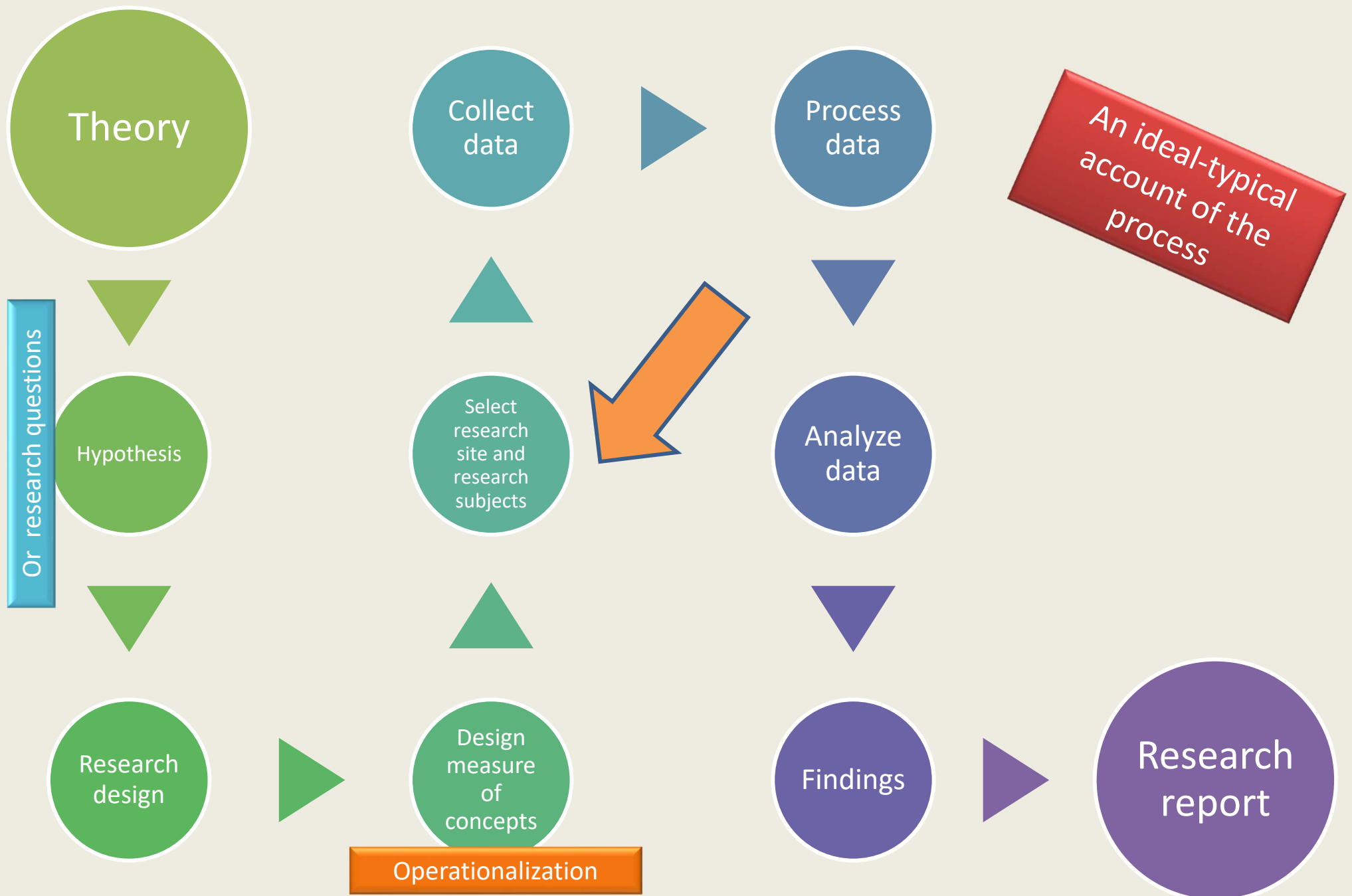


Quantitative research process



Basic terms

Population: The universe of units from which the sample is to be selected. Units may be people, communities, regions, books, newspaper articles, etc.

Census: The exploration of an entire population.

Sample: A subset of the population that is selected for investigation.

Probability sample: A sample that has been selected using random selection so that each unit in the population has a known chance of being selected.

