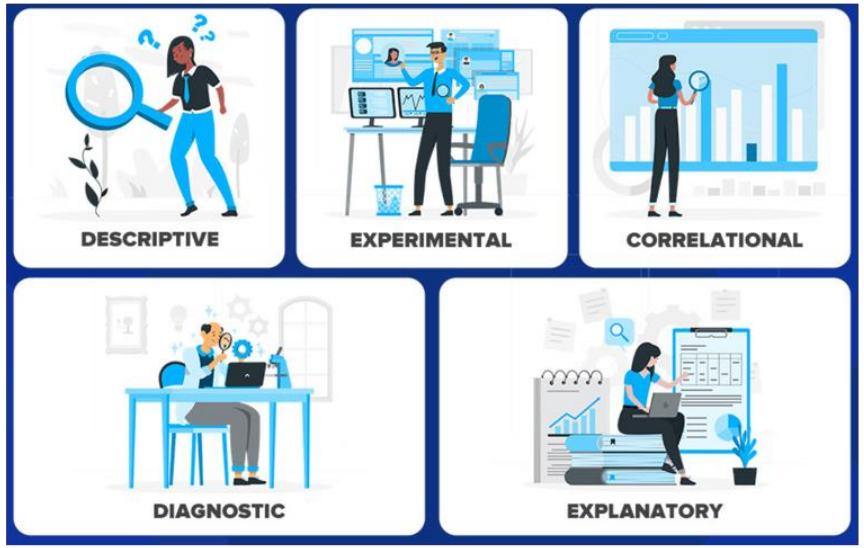
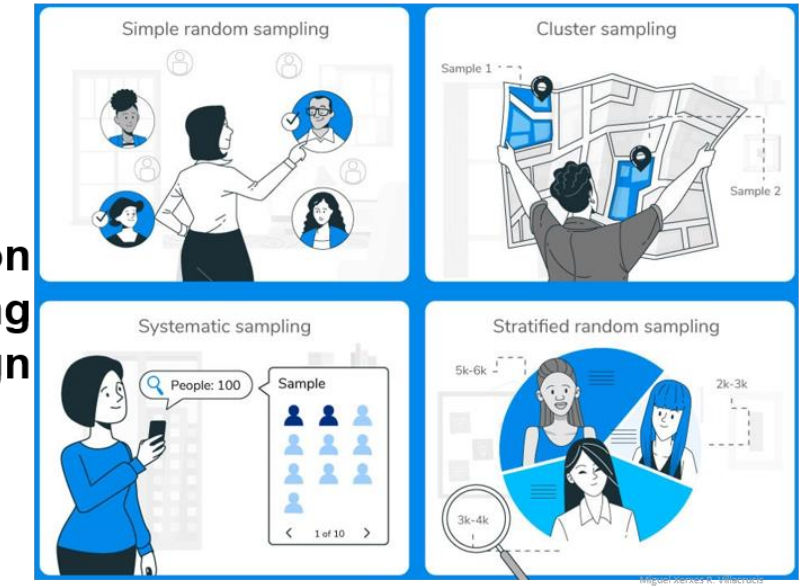


Research Design Identification

Miguel Xerxes R. Villacrucis

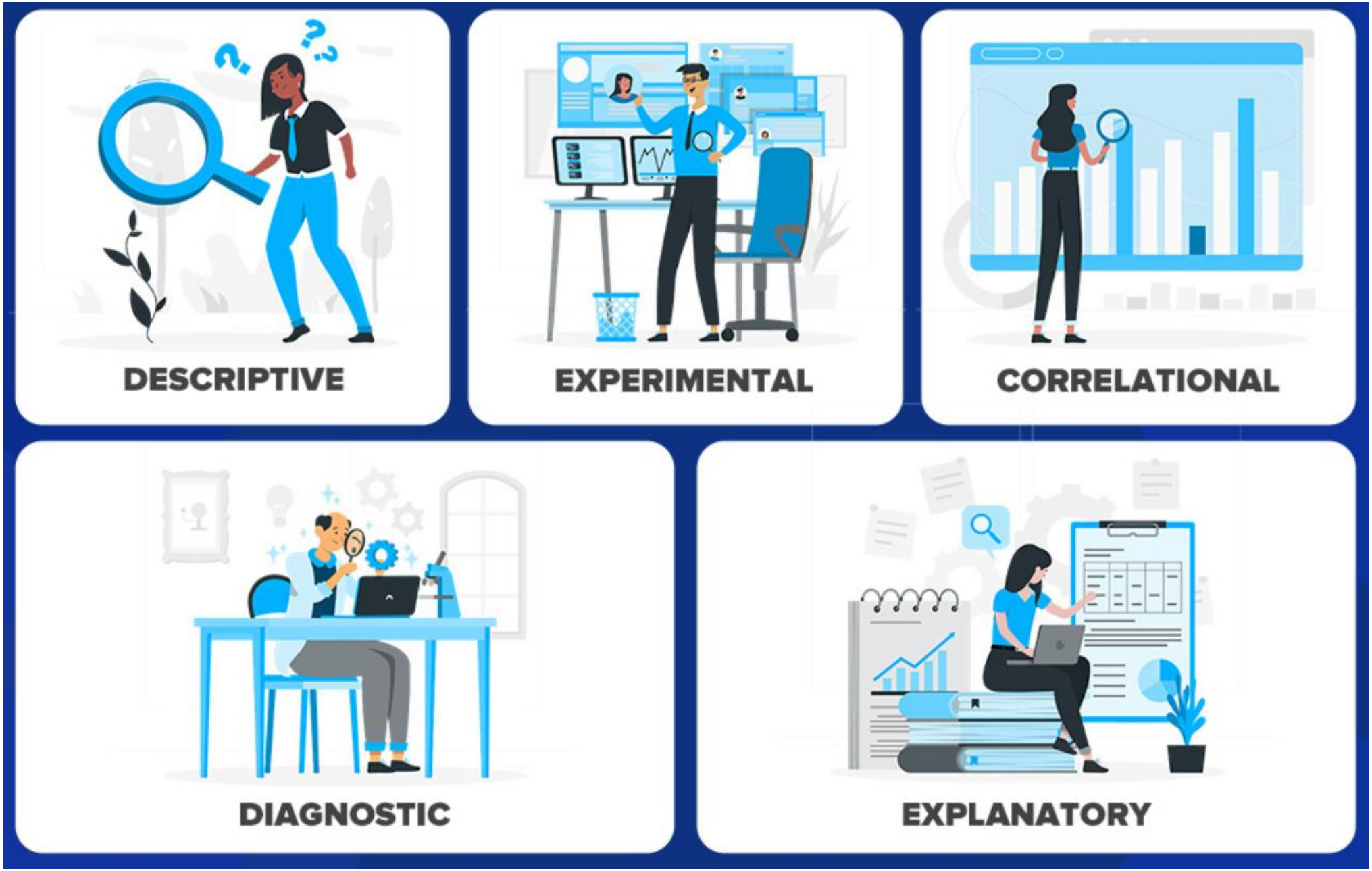
Population and Sampling Design



Use of Appropriate Research Instrument

Miguel Xerxes R. Villacrucis

Statistical Tools



Research Design Identification

Miguel Xerxes R. Villacrucis

A **research design** is a strategy for answering a research question. It defines the overall approach and determines how one will collect and analyze data.

Creating a research design means making decisions about:

(1) the overall research aims and approach

(2) the type of research design to be use

(3) the sampling or criteria for selecting respondents

(4) the data collection methods

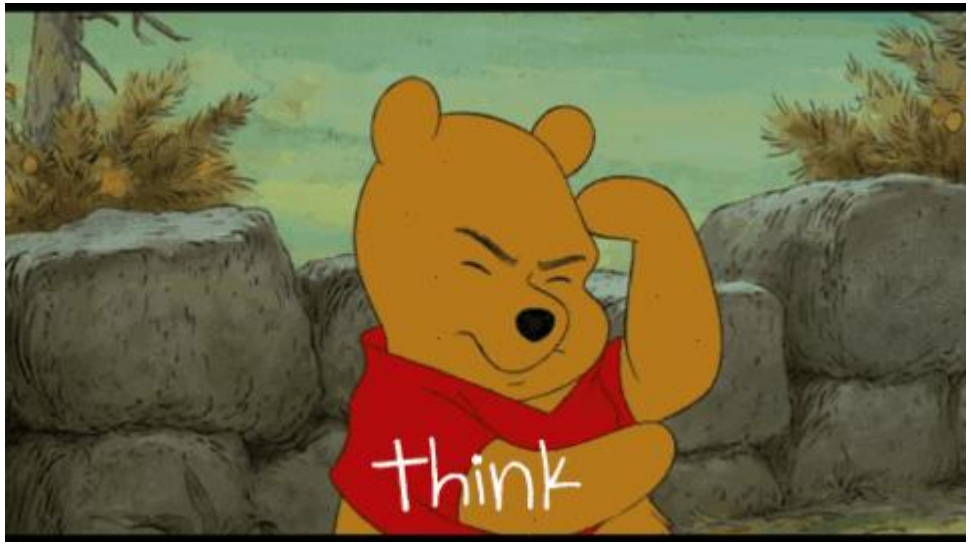
(5) the procedures to follow in collecting data

(6) the data analysis methods

Research Design Identification

(1) Overall research aims and approach

"How can teachers adapt their lessons for effective online learning?"



- Start by thinking about what you want to achieve.
- The first choice you need to make is whether you will take a qualitative or quantitative approach.

Research Design Identification

(1) Overall research objectives and approach

“How can teachers adapt their lessons for effective online learning?”

If your aim is to generate new ideas for online teaching strategies to explore exactly what teachers and students struggle with in online classes, a **qualitative approach** would make sense.

Research Design Identification

(1) Overall research objectives and approach

“How can teachers adapt their lessons for effective online learning?”

If your aim is to test the (extent of) effectiveness of an online teaching method by measuring the learning outcomes like grades and test scores, a **quantitative approach** is most suitable.

Research Design Identification

(1) Overall research objectives and approach

"How can teachers adapt their lessons for effective online learning?"

It is also possible to use a **mixed-methods** design that integrates aspects of both approaches so that you can gain a more complete picture of the problem you are studying and strengthen the credibility of your conclusions.

QUANTITATIVE RESEARCH

VS

QUALITATIVE RESEARCH

Research Design Identification

(2) The type of research design you will use

QUALITATIVE APPROACH

Understand subjective experiences, beliefs, and concepts

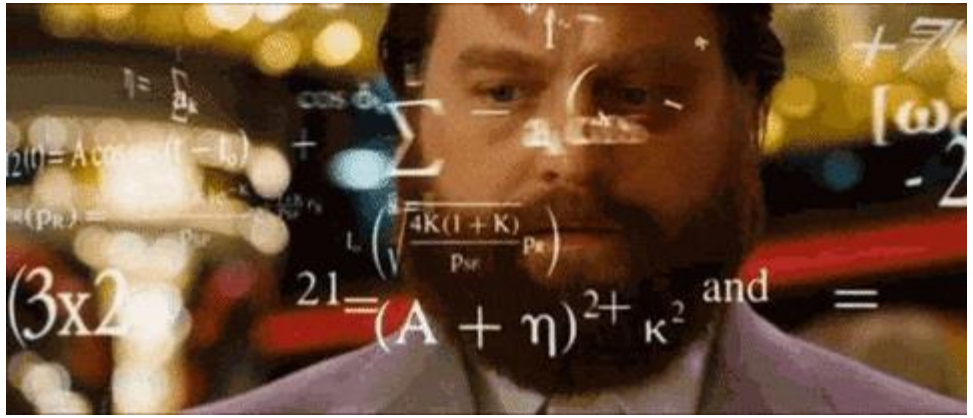
Gain in-depth knowledge of a specific context or culture

Explore under-researched problems and generate new ideas

Research Design Identification

(2) The type of research design you will use

QUANTITATIVE APPROACH



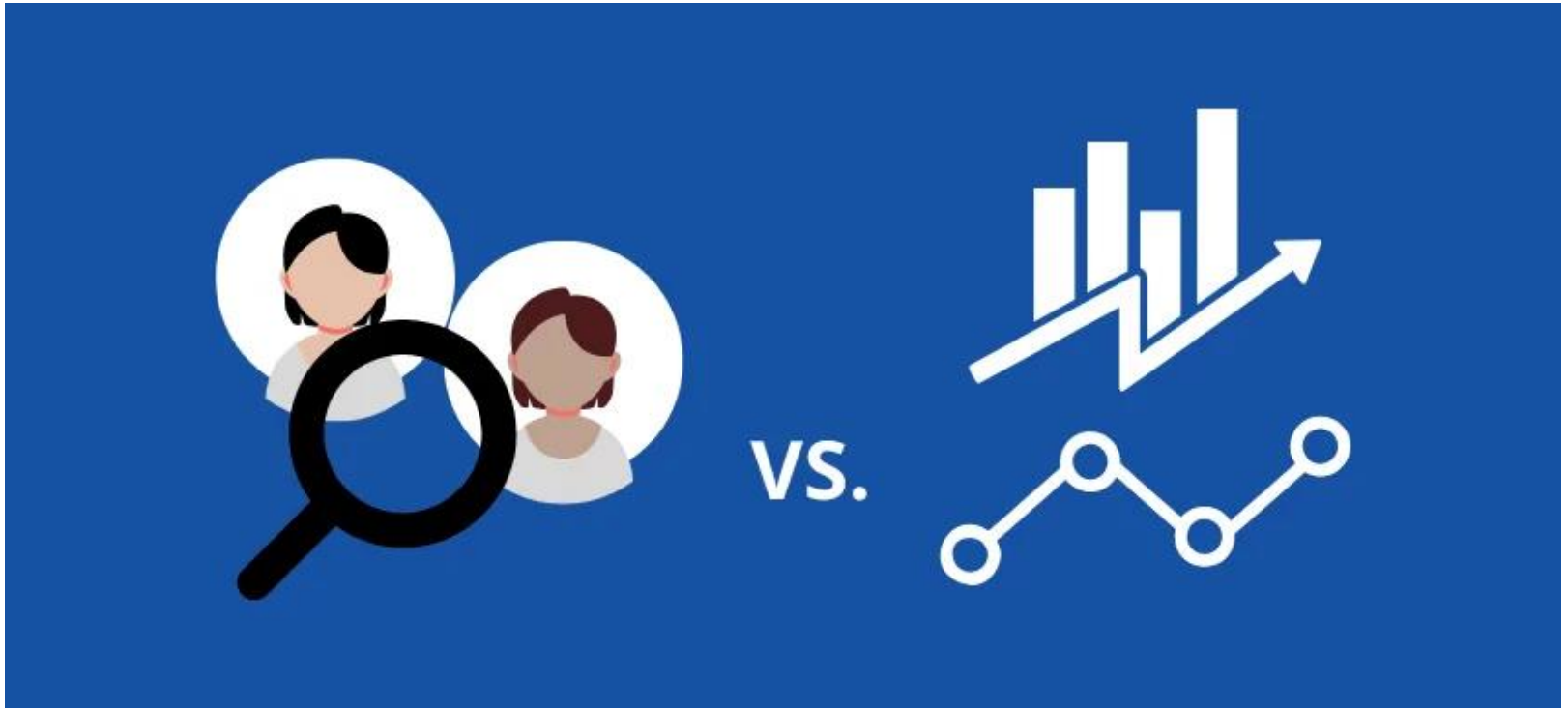
Measure variables and describe frequencies, averages, and correlations

Test hypotheses about relationships between variables

Test the effectiveness of a new treatment, program or product

Research Design Identification

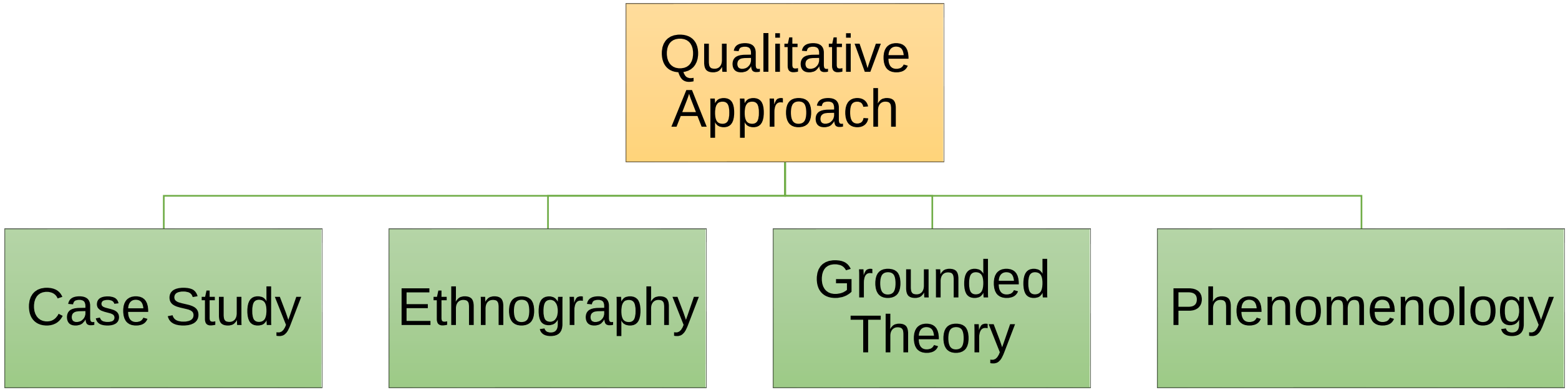
(2) The type of research design you will use



Within qualitative and quantitative approaches, there are several types of research design to choose from that provides a framework for the overall shape of your research.

