999
.00	MU	.048	.093	.232	.447	.684	.864	.957	.990	.998	1.000
.00	MUT	.049	.091	.226	.438	.673	.856	.953	.989	.998	1.000
.00	UU	.048	.093	.232	.447	.684	.864	.957	.990	.998	1.000
.10	MM	.050	.091	.218	.424	.651	.836	.940	.984	.997	1.000
.10	MU	.049	.093	.232	.450	.685	.864	.956	.990	.998	1.000
.10	MUT	.049	.092	.225	.440	.674	.856	.952	.988	.998	1.000
.20	MM	.049	.093	.227	.437	.668	.847	.947	.986	.998	1.000
.20	MU	.045	.089	.229	.452	.691	.869	.959	.991	.999	1.000
.20	MUT	.046	.089	.226	.445	.682	.861	.956	.990	.999	1.000
.30	MM	.050	.094	.232	.451	.687	.865	.956	.990	.998	1.000
.30	MU	.041	.083	.221	.448	.693	.875	.963	.992	.999	1.000
.30	MUT	.044	.086	.221	.444	.686	.869	.960	.991	.999	1.000
.40	MM	.049	.097	.251	.486	.728	.892	.970	.994	.999	1.000
.40	MU	.033	.074	.216	.449	.702	.885	.968	.994	.999	1.000
.40	MUT	.040	.083	.225	.455	.705	.883	.967	.993	.999	1.000
.50	MM	.050	.102	.272	.525	.770	.921	.981	.997	1.000	1.000
.50	MU	.025	.063	.200	.442	.710	.894	.974	.996	1.000	1.000
.50	MUT	.039	.082	.228	.470	.726	.900	.976	.996	1.000	1.000
.60	MM	.049	.114	.313	.595	.833	.955	.992	.999	1.000	1.000
.60	MU	.017	.052	.188	.444	.724	.909	.981	.997	1.000	1.000
.60	MUT	.039	.090	.256	.519	.772	.928	.986	.998	1.000	1.000
.70	MM	.051	.130	.374	.692	.906	.983	.998	1.000	1.000	1.000
.70	MU	.010	.037	.165	.436	.743	.927	.987	.999	1.000	1.000
.70	MUT	.046	.112	.319	.611	.849	.963	.994	.999	1.000	1.000
.80	MM	.051	.165	.497	.832	.973	.998	1.000	1.000	1.000	1.000
.80	MU	.003	.021	.137	.430	.772	.949	.995	1.000	1.000	1.000
.80	MUT	.051	.161	.466	.786	.950	.993	1.000	1.000	1.000	1.000
.90	MM	.049	.270	.765	.980	.999	1.000	1.000	1.000	1.000	1.000
.90	MU	.000	.006	.094	.426	.817	.976	.999	1.000	1.000	1.000
.90	MUT	.054	.284	.772	.977	.999	1.000	1.000	1.000	1.000	1.000