Non-probability sample: A sample that has not been selected using random selection.

Representative sample: A sample that accurately reflects the population. Is more likely to be the outcome of probability sampling method.

Examples:

Data Collection & Analysis

The data for this article were collected from seventh-grade students at a middle school in a midwestern college town in the United States. All of the students were given questionnaires about their use of different media, focusing on their use of instant messaging, text messaging, and other technology (computer, Internet, email, television, telephones, etc.). In addition, the questionnaires asked the students whom they consider to be their friends and, if they use SITs, with whom they IM and text message. There were 40 respondents to the questionnaire, all of them between 11 and 13 years old. Eleven of the respondents were male and 29 were female.

Methods: A total of 68 nurses (76% women) and 55 laypeople (62% women) were asked to identify, through free association, the most frequent common pains that people in general associate with the typical man and woman, respectively, and also to report their personal past pain experiences. A content analysis was used to categorize and quantify participants' responses. A multiple correspondence analysis was performed to identify gendered patterns of common pains, followed by a cluster analysis to classify participants according to their endorsed patterns.

3. Method

Participants. We recruited 154 students at a Hungarian university. Participants were native Hungarian speakers who volunteered without compensation to take part in the 30-min study. In order to ensure that participants had their mobile phones out of sight, they were told to put away all of their belongings when they arrived for the study. Ten participants, who did not comply with the instruction, were excluded. Five participants, who did not finish the survey and left variables unanswered, were also excluded. That left 139 people in the sample (Mean age = 23.19, $SD = 4.32$; 102 female, 37 male). The study was approved by one of the authors' Institutional Committee of Science and Research Ethics.

