Chapter 113

Confidence Intervals for One Proportion in a Stratified Cluster-Randomized Design

Introduction

This procedure calculates sample size and half-width for confidence intervals of a proportion from a stratified cluster randomization trial (CRT) in which the outcome variable is binary. It uses the results from elementary sampling theory which are presented in Xu, Zhu, and Ahn (2019).

Suppose that the response proportion of a binary outcome variable of a sample from a population of subjects (or items) is to be estimated with a confidence interval. Further suppose that the population can be separated into a few subpopulations, often called *strata*. Further suppose that each stratum can be separated into a number of clusters and that sampling occurs at the cluster level. That is, a simple random sample of clusters is drawn within a stratum. Next, a simple random sample of subjects is drawn from within each cluster.

Note that this procedure assumes an infinite population in which the size of every cluster and every stratum is not known.

This procedure allows you to determine the appropriate sample size to be taken from each stratum so that width of the confidence interval is guaranteed.

Technical Details

The following discussion summarizes the results in Xu *et al*. (2019).

Suppose you are interested in estimating the disease response rate of a particular population. Further suppose that response rate is known to be related to other covariates (such as age, race, or gender). It may be possible to improve estimation efficiency by stratifying on one or more of these covariates.

In this design, assume clusters are grouped into *H* strata. Let K_h denote the number of clusters sampled in the h^{th} stratum, *h* = 1, ..., *H*.

Let N_{kh} denote the number of subjects sampled (the cluster size) in cluster *k* in stratum *h,* $k = 1, \ldots, K_h, h = 1, \ldots, H$. Assume that the $N_{kh}{'s}$ are independently and identically distributed with mean M_h and variance v_h^2. The total number of subjects in the trial is $N = \sum_{h=1}^{H} \sum_{k=1}^{K_h} N_{kh} = \sum_{h=1}^{H} N_h$ where N_h is the number of subjects sampled from stratum *h*. Note that $N_h = \sum_{k=1}^{K_h} N_{kh} = K_h M_h$.

Let Y_{ikh} indicate the binary variable (0 or 1) of subject *i* of cluster *j* of stratum *h*. Let P_h indicate the response probability (or proportion) in stratum *k*. This value is estimated by

$$p_h = \sum_{k=1}^{K_h} \sum_{i=1}^{n_{kh}} Y_{ikh} \,/\, \sum_{k=1}^{K_h} N_{kh}.$$

The variance of p_h is given by

$$V(p_h) = \frac{P_h(1-P_h)}{K_h M_h}\left[\rho M_h\left(C_h^2+1\right)+(1-\rho)\right]$$
$$= \frac{P_h(1-P_h)}{K_h M_h}A_h$$

where $C_h = v_h/M_h$ is the coefficient of variation of the sizes of clusters within stratum *h*.

Let ρ indicate the intracluster correlation coefficient (ICC) give the correlation of subjects within the same cluster. This value is assumed to be constant for all clusters.

The overall response probability (proportion) *P* is given by

$$P = \sum_{h=1}^{H} f_h P_h$$

where f_h is the fraction of sampled subjects in stratum *h*. Note that $f_h = K_h M_h/N$.

The parameter *P* is estimated by

$$p = \sum_{h=1}^{H} f_h p_h$$

The variance of this estimate is given by

$$V(p) = \sum_{h=1}^{H} f_h^2 \frac{P_h(1-P_h)}{K_h M_h}\left[\rho M_h\left(C_h^2+1\right)+(1-\rho)\right]$$
$$= \frac{1}{N^2}\sum_{h=1}^{H} K_h M_h P_h(1-P_h)A_h$$
$$= \frac{1}{N}\sum_{h=1}^{H} f_h P_h(1-P_h)A_h$$

This quantity can be estimated by substituting p_h for P_h.