POWER FOR 14 PAIRS

ρ_{xy}	METHOD	.0	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25
		EFFECT SIZE									
.00	MM	.049	.093	.231	.451	.687	.862	.955	.989	.998	1.000
.00	MU	.049	.096	.246	.480	.720	.889	.969	.994	.999	1.000
.00	MUT	.048	.094	.240	.471	.711	.883	.966	.993	.999	1.000
.00	UU	.049	.096	.246	.480	.720	.889	.969	.994	.999	1.000
.10	MM	.050	.094	.234	.456	.693	.867	.957	.990	.998	1.000
.10	MU	.050	.097	.246	.482	.723	.892	.969	.994	.999	1.000
.10	MUT	.049	.095	.241	.473	.714	.886	.967	.993	.999	1.000
.20	MM	.049	.096	.238	.464	.703	.877	.961	.991	.999	1.000
.20	MU	.046	.094	.242	.479	.725	.893	.970	.994	.999	1.000
.20	MUT	.046	.094	.239	.472	.717	.888	.968	.994	.999	1.000
.30	MM	.050	.099	.251	.488	.728	.892	.969	.994	.999	1.000
.30	MU	.040	.086	.238	.482	.731	.898	.974	.995	.999	1.000
.30	MUT	.043	.089	.238	.479	.727	.895	.972	.995	.999	1.000
.40	MM	.050	.102	.267	.519	.762	.915	.980	.997	1.000	1.000
.40	MU	.034	.078	.231	.480	.737	.908	.979	.997	1.000	1.000
.40	MUT	.040	.086	.240	.486	.740	.908	.979	.996	1.000	1.000
.50	MM	.050	.110	.295	.565	.804	.940	.988	.999	1.000	1.000
.50	MU	.025	.068	.219	.480	.748	.917	.982	.998	1.000	1.000
.50	MUT	.038	.087	.248	.508	.763	.922	.983	.998	1.000	1.000
.60	MM	.050	.119	.332	.632	.864	.969	.995	1.000	1.000	1.000
.60	MU	.017	.055	.201	.477	.763	.933	.989	.999	1.000	1.000
.60	MUT	.039	.093	.271	.551	.808	.947	.991	.999	1.000	1.000
.70	MM	.050	.138	.404	.729	.928	.989	.999	1.000	1.000	1.000
.70	MU	.008	.040	.182	.476	.785	.948	.994	1.000	1.000	1.000
.70	MUT	.043	.117	.344	.649	.878	.975	.997	1.000	1.000	1.000
.80	MM	.049	.176	.533	.863	.982	.999	1.000	1.000	1.000	1.000
.80	MU	.003	.022	.152	.477	.816	.969	.997	1.000	1.000	1.000
.80	MUT	.051	.171	.502	.821	.963	.996	1.000	1.000	1.000	1.000
.90	MM	.049	.290	.800	.988	1.000	1.000	1.000	1.000	1.000	1.000
.90	MU	.000	.007	.106	.475	.864	.987	1.000	1.000	1.000	1.000
.90	MUT	.055	.306	.807	.986	1.000	1.000	1.000	1.000	1.000	1.000

POWER FOR 15 PAIRS

ρ_{xy}	METHOD	.0	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25
						EFFECT SIZE					
.00	MM	.050	.098	.248	.480	.720	.888	.968	.993	.999	1.000
.00	MU	.050	.102	.263	.508	.752	.910	.977	.996	.999	1.000
.00	MUT	.048	.098	.254	.496	.740	.903	.974	.996	.999	1.000
.00	UU	.050	.102	.263	.508	.752	.910	.977	.996	.999	1.000
.10	MM	.049	.098	.250	.484	.727	.892	.969	.994	.999	1.000
.10	MU	.049	.100	.261	.510	.755	.912	.978	.996	1.000	1.000
.10	MUT	.047	.097	.252	.497	.744	.905	.976	.996	1.000	1.000
.20	MM	.049	.099	.256	.497	.739	.902	.973	.995	.999	1.000
.20	MU	.045	.097	.257	.509	.757	.916	.979	.997	1.000	1.000
.20	MUT	.045	.094	.252	.499	.747	.910	.977	.996	1.000	1.000
.30	MM	.049	.102	.266	.518	.764	.916	.979	.997	1.000	1.000
.30	MU	.040	.090	.253	.510	.765	.921	.982	.997	1.000	1.000
.30	MUT	.043	.092	.252	.505	.759	.916	.980	.997	1.000	1.000
.40	MM	.051	.109	.286	.552	.795	.936	.986	.998	1.000	1.000
.40	MU	.034	.083	.245	.511	.771	.928	.985	.998	1.000	1.000
.40	MUT	.040	.092	.255	.516	.771	.927	.985	.998	1.000	1.000
.50	MM	.050	.115	.313	.596	.835	.956	.992	.999	1.000	1.000
.50	MU	.026	.073	.236	.510	.780	.936	.988	.999	1.000	1.000
.50	MUT	.038	.092	.265	.538	.795	.941	.989	.999	1.000	1.000
.60	MM	.050	.126	.358	.667	.889	.979	.998	1.000	1.000	1.000
.60	MU	.017	.058	.221	.514	.799	.950	.993	.999	1.000	1.000
.60	MUT	.040	.101	.300	.593	.842	.962	.995	1.000	1.000	1.000
.70	MM	.051	.143	.428	.761	.945	.993	1.000	1.000	1.000	1.000
.70	MU	.009	.041	.196	.512	.819	.963	.996	1.000	1.000	1.000
.70	MUT	.045	.125	.372	.691	.906	.984	.998	1.000	1.000	1.000
.80	MM	.049	.186	.568	.889	.989	1.000	1.000	1.000	1.000	1.000
.80	MU	.002	.024	.169	.521	.853	.981	.999	1.000	1.000	1.000
.80	MUT	.050	.182	.542	.858	.977	.998	1.000	1.000	1.000	1.000
.90	MM	.049	.308	.833	.992	1.000	1.000	1.000	1.000	1.000	1.000
.90	MU	.000	.007	.121	.527	.900	.993	1.000	1.000	1.000	1.000
.90	MUT	.054	.321	.839	.991	1.000	1.000	1.000	1.000	1.000	1.000