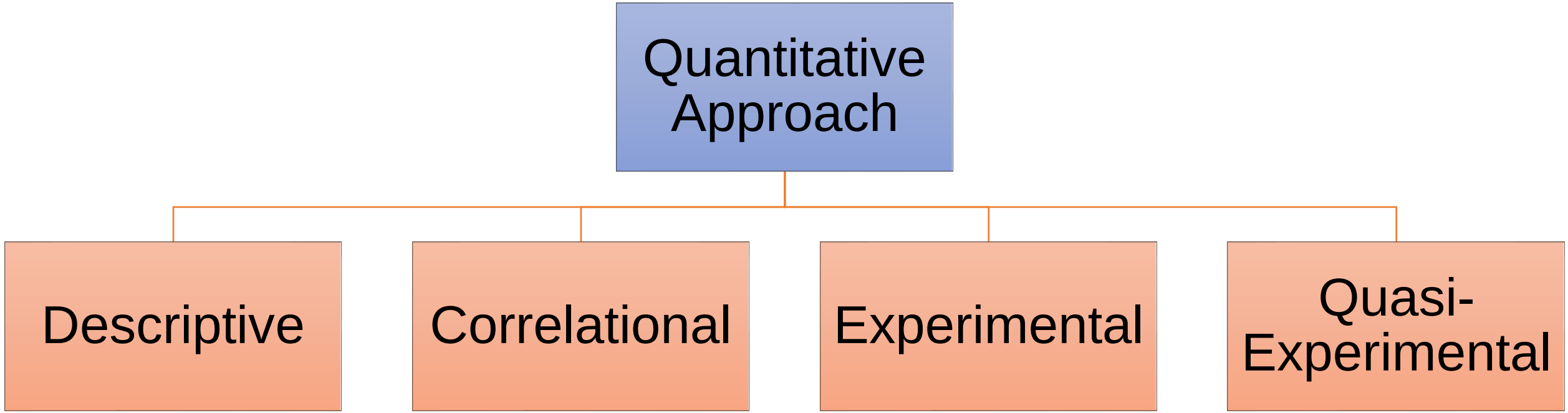
Research Design Identification

(2) The type of research design you will use



Research Design Identification

(2) The type of research design you will use



Type of design	Purpose and characteristics
Experimental	• Used to test causal relationships • Involves manipulating an independent variable and measuring its effect on a dependent variable • Subjects are randomly assigned to groups • Usually conducted in a controlled environment (e.g. a laboratory)
Quasi-Experimental	• Used to test causal relationships • Similar to experimental design, but without random assignment • Often involves comparing the outcomes of pre-existing groups • Often conducted in a natural environment

Type of design	Purpose and characteristics
Correlational	• Used to test whether (and how strongly) variables are related • Variables are measured without influencing them
Descriptive	• Used to describe characteristics, averages, trends, etc. • Variables are measured without influencing them

Research Design Identification

(2) The type of research design you will use

"How can teachers adapt their lessons for effective online learning?"

Descriptive Design

You can use descriptive design to get a picture of the extent of effectiveness in online teaching by getting the average of the students' test scores, grade point average (GPA) or their response to Likert-type questionnaire.

Research Design Identification

(2) The type of research design you will use

"How can teachers adapt their lessons for effective online learning?"

Correlational Design

You could use a correlational design to find out if the rise in online teaching in the past regular terms and short terms correlates with any change in test scores.

Research Design Identification

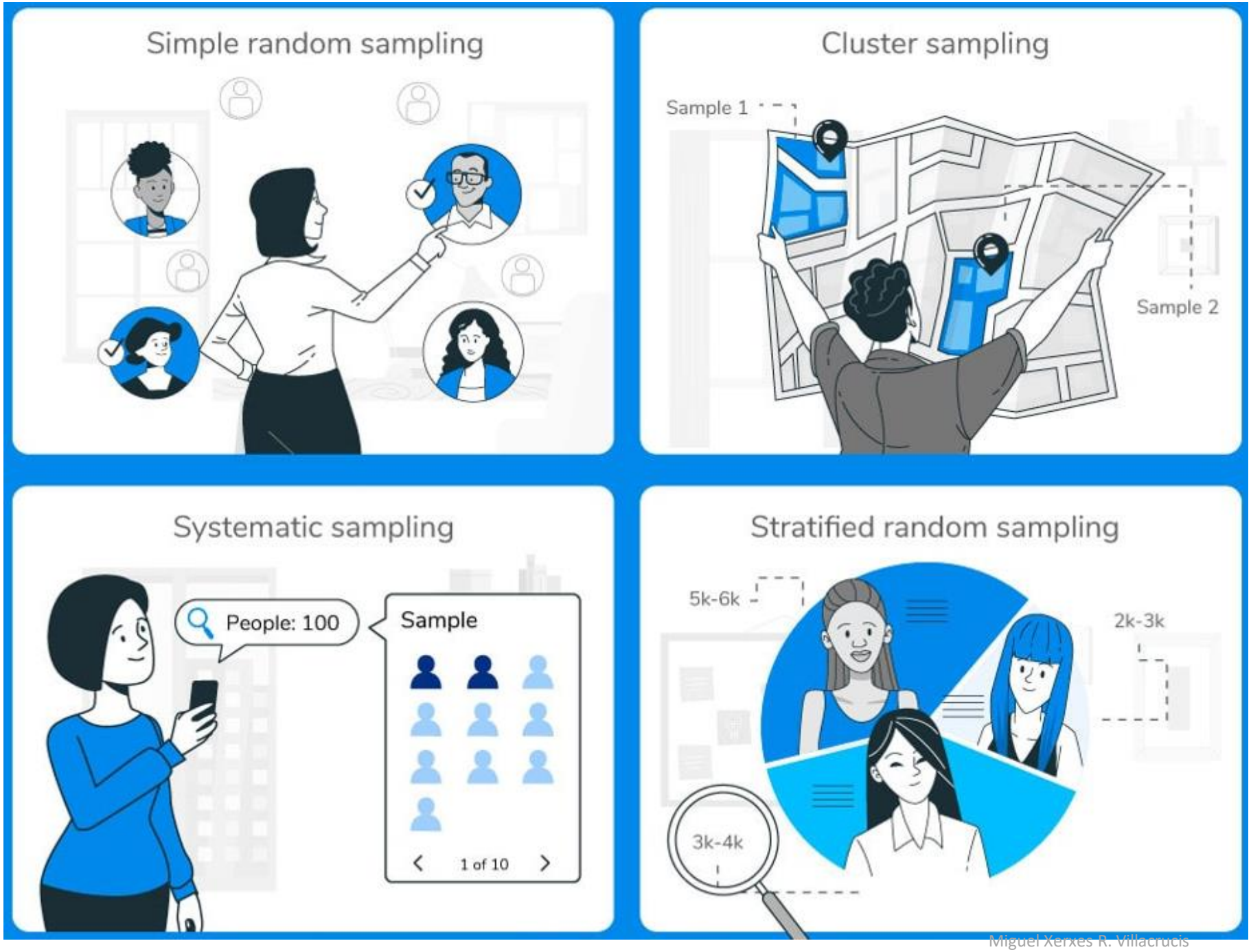
(2) The type of research design you will use

"How can teachers adapt their lessons for effective online learning?"

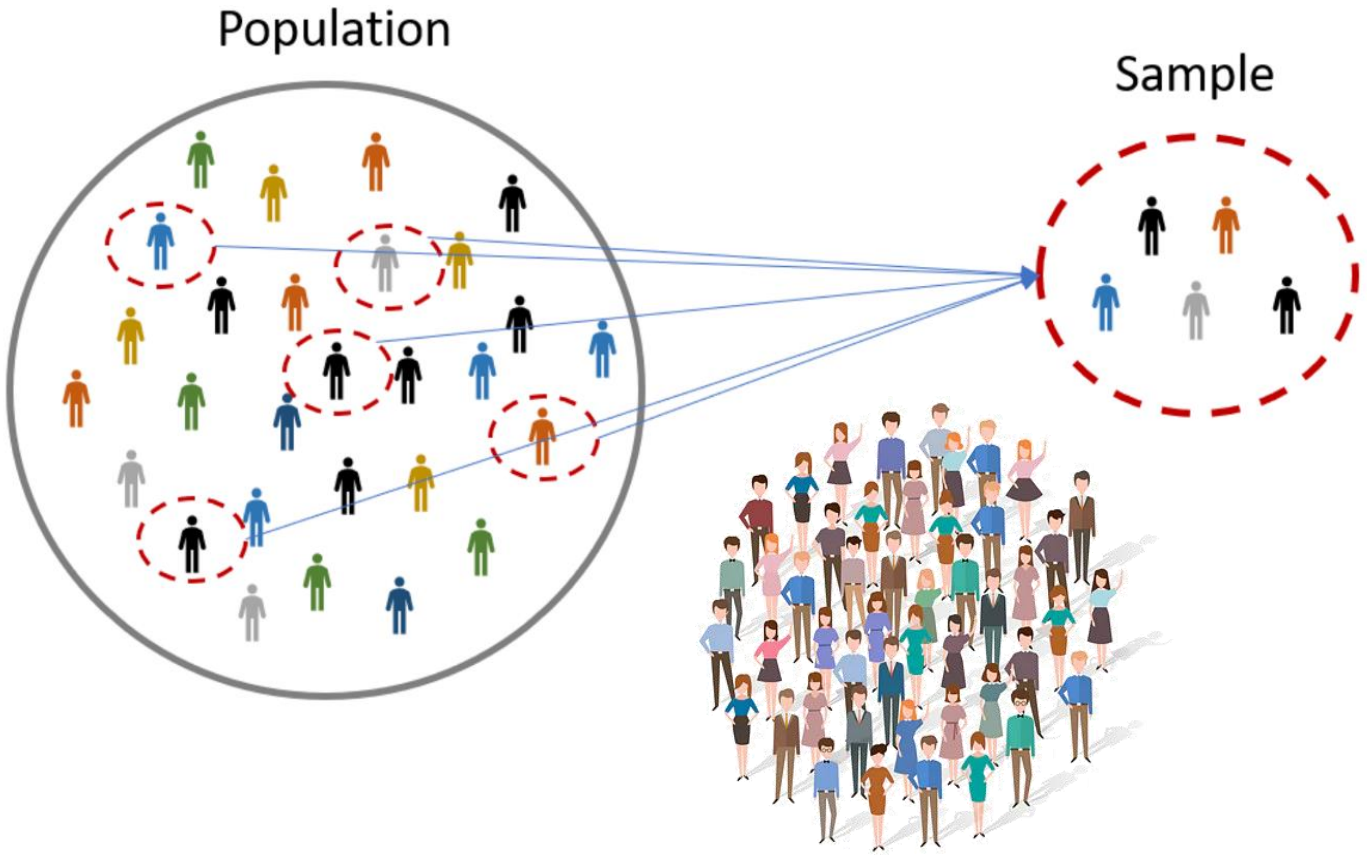
Quasi-Experimental or Experimental Design

You could gather a sample of students and then randomly assign half of them to be taught online and the other half to be taught in person. By comparing their outcomes in test scores, you can be more confident that it was the method of teaching (and not other variables) that caused any change in scores.

Population and Sampling Design

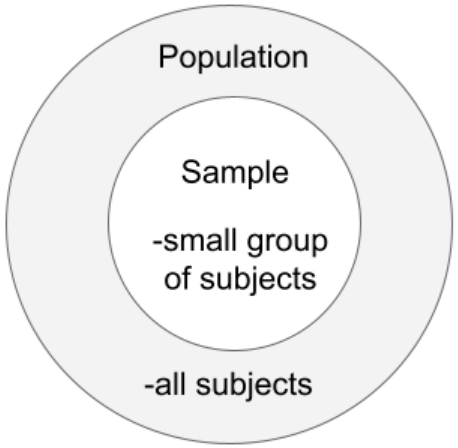


Your research design should clearly define who or what your research will focus on, and how you will go about choosing your participants or subjects.



In research, a **population** is the entire group that you want to draw conclusions about, while a **sample** is the smaller group of individuals you will actually collect data from.

POPULATION VS. SAMPLE



Population	Sample
It contains all members of a group.	It is a portion that represents the entire population.
Parameter	Statistic
Results are a true representation of opinion.	Results have a margin of error and confidence interval.
Deductive or descriptive	Inductive

Parameter
-is a measure which describes the entire population.

Sample
-is a measure which describes the sample.

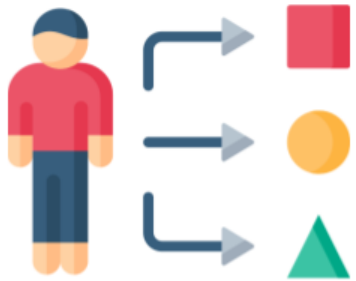
EXAMPLE

Population
Songs from "The Voice USA"

Population
All countries in Asia.

Sample
Winning songs from "The Voice USA" that were performed by a female.

Sample
All first world countries in Asia.



Population
Graduate students in the Philippines

Sample
350 graduate students from five top 5 universities in the Philippines.

Mr. Anderson, a school principal, asked the students in his school to respond to the question: "What school motto would you suggest for the upcoming school year?" Responders were given several choices and 85% of 1 863 responses chose Motto B.