If the common assumption is made that *p* is asymptotically standard normal, then a confidence interval for *P* can be constructed as follows

$$CI(P) = p \pm z_{1-\alpha/2}\sqrt{V(p)}$$

The lower and upper limits of this confidence interval are denoted as LCL_P and UCL_P. The half-width, *d*, of this interval is given by

$$d = \left|z_{1-\alpha/2}\right|\sqrt{V(p)}$$
$$= \left|z_{1-\alpha/2}\right|\sqrt{\frac{1}{N}\sum_{h=1}^{H} f_h P_h(1-P_h)A_h}$$

This can be rearranged to provide the following formula for the total sample size.

$$N = \frac{z_{1-\alpha/2}^2}{d^2} \sum_{h=1}^{H} f_h P_h (1 - P_h) A_h$$

Estimating ICC

An often-difficult task necessary in computing the sample size is to estimate the value of the intracluster correlation coefficient (ICC or ρ). Xu et al. (2019) provides guidance in estimating this parameter using the ANOVA method. The **PASS** procedure *Confidence Intervals for Intraclass Correlation* provides methods for estimating ICC within a stratum. These stratum estimates can be averaged to provide an overall estimate.

Step 1. Estimate ρ_h for each stratum using one of the methods given in the **PASS** procedure *Confidence Intervals for Intraclass Correlation.*

Step 2. Compute the average of these estimates and use it as the overall estimate of ρ.

Example 1 – Finding Sample Size

A study using a stratified cluster design is being planned to estimate the effectiveness of a certain drug in treating a certain disease. The strata are four large metropolitan areas. The clusters are doctor's practices.

The average size of the practices in each of the strata are 80, 60, 50, 40. The cluster allocation pattern for the relative frequencies of clusters for the strata are 1, 1.5, 1.75, and 2. The COV for all strata will be set to 0.40. The ICC of similar studies has been 0.02.

Prior studies have shown the response proportion for this disease is 0.67. The confidence level is set to 0.95 and *d* is set to three values 0.02, 0.03, 0.04.

Setup

If the procedure window is not already open, use the PASS Home window to open it. The parameters for this example are listed below and are stored in the **Example 1** settings file. To load these settings to the procedure window, click **Open Example Settings File** in the Help Center or File menu.

Design Tab

Solve For .... **Sample Size**
Confidence Level **0.95**
d (Precision, Half-Width) **0.02 0.03 0.04**
Cluster Allocation Pattern .... **Proportional (Enter Rh = Cluster Allocation Pattern)**
Mh (Average Cluster Size)............................ **Custom**
Adjust results… .... **Checked**
Ch (COV of Cluster Sizes) .... **All Equal**
Ch for All Strata **0.4**
Ph (Response Proportions)........................... **All Equal**
Ph for All Strata... **0.67**
ρ (Intracluster Correlation, ICC) **0.02**

Set 1 Number of Strata **1**
Set 1 Rh (Cluster Allocation Pattern) **1**
Set 1 Mh (Average Cluster Size) **80**

Set 2 Number of Strata **1**
Set 2 Rh (Cluster Allocation Pattern) **1.5**
Set 2 Mh (Average Cluster Size) **60**

Set 3 Number of Strata **1**
Set 3 Rh (Cluster Allocation Pattern) **1.75**
Set 3 Mh (Average Cluster Size) **50**

Set 4 Number of Strata **1**
Set 4 Rh (Cluster Allocation Pattern) **2**
Set 4 Mh (Average Cluster Size) **40**

Set 5 Number of Strata **0**
Show More Strata Sets .... **Unchecked**

Output

Click the Calculate button to perform the calculations and generate the following output.

Numeric Reports

Numeric Results

Solve For: Sample Size
Number of Strata: 4
Allocation: Proportional

	Sample Size							
Confidence Interval Half-Width d	Total Number of Subjects N	Total Number of Clusters K	Average Clusters per Stratum K0	Average Cluster Size M	Average COV of Cluster Sizes C	Average Proportion P	Intracluster Correlation (ICC) ρ	Confidence Level CL
0.0200	4930	91	22.75	54	0.4	0.67	0.02	0.95
0.0297	2230	41	10.25	54	0.4	0.67	0.02	0.95
0.0396	1260	23	5.75	54	0.4	0.67	0.02	0.95

d The half-width of the confidence interval of P. d = [UCL(P) - LCL(P)] / 2.
N The total number of subjects.
K The total number of clusters.
K0 The average number of clusters per stratum.
M The average cluster size. The weighted average of the number of subjects per cluster.
C The average COV of cluster sizes. The weighted average COV of all clusters.
P The weighted average of the strata proportions. The weights are proportional to the number of subjects.
ρ The intracluster correlation coefficient (ICC) averaged across all strata.
CL The confidence level of the confidence interval for P.

