Research Design

Beyond Randomized Control Trials

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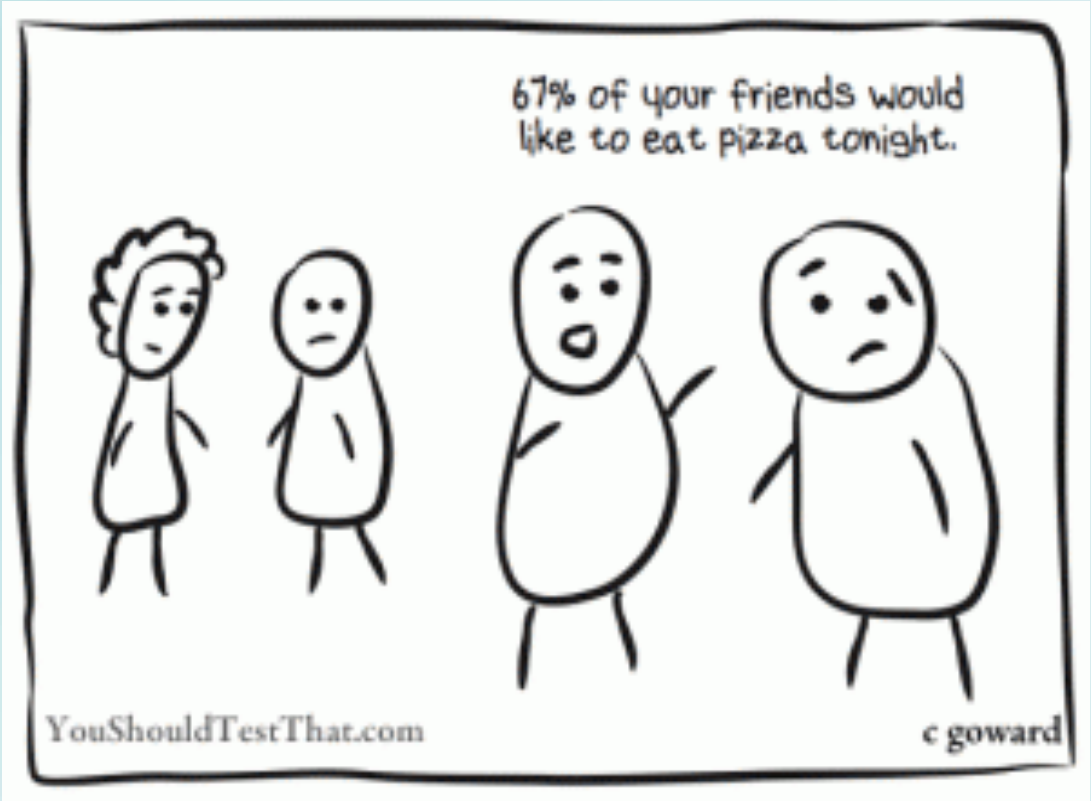
Introduction to the series

