

Types of Probability Samples

Simple Random

Systematic Random

Stratified Random

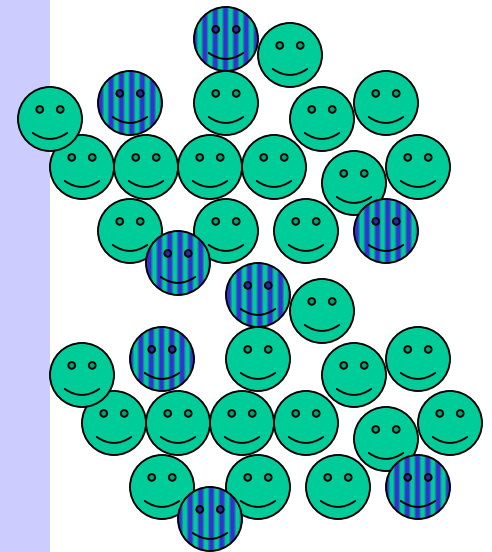
Random Cluster

Stratified Cluster

Complex Multi-stage Random (various kinds)

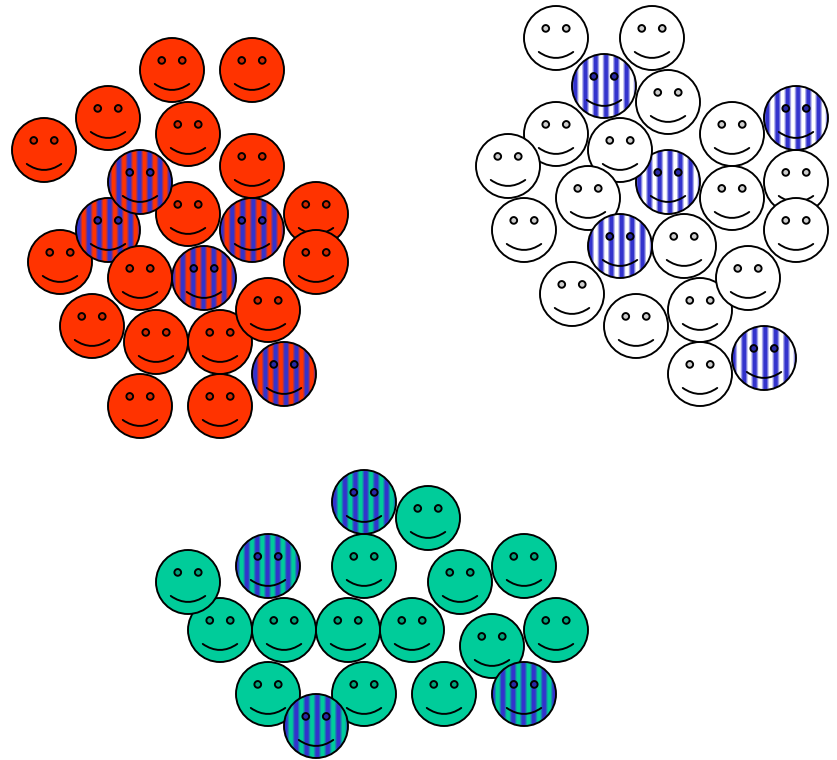
Simple Random Sampling

- Each element in the population has an equal probability of selection AND each combination of elements has an equal probability of selection
- Names drawn out of a hat
- Random numbers to select elements from an ordered list



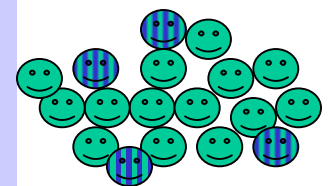
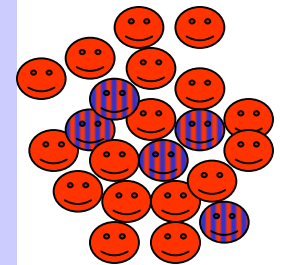
Stratified Random Sampling-1

- Divide population into groups that differ in important ways
- Basis for grouping must be known before sampling
- Select random sample from within each group