Summary Statements

A stratified cluster-randomized design will be used to obtain a two-sided 95% confidence interval for a single proportion. The average response proportion is assumed to be 0.67 and the intracluster correlation coefficient is assumed to be 0.02. The average coefficient of variation of cluster sizes is assumed to be 0.4. With an average cluster size of 54, and with clusters allocated to 4 strata, to produce a confidence interval with a half-width of 0.02, a total of 91 clusters (an average of 22.75 per stratum) will be needed. The total sample size needed is 4930.

This report gives the results for each of the three values of d.

Strata-Detail Report

Strata-Detail Report for Row 1

	Sample Size				Proportion of Total		
Strata h	Number of Subjects Nh	Number of Clusters Kh	Average Cluster Size Mh	COV of Cluster Sizes Ch	Subjects Fh	Clusters sRh	Response Proportion Ph
1	1200	15	80	0.4	0.243	0.16	0.67
2	1320	22	60	0.4	0.268	0.24	0.67
3	1250	25	50	0.4	0.254	0.28	0.67
4	1160	29	40	0.4	0.235	0.32	0.67

Strata-Detail Report for Row 2

	Sample Size				Proportion of Total		
Strata h	Number of Subjects Nh	Number of Clusters Kh	Average Cluster Size Mh	COV of Cluster Sizes Ch	Subjects Fh	Clusters sRh	Response Proportion Ph
1	560	7	80	0.4	0.251	0.16	0.67
2	600	10	60	0.4	0.269	0.24	0.67
3	550	11	50	0.4	0.247	0.28	0.67
4	520	13	40	0.4	0.233	0.32	0.67

Strata-Detail Report for Row 3

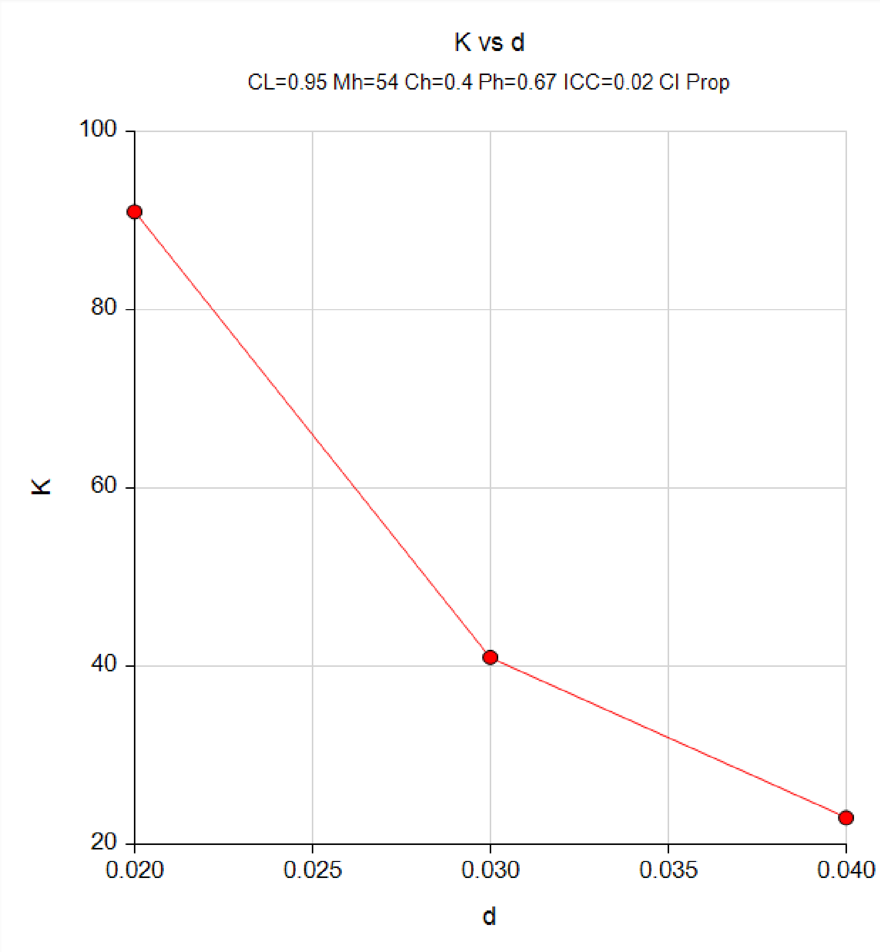
	Sample Size				Proportion of Total		
Strata h	Number of Subjects Nh	Number of Clusters Kh	Average Cluster Size Mh	COV of Cluster Sizes Ch	Subjects Fh	Clusters sRh	Response Proportion Ph
1	320	4	80	0.4	0.254	0.16	0.67
2	360	6	60	0.4	0.286	0.24	0.67
3	300	6	50	0.4	0.238	0.28	0.67
4	280	7	40	0.4	0.222	0.32	0.67