Population
All students

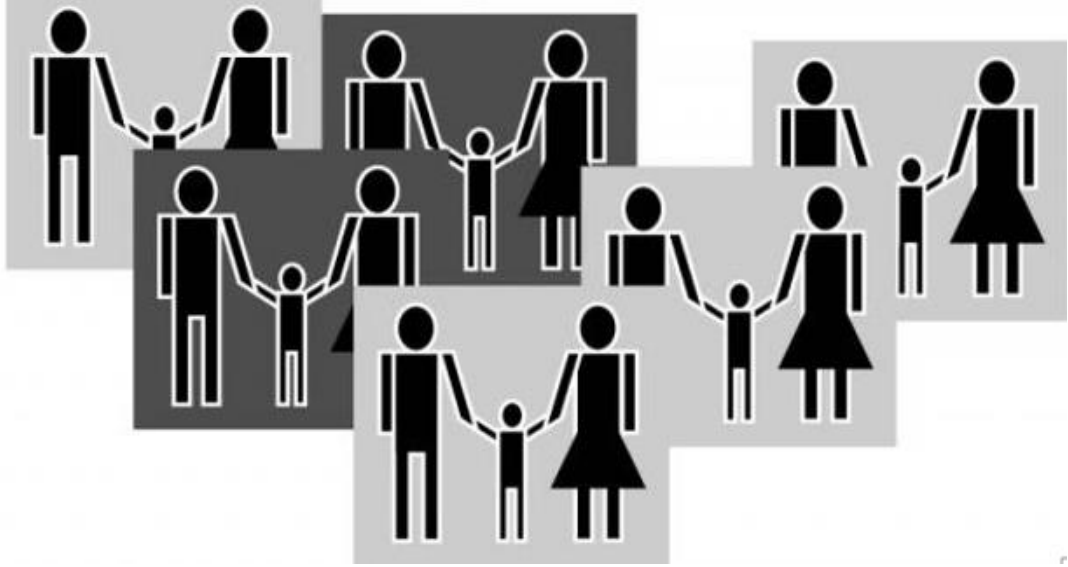
Sample
The 1 863 responses

For example, will you focus on students from a specific demographic, region or background? Are you interested in students with a certain characteristics like their gender, socio economic status, or whether they enrolled in a private or public institution.

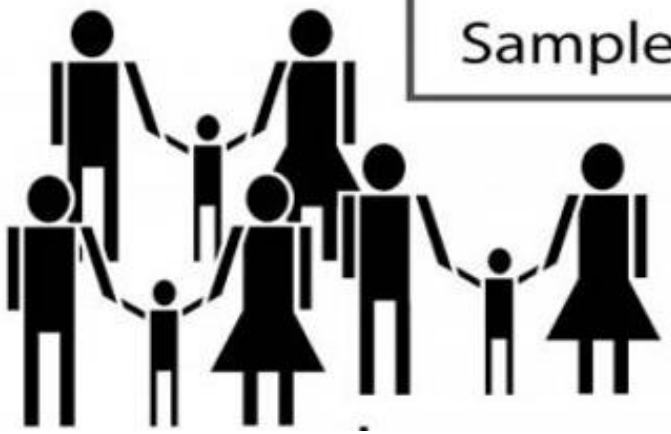
The more precisely you define your population, the easier it will be to gather a representative sample.

Population

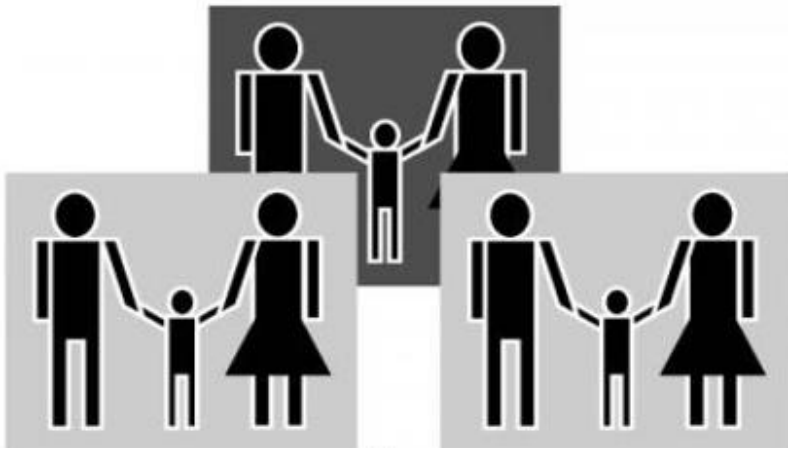
Population after statistical analysis



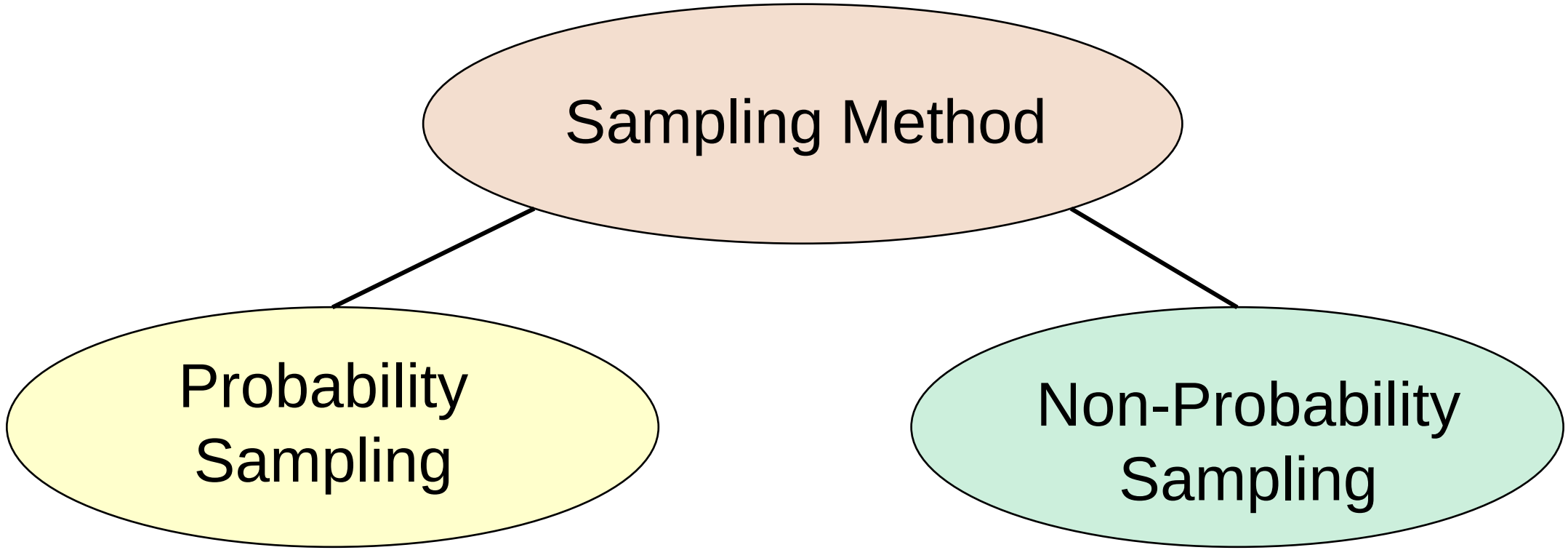
Sample



Statistical (inferential) analysis on the sample



The sampling method you use affects how confidently you can generalize your results to the population as a whole.

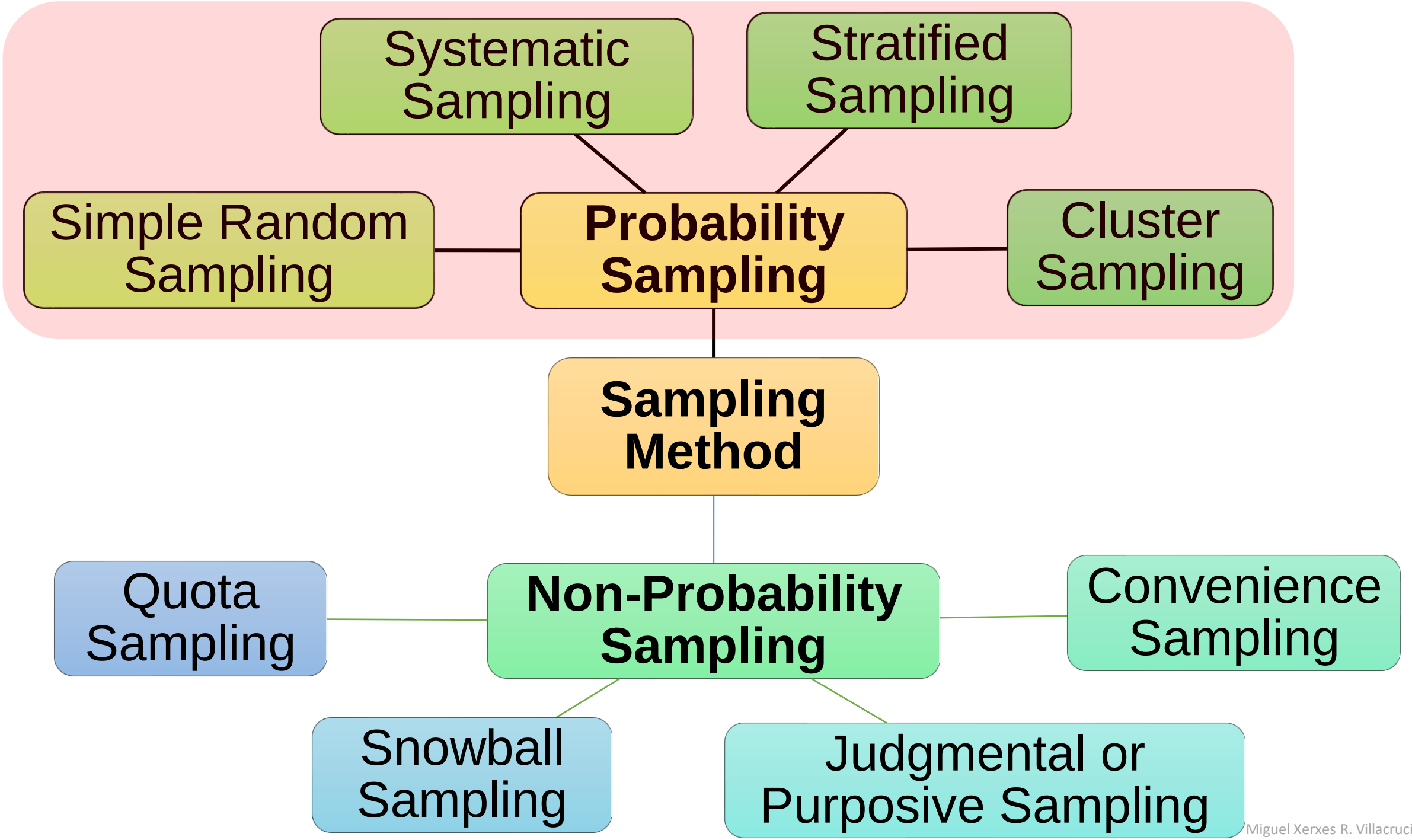


SAMPLING
is a process or procedure of taking samples from a population

Probability Sampling
a random sampling technique that each element (people or things) in a population has an equal chance of being selected.

Probability samples are selected in such a way as to be representative of the population.

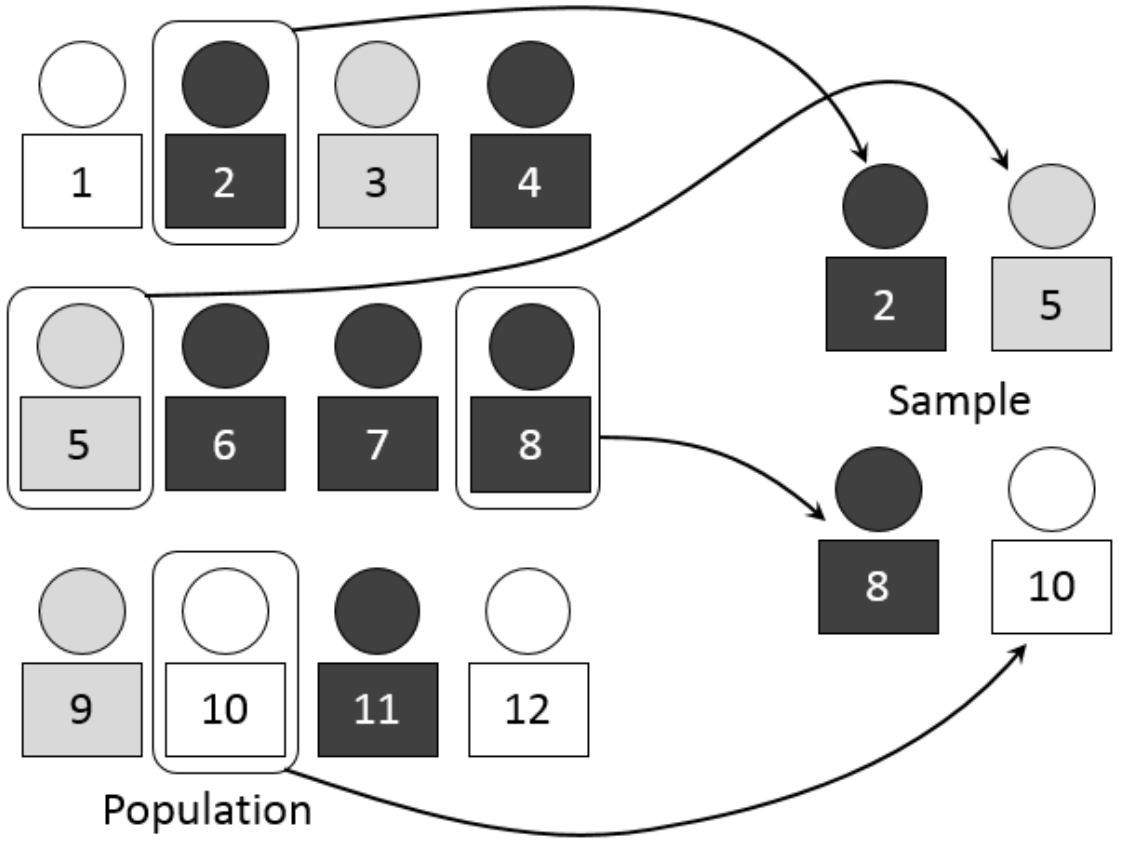
They provide the **most valid** or **credible results** because they reflect the characteristics of the population from which they are selected.



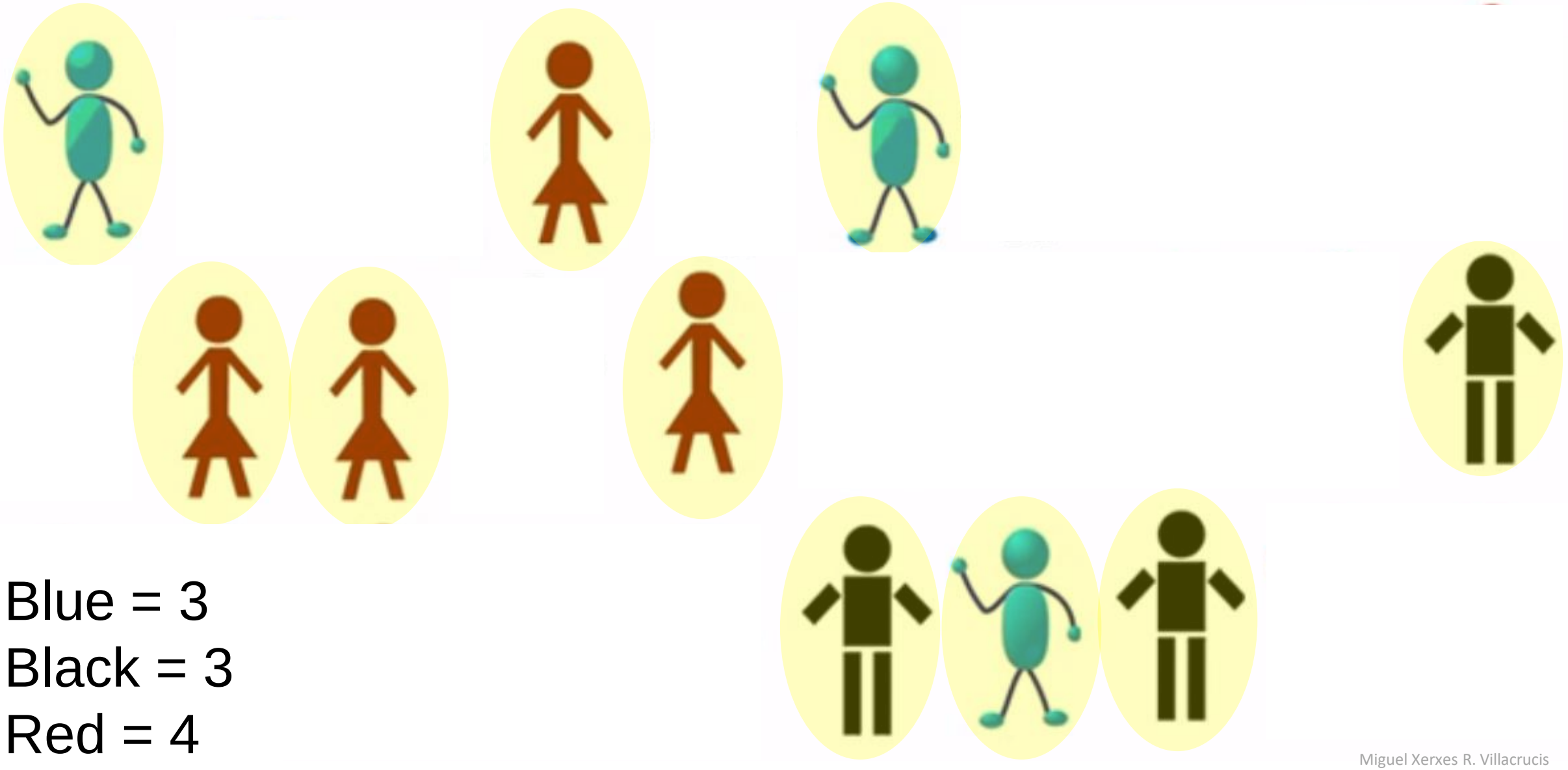
Simple Random Sampling (SRS)

- a process of selecting a sample from a population regardless of their characteristics (gender, economic status, religion, etc.)