J.B. Walther / Computers in Human Behavior 23 (2007) 2538–2557

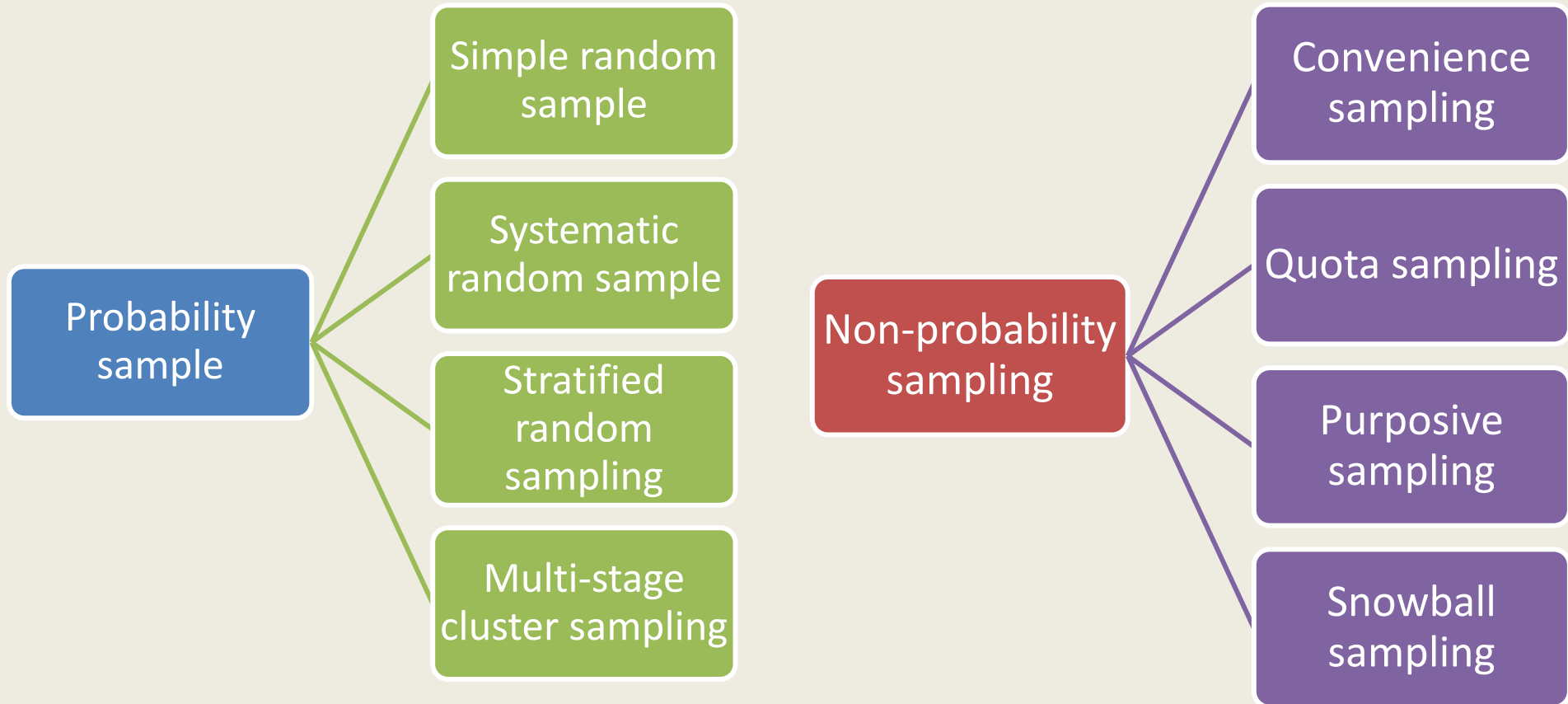
2545

3. Methods

3.1. Participants

Sixty individuals were recruited from a large undergraduate university course. Participation was rewarded by extra course credit. Solicitation for subjects included the qualification that they used e-mail in the previous month. Failure to attend the experiment resulted in the loss of six subjects. The final sample consisted of 26 females and 28 males. Their ages ranged from 18 to 23, with a mean of 19.69 years ($SD = 1.03$).

Types of sampling



Types of probability sample

Simple random sample

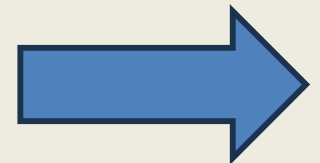
The most basic form of probability sample.

Key steps:

1. *Define the population*
2. *Select or devise a comprehensive sampling frame*
3. *Decide your sample size*
4. *List all the units of the population and assign them consecutive numbers from 1 to N.*
5. *Select n different random numbers that lie between 1 and N using a table of random numbers or a random generator computer program.*

Sampling frame:

The listing of all units in the population from which the sample will be selected.



1. A contest is randomly picking winners based on their entry number. Use the random number table below to select 10 winners based on their entry number out of the 748 people who entered the contest.

Range: 1 to 748

Winners: 489, 22, 182, 4, 167, 392, 572, 112, 64, 571

60887	21345	71859	24662	41925	17217	<u>00471</u>	78647	89339	59831	28208
24801	18550	98783	73139	37906	85194	93550	<u>06499</u>	36892	33360	83526
00567	75273	42650	66127	99570	83688	<u>16794</u>	96389	34734	48521	04399
97995	89609	01655	27627	61749	36080	<u>39232</u>	<u>57138</u>	12071	72619	27798
12314	42673	68706	85260	24343	64837	81353	33435	02558	71795	94842
21897	07428	52255	16679	42051	89425	<u>57263</u>	85927	33217	51326	81191
30275	82255	86968	71798	62093	<u>48910</u>	<u>11248</u>	08788	66356	20572	73089
14375	33074	70926	63877	10934	<u>02230</u>	96357	19982	06348	70518	77713
37001	73178	36493	52782	97926	<u>18231</u>	84335	29583	94827	95712	88039

random number generator
computer software
<https://www.bitsdujour.com/software/random-number-generator>

table of random numbers
<https://study.com/skill/learn/how-to-use-a-random-number-table-to-simulate-a-simple-event-explanation.html>

File Tutorial Purchase About

Generate Integers

All Numbers

Use only certain digits?

0 1 2 3 4 5 6 7 8 9

Generate Floating Point

Precision (Decimal Places) 2

Generate how many 100000

Minimum Value 0

Maximum Value 100

Delimiter (Blank for newline) .

Unique Numbers? (May take longer)

Status: Complete.