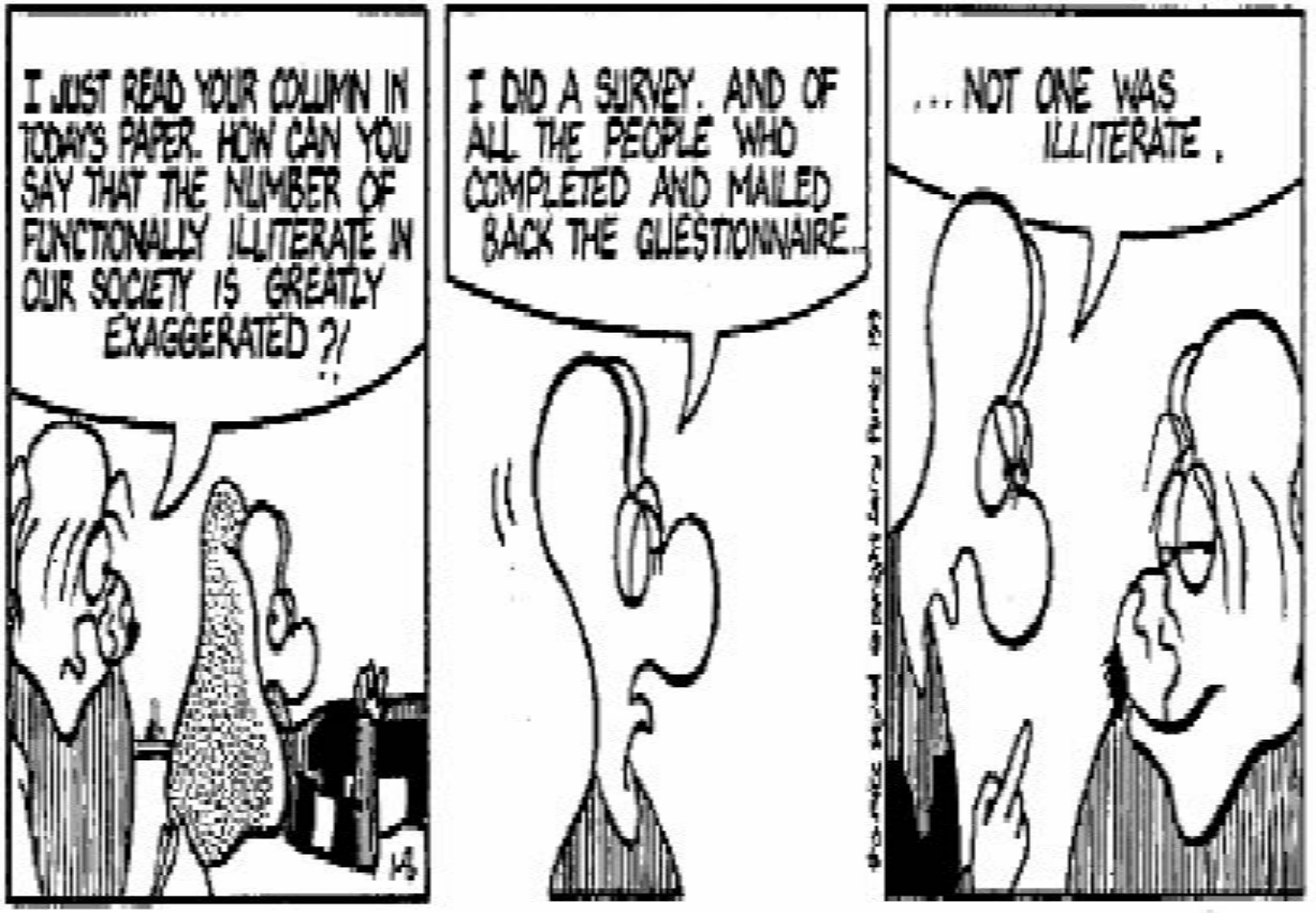
- Day 1: Nonrandomized Designs
- Day 2: Sampling Strategies
- Day 3: Matching Techniques for Balanced Designs

WHAT CAN HAPPEN IF YOU USE AN INCORRECT SAMPLE?



Samples and Sampling Strategies

- A sample is the next best thing to collecting data from the entire target population.
- Paradox of Sampling
- Resolve the paradox *via* incrementalism and obtaining the best sample possible.


I JUST READ YOUR COLUMN IN TODAY'S PAPER. HOW CAN YOU SAY THAT THE NUMBER OF FUNCTIONALLY ILLITERATE IN OUR SOCIETY IS GREATLY EXAGGERATED ?!
I DID A SURVEY. AND OF ALL THE PEOPLE WHO COMPLETED AND MAILED BACK THE QUESTIONNAIRE...
... NOT ONE WAS ILLITERATE.