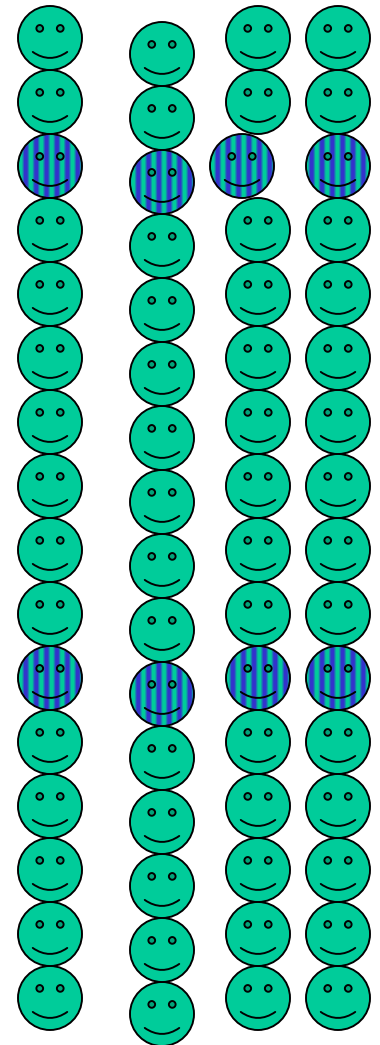
Stratified Random Sampling-2

- For a given sample size, reduces error compared to simple random sampling IF the groups are different from each other
- Tradeoff between the cost of doing the stratification and smaller sample size needed for same error
- Probabilities of selection may be different for different groups, as long as they are known
- Oversampling small groups improves inter-group comparisons



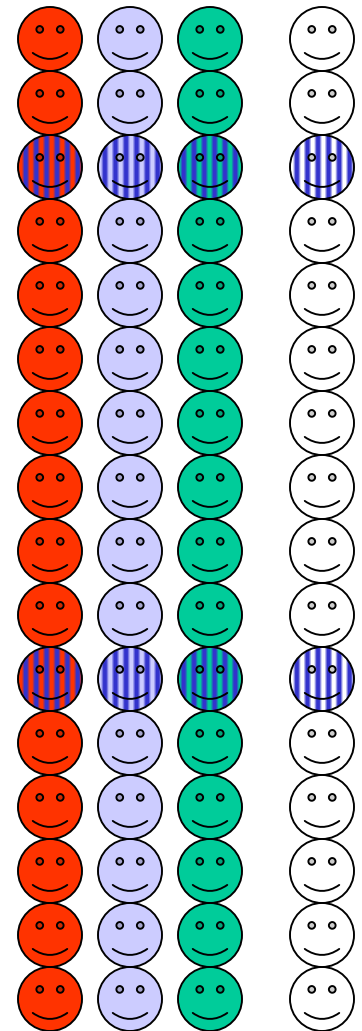
Systematic Random Sampling-1

- Each element has an equal probability of selection, but combinations of elements have different probabilities.
- Population size N , desired sample size n , sampling interval $k=N/n$.
- Randomly select a number j between 1 and k , sample element j and then every k^{th} element thereafter, $j+k$, $j+2k$, etc.
- Example: $N=64$, $n=8$, $k=64/8=8$.
Random $j=3$.



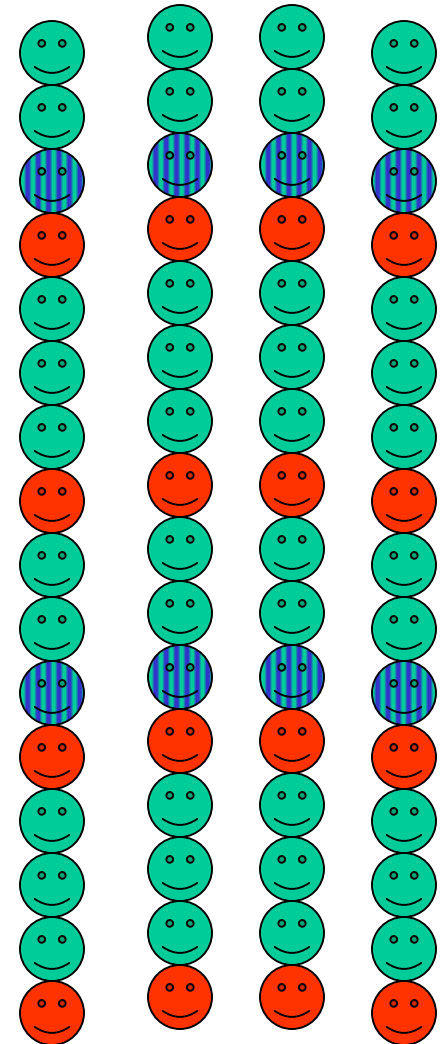
Systematic Random Sampling-2

- Has same error rate as simple random sample if the list is in random or haphazard order
- Provides the benefits of implicit stratification if the list is grouped



Systematic Random Sampling-3

- Runs the risk of error if periodicity in the list matches the sampling interval
- This is rare.
- In this example, every 4th element is red, and red never gets sampled. If j had been 4 or 8, ONLY reds would be sampled.

