Sampling People, Records, & Networks

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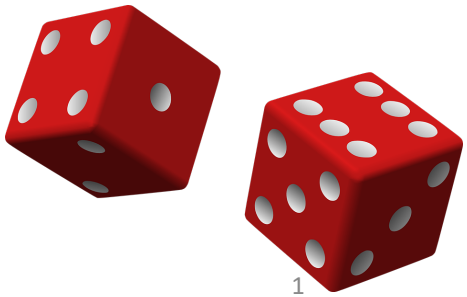
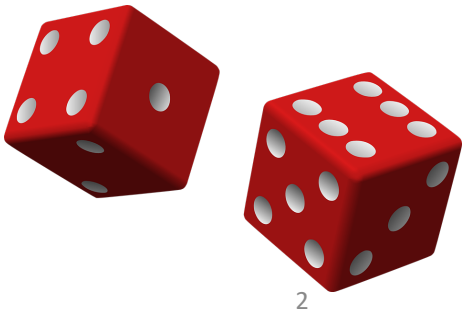


Unit 6

1. Stratified multistage sampling
2. Weights for over/under sampling
3. Nonresponse & noncoverage weighting
4. Variance estimation and software
5. Statistical software for sample selection
6. Sampling networks: multiplicity weighting

- Unit 1: Sampling as a research tool
- Unit 2: Mere randomization
- Unit 3: Saving money
- Unit 4: Being more efficient
- Unit 5: Simplifying sampling
- Unit 6: Some extensions & applications



Unit 6

1. Stratified multistage sampling
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3. Nonresponse & noncoverage weighting
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5. Statistical software for sample selection
6. Sampling networks: multiplicity weighting

- Unit 1: Sampling as a research tool
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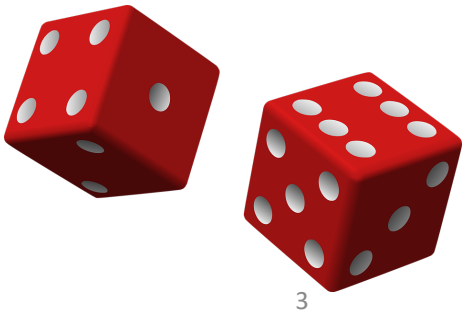
- **Unit 6: Some extensions & applications**
  1. Statistical software for sample selection
  2. Stratified multistage sampling
  3. Weights for over/under sampling
  4. Nonresponse & noncoverage weighting
  5. Sampling networks: multiplicity weighting
  6. Non-probability sampling



Unit 6

1. **Statistical software for sample selection**
2. Stratified multistage sampling
3. Weights for over/under sampling
4. Nonresponse & noncoverage weighting
5. Sampling networks: multiplicity weighting
6. Non-probability sampling

- Unit 1: Sampling as a research tool
- Unit 2: Mere randomization
- Unit 3: Saving money
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- Unit 5: Simplifying sampling
- **Unit 6: Some extensions & applications**
  1. **Statistical software for sample selection**
  2. Stratified multistage sampling
  3. Weights for over/under sampling
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  5. Sampling networks: multiplicity weighting
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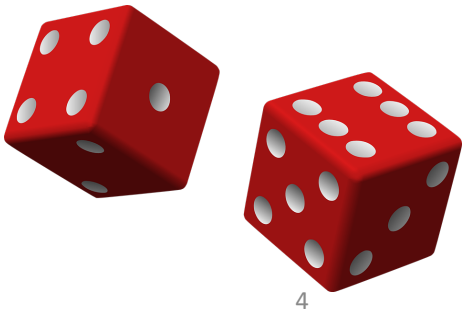
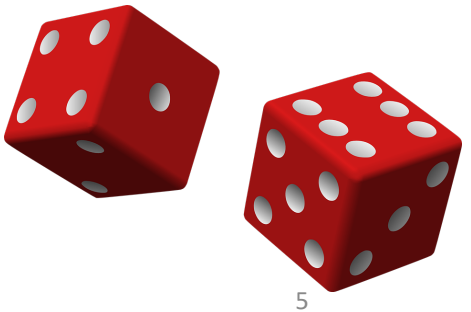