POWER FOR 16 PAIRS

ρ_{xy}	METHOD	.0	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25
		EFFECT SIZE									
.00	MM	.049	.102	.261	.510	.752	.909	.977	.996	.999	1.000
.00	MU	.049	.105	.276	.537	.780	.927	.984	.997	1.000	1.000
.00	MUT	.045	.097	.260	.516	.763	.918	.981	.997	1.000	1.000
.00	UU	.049	.105	.276	.537	.780	.927	.984	.997	1.000	1.000
.10	MM	.050	.103	.263	.514	.755	.912	.978	.996	1.000	1.000
.10	MU	.050	.104	.276	.536	.781	.928	.984	.998	1.000	1.000
.10	MUT	.046	.097	.261	.515	.763	.919	.981	.997	1.000	1.000
.20	MM	.050	.105	.273	.527	.770	.921	.981	.997	1.000	1.000
.20	MU	.046	.101	.275	.539	.787	.932	.985	.998	1.000	1.000
.20	MUT	.044	.096	.262	.519	.771	.924	.983	.997	1.000	1.000
.30	MM	.050	.107	.283	.546	.791	.933	.985	.998	1.000	1.000
.30	MU	.041	.093	.268	.537	.792	.936	.987	.998	1.000	1.000
.30	MUT	.041	.091	.259	.523	.779	.930	.985	.998	1.000	1.000
.40	MM	.051	.110	.299	.579	.820	.948	.990	.999	1.000	1.000
.40	MU	.034	.084	.258	.538	.799	.942	.989	.999	1.000	1.000
.40	MUT	.038	.089	.259	.535	.792	.938	.988	.999	1.000	1.000
.50	MM	.050	.120	.332	.629	.861	.968	.996	1.000	1.000	1.000
.50	MU	.025	.075	.251	.544	.813	.952	.993	.999	1.000	1.000
.50	MUT	.037	.092	.277	.562	.819	.953	.993	.999	1.000	1.000
.60	MM	.049	.131	.379	.699	.910	.984	.999	1.000	1.000	1.000
.60	MU	.017	.060	.236	.546	.830	.963	.995	1.000	1.000	1.000
.60	MUT	.037	.102	.310	.616	.863	.971	.997	1.000	1.000	1.000
.70	MM	.050	.152	.458	.793	.959	.996	1.000	1.000	1.000	1.000
.70	MU	.009	.044	.215	.552	.853	.974	.998	1.000	1.000	1.000
.70	MUT	.043	.129	.395	.722	.925	.989	.999	1.000	1.000	1.000
.80	MM	.050	.196	.596	.910	.993	1.000	1.000	1.000	1.000	1.000
.80	MU	.002	.025	.184	.559	.884	.987	.999	1.000	1.000	1.000
.80	MUT	.049	.187	.565	.881	.985	.999	1.000	1.000	1.000	1.000
.90	MM	.050	.329	.857	.995	1.000	1.000	1.000	1.000	1.000	1.000
.90	MU	.000	.007	.139	.578	.929	.996	1.000	1.000	1.000	1.000
.90	MUT	.051	.332	.858	.994	1.000	1.000	1.000	1.000	1.000	1.000

