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DETERMINING SAMPLE SIZE FOR RESEARCH ACTIVITIES

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The ever increasing demand for research has created a need for an efficient method of determining the sample size needed to be representative of a given population. In the article "Small Sample Techniques," the research division of the National Education Association has published a formula for determining sample size. Regrettably a table has not bee available for ready, easy reference which could have been constructed using the following formula.

$$s = X^2NP(1-P) \div d^2(N-1) + X^2P(1-P).$$

s = required sample size.

X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).

N = the population size.

P = the population proportion (assumed to be .50 since this would provide the maximum sample size).

d = the degree of accuracy expressed as a proportion (.05).

No calculations are needed to use Table 1. For example, one may wish to know the sample size required to be representative of the opinions of 9000 high school teachers relative to merit pay increases. To obtain the required sample size enter Table 1 at N = 9000. The sample size representative of the teachers in this example is 368. Table 1 is applicable to any defined population.

The relationship between sample size and total population is illustrated in Figure 1. It should be noted that as the population increases the sample size increases at a diminishing rate and remains relatively constant at slightly more than 380 cases.

REFERENCE

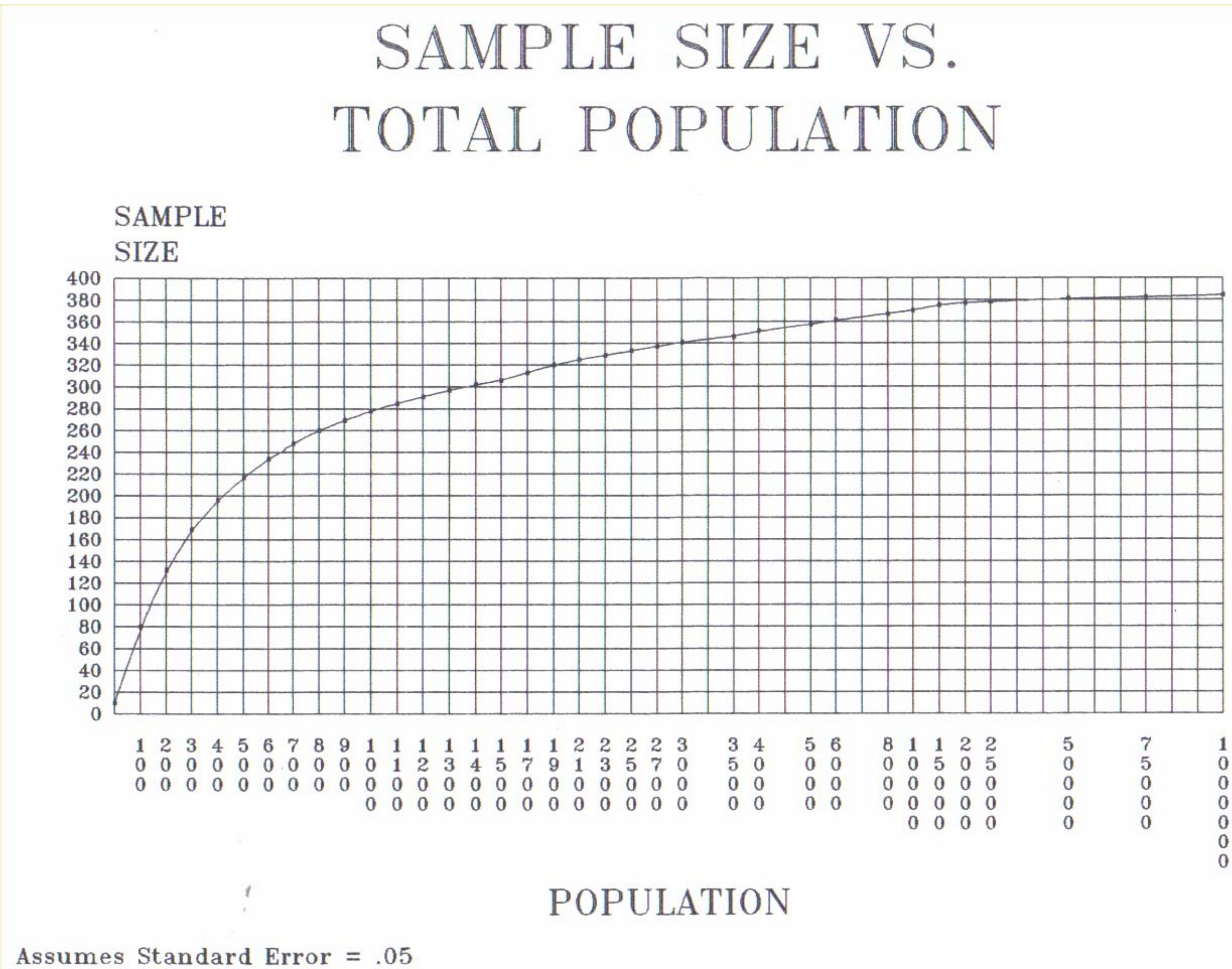
Small-Sample Techniques. *The NEA Research Bulletin*, Vol. 38 (December, 1960), p. 99.

TABLE 1

Table for Determining Sample Size from a Given Population

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size.
S is sample size.


SAMPLE SIZE VS.
TOTAL POPULATION
SAMPLE
SIZE
400
380
360
340
320
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1700 1900 2100 2300 2500 2700 3000 3500 4000 5000 6000 8000 10000 15000 20000 25000 50000 75000 1000000
POPULATION
Assumes Standard Error = .05

FORMULAE FOR DETERMINING NEEDED SAMPLE SIZES

POPULATION SIZE UNKNOWN:

$$\text{SAMPLE SIZE} = \frac{\left(\dfrac{\text{RANGE}}{2}\right)^2}{\left(\dfrac{\text{ACCURACY LEVEL}}{\text{CONFIDENCE LEVEL}}\right)^2}$$

Confidence Levels:

	α	$\alpha/2$
.10 level =	1.28	1.64
.05 level =	1.64	1.96
.01 level =	2.33	2.58
.001 level =	3.09	3.29

Accuracy Levels:

Range X Desired Level of Accuracy (expressed as a proportion)

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POPULATION SIZE KNOWN:

$$\text{SIZE} = \frac{X^2 NP\,(1-P)}{d^2\,(N-1) + X^2 P\,(1-P)}$$

X^2 = table value of Chi-Square @ *d.f.* = 1 for desired confidence level
.10 = 2.71 .05 = 3.84 .01 = 6.64 .001 = 10.83
N = population size
P = population proportion (assumed to be .50)
d = degree of accuracy (expressed as a proportion)