h An arbitrary sequence number for each stratum.
Nh The number of subjects in stratum h. Nh = Kh x Mh.
Kh The number of clusters in stratum h.
Mh The average cluster size in stratum h.
Ch The COV of the cluster sizes in stratum h.
Fh The proportion of the total subjects in stratum h.
sRh The proportion of the total clusters in stratum h.
Ph The response proportion of the event of interest in stratum h.

This report shows the values of the individual, strata-level parameters.

Plots Section

Plots



The values from the Numerical Results report are displayed in this plot.

Example 2 – Validation using Hand Calculations

We could not find an example of this procedure in the literature, so we will validate it using hand calculations. To do this, we will use the following example.

Suppose a stratified cluster design has two clusters: A and B. Suppose the number of clusters per stratum is 10 for stratum A and 20 for stratum B. Suppose the average cluster sizes are 20 in both strata and the COV of cluster sizes are 0.4 in both strata. Suppose the response proportions in A and B are 0.4 and 0.5, respectively. Further suppose that the ICC is 0.1 and the confidence level is 0.95.

These strata values are summarized in the following table.

Strata h	Number Clusters Kh	Average Cluster Size Mh	COV of Cluster Sizes Ch	Response Proportion Ph
A	10	20	0.4	0.4
B	20	20	0.4	0.5

First, calculate N = 10(20) + 20(20) = 600.

Next, calculate $f_A = \frac{K_A M_A}{N} = \frac{10 \times 20}{600} = \frac{1}{3}$.

Similarly, calculate $f_B = \frac{K_B M_B}{N} = \frac{20 \times 20}{600} = \frac{2}{3}$.

Next, calculate $A_A = A_B = \rho M_h \left(C_h^2 + 1\right) + (1 - \rho) = 0.1(20)(0.4^2 + 1) + (1 - 0.1) = 3.22$.

The variance can then be calculated as

$$V(p) = \sum_{h=1}^{H} f_h^2 \frac{P_h(1 - P_h)}{K_h M_h} \left[\rho M_h \left(C_h^2 + 1\right) + (1 - \rho)\right]$$

$$= 3.22 \left[\frac{1}{9}\left(\frac{0.4(0.6)}{200}\right) + \frac{4}{9}\left(\frac{0.5(0.5)}{400}\right)\right]$$

$$= 3.22 \left[\frac{0.0012}{9} + \frac{0.0025}{9}\right]$$

$$= 0.00132377778$$

Finally, the half-width is calculated as

$$d = \left|z_{1-\alpha/2}\right| \sqrt{V(p)}$$

$$= 1.95996398\sqrt{0.00132377778} = 0.07131085$$

Setup

If the procedure window is not already open, use the PASS Home window to open it. The parameters for this example are listed below and are stored in the **Example 2** settings file. To load these settings to the procedure window, click **Open Example Settings File** in the Help Center or File menu.

Design Tab

Solve For .... **Half-Width of C.I.**
Confidence Level **0.95**
Cluster Allocation Pattern .... **Custom Kh**
Mh (Average Cluster Size)............................ **All Equal**
Mh for All Strata **20**
Adjust results… .... **Checked**
Ch (COV of Cluster Sizes)............................ **All Equal**
Ch for All Strata **0.4**
Ph (Response Proportions)........................... **Custom**
ρ (Intracluster Correlation, ICC) **0.1**

Set 1 Number of Strata **1**
Set 1 Kh (Number of Clusters)...................... **10**
Set 1 Ph (Response Proportion) **0.4**

Set 2 Number of Strata **1**
Set 2 Kh (Number of Clusters)...................... **20**
Set 2 Ph (Response Proportion) **0.5**

Output

Click the Calculate button to perform the calculations and generate the following output.

