

# Statistical Methods

## 13 Sampling Techniques

Based on materials provided by Coventry University and  
Loughborough University under a National HE STEM  
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# Workshop outline

We will consider:

## □ Sampling techniques:

- Non-random
- Random



# Sample surveys

Subjects included in a study can be selected using either:

- A non-random sampling approach, or
- A random sampling approach



# Non-random sampling

- ❑ Types:
  - Self-selecting samples
  - Convenience samples
  - Judgemental samples
  - Quota sampling: The interviewer has been given quotas to fill from specified subgroups of the population, e.g. 20 women 20-30 years old
- ❑ Can all be very biased
- ❑ Not representative of population

# Random sampling

Requires:

- Random sampling method
- Random number generation
- Sampling frame



# Random sampling methods

- ❑ **Simple Random Sampling:** Every member of the population is equally likely to be selected)
- ❑ **Systematic Sampling:** Simple Random Sampling in an ordered systematic way, e.g. every 100<sup>th</sup> name in the yellow pages
- ❑ **Stratified Sampling:** Population divided into different groups from which we sample randomly
- ❑ **Cluster Sampling:** Population is divided into (geographical) clusters - some clusters are chosen at random - within cluster units are chosen with Simple Random Sampling



# Generating random numbers

- ❑ Best way is to select numbered balls out of a bag
- ❑ Or use random number generators
  - Many available online, e.g. [www.random.org/integers](http://www.random.org/integers)
- ❑ Or use Excel:
  - E.g. “=randbetween(1,200)” generates a random number between 1 and 200

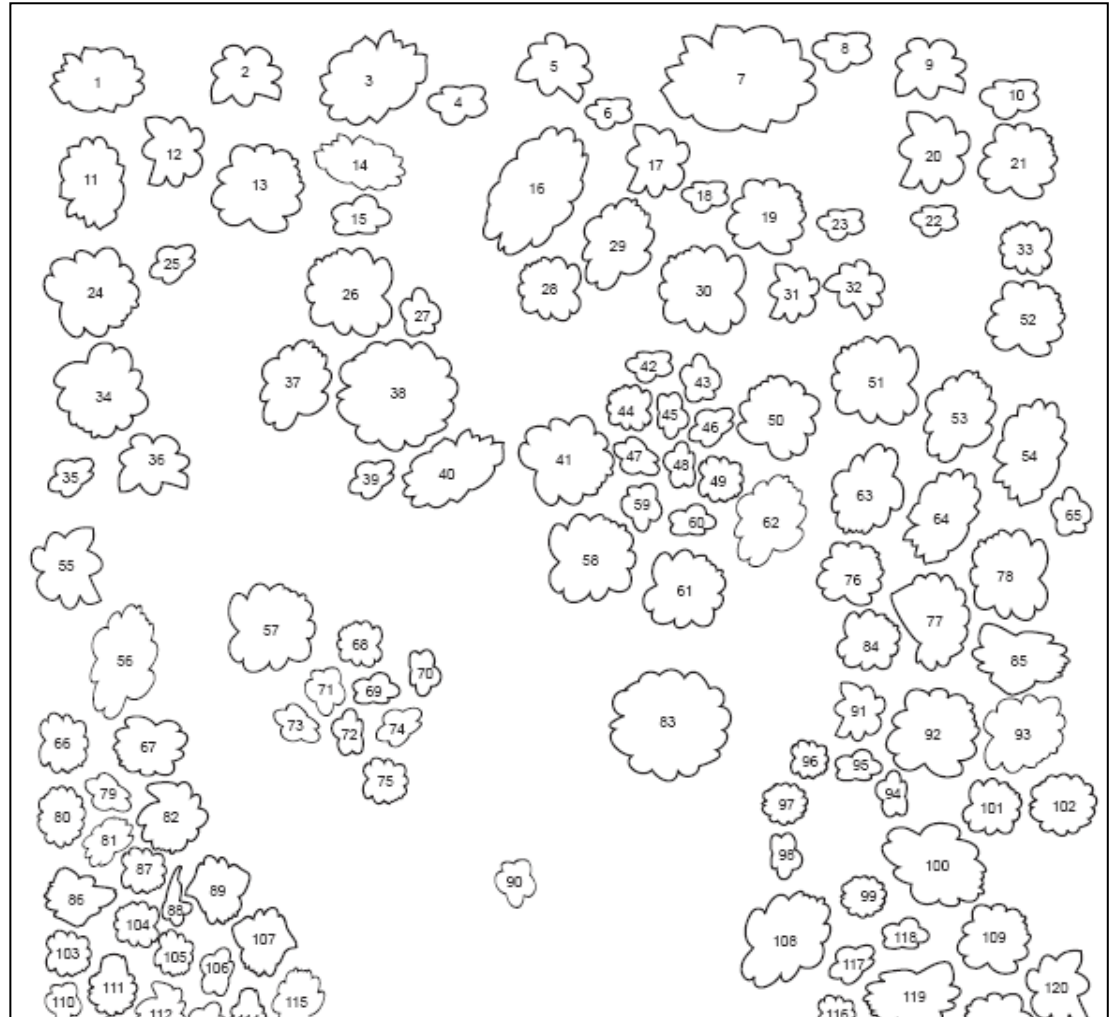
# Sampling frame

- ❑ A list of subjects from which a sample of subjects is selected
- ❑ Examples:
  - Map
  - Census database
  - Employee database
  - Telephone directory
- ❑ Need to select subjects at **random**
- ❑ Without a sampling frame, random selection is difficult/impossible