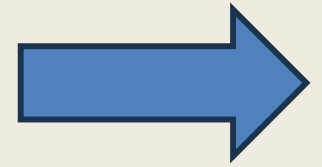
Results:

77,37,84,55,28,95,7,25,26,2,7,81,7,30,29,27,71,67,62,16,57,70,95,21, 59,39,79,16,56,24,26,98,67,45,28,21,37,48,4,60,44,81,68,2,32,94,27, 62,68,65,99,16,26,56,58,71,93,84,6,50,5,26,70,9,1,46,18,74,7,42,5,8, 47,29,48,93,72,36,16,55,17,32,52,93,89,84,20,48,70,24,73,93,52,59,4 9,41,94,93,94,94,5,80,1,97,52,99,86,32,93,59,83,34,34,22,61,25,13,5 6,72,81,6,12,18,22,64,25,54,24,63,40,97,58,96,64,81,55,73,45,24,97, 61,68,21,27,34,88,68,90,62,78,4,98,17,3,84,17,4,27,73,84,22,38,67,4 4,45,98,38,12,27,18,3,66,41,65,21,62,32,84,13,66,2,50,7,26,17,48,10, 55,40,69,99,51,89,43,46,30,18,84,61,93,28,73,62,18,99,53,71,67,44,6 1,36,32,99,77,73,93,23,0,38,15,37,54,22,52,77,6,74,94,80,27,41,29,9 3,62,42,30,0,35,64,71,87,73,78,65,19,61,90,29,51,14,7,74,60,84,33,1 5,2,81,91,15,98,29,69,47,37,39,85,81,11,14,90,1,75,74,81,43,27,6,51, 61,15,43,58,11,75,64,21,69,82,21,39,71,37,93,35,75,75,57,31,48,97,9 4,39,86,24,17,83,46,88,15,45,17,32,38,33,3,47,95,79,42,30,79,57,40, 63,22,30,41,25,68,20,10,23,78,2,53,50,54,27,50,69,90,63,25,17,54,71 29,43,82,96,61,63,9,86,100,40,20,44,73,100,27,93,45,55,69,70,31,69 38,52,35,35,36,97,13,86,43,14,68,28,27,62,55,95,62,68,28,36,89,69, 100,16,86,90,32,59,69,33,49,95,24,100,77,51,55,36,11,55,60,2,97,67, 33,70,53,44,93,42,4,14,34,95,49,90,97,53,47,100,82,83,33,45,64,10,5 6,84,50,70,44,38,56,75,93,27,4,9,81,25,55,49,5,42,56,12,49,37,16,22, 70,44,12,9,13,34,11,24,49,98,25,92,43,52,85,74,37,72,43,69,69,52,1, 30,10,85,59,11,28,72,94,37,78,57,60,2,16,79,18,83,35,60,82,91,34,13 99,41,5,69,52,42,44,42,83,25,96,8,46,82,14,12,84,40,50,4,31,53

NOTE: For large sets generated, not all values may be displayed in textbox. Instead, 'save output' to save all results.

Cancel Generate Numbers Save Output

Systematic random sample



A variation of the simple random sample is the systematic sample.

We don't need a table of random numbers or to assign numbers to the units of the population.

Key steps:

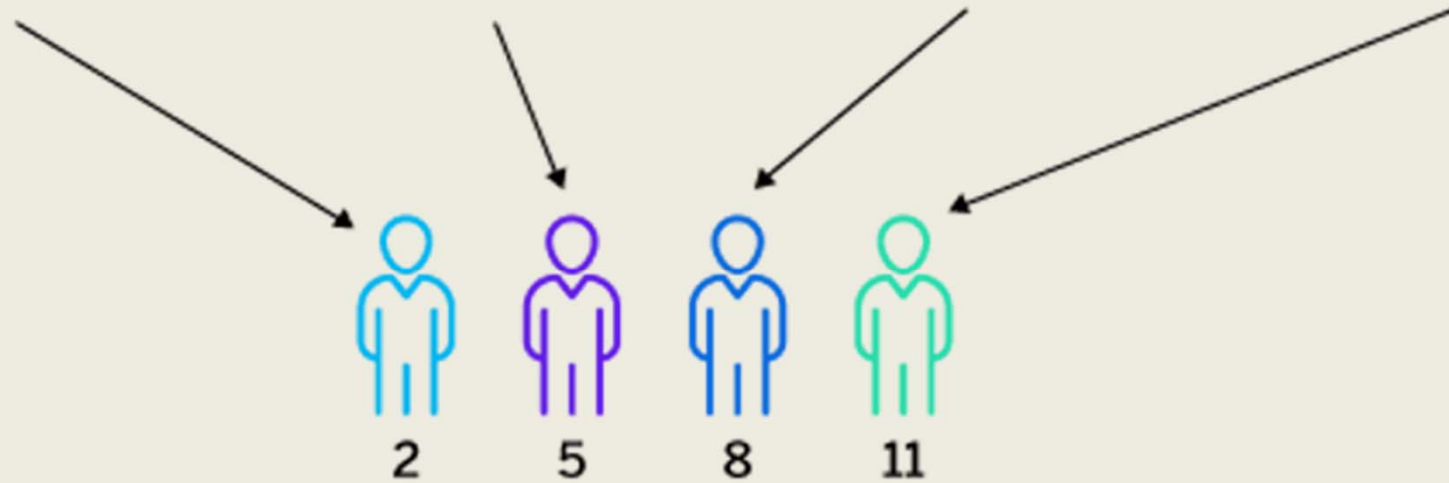
1. *Define the population*
2. *Select or devise a comprehensive sampling frame*
3. *Decide your sample size*
4. *Determine the sampling interval*
5. *Randomly select first unit of the sample, which is located between numbers 1 and k .*
6. *Include each k^{th} element in your sample*