Numeric Results

Solve For: Half-Width of C.I.
Number of Strata: 2
Allocation: Custom

	Sample Size							
Confidence Interval Half-Width d	Total Number of Subjects N	Total Number of Clusters K	Average Clusters per Stratum K0	Average Cluster Size M	Average COV of Cluster Sizes C	Average Proportion P	Intracluster Correlation (ICC) ρ	Confidence Level CL
0.0713	600	30	15	20	0.4	0.4667	0.1	0.95

Strata-Detail Report

	Sample Size				Proportion of Total		
Strata h	Number of Subjects Nh	Number of Clusters Kh	Average Cluster Size Mh	COV of Cluster Sizes Ch	Subjects Fh	Clusters sRh	Response Proportion Ph
1	200	10	20	0.4	0.333	0.333	0.4
2	400	20	20	0.4	0.667	0.667	0.5

This report shows that **PASS** has also computed *d* = 0.0713. Thus, the procedure is validated.

Example 3 – Looking at the Impact of ICC on the Half-Width

We will continue with the scenario began in Example 1 to show the impact of the intracluster correlation coefficient (ICC) on half-width.

From Example 1: a study using a stratified cluster design is being planned to estimate the effectiveness of a certain drug in treating a certain disease. The strata are four large metropolitan areas. The clusters are doctor's practices. The total number of clusters will be set to 100. The average size of the practices in each of the strata are 80, 60, 50, 40. The cluster allocation pattern for the relative frequencies of clusters for the strata are 1, 1.5, 1.75, and 2. The COV for all strata will be set to 0.40. Prior studies have shown the response proportion for this disease is 0.67. The confidence level is set to 0.95 and *d* will be solved for.

The values of ICC will be 0, 0.05, 0.1, 0.2, 0.4, 0.6, 0.8, 0.9, 0.99, 0.999.

Setup

If the procedure window is not already open, use the PASS Home window to open it. The parameters for this example are listed below and are stored in the **Example 3** settings file. To load these settings to the procedure window, click **Open Example Settings File** in the Help Center or File menu.

Design Tab

Solve For ....**Half-Width of C.I.**
Confidence Level **0.95**
Cluster Allocation Pattern ....**Proportional (Enter Rh = Cluster Allocation Pattern and K)**
K (Total Number of Clusters) **100**
Mh (Average Cluster Size)............................**Custom**
Adjust results… ....**Checked**
Ch (COV of Cluster Sizes) ....**All Equal**
Ch for All Strata **0.4**
Ph (Response Proportions)...........................**All Equal**
Ph for All Strata...**0.67**
ρ (Intracluster Correlation, ICC).....................**0 0.05 0.1 0.2 0.4 0.6 0.8 0.9 0.99 0.999**

Set 1 Number of Strata **1**
Set 1 Rh (Cluster Allocation Pattern).............**1**
Set 1 Mh (Average Cluster Size) **80**

Set 2 Number of Strata **1**
Set 2 Rh (Cluster Allocation Pattern).............**1.5**
Set 2 Mh (Average Cluster Size) **60**

Set 3 Number of Strata **1**
Set 3 Rh (Cluster Allocation Pattern).............**1.75**
Set 3 Mh (Average Cluster Size) **50**

Set 4 Number of Strata **1**
Set 4 Rh (Cluster Allocation Pattern).............**2**
Set 4 Mh (Average Cluster Size) **40**

Output

Click the Calculate button to perform the calculations and generate the following output.