POWER FOR 17 PAIRS

ρ_{xy}	METHOD	.0	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25
		EFFECT SIZE									
.00	MM	.049	.106	.278	.539	.782	.928	.984	.997	1.000	1.000
.00	MU	.050	.110	.295	.567	.810	.944	.989	.998	1.000	1.000
.00	MUT	.047	.105	.284	.553	.798	.938	.988	.998	1.000	1.000
.00	UU	.050	.110	.295	.567	.810	.944	.989	.998	1.000	1.000
.10	MM	.049	.105	.282	.543	.786	.930	.985	.998	1.000	1.000
.10	MU	.049	.110	.296	.569	.811	.944	.989	.999	1.000	1.000
.10	MUT	.047	.105	.285	.554	.799	.939	.988	.998	1.000	1.000
.20	MM	.050	.108	.286	.553	.799	.937	.987	.998	1.000	1.000
.20	MU	.047	.105	.290	.566	.814	.947	.990	.999	1.000	1.000
.20	MUT	.046	.102	.281	.552	.805	.942	.989	.999	1.000	1.000
.30	MM	.050	.112	.301	.578	.819	.948	.990	.999	1.000	1.000
.30	MU	.041	.099	.288	.569	.820	.951	.992	.999	1.000	1.000
.30	MUT	.042	.100	.285	.562	.812	.947	.991	.999	1.000	1.000
.40	MM	.051	.117	.323	.610	.848	.962	.994	.999	1.000	1.000
.40	MU	.034	.090	.282	.572	.829	.957	.993	.999	1.000	1.000
.40	MUT	.040	.098	.288	.574	.826	.956	.993	.999	1.000	1.000
.50	MM	.049	.123	.352	.658	.884	.976	.997	1.000	1.000	1.000
.50	MU	.026	.077	.269	.577	.841	.964	.995	1.000	1.000	1.000
.50	MUT	.038	.098	.299	.602	.851	.966	.995	1.000	1.000	1.000
.60	MM	.050	.138	.405	.731	.928	.989	.999	1.000	1.000	1.000
.60	MU	.017	.066	.258	.586	.859	.973	.997	1.000	1.000	1.000
.60	MUT	.040	.111	.341	.660	.891	.980	.998	1.000	1.000	1.000
.70	MM	.050	.158	.482	.818	.969	.998	1.000	1.000	1.000	1.000
.70	MU	.009	.046	.233	.589	.879	.983	.999	1.000	1.000	1.000
.70	MUT	.045	.138	.426	.761	.944	.993	1.000	1.000	1.000	1.000
.80	MM	.051	.208	.624	.927	.995	1.000	1.000	1.000	1.000	1.000
.80	MU	.003	.028	.206	.606	.911	.992	1.000	1.000	1.000	1.000
.80	MUT	.052	.205	.605	.908	.991	1.000	1.000	1.000	1.000	1.000
.90	MM	.048	.349	.880	.997	1.000	1.000	1.000	1.000	1.000	1.000
.90	MU	.000	.008	.156	.634	.954	.999	1.000	1.000	1.000	1.000
.90	MUT	.051	.359	.885	.997	1.000	1.000	1.000	1.000	1.000	1.000

POWER FOR 18 PAIRS

ρ_{xy}	METHOD	.0	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25
		EFFECT SIZE									
.00	MM	.051	.110	.294	.567	.809	.943	.988	.999	1.000	1.000
.00	MU	.051	.115	.310	.593	.834	.955	.992	.999	1.000	1.000
.00	MUT	.050	.111	.303	.584	.826	.952	.991	.999	1.000	1.000
.00	UU	.051	.115	.310	.593	.834	.955	.992	.999	1.000	1.000
.10	MM	.050	.110	.295	.565	.809	.943	.989	.999	1.000	1.000
.10	MU	.049	.112	.306	.588	.831	.955	.992	.999	1.000	1.000
.10	MUT	.048	.109	.299	.579	.823	.952	.991	.999	1.000	1.000
.20	MM	.050	.112	.306	.583	.826	.951	.991	.999	1.000	1.000
.20	MU	.046	.109	.307	.595	.838	.958	.993	.999	1.000	1.000
.20	MUT	.046	.108	.303	.588	.832	.956	.992	.999	1.000	1.000
.30	MM	.050	.115	.317	.603	.842	.959	.993	.999	1.000	1.000
.30	MU	.041	.101	.301	.595	.841	.961	.994	.999	1.000	1.000
.30	MUT	.043	.103	.302	.591	.838	.960	.994	.999	1.000	1.000
.40	MM	.051	.120	.337	.638	.871	.971	.996	1.000	1.000	1.000
.40	MU	.034	.093	.293	.597	.852	.966	.995	1.000	1.000	1.000
.40	MUT	.040	.103	.305	.605	.854	.966	.995	1.000	1.000	1.000
.50	MM	.050	.128	.372	.687	.902	.982	.998	1.000	1.000	1.000
.50	MU	.026	.081	.284	.603	.863	.973	.997	1.000	1.000	1.000
.50	MUT	.039	.105	.323	.635	.877	.975	.997	1.000	1.000	1.000
.60	MM	.050	.143	.422	.756	.942	.993	1.000	1.000	1.000	1.000
.60	MU	.017	.065	.268	.609	.881	.981	.999	1.000	1.000	1.000
.60	MUT	.041	.118	.363	.692	.914	.987	.999	1.000	1.000	1.000
.70	MM	.050	.169	.510	.845	.977	.999	1.000	1.000	1.000	1.000
.70	MU	.008	.048	.252	.624	.903	.989	.999	1.000	1.000	1.000
.70	MUT	.046	.152	.463	.798	.961	.996	1.000	1.000	1.000	1.000
.80	MM	.050	.218	.656	.941	.997	1.000	1.000	1.000	1.000	1.000
.80	MU	.002	.029	.223	.644	.930	.995	1.000	1.000	1.000	1.000
.80	MUT	.052	.217	.642	.928	.994	1.000	1.000	1.000	1.000	1.000
.90	MM	.050	.370	.901	.998	1.000	1.000	1.000	1.000	1.000	1.000
.90	MU	.000	.009	.173	.682	.968	.999	1.000	1.000	1.000	1.000
.90	MUT	.053	.382	.906	.998	1.000	1.000	1.000	1.000	1.000	1.000