- Frame
- SRS WOR
- SRS WR
- Systematic
- PPS

- Unit 1: Sampling as a research tool
- Unit 2: Mere randomization
- Unit 3: Saving money
- Unit 4: Being more efficient
- Unit 5: Simplifying sampling
- Unit 6: Some extensions & applications
  1. **Statistical software for sample selection**
  2. Stratified multistage sampling
  3. Weights for over/under sampling
  4. Nonresponse & noncoverage weighting
  5. Sampling networks: multiplicity weighting
  6. Non-probability sampling



- **Frame**
- SRS WOR
- SRS WR
- Systematic
- PPS

seqno	rent	own
1	196	118
2	327	0
3	331	1
4	266	81
5	334	23
6	354	34
7	395	3
8	397	7
9	145	278
10	383	91
11	584	75
12	1	0
13	0	1
14	1	0
15	0	1
16	1	0
17	1	0
18	0	1
19	0	1
20	1	0
21	0	1
22	0	1
23	0	1
24	0	1
25	1	0
26	1	0
27	0	1
28	0	1
29	0	1
30	0	1

- **Frame**
- SRS WOR
- SRS WR
- Systematic
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seqno	rent	own
1	196	118
2	327	0
3	331	1
4	266	81
5	334	23
6	354	34
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14	1	0
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17	1	0
18	0	1
19	0	1
20	1	0
21	0	1
22	0	1
23	0	1
24	0	1
25	1	0
26	1	0
27	0	1
28	0	1
29	0	1
30	0	1

$$N = 975$$

$$n = 20$$

$$f = \frac{1}{48.675}$$

- **Frame**
- SRS WOR
- SRS WR
- Systematic
- PPS

seqno	rent	own
1	196	118
2	327	0
3	331	1
4	266	81
5	334	23
6	354	34
7	395	3
8	397	7
9	145	278
10	383	91
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12	1	0
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14	1	0
15	0	1
16	1	0
17	1	0
18	0	1
19	0	1
20	1	0
21	0	1
22	0	1
23	0	1
24	0	1
25	1	0
26	1	0
27	0	1
28	0	1
29	0	1
30	0	1

$$N = 975$$

$$n = 20$$

$$f = \frac{1}{48.675}$$

- **SRS (WOR)**
- **SRS WR**
- **Systematic**
- **PPS**
- **(Stratified)**

- Frame
- SRS WOR
- SRS WR
- Systematic
- PPS

```
# Change directory
setwd("M:\\Coursera sampling methods")
```

- Frame
- SRS WOR
- SRS WR
- Systematic
- PPS

```
# Change directory
setwd("M:\\Coursera sampling methods")

# Open data file
frame <- read.table(file = "frame.txt", header = TRUE, sep = "\t")
```

- Frame
- SRS WOR
- SRS WR
- Systematic
- PPS

```
# Change directory
setwd("M:\\Coursera sampling methods")

# Open data file
frame <- read.table(file = "frame.txt", header = TRUE, sep = "\t")

# View data in a spreadsheet
edit(frame)
```

- **Frame**
- SRS WOR
- SRS WR
- Systematic
- PPS

```
>setwd("//Users/Jim/Dropbox/Teaching/JPSM short course/Coursera sampling methods")
> frame <- read.table(file = "frame.txt", header = TRUE, sep = "\t")
> frame
    seqno     rent     owner
1       1      196       118
2       2      327         0
3       3      331         1
4       4      266        81
5       5      334        23
6       6      354        34
7       7      395         3
8       8      397         7
9       9      145       278
10     10      383        91
11     11      584        75
12     12        1         0
13     13        0         1
14     14        1         0
15     15        0         1
16     16        1         0
17     17        1         0
18     18        0         1
19     19        0         1
20     20        1         0
21     21        0         1
22     22        0         1
23     23        0         1
24     24        0         1
25     25        1         0
26     26        1         0
27     27        0         1
28     28        0         1
29     29        0         1
30     30        0         1
...
```