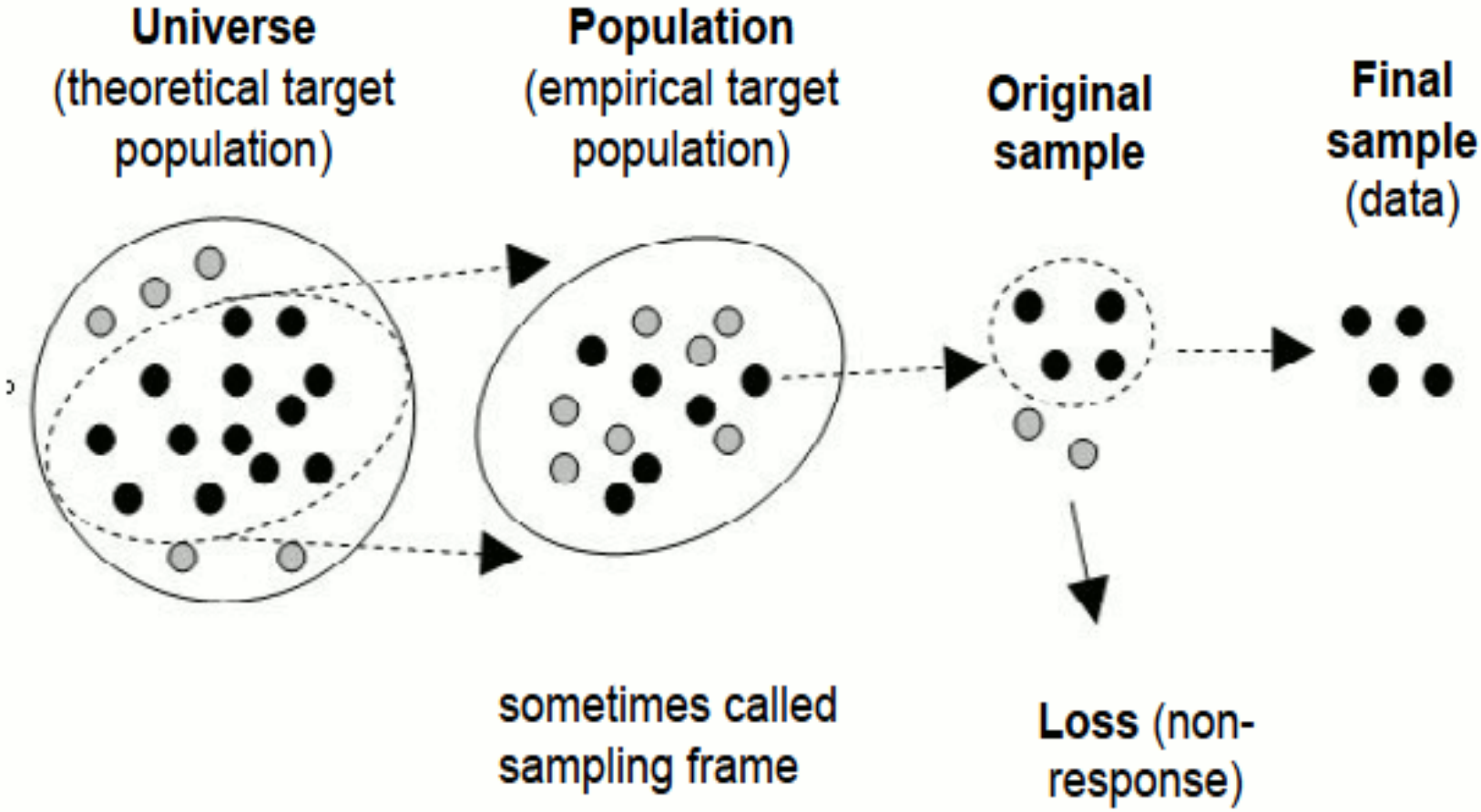
Nonprobability vs. Probability Sampling

- Nonprobability– Sample is selected using some nonrandom process (not based on chance).

- Probability – Sample is selected based on a random process.