# Example: simple random sampling

- ❑ Survey of insect population living in woodland
- ❑ Trees numbered 1 to 200
- ❑ 10 trees chosen at random



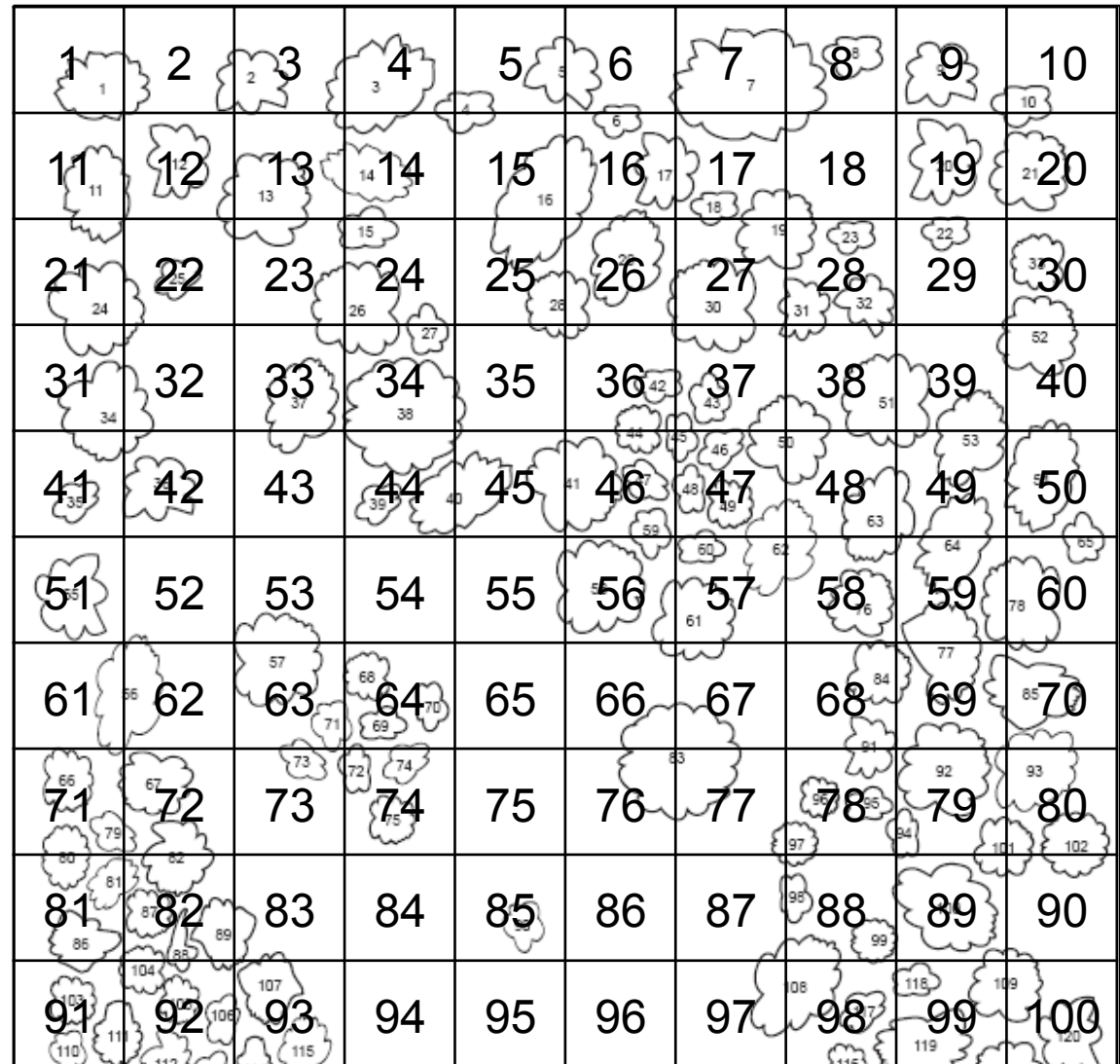
# Example: Stratified sampling

- ❑ Foot measurement study of the population of Taiwan
- ❑ Total sample size of 1,000
- ❑ Sample for each category selected randomly from the population

Age Group	Population (000s)			Sample		
	Male	Female	Total	Male	Female	Total
0-4	830	772	1602	41	38	79
5-9	1005	945	1950	50	47	97
10-14	1016	958	1974	51	48	99
15-19	929	885	1814	46	44	90
20-29	1993	1895	3888	99	94	193
30-49	2744	2635	5379	137	131	268
50+	1882	1618	3500	94	80	174
<b>Total</b>	<b>10399</b>	<b>9708</b>	<b>20107</b>	<b>518</b>	<b>482</b>	<b>1000</b>

# Example: cluster sampling

- ❑ Survey of insect population living in woodland
- ❑ Squares chosen a random on the grid
- ❑ Trees lying within the squares chosen until 10 chosen



# Cluster sampling v. stratified sampling

## ❑ Cluster sampling:

- Cheaper
- Usually not representative of whole population

## ❑ Stratified sampling:

- Sample more representative
- Good information on subgroups

# Recap

- ❑ Random sampling reduces bias
- ❑ Random sampling requires:
  - A random sampling method
  - Random number generation
  - A sampling frame