- **Frame**
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```
>setwd("//Users/Jim/Dropbox/Teaching/JPSM short course/Coursera sampling methods")
> frame <- read.table(file = "frame.txt", header = TRUE, sep = "\t")
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```

	seqno	rent	owner
1	1	196	118
2	2	327	0
3	3	331	1
4	4	266	81
5	5	334	23
6	6	354	34
7	7	395	3
8	8	397	7
9	9	145	278
10	10	383	91
11	11	584	75
12	12	1	0
13	13	0	1
14	14	1	0
15	15	0	1
16	16	1	0
17	17	1	0
18	18	0	1
19	19	0	1
20	20	1	0
21	21	0	1
22	22	0	1
23	23	0	1
24	24	0	1
25	25	1	0
26	26	1	0
27	27	0	1
28	28	0	1
29	29	0	1
30	30	0	1

…

- Frame
- **SRS WOR**
- SRS WR
- Systematic
- PPS

```
> ## Using functions of the 'sampling' package ##
> library(sampling)
>
```

- Frame
- **SRS WOR**
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```
> ## Using functions of the 'sampling' package ##
> library(sampling)
> ## Simple Random Sample ##
>       ## without replacement ##
> sam.srswor <- srswor(n = 20, N = 975)
```

- Frame
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> ## Using functions of the 'sampling' package ##
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> ## Simple Random Sample ##
>       ## without replacement ##
> sam.srswor <- srswor(n = 20, N = 975)
> sample.srswor <- frame[which(x = (sam.srswor == 1)),]
```

- Frame
- **SRS WOR**
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```
> ## Using functions of the 'sampling' package ##
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- Frame
- **SRS WOR**
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- Systematic
- PPS

```
> ## Using functions of the 'sampling' package ##
> library(sampling)
> ## Simple Random Sample ##
>       ## without replacement ##
> sam.srswor <- srswor(n = 20, N = 975)
> sample.srswor <- frame[which(x = (sam.srswor == 1)),]
> sam.srswor
  [1] 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 [38] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 [75] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
…
```

- Frame
- **SRS WOR**
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```
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>       ## without replacement ##
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> sam.srswor
  [1] 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 [38] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 [75] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
…
```

- Frame
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```
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>       ## without replacement ##
> sam.srswor <- srswor(n = 20, N = 975)
> sample.srswor <- frame[which(x = (sam.srswor == 1)),]
> sam.srswor
  [1] 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 [38] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 [75] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
…
```

- Frame
- **SRS WOR**
- SRS WR
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- PPS

```
> sample.srswor
     seqno     rent     owner
7        7      395         3
21      21        0         1
93      93        5         0
185    185        0         9
222    222        0        11
228    228       10         1
246    246        0        12
301    301        0        14
306    306       14         0
347    347        0        17
467    467        6        16
472    472        8        14
495    495       12        12
506    506        6        18
538    538        0        26
705    705        6        33
778    778       51         0
804    804        1        57
809    809       10        49
879    879       64        20
```

- Frame
- SRS WOR
- **SRS WR**
- Systematic
- PPS

```
>        ## with replacement ##
> sam.srswr <- srswr(n = 20, N = 975)
```

- Frame
- SRS WOR
- **SRS WR**
- Systematic
- PPS

```
>        ## with replacement ##
> sam.srswr <- srswr(n = 20, N = 975)
```

- Frame
- SRS WOR
- **SRS WR**
- Systematic
- PPS

```
>       ## with replacement ##
> sam.srswr <- srswr(n = 20, N = 975)
> sample.srswr <- frame[which(x = (sam.srswr >= 1)),]
```