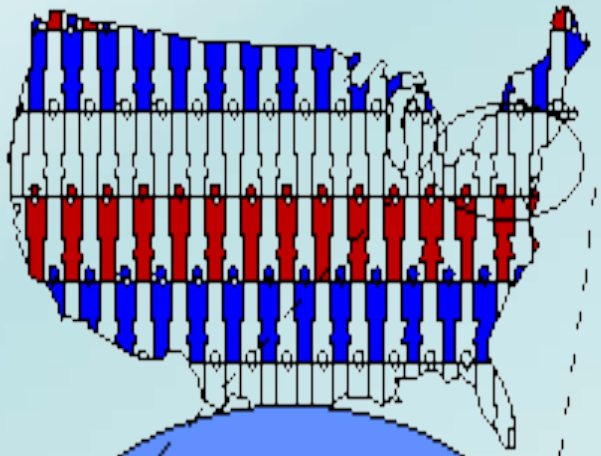
QUESTIONS TO ASK: MAKING SENSE OF NUMBERS

SAMPLING: DO I HAVE TO COUNT EVERYTHING?



Who do you want to generalize to?

The Theoretical Population



What population can you get access to?

The Study Population

How can you get access to them?

The Sampling Frame

Who is in your study?

The Sample

Nonprobability Sampling

Obtain subjects in some nonrandom way.