- Each individual is chosen randomly and entirely by chance, such that each individual has the same probability of being chosen at any stage during the sampling process,



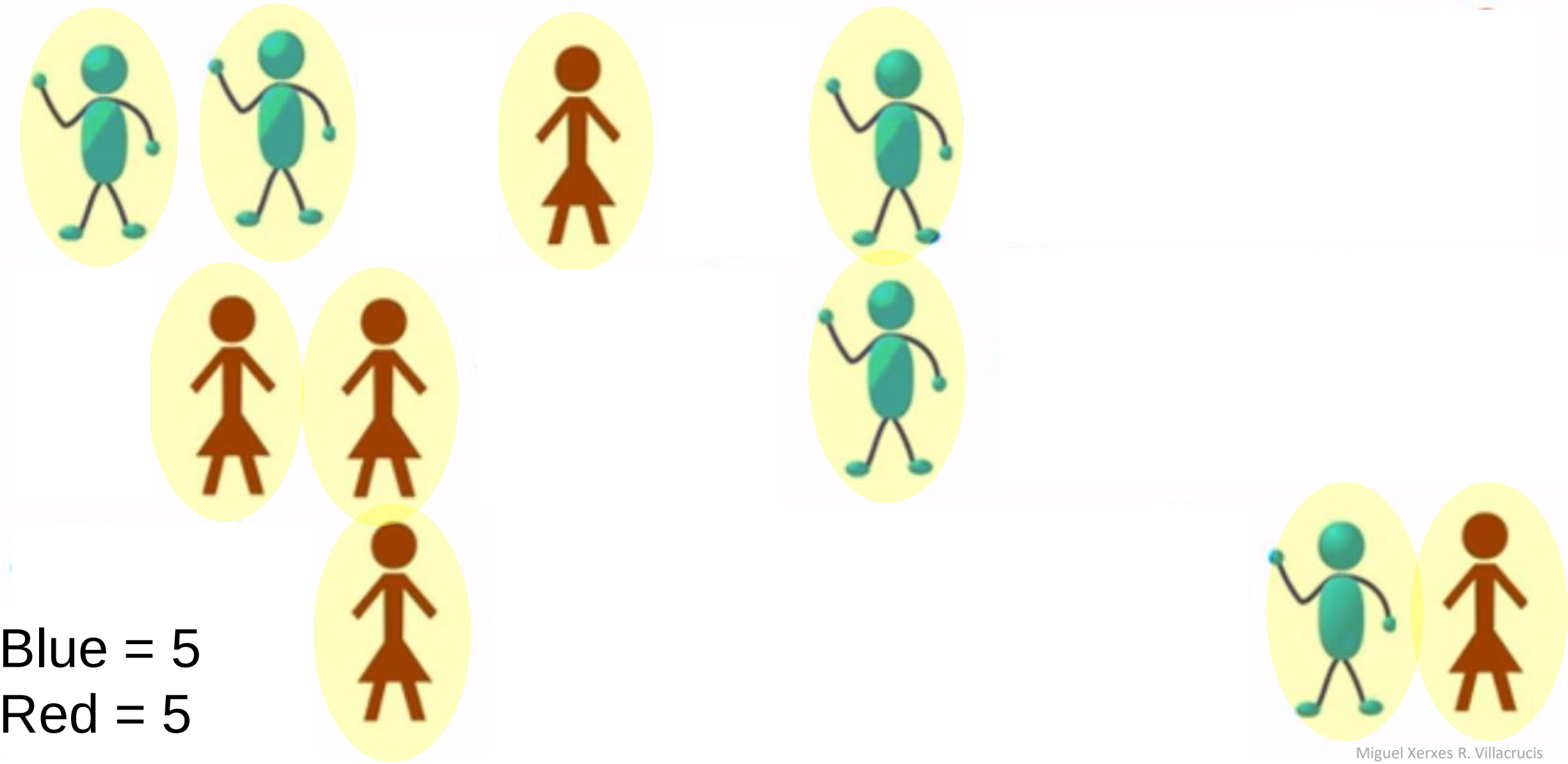
Simple Random Sampling (SRS) N = 30 Sample of n = 10



Blue = 3
Black = 3
Red = 4

Miguel Xerxes R. Villacrucis

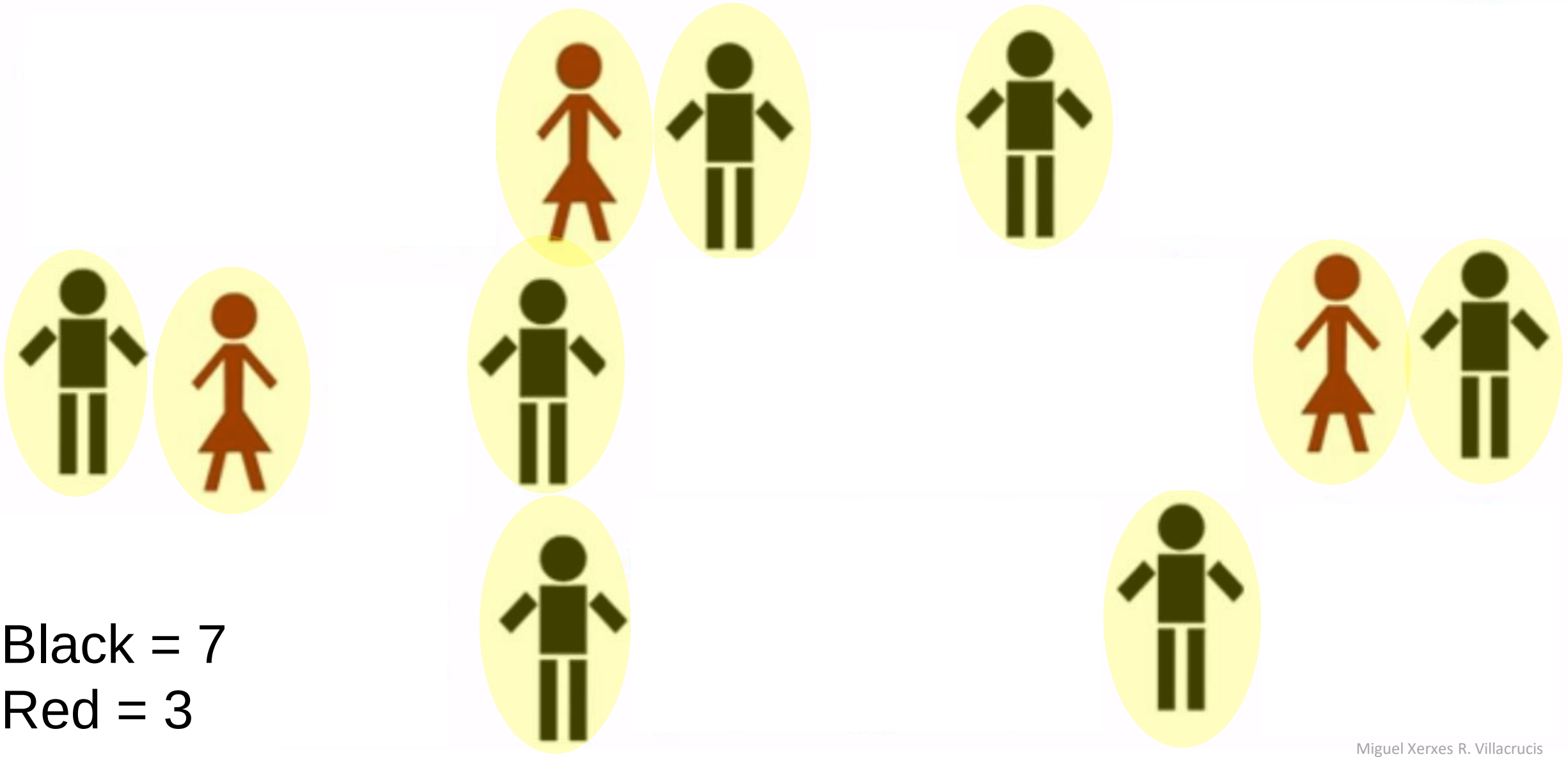
Simple Random Sampling (SRS) N = 30 Sample of n = 10



Blue = 5

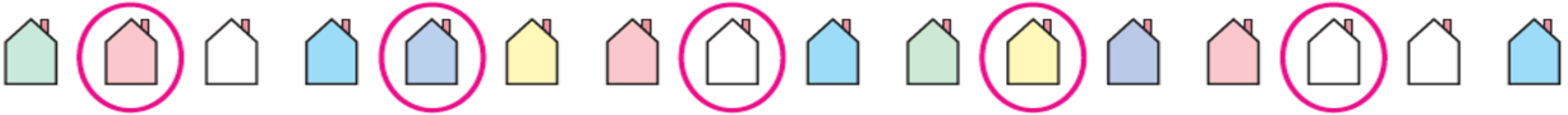
Red = 5

Simple Random Sampling (SRS) N = 30 Sample of n = 10



Black = 7
Red = 3

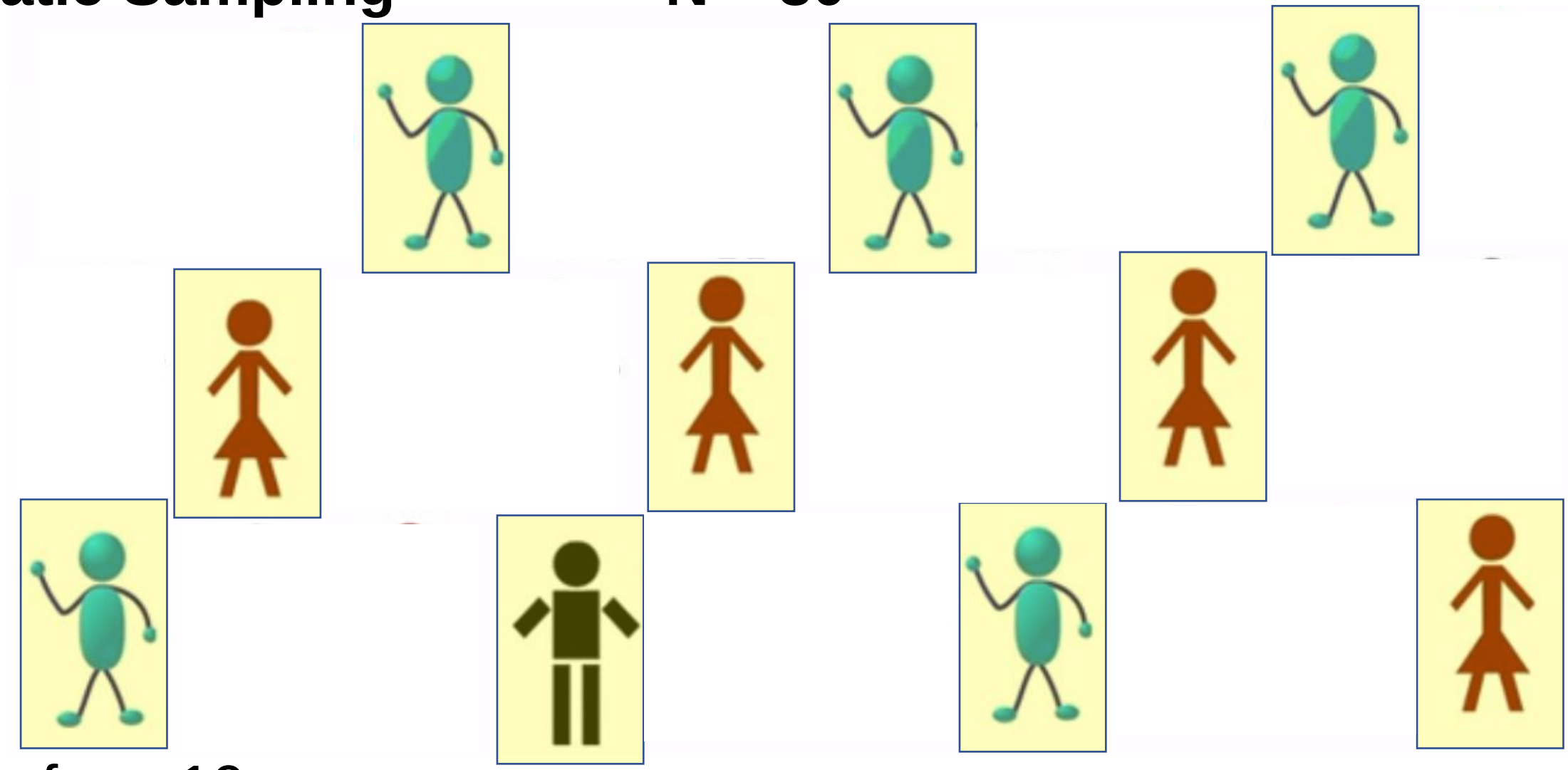
Miguel Xerxes R. Villacrucis



Systematic Sampling – is an alternative technique to simple random sampling (SRS).

Each member of a population is assigned a number and a starting number is randomly selected and then sample members are selected at a regular intervals from the starting number (every 3rd, 5th or 100th member is selected).