Sampling interval: The population size divided by the desired sample size. Symbolized by the letter k .

$$k = \frac{N}{n}$$

k = systematic sampling interval
 N = population size
 n = sample size

Population



Sample (every 3rd person selected)

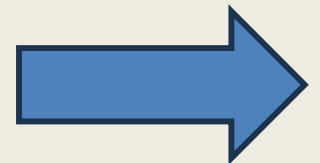
Stratified random sample

Sampling method in respect to a criterion

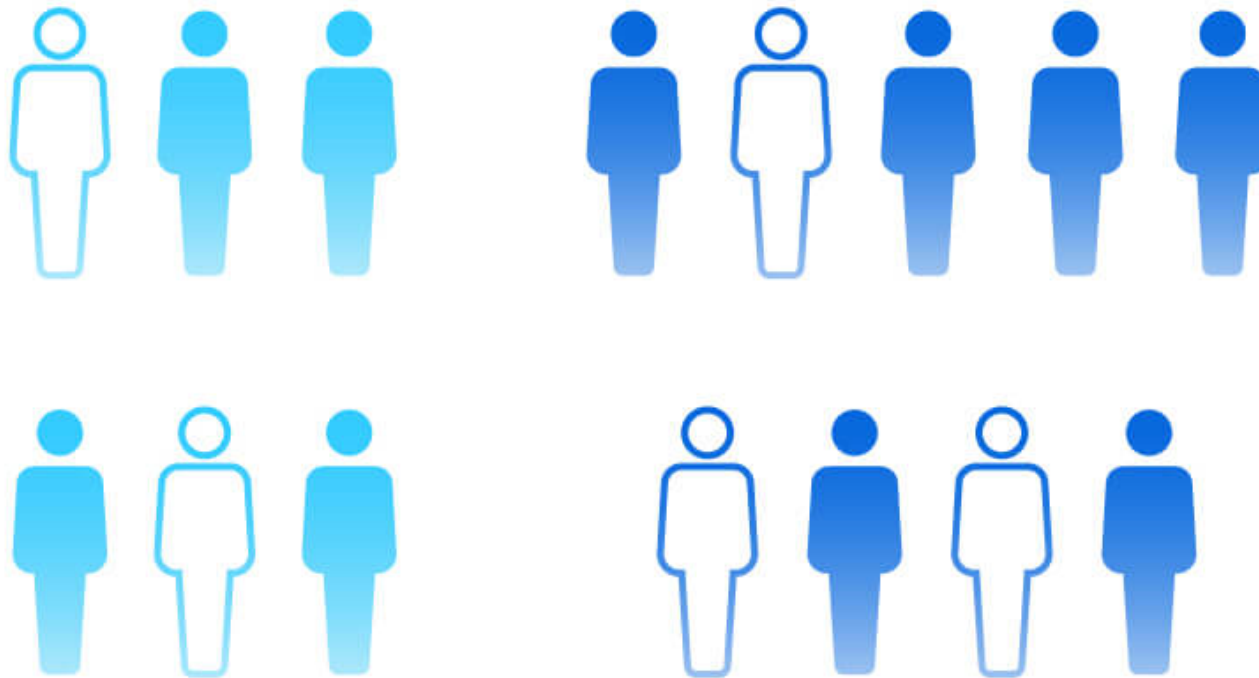
Key steps:

1. *Define the population*
2. *Select or devise a comprehensive sampling frame*
3. *Decide your sample size*
4. *Stratify the sampling frame and give the units in each set identifying numbers. The sets are stratified by a stratification variable.*
5. *Draw a random sample from each of the groups (either with simple random sample method or systematic method)*
6. *Combine the sets of randomly selected samples and you have the final sample*

Stratification variable: The variable on which the population units are divided for the purpose of stratified sampling.