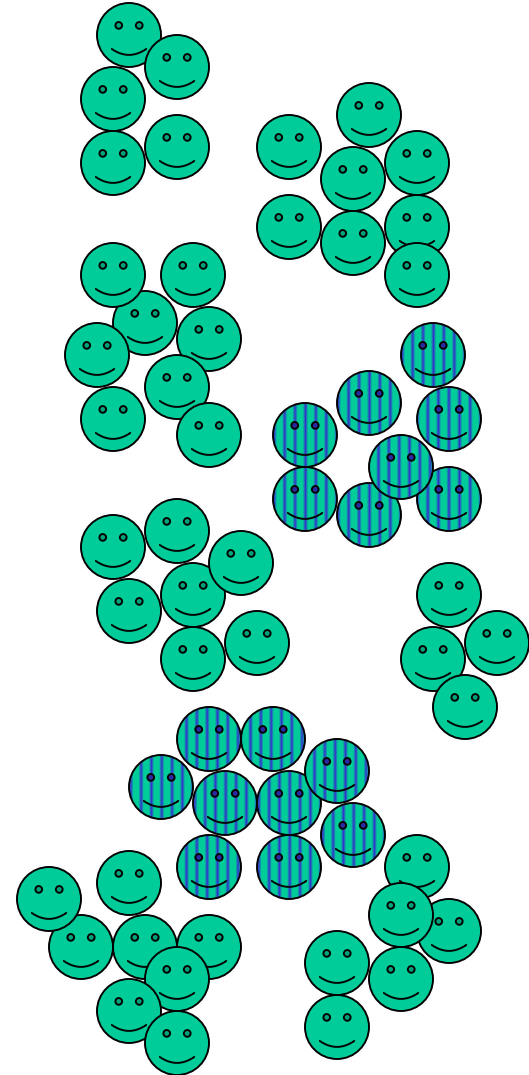


Random Cluster Sampling - 1

- Done correctly, this is a form of random sampling
- Population is divided into groups, usually geographic or organizational
- Some of the groups are randomly chosen
- In pure cluster sampling, whole cluster is sampled.
- In simple multistage cluster, there is random sampling within each randomly chosen cluster

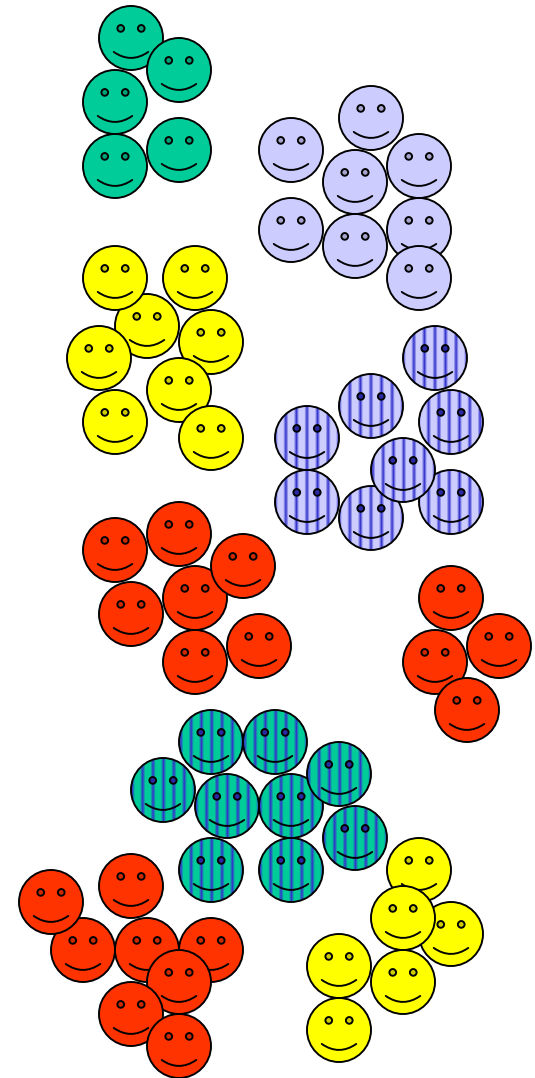
Random Cluster Sampling - 2

- Population is divided into groups
- Some of the groups are randomly selected
- For given sample size, a cluster sample has more error than a simple random sample
- Cost savings of clustering may permit larger sample
- Error is smaller if the clusters are **similar** to each other



Random Cluster Sampling - 3

- Cluster sampling has very high error if the clusters are different from each other
- Cluster sampling is NOT desirable if the clusters are different
- It IS random sampling: you randomly choose the clusters
- But you will tend to omit some kinds of subjects