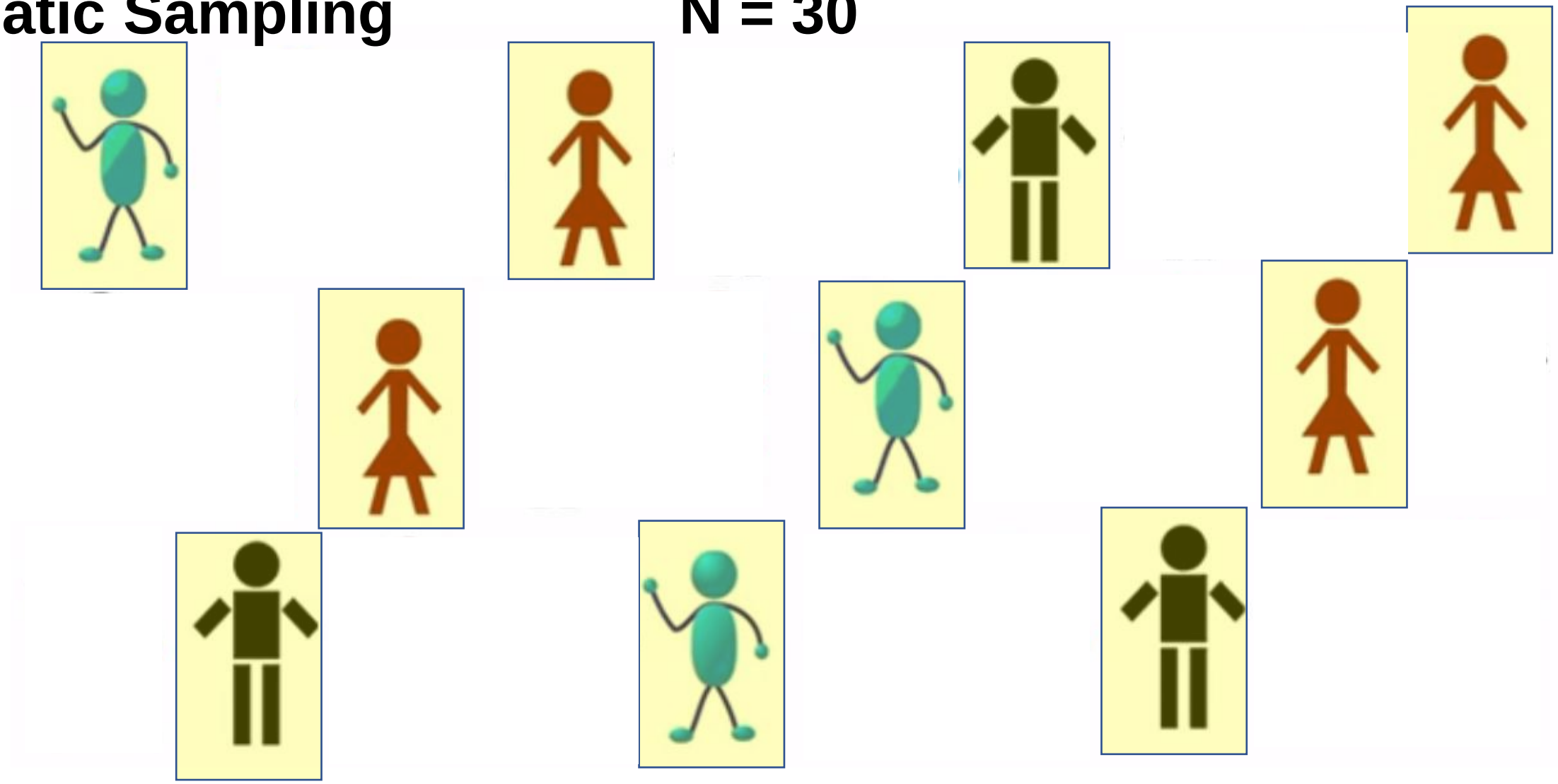
Systematic Sampling N = 30



Sample of n = 10

System: 30 ÷ 10 = 3 (every 3rd person)

Systematic Sampling N = 30

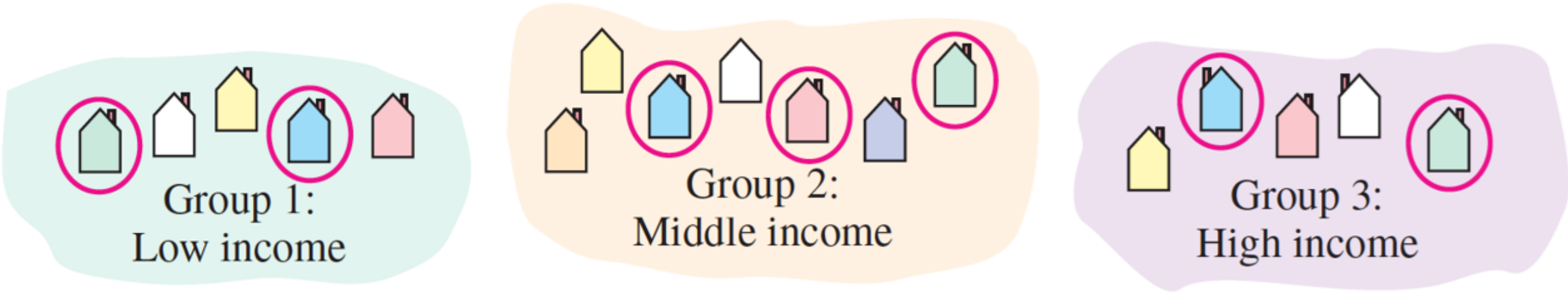


Sample of n = 10

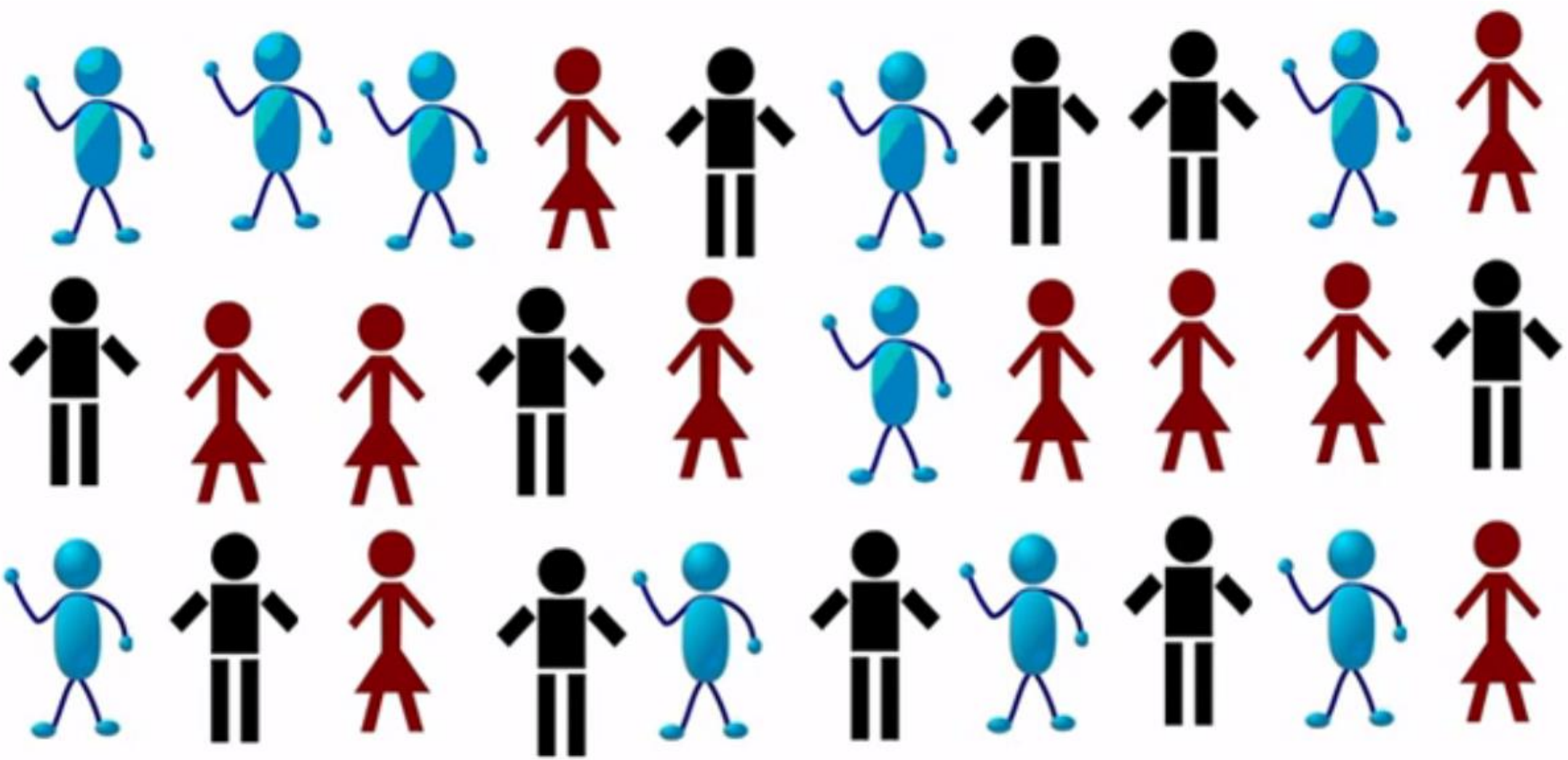
System: Start with the first person then every 3rd after

Stratified Sampling

entails subdividing the population according to a certain characteristic, then selecting the samples from every subgroup or stratum.

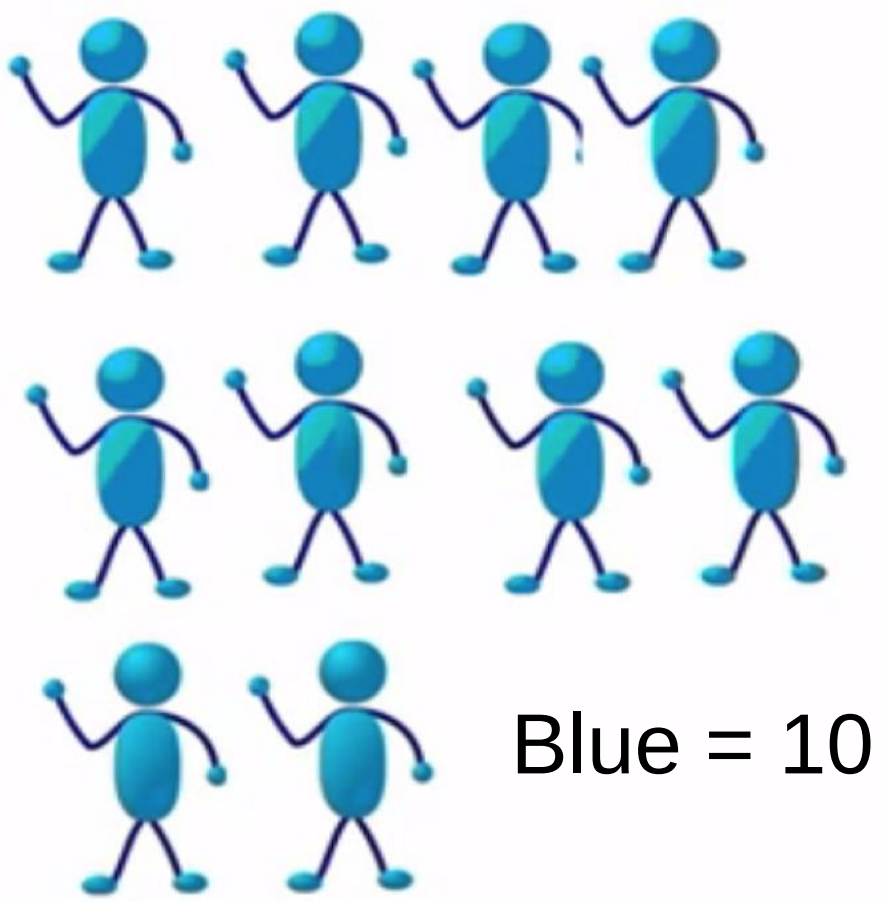


Stratified Sampling

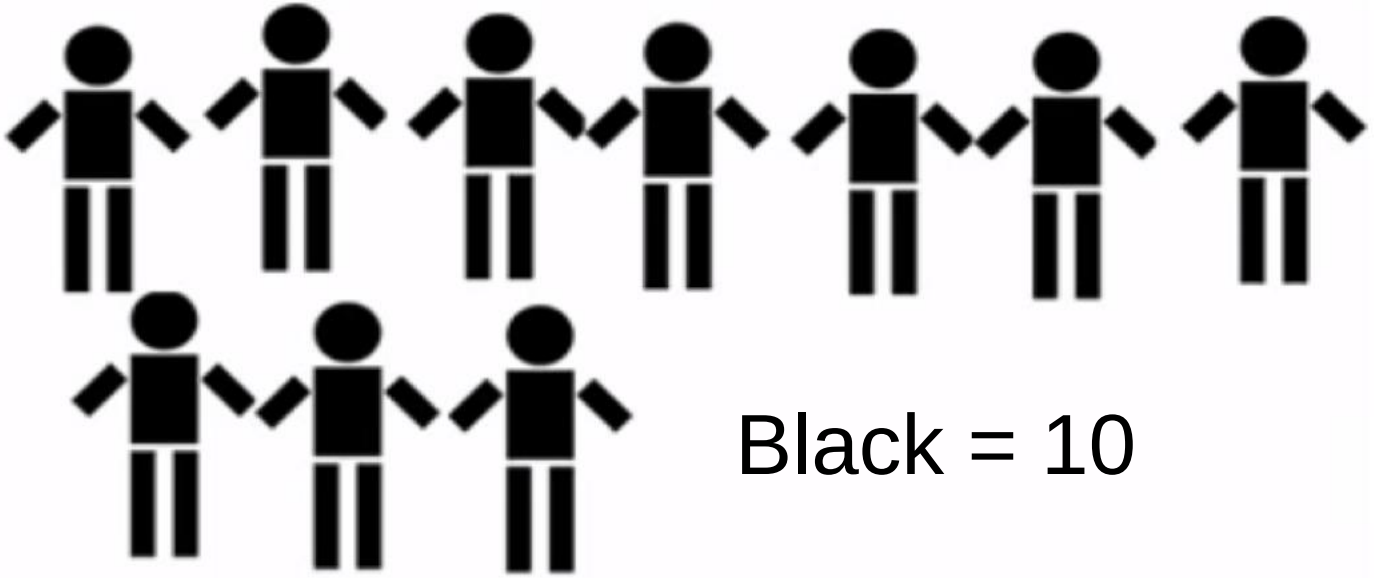


Sample of n = 10

Stratified Sampling



Blue = 10



Black = 10

Red = 10

N = 30

Sample of n =10

Proportionate:

(n/N)× Stratum Size

Miguel Xerxes R. Villacrucis

Stratified Sampling

Sample of n = 10

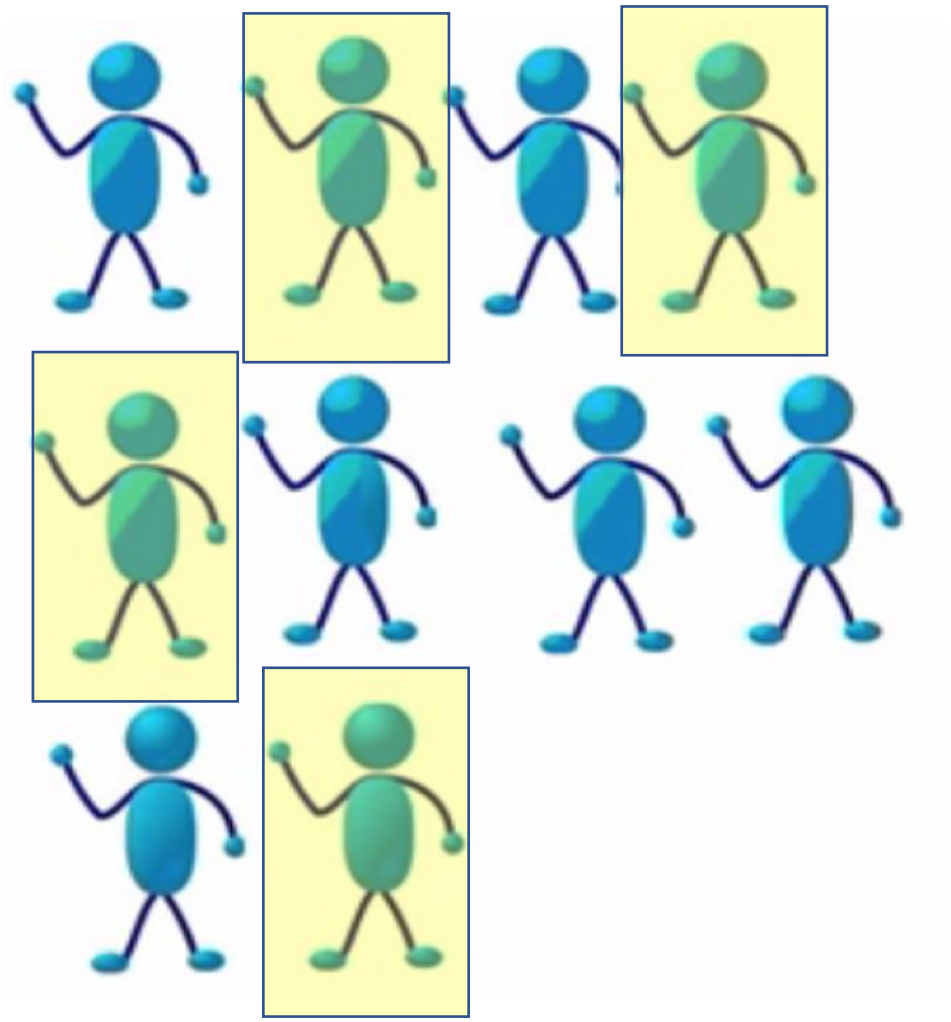
Proportionate: (n/N)× Stratum Size

Blue: 10/30 × 10 = 0.3 × 10 = 3 + 1 = 4
Black: 10/30 × 10 = 0.3 × 10 = 3 + 1 = 4
Red: 10/30 × 10 = 0.3 × 10 = 3 + 1 = 4
Total = 9 **n =12**