Numeric Results

Numeric Results

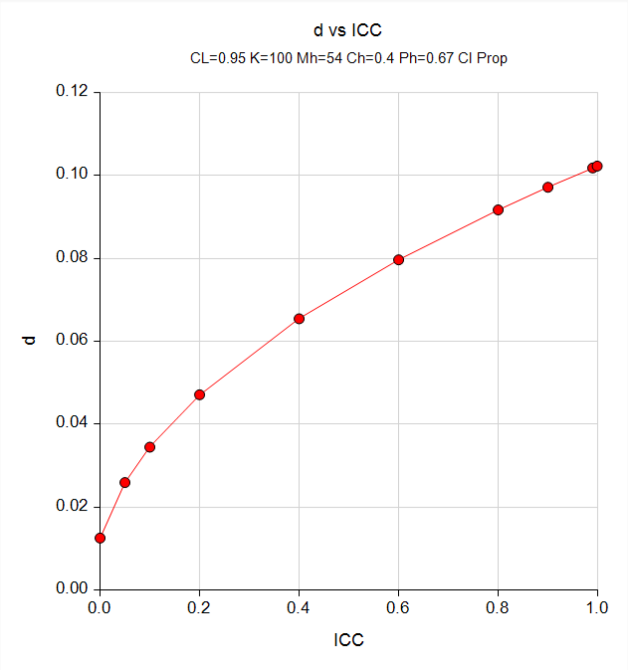
Solve For: Half-Width of C.I.
Number of Strata: 4
Allocation: Proportional

	Sample Size							
Confidence Interval Half-Width d	Total Number of Subjects N	Total Number of Clusters K	Average Clusters per Stratum K0	Average Cluster Size M	Average COV of Cluster Sizes C	Average Proportion P	Intracluster Correlation (ICC) ρ	Confidence Level CL
0.0125	5400	100	25	54	0.4	0.67	0.000	0.95
0.0259	5400	100	25	54	0.4	0.67	0.050	0.95
0.0345	5400	100	25	54	0.4	0.67	0.100	0.95
0.0471	5400	100	25	54	0.4	0.67	0.200	0.95
0.0655	5400	100	25	54	0.4	0.67	0.400	0.95
0.0797	5400	100	25	54	0.4	0.67	0.600	0.95
0.0917	5400	100	25	54	0.4	0.67	0.800	0.95
0.0972	5400	100	25	54	0.4	0.67	0.900	0.95
0.1018	5400	100	25	54	0.4	0.67	0.990	0.95
0.1023	5400	100	25	54	0.4	0.67	0.999	0.95

This report gives the results for each of the various values of *ICC*.

Plots Section

Plots



This plot shows the impact on half-width of increasing *ICC*. The value of *d* increases from 0.0125 to 0.1023.

Example 4 – Looking at the Impact of ICC on the Sample Size

We will continue with the scenario began in Example 1 to show the impact of the intracluster correlation coefficient (ICC) on sample size.

From Example 1: a study using a stratified cluster design is being planned to estimate the effectiveness of a certain drug in treating a certain disease. The strata are four large metropolitan areas. The clusters are doctor's practices. The average size of the practices in each of the strata are 80, 60, 50, 40. The cluster allocation pattern for the relative frequencies of clusters for the strata are 1, 1.5, 1.75, and 2. The COV for all strata will be set to 0.40. Prior studies have shown the response proportion for this disease is 0.67. The confidence level is set to 0.95 and *d* will be set to 0.05. The total number of clusters, K, will be solved for.

The values of ICC will be 0, 0.05, 0.1, 0.2, 0.4, 0.6, 0.8, 0.9, 0.99, 0.999.

Setup

If the procedure window is not already open, use the PASS Home window to open it. The parameters for this example are listed below and are stored in the **Example 4** settings file. To load these settings to the procedure window, click **Open Example Settings File** in the Help Center or File menu.

Design Tab

Solve For ....**Sample Size**
Confidence Level **0.95**
d (Precision, Half-Width)...............................**0.05**
Cluster Allocation Pattern ....**Proportional (Enter Rh = Cluster Allocation Pattern)**
Mh (Average Cluster Size)............................**Custom**
Adjust results… ....**Checked**
Ch (COV of Cluster Sizes)............................**All Equal**
Ch for All Strata **0.4**
Ph (Response Proportions)...........................**All Equal**
Ph for All Strata...**0.67**
ρ (Intracluster Correlation, ICC).....................**0 0.05 0.1 0.2 0.4 0.6 0.8 0.9 0.99 0.999**