POWER FOR 19 PAIRS

ρ_{xy}	METHOD	.0	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25
						EFFECT SIZE					
.00	MM	.049	.112	.311	.590	.833	.954	.992	.999	1.000	1.000
.00	MU	.049	.116	.323	.614	.851	.963	.995	.999	1.000	1.000
.00	MUT	.050	.117	.323	.612	.849	.962	.995	.999	1.000	1.000
.00	UU	.049	.116	.323	.614	.851	.963	.995	.999	1.000	1.000
.10	MM	.050	.113	.311	.595	.836	.955	.992	.999	1.000	1.000
.10	MU	.049	.115	.321	.614	.853	.963	.995	.999	1.000	1.000
.10	MUT	.050	.116	.321	.613	.851	.963	.994	.999	1.000	1.000
.20	MM	.051	.116	.319	.607	.846	.960	.994	.999	1.000	1.000
.20	MU	.046	.111	.319	.616	.855	.965	.995	.999	1.000	1.000
.20	MUT	.048	.114	.322	.617	.854	.965	.995	.999	1.000	1.000
.30	MM	.050	.120	.336	.631	.863	.968	.996	1.000	1.000	1.000
.30	MU	.040	.106	.317	.619	.859	.970	.996	1.000	1.000	1.000
.30	MUT	.045	.112	.325	.625	.861	.970	.996	1.000	1.000	1.000
.40	MM	.050	.125	.355	.665	.888	.977	.997	1.000	1.000	1.000
.40	MU	.033	.095	.308	.623	.870	.973	.997	1.000	1.000	1.000
.40	MUT	.042	.108	.327	.638	.877	.974	.997	1.000	1.000	1.000
.50	MM	.049	.133	.391	.711	.919	.987	.999	1.000	1.000	1.000
.50	MU	.025	.083	.298	.627	.882	.979	.998	1.000	1.000	1.000
.50	MUT	.040	.111	.345	.666	.898	.982	.998	1.000	1.000	1.000
.60	MM	.049	.149	.443	.778	.954	.995	1.000	1.000	1.000	1.000
.60	MU	.016	.069	.286	.638	.898	.986	.999	1.000	1.000	1.000
.60	MUT	.042	.126	.391	.726	.931	.991	.999	1.000	1.000	1.000
.70	MM	.050	.175	.530	.864	.983	.999	1.000	1.000	1.000	1.000
.70	MU	.007	.051	.269	.653	.920	.992	1.000	1.000	1.000	1.000
.70	MUT	.048	.162	.491	.825	.971	.998	1.000	1.000	1.000	1.000
.80	MM	.049	.229	.679	.954	.998	1.000	1.000	1.000	1.000	1.000
.80	MU	.002	.030	.239	.676	.947	.997	1.000	1.000	1.000	1.000
.80	MUT	.053	.234	.672	.945	.997	1.000	1.000	1.000	1.000	1.000
.90	MM	.050	.387	.916	.999	1.000	1.000	1.000	1.000	1.000	1.000
.90	MU	.000	.009	.191	.721	.977	1.000	1.000	1.000	1.000	1.000
.90	MUT	.055	.405	.923	.999	1.000	1.000	1.000	1.000	1.000	1.000