Remember n = 10

Need to add one (1) from each stratum

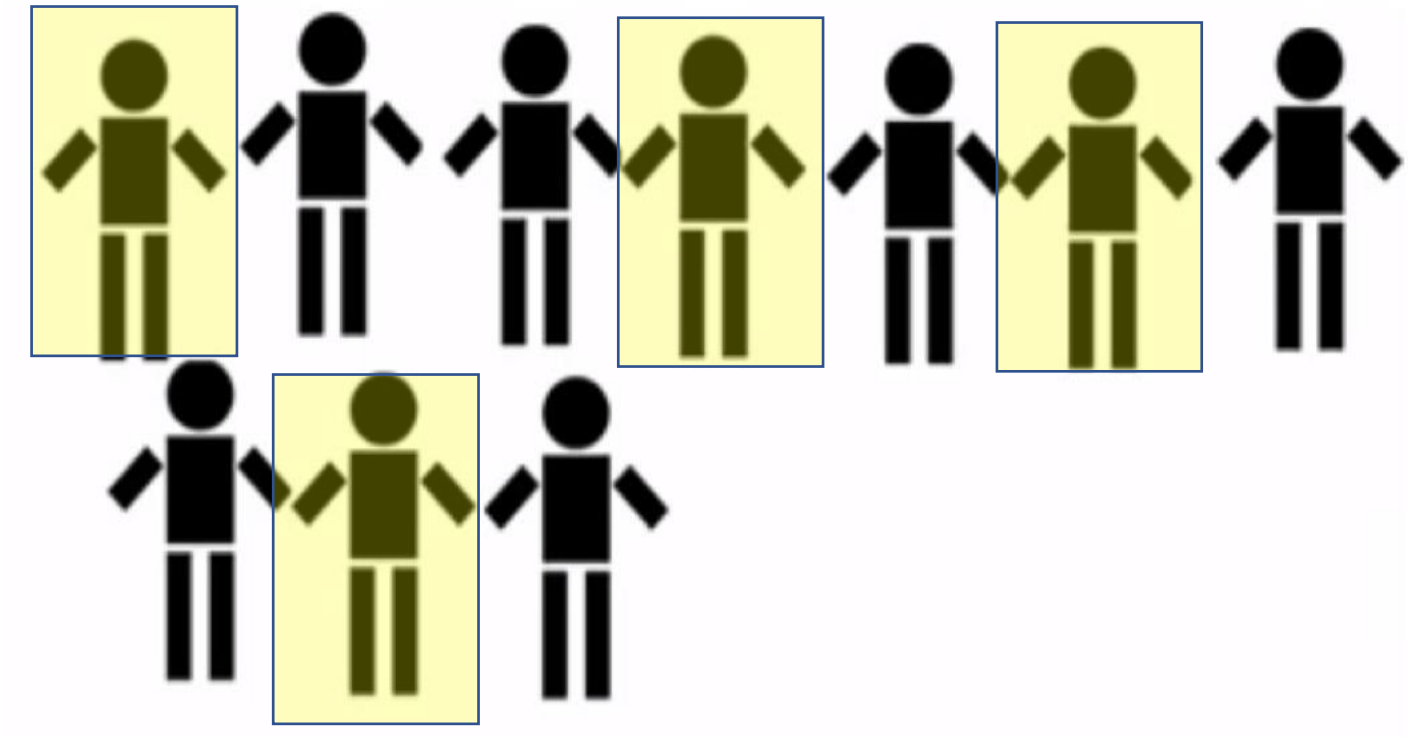
Stratified Sampling



Use SRS in selecting 4 respondents in each stratum

Sample of n = 12

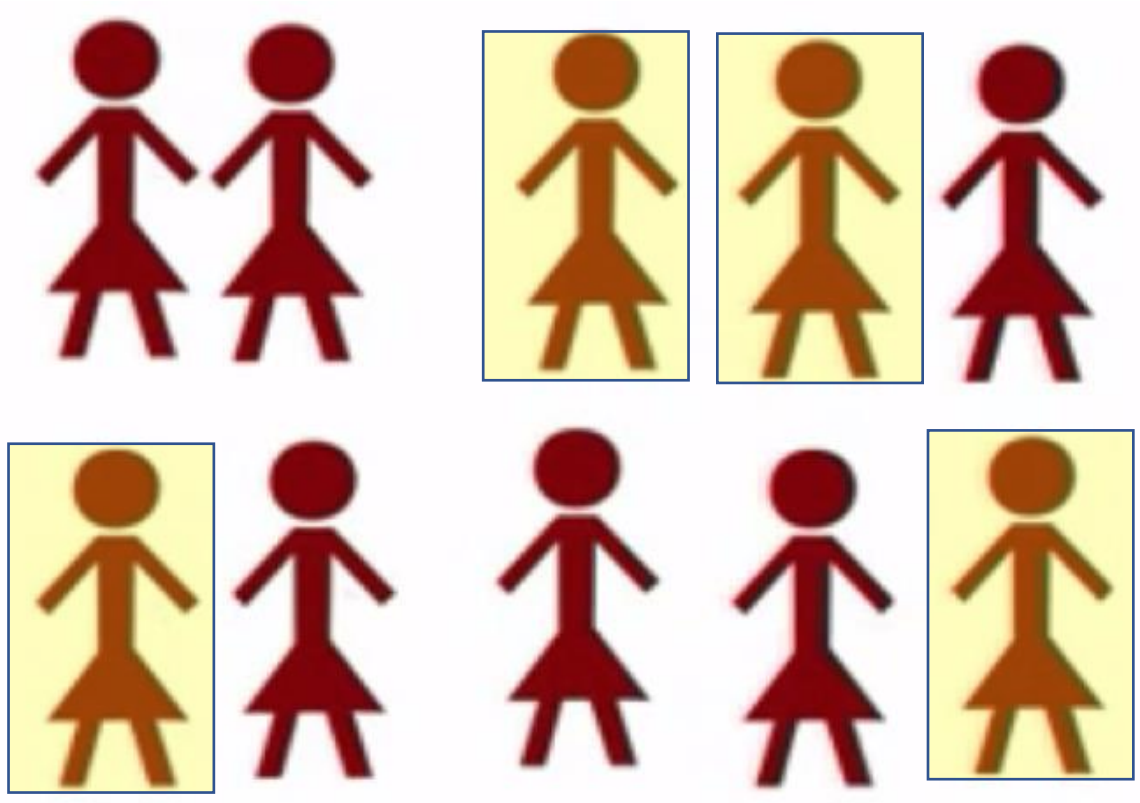
Stratified Sampling



Use SRS in selecting 4 respondents in each stratum

Sample of n = 12

Stratified Sampling



Sample of n = 12

Use SRS in selecting 4 respondents in each stratum

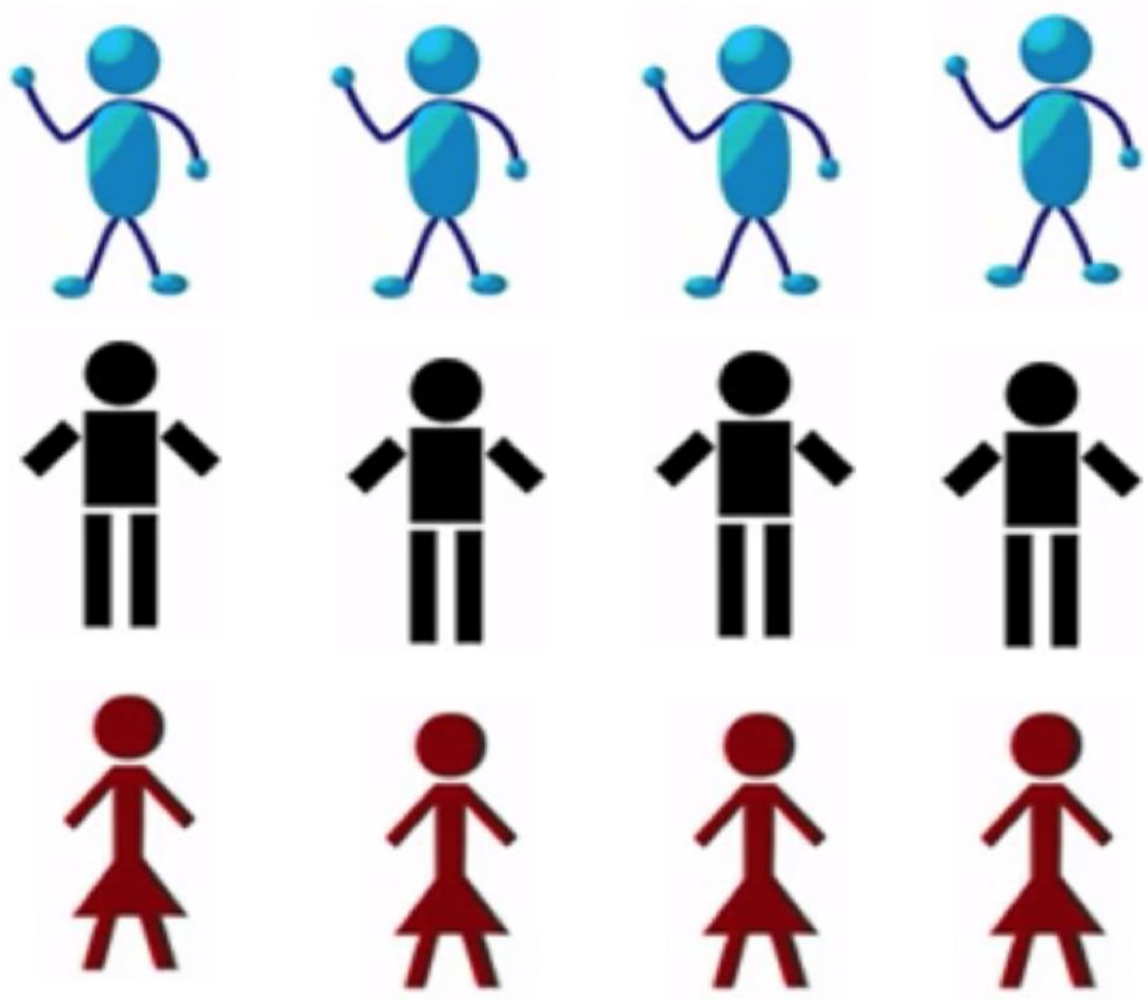
Stratified Sampling

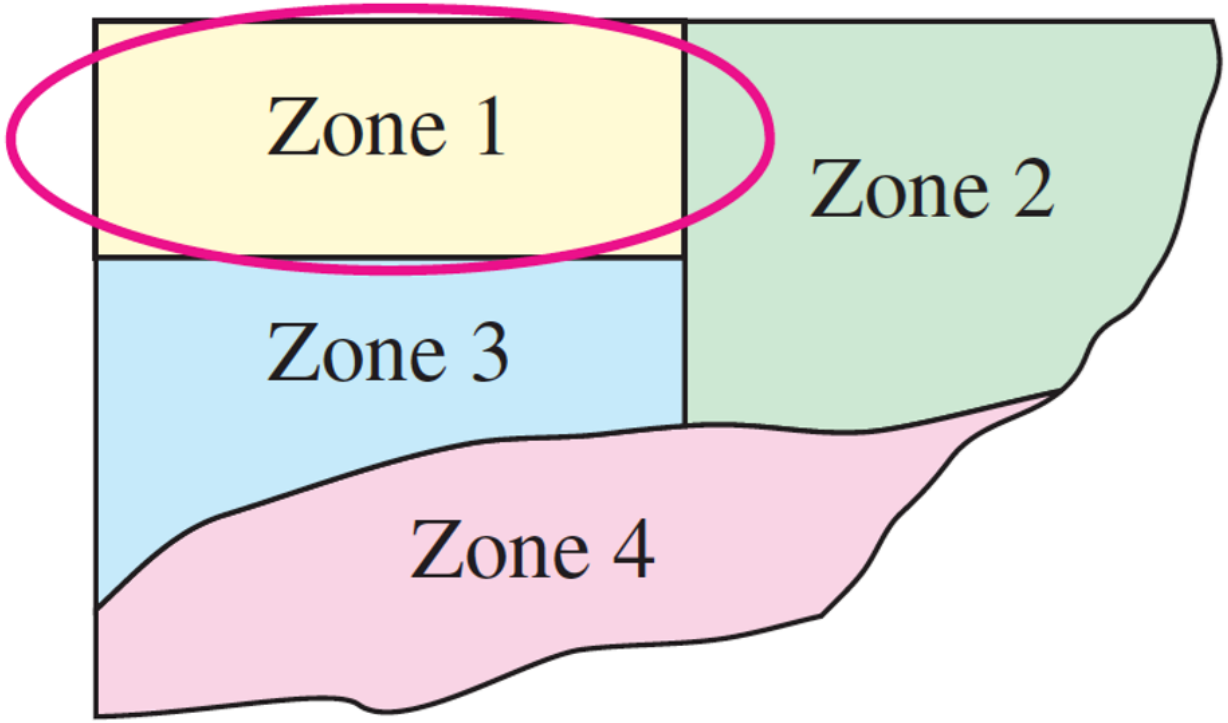
Sample of n = 12

Blue = 4

Black = 4

Red = 4

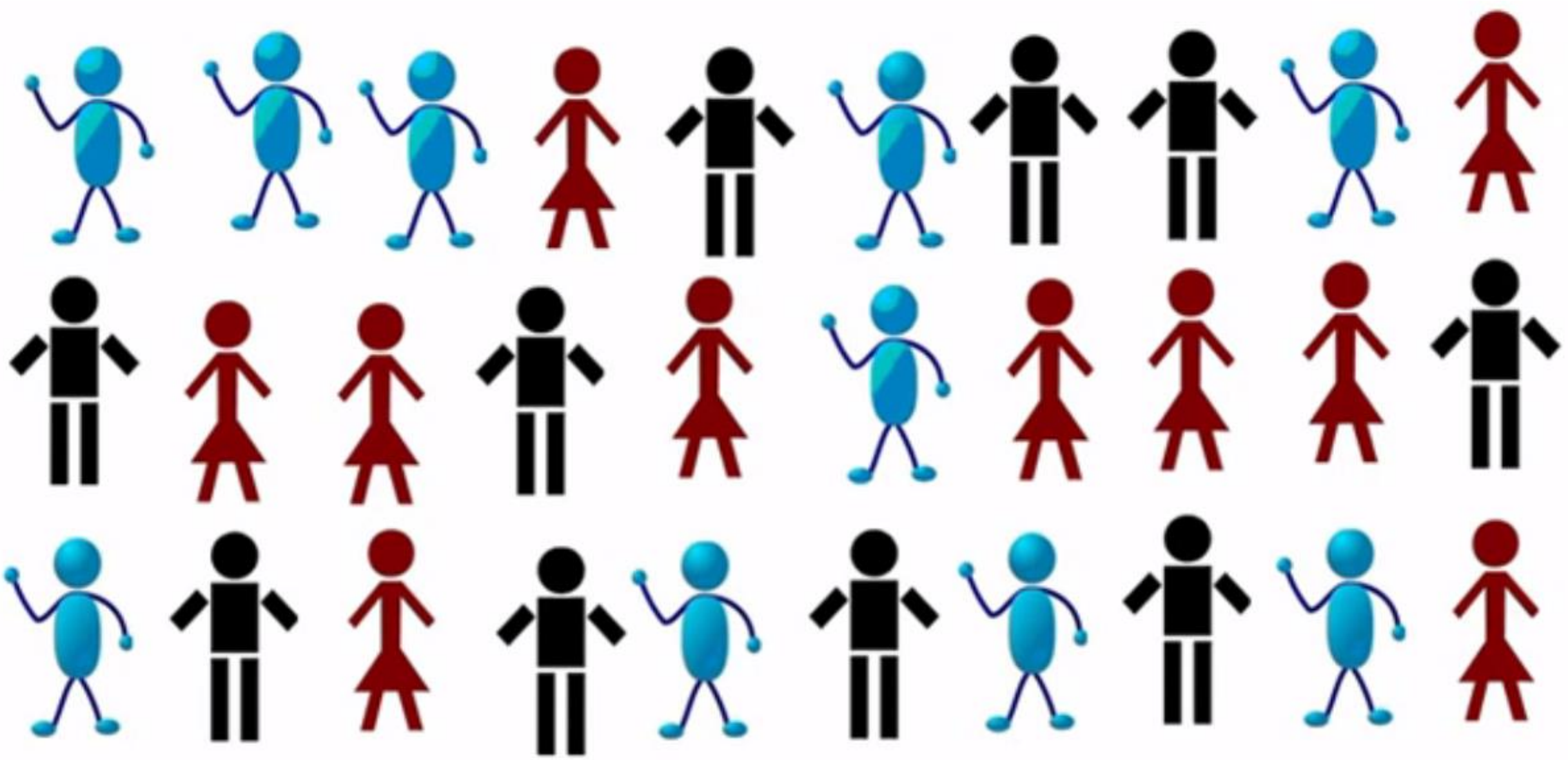




Cluster sampling is a technique used when a relatively homogeneous groupings are evident in a statistical population. It is often used in marketing research.

In this technique, the total population is divided into groups (or **clusters**) and a simple random **sample** of the groups is selected.

Cluster Sampling



Cluster Sampling

Cluster 1

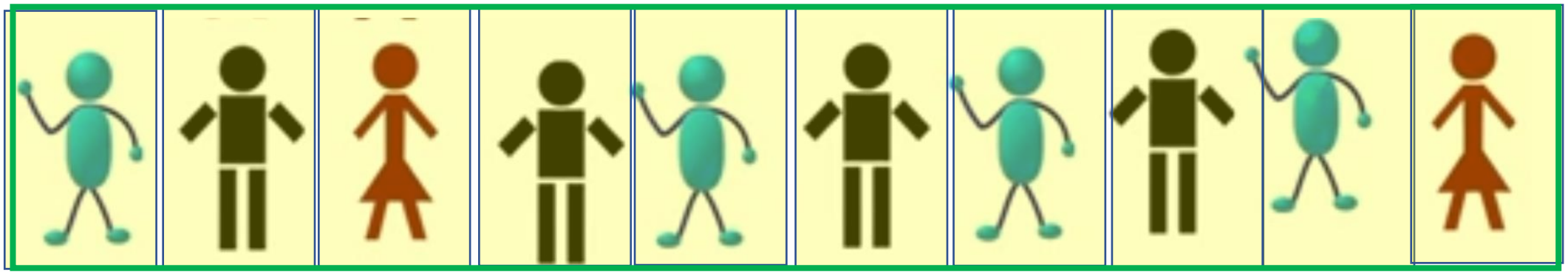
Cluster 2

Cluster 3

Cluster Sampling

Cluster 1

Cluster 2



Cluster 3

Use SRS to choose one cluster (one group)

SAMPLING STRATEGIES APPROPRIATE TO PARTICULAR FEATURES OF THE POPULATION

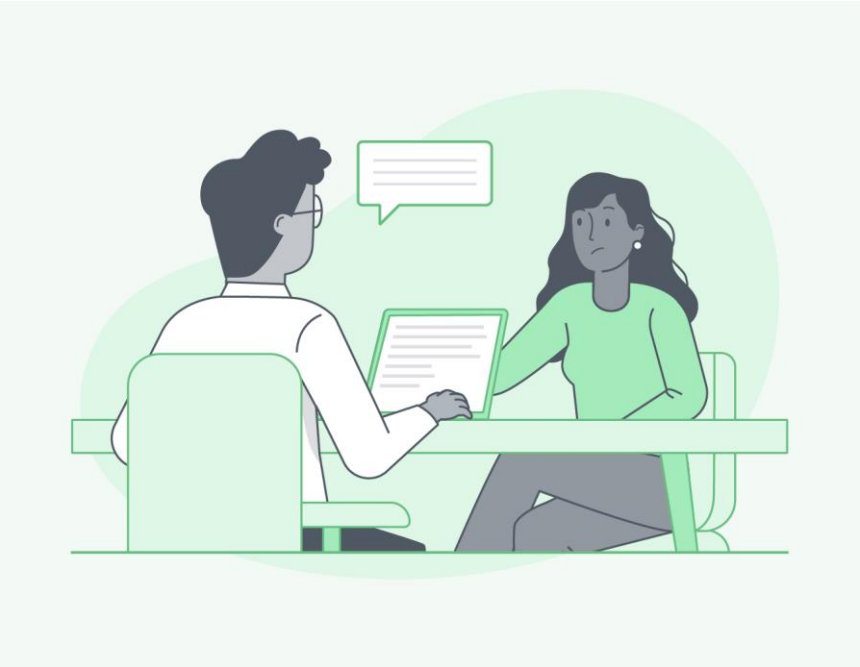
Personal Attributes	Geographical Spread	Sampling Strategies
Homogeneous: No comparison to be considered	**Concentrated** (one location)	Simple Random or Systematic
	Dispersed (several locations)	1) Cluster Sampling 2) Simple Random or Systematic
Heterogeneous: Comparison between different groups are considered	**Concentrated** (one location)	1) Stratified Sampling 2) Simple Random or Systematic