Set 1 Number of Strata **1**
Set 1 Rh (Cluster Allocation Pattern).............**1**
Set 1 Mh (Average Cluster Size) **80**

Set 2 Number of Strata **1**
Set 2 Rh (Cluster Allocation Pattern).............**1.5**
Set 2 Mh (Average Cluster Size) **60**

Set 3 Number of Strata **1**
Set 3 Rh (Cluster Allocation Pattern).............**1.75**
Set 3 Mh (Average Cluster Size) **50**

Set 4 Number of Strata **1**
Set 4 Rh (Cluster Allocation Pattern).............**2**
Set 4 Mh (Average Cluster Size) **40**

Output

Click the Calculate button to perform the calculations and generate the following output.

Numeric Results

Numeric Results

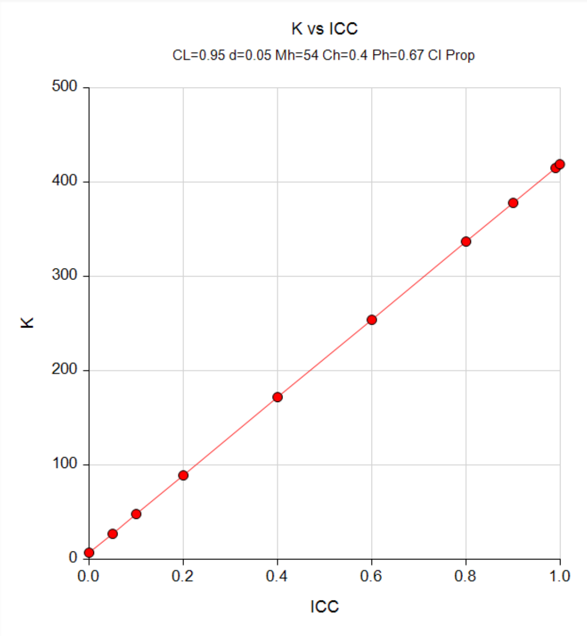
Solve For: Sample Size
Number of Strata: 4
Allocation: Proportional

Confidence Interval Half-Width d	Sample Size: Total Number of Subjects N	Sample Size: Total Number of Clusters K	Average Clusters per Stratum K0	Average Cluster Size M	Average COV of Cluster Sizes C	Average Proportion P	Intracluster Correlation (ICC) ρ	Confidence Level CL
0.0473	380	7	1.75	54	0.4	0.67	0.000	0.95
0.0500	1440	27	6.75	54	0.4	0.67	0.050	0.95
0.0498	2610	48	12.00	54	0.4	0.67	0.100	0.95
0.0500	4790	89	22.25	54	0.4	0.67	0.200	0.95
0.0499	9300	172	43.00	54	0.4	0.67	0.400	0.95
0.0500	13730	254	63.50	54	0.4	0.67	0.600	0.95
0.0500	18200	337	84.25	54	0.4	0.67	0.800	0.95
0.0500	20400	378	94.50	54	0.4	0.67	0.900	0.95
0.0500	22400	415	103.75	54	0.4	0.67	0.990	0.95
0.0500	22630	419	104.75	54	0.4	0.67	0.999	0.95

This report gives the results for each of the various values of *ICC*.

Plots Section

Plots



This plot shows the impact on sample size (number of clusters) of increasing *ICC*. The value of *K* increases from 7 to 419 and the value of N increases from 380 to 22,630.

Example 5 – Looking at the Impact of COV on the Sample Size

We will continue with the scenario began in Example 1 to show the impact of the cluster size COV on sample size.

From Example 1: a study using a stratified cluster design is being planned to estimate the effectiveness of a certain drug in treating a certain disease. The strata are four large metropolitan areas. The clusters are doctor's practices. The average size of the practices in each of the strata are 80, 60, 50, 40. The cluster allocation pattern for the relative frequencies of clusters for the strata are 1, 1.5, 1.75, and 2. Prior studies have shown the response proportion for this disease is 0.67. The confidence level is set to 0.95 and *d* will be set to 0.05. The total number of clusters, K, will be solved for.

The values of Ch will be 0, 0.1, 0.3, 0.5, 0.7, 0.9, 1.1, 1.3, and 1.5.