Stratification vs. Clustering

Stratification

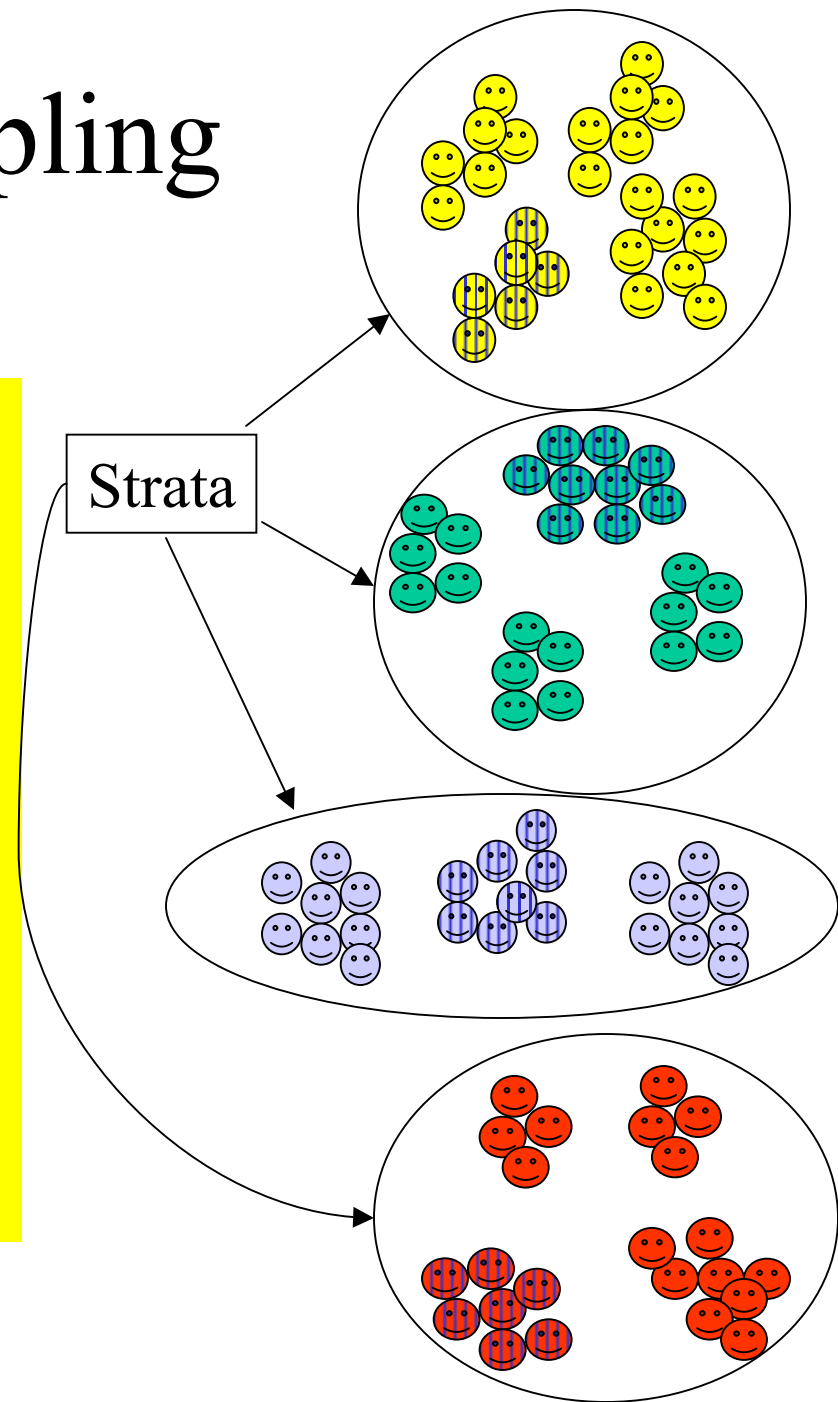
- Divide population into groups different from each other: sexes, races, ages
- Sample randomly from each group
- Less error compared to simple random
- More expensive to obtain stratification information before sampling

Clustering

- Divide population into comparable groups: schools, cities
- Randomly sample some of the groups
- More error compared to simple random
- Reduces costs to sample only some areas or organizations

Stratified Cluster Sampling

- Reduce the error in cluster sampling by creating strata of clusters
- Sample one cluster from each stratum
- The cost-savings of clustering with the error reduction of stratification



Stratified Cluster Sampling

- Combines elements of stratification and clustering
- First you define the clusters
- Then you group the clusters into strata of clusters, putting similar clusters together in a stratum
- Then you randomly pick one (or more) cluster from each of the strata of clusters
- Then you sample the subjects within the sampled clusters (either all the subjects, or a simple random sample of them)