- Frame
- SRS WOR
- **SRS WR**
- Systematic
- PPS

```
>        ## with replacement ##
> sam.srswr <- srswr(n = 20, N = 975)
> sample.srswr <- frame[which(x = (sam.srswr >= 1)),]
```

- Frame
- SRS WOR
- **SRS WR**
- Systematic
- PPS

```
>        ## with replacement ##
> sam.srswr <- srswr(n = 20, N = 975)
> sample.srswr <- frame[which(x = (sam.srswr >= 1)),]
> sam.srswr
  [1] 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 0 0 0 0 0
 [38] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
 [75] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
…
```

- Frame
- SRS WOR
- **SRS WR**
- Systematic
- PPS

```
>       ## with replacement ##
> sam.srswr <- srswr(n = 20, N = 975)
> sample.srswr <- frame[which(x = (sam.srswr >= 1)),]
> sam.srswr
  [1] 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 0 0 0 0 0
 [38] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
 [75] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
…
```

- Frame
- SRS WOR
- **SRS WR**
- Systematic
- PPS

```
>       ## with replacement ##
> sam.srswr <- srswr(n = 20, N = 975)
> sample.srswr <- frame[which(x = (sam.srswr >= 1)),]
> sam.srswr
  [1] 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 0 0 0 0 0
 [38] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
 [75] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
…
```

- Frame
- SRS WOR
- **SRS WR**
- Systematic
- PPS

```
> sample.srswr
     seqno     rent     owner
24      24        0         1
157    157        0         8
213    213        1        10
240    240        2        10
278    278        2        11
281    281        4        10
296    296        0        14
352    352        9         8
464    464        5        17
485    485        2        21
547    547        6        21
614    614        2        29
675    675       35         1
739    739       28        15
760    760       46         2
820    820       53         8
881    881       10        74
886    886       86         0
941    941      142        15
956    956      171        15
```

- Frame
- SRS WOR
- **SRS WR**
- Systematic
- PPS

```
> sample.srswr
     seqno     rent     owner      dup
24      24        0         1        1
157    157        0         8        1
213    213        1        10        2
240    240        2        10        1
278    278        2        11        1
281    281        4        10        1
296    296        0        14        1
352    352        9         8        1
464    464        5        17        1
485    485        2        21        1
547    547        6        21        1
614    614        2        29        1
675    675       35         1        1
739    739       28        15        1
760    760       46         2        1
820    820       53         8        1
881    881       10        74        1
886    886       86         0        1
941    941      142        15        1
956    956      171        15        1
...
```

- Frame
- SRS WOR
- SRS WR
- **Systematic**
- PPS

```
> ## Systematic samples ##
>       ## Random start - equal size ##
> prob.sys <- rep(x = 20/975, times = 975)
```

```
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>        ## Random start - equal size ##
> prob.sys <- rep(x = 20/975, times = 975)
```

- Frame
- SRS WOR
- SRS WR
- **Systematic**
- PPS

```
> ## Systematic samples ##
>       ## Random start - equal size ##
> prob.sys <- rep(x = 20/975, times = 975)
```

- Frame
- SRS WOR
- SRS WR
- **Systematic**
- PPS

```
> ## Systematic samples ##
>       ## Random start - equal size ##
> prob.sys <- rep(x = 20/975, times = 975)
> sam.sys <- UPsystematic(pik = prob.sys)
```

- Frame
- SRS WOR
- SRS WR
- **Systematic**
- PPS

```
> ## Systematic samples ##
>       ## Random start - equal size ##
> prob.sys <- rep(x = 20/975, times = 975)
> sam.sys <- UPsystematic(pik = prob.sys)
```