Typically volunteers

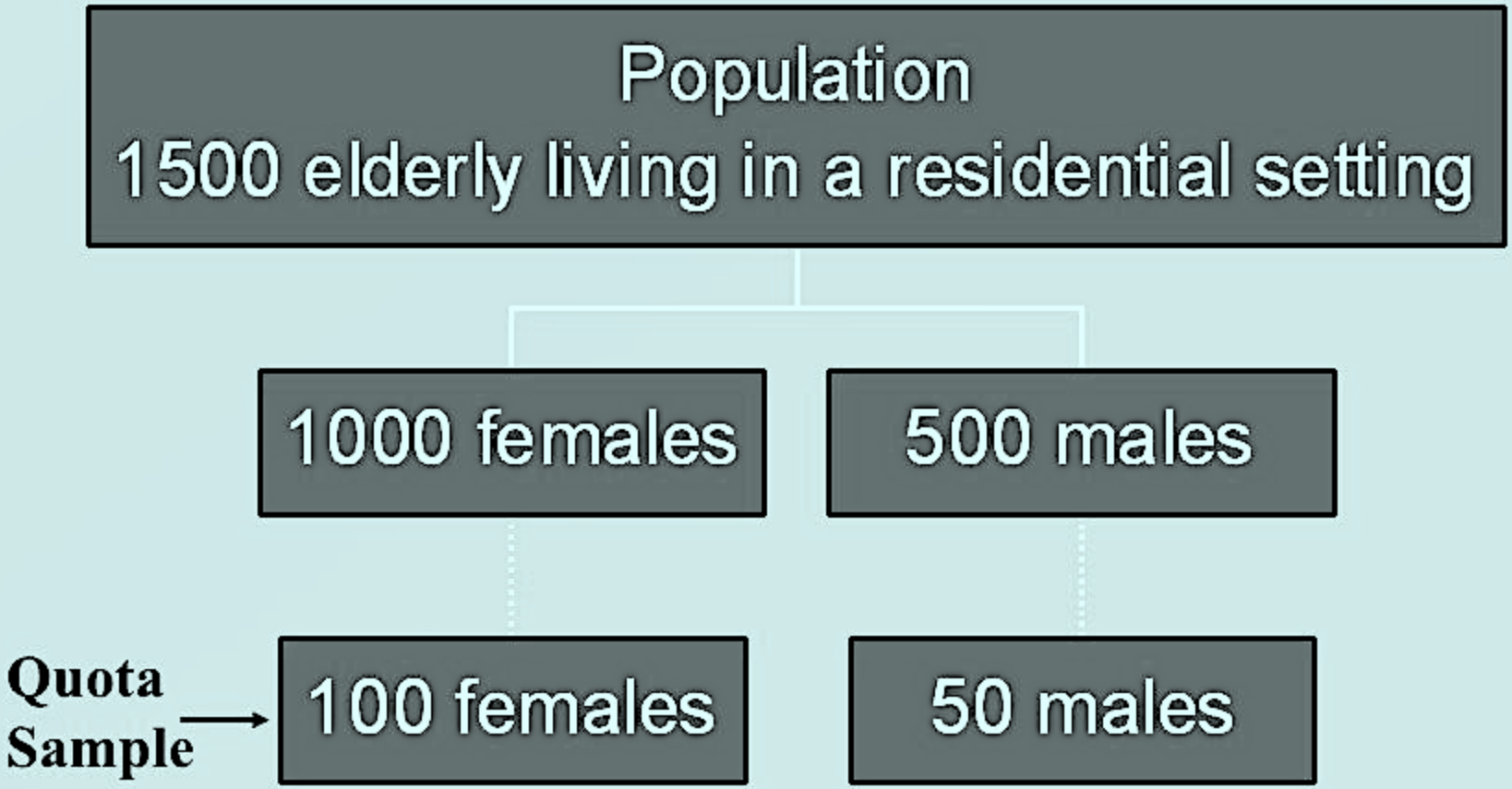
Types of Nonprobability Samples

- Stratified Disproportionate/Stratified Quota
- Purposive or Judgmental
- Accidental/Use of Available Subjects
- Snowball

Quota Sampling

- Divide the population into various categories
- Determine the number of people to be selected for each category
- For each category, you obtain an accidental sample until you fill the quota of people you need for that category
- Assign a weight to all respondents in a given cell according to their proportion of the total population.

Quota Sampling - Example



Purposive or Judgmental Sample

- Select your sample on the basis of your knowledge of the population, its elements and the purpose of the study.

- Community needs assessment
  - Pastor of Church
  - Local chapter leader of AARP
  - Older person who has been living community for years.

Purposive/Judgmental Sample

- Why some individuals who experience severe poverty and deprivation in childhood are successful as adults and others not.

- Why some women who experience a trauma such as a rape are devastated by the event and others are able to rebound.

Accidental/Convenience/ Availability Sample

- Select people because they are readily available.

- Sample members chosen because convenient. Easy to access

Examples of Accidental Samples

- Place ad in newspaper. Those who call to volunteer to participate.
- Working at a local senior center so sample older people from Center
- People who belong to an organization

Random Sampling from a Convenient List

Study relationship between experiences of abuse and psychological well-being.

Take a random sample from Mental Health Center of Dane County

Snowball Sample

- Find someone who fits the criteria for the study (accidental/convenience sample)
- Interview person and at end of interview, you ask if he/she knows of other people who meet the study criteria and may be willing to participate

Probability Sample

Enhances likelihood of getting a representative sample.

Calculate sample error and confidence interval

Obama 52% of the vote with a +/- 3% Margin of Error

(with a 95% confidence)

If able to poll everyone, you are 95% confidence that you would find that somewhere between 49% and 55% of the population favored Obama.

Trump 52% Clinton 48%
+/- 3% (with 95% confidence)

Polling Data for Iowa– October 5, 2016

So, Why do we say they are equally favored?

- Trump 49% to 55%
- Clinton 45% to 51%

October 6: Clinton 51% Trump 49%

http://projects.fivethirtyeight.com/2016-election-forecast/iowa/

Types of Probability Samples

- Simple Random Sample
- Systematic Random Sample
- Stratified Random Sample

Simple Random Sample

Each element in the population has an equal probability (chance) of being selected for the sample

Systematic Random Sample

- Every k^{th} element in the list is chosen for inclusion in the sample

- K is called the sampling interval

  K= population size/sample size

  population has 200 people. And you have resources to sample 50 people. K=200/50=4

Sample every 4^{th} person on the list. Start at random location

Stratified Random, or Stratified Proportionate

(a. k. a. Full Probability)

- Requirements
  - Must know characteristics about the population
  - Must be mutually exclusive and homogenous subparts
- Purpose
  - Increase the probability of obtaining an accurate sample by randomly selecting participants from each significant element of the population
  - Increase the accuracy of the sample

Stratified Random Sample

- Population is first divided into two or more strata.