	Dispersed (several locations)	1) Stratified 2) Cluster 3) Simple Random or Systematic

Use of Appropriate Research Instrument

Miguel Xerxes R. Villacrucis

Research Instrument

A tool used to collect, measure, and analyze data related to research interests.

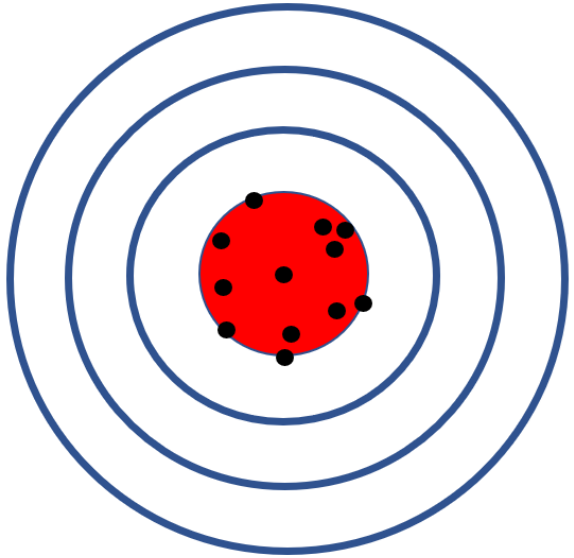


Characteristics of a Good Research Instrument

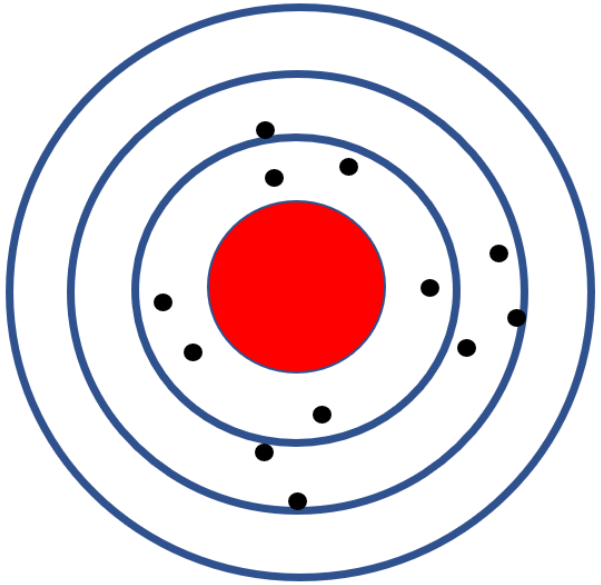
Valid and reliable

The relationship between Val and Rel

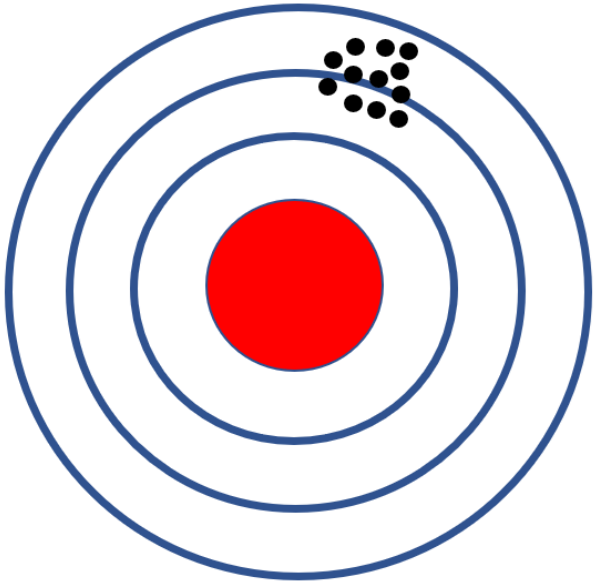
Characteristics of a Good Research Instrument



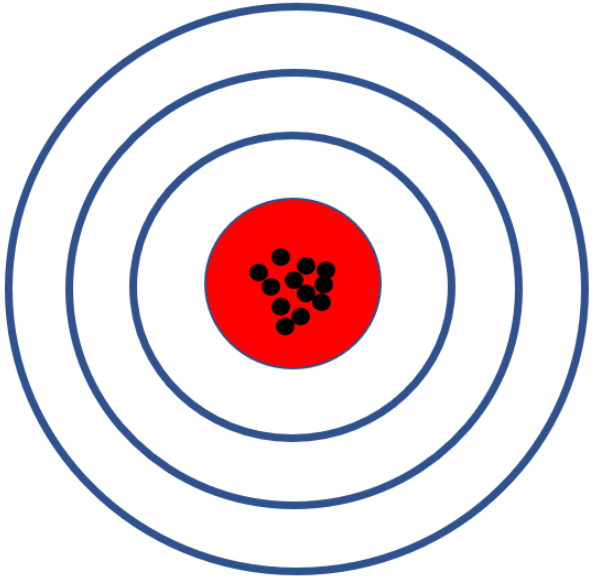
Valid but not Reliable



Neither valid nor reliable



Reliable but not valid



Valid and reliable

Characteristics of a Good Research Instrument

- Based on a conceptual framework, or the researcher's understanding of how the particular variables in the study connect with each other.
- Must gather data suitable for and relevant to the research topic.
- Able to test hypothesis and/or answer proposed research questions under investigation
- Free of bias and appropriate for the context, culture, and diversity of the study site
- Contains clear and definite instructions to use the instrument

Types of Research Instruments: Interviews

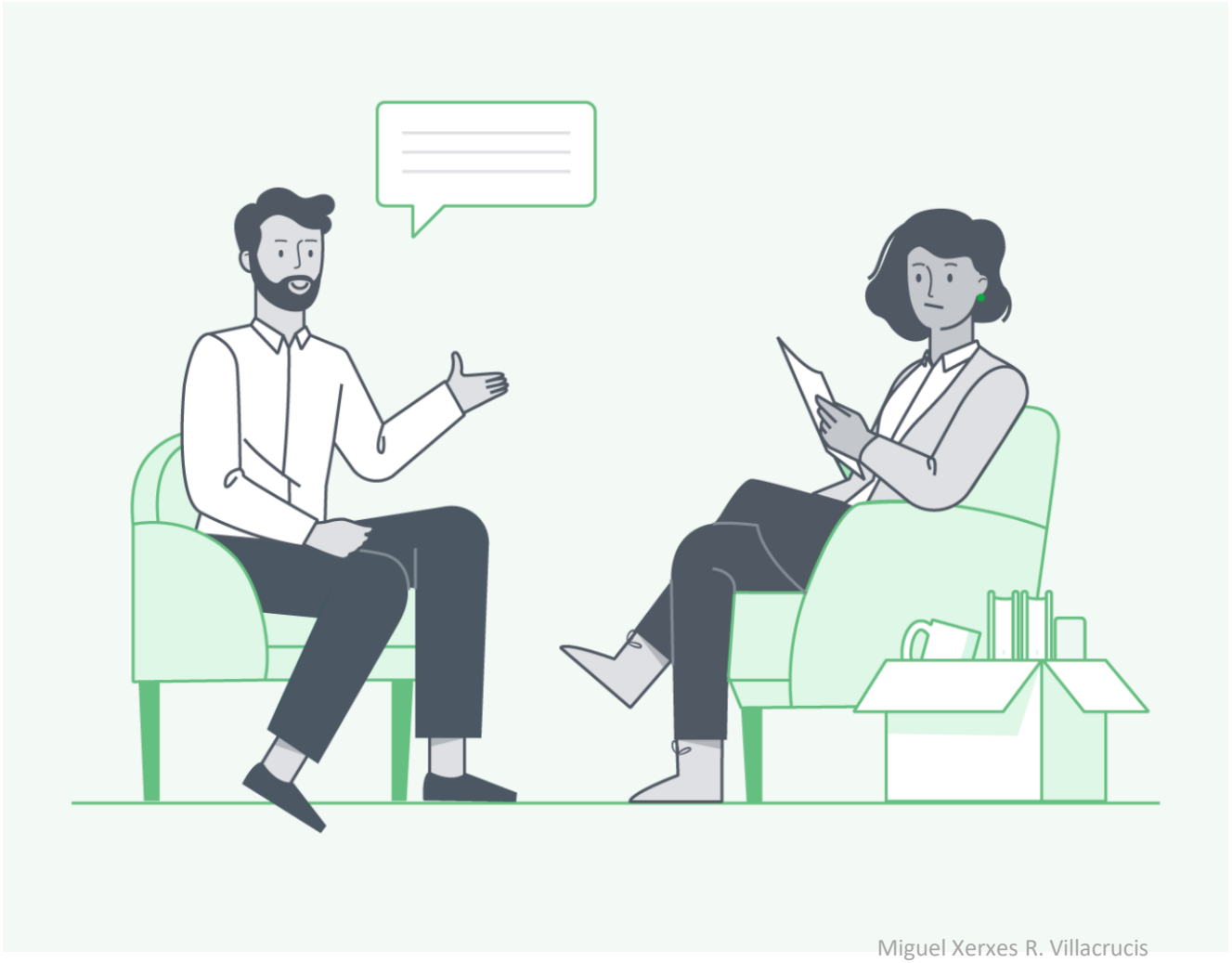
This involves verbal communication between the researcher and the respondent, during which information is obtained for the study.

An appropriate method when there is a need to collect in-depth information on people's opinions, thoughts, experiences, and feelings.