Stratified Sample



[https://www.qualtrics.com/experience-management/research/stratified-random-sampling/#:~:text=Stratified%20random%20sampling%20\(also%20known,to%20complete%20the%20sampling%20p rocess.](https://www.qualtrics.com/experience-management/research/stratified-random-sampling/#:~:text=Stratified%20random%20sampling%20(also%20known,to%20complete%20the%20sampling%20p rocess.)

Multi-stage cluster sample

Key steps:

1. *Define the population*
2. *Select or devise a comprehensive sampling frame*
3. *Decide your sample size*
4. *Apply a probability sampling method to select clusters*

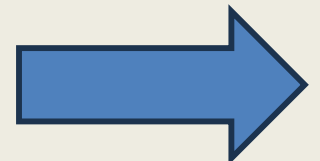
Cluster: A collective type of unit that includes multiple elements.

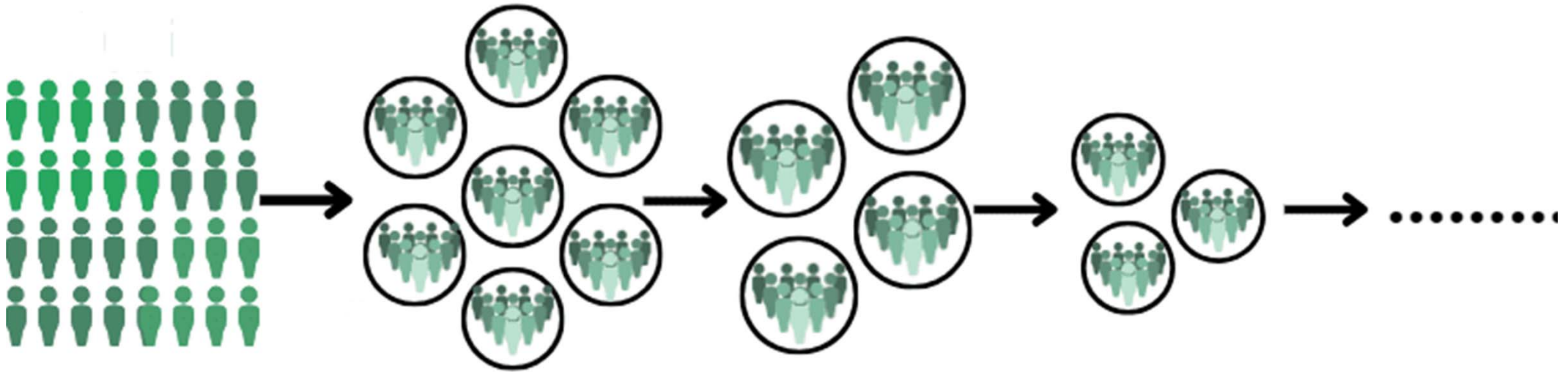
----- *One-stage cluster sampling* -----

5. *Draw a random sample from each of the units in each of the clusters selected in the first stage*

----- *Two-stage cluster sampling* -----

Clusters should be approximately the same size.





Population

Sample Clusters

Sample Clusters
within clusters

Clusters formed
by further dividing

First stage

Second stage

Third stage

Sample size

Sample size is affected by many different factors.

If your population is 100 people or fewer, then include the entire population in your study.

Examine other similar studies to get an idea of how many participants other researchers selected.