Setup

If the procedure window is not already open, use the PASS Home window to open it. The parameters for this example are listed below and are stored in the **Example 5** settings file. To load these settings to the procedure window, click **Open Example Settings File** in the Help Center or File menu.

Design Tab

Solve For .... **Sample Size**
Confidence Level **0.95**
d (Precision, Half-Width) **0.05**
Cluster Allocation Pattern .... **Proportional (Enter Rh = Cluster Allocation Pattern)**
Mh (Average Cluster Size) .... **Custom**
Adjust results… .... **Checked**
Ch (COV of Cluster Sizes) .... **All Equal**
Ch for All Strata **0 0.1 0.3 0.5 0.7 0.9 1.1 1.3 1.5**
Ph (Response Proportions) .... **All Equal**
Ph for All Strata... **0.67**
ρ (Intracluster Correlation, ICC) **0.2**

Set 1 Number of Strata **1**
Set 1 Rh (Cluster Allocation Pattern) **1**
Set 1 Mh (Average Cluster Size) **80**

Set 2 Number of Strata **1**
Set 2 Rh (Cluster Allocation Pattern) **1.5**
Set 2 Mh (Average Cluster Size) **60**

Set 3 Number of Strata **1**
Set 3 Rh (Cluster Allocation Pattern) **1.75**
Set 3 Mh (Average Cluster Size) **50**

Set 4 Number of Strata **1**
Set 4 Rh (Cluster Allocation Pattern) **2**
Set 4 Mh (Average Cluster Size) **40**

Output

Click the Calculate button to perform the calculations and generate the following output.

Numeric Results

Numeric Results

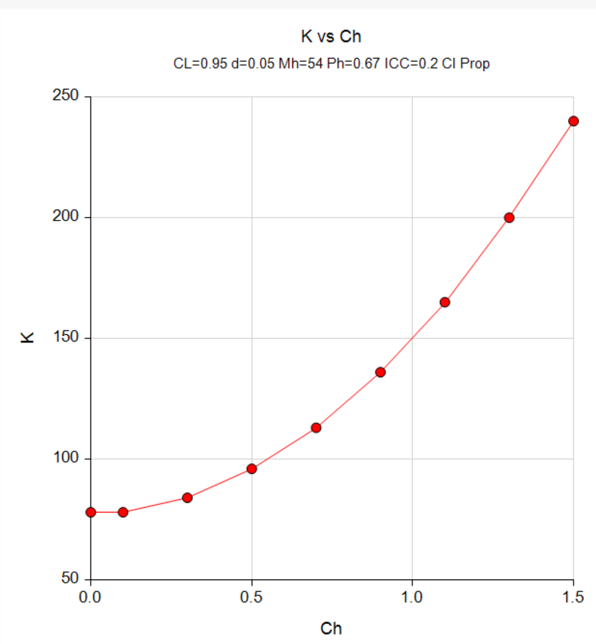
Solve For: Sample Size
Number of Strata: 4
Allocation: Proportional

	Sample Size							
Confidence Interval Half-Width d	Total Number of Subjects N	Total Number of Clusters K	Average Clusters per Stratum K0	Average Cluster Size M	Average COV of Cluster Sizes C	Average Proportion P	Intracluster Correlation (ICC) ρ	Confidence Level CL
0.0497	4200	78	19.50	54	0.0	0.67	0.2	0.95
0.0500	4200	78	19.50	54	0.1	0.67	0.2	0.95
0.0499	4520	84	21.00	54	0.3	0.67	0.2	0.95
0.0498	5170	96	24.00	54	0.5	0.67	0.2	0.95
0.0499	6100	113	28.25	54	0.7	0.67	0.2	0.95
0.0500	7360	136	34.00	54	0.9	0.67	0.2	0.95
0.0499	8900	165	41.25	54	1.1	0.67	0.2	0.95
0.0499	10800	200	50.00	54	1.3	0.67	0.2	0.95
0.0500	12950	240	60.00	54	1.5	0.67	0.2	0.95

This report gives the results for each of the various values of *COV*. The value of *K* increases from 78 to 240 and the value of *N* increases from 4200 to 12,950.

Plots Section

Plots



This plot shows the impact on sample size (number of clusters) of increasing *ICC*.