Types of Research Instruments: Interviews

Structured, Unstructured, Non-Directive, Focus or Focus Group

- More common in qualitative research.
- Usually allow participants to answer in their own words
- Useful when the topic of inquiry relates to issues that require complex questioning and considerable probing.



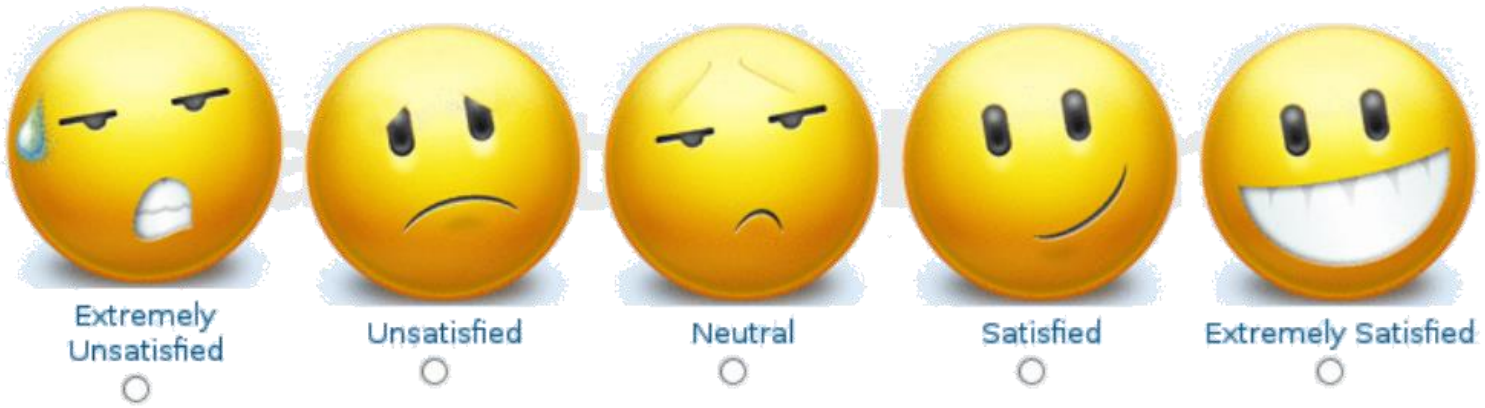
Types of Research Instruments: Survey – Questionnaire

A series of questions designed to elicit information, which is filled in by all participants.

More common in quantitative research.

Usually offer closed questions with limited options

How satisfied are you in learning Mathematics?



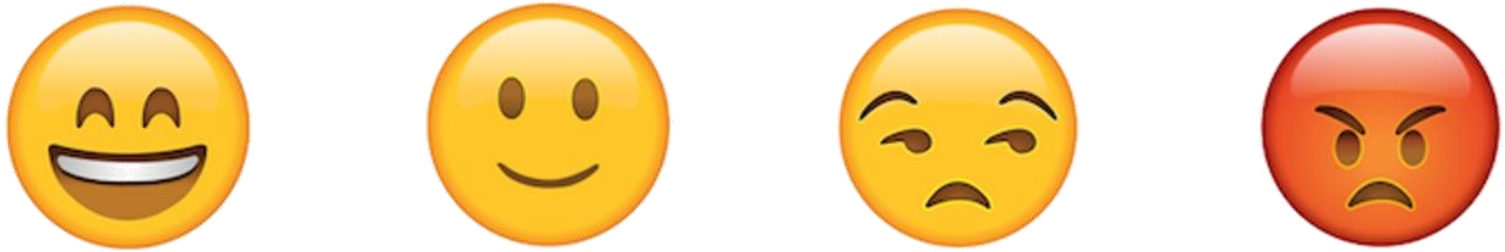
Types of Research Instruments: Survey – Questionnaire

Guided Response Type (Close-ended)

allows the respondents to choose one of the given alternatives

Do you like my presentation?

How is the delivery of my presentation?

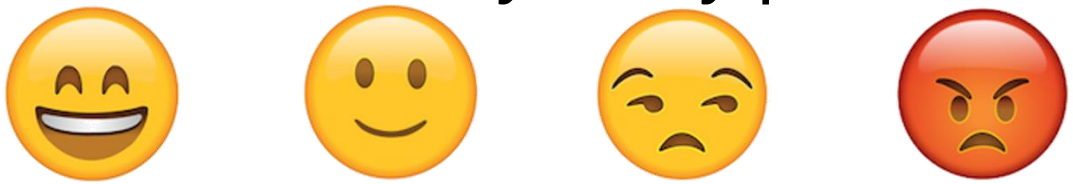


Excellent Good Bad Terrible

Types of Research Instruments: Survey - Questionnaire

Free-Answer (Open-ended)

gives the respondents the ability to respond on their own words

Closed-ended Questions	Open-ended Questions
Do you like my presentation? 	Tell us about your experience about my presentation?
How is the delivery of my presentation? 	What did you expect from my presentation?

Types of Research Instruments: Observations

Observation (watching what people do) is a type of non experimental method where researchers observe ongoing behavior.

Structured Observations (Systematic Observation):
Research conducted at a specific place, time, where participants are observed in a standardized procedure. Rather than writing a detailed description of all behaviors observed, researchers code observed behaviors according to a previously agreed upon scale.

Types of Research Instruments: Observations

Structured Observations (Systematic Observation)

- Behaviors are identified before the Observation
- Recording focuses on frequency or timing of occurrences
- Recording takes place live




Types of Research Instruments: Observations

Naturalistic Observation (Non-participant Observation):
To study the spontaneous behavior of participants in natural surroundings. The researcher simply records what they see in whatever way they see it.
(Passive Participant)

Types of Research Instruments: Observations

Participant Observation: A variation on natural observations where the researcher joins in and becomes part of the group they are studying to get a deeper insight into their lives. **(Active Participant)**

Statistical Tools

Miguel Xerxes R. Villacrucis

DESCRIPTIVE STATISTICS

Is your intent **descriptive** because you wish merely to *summarize* existing data.

The mean grade point average (GPA) of the sampled 150 non-engineering students in UB who enrolled in Mathematics class is 88.5 (SD = 4.5).

The percentage of students (n = 200) in UB who considered Mathematics as their favorite subject is 33%.

INFERENTIAL STATISTICS:
Hypothesis Test or Confidence Interval?

Is your intent **inferential** because you wish to *generalize* beyond existing data?

Confidence Interval

At 95% confidence, the true mean grade point average (GPA) of all non-engineering UB students in Mathematics is between 87.8 and 89.2 inclusive with 0.72 as margin of error.

Hypothesis Test

At 5% level, the sample data is a sufficient to support the claim that fewer than 33% of all students in UB, considered Mathematics as their favorite subject.

QUANTITATIVE OR QUALITATIVE DATA?
ONE, TWO, OR MORE GROUPS?

Parametric Test
(Quantitative)

1 Variable
with 1, 2 or more groups

2 Variables
with 1, 2 or more groups
per variable

Non-Parametric Test
(Qualitative)

1 Variable
with 2 or more groups

2 Variables
with 2 or more groups
per variable

Miguel Xerxes R. Villacrucis

Qualitative Data
(non-measurable)

Are observations
cross-classified?
NO YES

One-variable
Chi-Square Test

Two-variable
Chi-Square Test

Student	Gender	Day	Student	Gender	Day
01	Male	Mon	11	Female	Mon
02	Male	Tue	12	Male	Tue
03	Female	Wed	13	Female	Wed
04	Male	Thu	14	Female	Wed
05	Female	Mon	15	Male	Thu
06	Female	Mon	16	Male	Tue
07	Male	Thu	17	Female	Fri
08	Male	Fri	18	Male	Fri
09	Male	Fri	19	Female	Mon
10	Female	Fri	20	Female	Thu

Number of absences in a day incurred by students in STELA

Monday	Tuesday	Wednesday	Thursday	Friday
20	12	10	8	28

Variable = Days of the Week

Number of absences in a day incurred by male and female students in STELA

	Mon	Tue	Wed	Thu	Fri
Male	20	12	10	8	28
Female	15	5	8	12	20

Variable 1 = Days of the Week

Variable 2 = Gender

Miguel Xerxes R. Villacrucis

Quantitative Data (measurable)

Number of Groups ONE

t-Test for one group

GPA of sampled BSED Students in UB

GPA of all UB Students (Population)

Compute for sample $\bar{x}$

Compute for population μ

Compare $\bar{x}$ and μ
Make a decision

Quantitative Data
(measurable)

Two Groups
Paired Observations?
NO

t-Test for
2 independent
samples

if any assumption
is violated or original
data are ranks

Mann-Whitney
U-Test

Wilcoxon
T-Test

Kruskal-Wallis
H-Test

POPULATION 1
Male Nursing Students

SAMPLE 1
Male

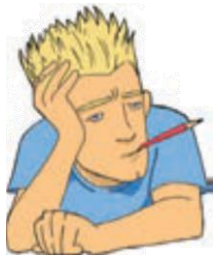
Compute
for $\bar{x}_1$

POPULATION 2
Female Nursing Students

SAMPLE 2
Female

Compute
for $\bar{x}_2$

Compare $\bar{x}_1$ and $\bar{x}_2$
Make a decision



Quantitative Data (measurable)

Two Groups Paired Observations? YES

Are paired observations evaluated for a relationship?

NO Difference

YES Relationships

t-Test for 2 dependent samples

t-Test for a correlation coefficient

if any assumption is violated or original data are ranks

- Mann-Whitney U-Test
- Wilcoxon T-Test
- Kruskal-Wallis H-Test

Miguel Xerxes R. Villacrucis

POPULATION

SAMPLE

Measure 1	Measure 2
x_1	y_1
x_2	y_2
x_3	y_3
.	.
.	.
.	.
x_k	y_k

Get the difference of paired scores and compute for $\bar{d}_{yx}$

Compute for *t*-value
Make a decision

t-Test for two dependent samples

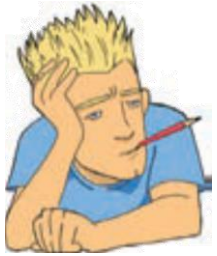
POPULATION

SAMPLE

Measure 1	Measure 2
x_1	y_1
x_2	y_2
x_3	y_3
.	.
.	.
.	.
x_k	y_k

Compute for correlation *r*

Compute for *t*-value
Make a decision



t-Test for a correlation coefficient

Quantitative Data (measurable)

Three or More Groups Are observations made for the same subjects?

NO YES

Are observations classified for two factors?

NO YES

Repeated measures F-Test ANOVA

One Way F-Test ANOVA

Two-Way F-Test ANOVA

if any assumption is violated or original data are ranks

- Mann-Whitney U-Test
- Wilcoxon T-Test
- Kruskal-Wallis H-Test

Miguel Xerxes R. Villacrucis

POPULATION 1
GPA of
IT Students

POPULATION 2
GPA of
Eng'g Students

POPULATION 3
GPA of
BSED-Math
Students

SAMPLE 1

SAMPLE 2

SAMPLE 3

Compute
for $\bar{x}_1$

Compute
for $\bar{x}_2$

Compute
for $\bar{x}_3$

Compare $\bar{x}_1$, $\bar{x}_2$ and $\bar{x}_3$
Make a decision

One-Way
F-Test
ANOVA

Variable = Group of
students

POPULATION 1
GPA of
male and female
IT Students

POPULATION 2
GPA of
male and female
Eng'g Students

POPULATION 3
GPA of
male and female
BSED-Math
Students

SAMPLE 1

SAMPLE 2

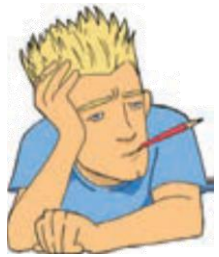
SAMPLE 3

Compute
for $\bar{x}_1$

Compute
for $\bar{x}_2$

Compute
for $\bar{x}_3$

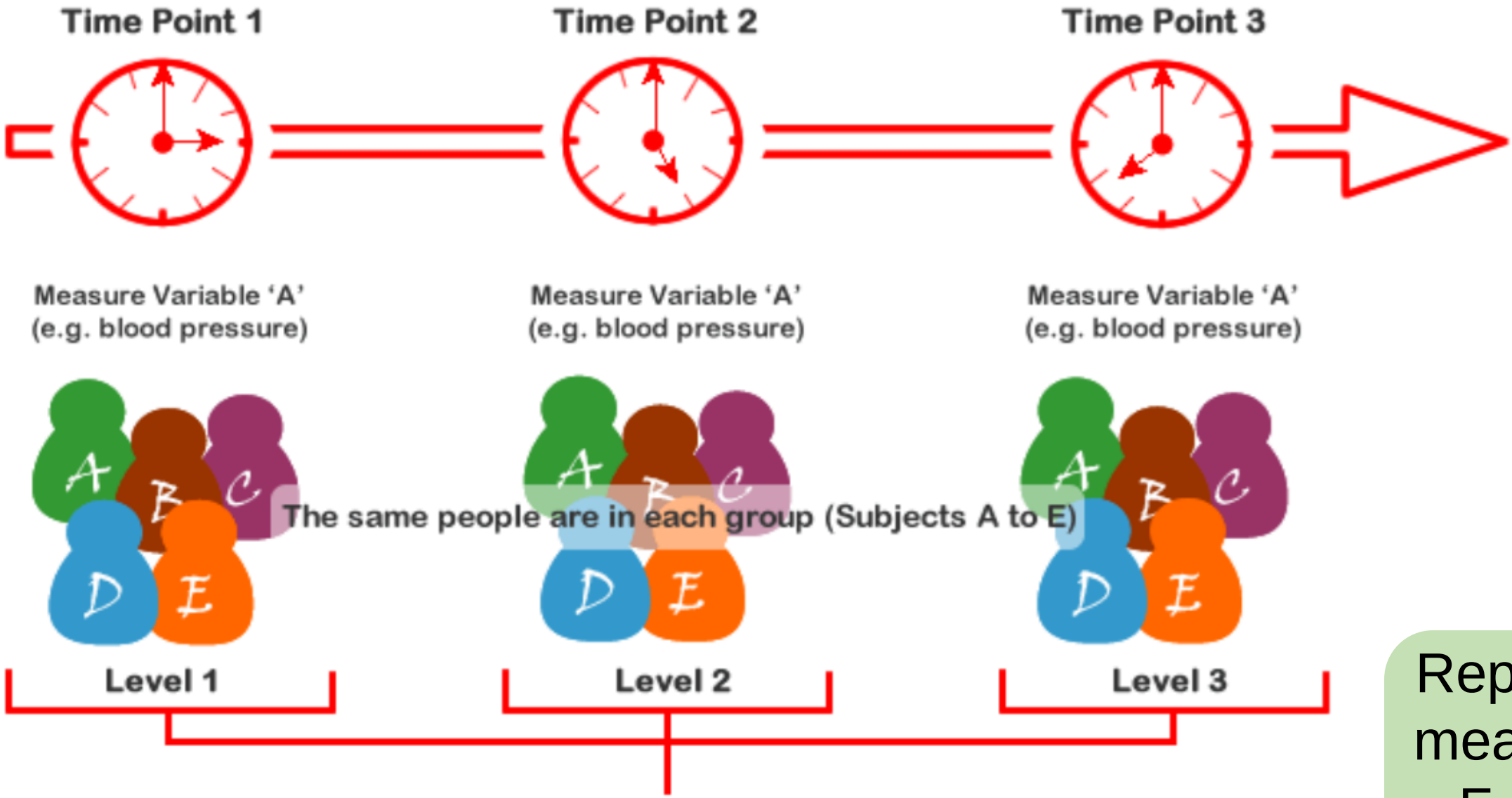
Compare $\bar{x}_1$, $\bar{x}_2$ and $\bar{x}_3$
Make a decision



Var 1
Group of
students

Var 2
Gender

Two-Way
F-Test
ANOVA



Repeated measures F-Test ANOVA

Other Statistical Tools (Seldom Preferred)

z-Test for Proportions
Spearman's Rank Correlation Test