Use a sample size calculator to determine the sample size. For example: G-Power

Use a sample size table

Research Methods, Design, and Analysis by Larry B. Christensen, R. Burke Johnson, Lisa A. Turner (2015)

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TABLE 5.3

Sample Sizes for Various Populations of Size 10–50 Million

***N* stands for the size of the population. *n* stands for the size of the recommended sample. The sample sizes are based on the 95% confidence level.**

<i>N</i>	<i>N</i>	<i>N</i>	<i>n</i>	<i>N</i>	<i>n</i>	<i>N</i>	<i>N</i>	<i>N</i>	<i>n</i>
10	10	130	97	250	152	950	274	10,000	370
20	19	140	103	260	155	1,000	278	20,000	377
30	28	150	108	270	159	1,100	285	30,000	379
40	36	160	113	280	162	1,200	291	40,000	380
50	44	170	118	290	165	1,300	297	50,000	381
60	52	180	123	300	169	1,400	302	75,000	382
70	59	190	127	400	196	1,500	306	100,000	384
80	66	200	132	500	217	2,000	322	250,000	384
90	73	210	136	600	234	3,000	341	500,000	384
100	80	220	140	700	248	3,500	346	1,000,000	384
110	86	230	144	800	260	4,000	351	10,000,000	384
120	92	240	148	900	269	5,000	357	50,000,000	384

Numbers in table were calculated by author.

Calculate your sample size

Population Size ⓘ

100000

Confidence Level (%) ⓘ

95 ▼

Margin of Error (%) ⓘ

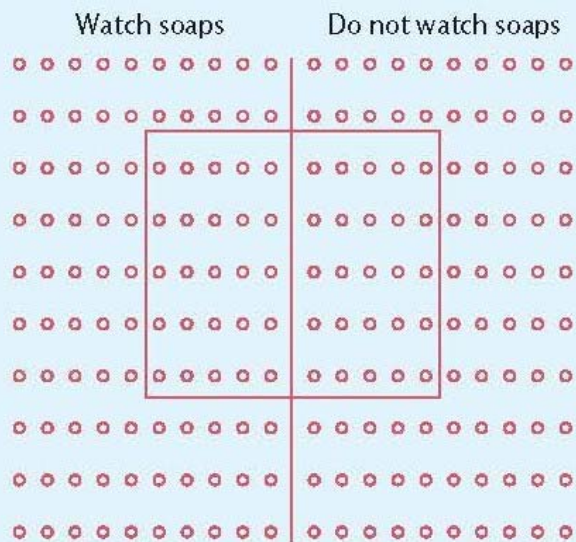
5

Sample size

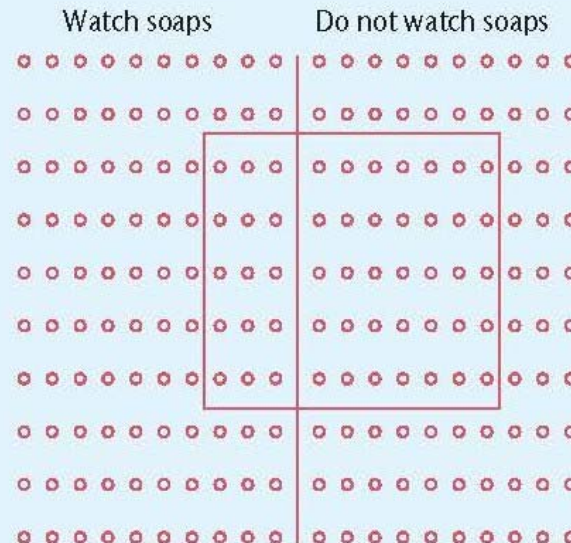
0

Sampling error & Sampling bias

A sample with no sampling error



A sample with a lot of sampling error



Sampling error: Error in the findings deriving from research due to the differences between the population and the sample.

Bryman, A. (2012). Social Research Methods, 4th Edition , pp.189-190.

Sampling bias: Refers to a nonrepresentative sample.

A biased sample may be produced when

- (a) Non-probability sampling methods are used
- (b) Sampling frame is inadequate
- (c) Sample members refuse to participate or are unattainable (non-response)

Types of non-probability sample

- ***Convenience sampling***: Use of people who are readily available, volunteer or are easily recruited.
- ***Quota sampling***: A researcher decides on the desired sample sizes (or quotas) for groups of people identified in the population. Convenience sampling follows to formulate the sample.
- ***Purposive sampling***: A researcher specifies the characteristics of the population of interest and then locates individuals who have these characteristics.
- ***Snowball sampling***: Each research participant is asked to identify other potential research participants who have a certain inclusion characteristic.