  Strata – is a group of people who share a common characteristic.

  Examples of strata – race, gender, marital status.

- From each stratum, a simple random sample is taken.
- The subsamples (samples from each stratum) are then joined to form the total sample

Stratified Random Sample

Variables		Attributes
Race		**Min./majority**
Religion		**Cath./Prot./Jew**
Education		**HS/Col./Grad-Prof.**
Income		**Low/Mod/High**
Age		**Young / Old**

The researcher must decide in advance which variables are to be stratified.

Know information about distribution of population according to strata.

Keep the number of stratification variables (strata) to a minimum because otherwise the sample size requirements to achieve a representative sample becomes unwieldy.

Minimum strata is 10 cases.

Stratified Random Sample

Conditions for Stratified Random Sample

- The researcher must decide in advance which variables are to be stratified.
- Know information about distribution of population according to strata.
- Keep the number of stratification variables (strata) to a minimum because otherwise the sample size requirements to achieve a representative sample becomes unwieldy.
- Minimum strata is 10 cases.
- To determine the number of strata, multiply the number of attributes, and then multiply that sum by 10 to get total number of strata.

Stratified Random Sample

Variables		Attributes		# of Attributes
Race		**Min./majority**		**2**
Religion		**Cath./Prot./Jew**		**3**
Education		**HS/Col./Grad-Prof.**		**3**
Income		**Low/Mod/High**		**3**
Age		**Young / Old**		**2**

To determine the number of strata, multiply the number of attributes, and then multiply that sum by 10 to get total number of strata.

STEPS

1. Multiply # attributes to get # of strata (2 * 3 * 3 * 3 * 2) = 108

2. Strata * 10 = # needed for sample = (108 * 10) = 1080

EXAMPLE: STRATIFIED RANDOM SAMPLE

Population: 70,000,000 U.S. voters in the Presidential election
Sample Size: 2,000
Sample Size as a proportion of the population: 2000/70,000,000 = .0000285 (sampling rate) = sample as a proportion of the population
Theoretically significant variables and their attributes:
1. Sex: Male, female
2. Age: Young (18-30 yr.); Middle Age (31-60 yr.); Aged (over 60 yr.)
3. Income: Poverty (< $15,000); Nonpoverty ($15,000 and over)

STEPS:
1. Name the Strata
2. Count the number in the population found in each strata
3. Calculate the proportion each stratum is of the population

Sex:	Male						Female						
Age:	Young		Middle		Aged		Young		Middle		Aged		
Income:	Poor	Rich	Poor	Rich	Poor	Rich*	Poor*	Rich	Poor	Rich	Poor	Rich	TOTALS
Number (**in millions**) in population, by stratum	4.2	5.6	10.5	7	5.6	1.4	2.1	6.3	7	10.5	3.5	6.3	70
Stratum as a percent of population	6	8	15	10	8	2	3	9	10	15	5	9	100
STRATIFIED RANDOM SAMPLE													
Stratum as a percent of Sample Size 2,000	6	8	15	10	8	2	3	9	10	15	5	9	100
Number in each Stratum of Sample:													
Technique I:													
Stratum n * % sample is of population	120	160	299	200	160	40	60	180	200	299	100	180	1995
Technique II:													
n * % Stratum is of population	120	160	300	200	160	40	60	180	200	300	100	180	2000
QUOTA Sample:													
Stratum as percent of Sample Size**	6	8	12	10	8	5	5	9	10	13	5	9	100
Number in each Stratum of Sample***	120	160	240	200	160	100	100	180	200	260	100	180	2000

* These strata are judged more significant than others, thus these quotas are fixed.
** Compare these percentages with those percentages for "Stratified Random Sample"
*** Compare these numbers with those numbers for "Stratified Random Sample"

Any Questions?