- Frame
- SRS WOR
- SRS WR
- **Systematic**
- PPS

```
> ## Systematic samples ##
>       ## Random start - equal size ##
> prob.sys <- rep(x = 20/975, times = 975)
> sam.sys <- UPsystematic(pik = prob.sys)
> sample.sys <- frame[which(x = (sam.sys == 1)),]
> sam.sys
  [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
 [38] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 [75] 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
…
```

- Frame
- SRS WOR
- SRS WR
- **Systematic**
- PPS

```
> ## Systematic samples ##
>        ## Random start - equal size ##
> prob.sys <- rep(x = 20/975, times = 975)
> sam.sys <- UPsystematic(pik = prob.sys)
> sample.sys <- frame[which(x = (sam.sys == 1)),]
> sam.sys
  [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
 [38] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 [75] 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
…
```

- Interval = 975/20 = 48.75
- Gaps of 48 and 49 …

- Frame
- SRS WOR
- SRS WR
- **Systematic**
- PPS

```
> sample.sys
     seqno     rent     owner
33      33        1         0
82      82        0         4
131    131        7         0
180    180        0         9
228    228       10         1
277    277        8         5
326    326       16         0
375    375        5        12
423    423        6        14
472    472        8        14
521    521        9        16
570    570        3        25
618    618       14        18
667    667       10        25
716    716       40         0
765    765       37        12
813    813        2        58
862    862       75         2
911    911      114         0
960    960      184        14
```

- Frame
- SRS WOR
- SRS WR
- Systematic
- **PPS**

```
> ## PPS samples ##
>       ## random selections ##
> prob.pps <- inclusionprobabilities(a = frame$owner_hu, n =
20)
```

- Frame
- SRS WOR
- SRS WR
- Systematic
- **PPS**

```
> ## PPS samples ##
>       ## random selections ##
> prob.pps <- inclusionprobabilities(a = frame$owner_hu, n = 20)
Warning message:
In inclusionprobabilities(a = frame$owner_hu, n = 20) :
  there are zero values in the initial vector a
```

- Frame
- SRS WOR
- SRS WR
- Systematic
- **PPS**

```
> ## PPS samples ##
>       ## random selections ##
> prob.pps <- inclusionprobabilities(a = frame$owner_hu, n = 20)
Warning message:
In inclusionprobabilities(a = frame$owner_hu, n = 20) :
  there are zero values in the initial vector a

> sam.pps <- UPbrewer(pik = prob.pps)
> sample.pps <- frame[which(x = (sam.pps == 1)),]
```

- Frame
- SRS WOR
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```
> ## PPS samples ##
>       ## random selections ##
> prob.pps <- inclusionprobabilities(a = frame$owner_hu, n = 20)
Warning message:
In inclusionprobabilities(a = frame$owner_hu, n = 20) :
  there are zero values in the initial vector a

> sam.pps <- UPbrewer(pik = prob.pps)
> sample.pps <- frame[which(x = (sam.pps == 1)),]
> sam.pps
  [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 [38] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 [75] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
…
```

- Frame
- SRS WOR
- SRS WR
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- **PPS**

```
> sample.pps
     seqno     rent     owner
149    149        1         6
236    236        0        12
252    252        2        10
403    403        6        13
410    410        0        19
447    447        0        21
491    491        5        19
569    569       12        16
576    576        0        28
620    620        0        32
639    639       10        23
687    687        1        36
693    693        8        29
738    738        3        40
762    762       12        36
920    920       52        71
923    923        5       121
944    944       18       140
962    962       87       120
975    975       41       257
```

- Frame
- SRS WOR
- SRS WR
- Systematic
- **PPS**

```
> sample.ppssys
     seqno    rent    owner
9        9     145      278
181    181       2        7
276    276       0       13
357    357       6       11
417    417       5       14
470    470       7       15
518    518      14       11
563    563       3       24
606    606      27        3
647    647       2       32
687    687       1       36
726    726       1       40
768    768       1       48
804    804       1       57
837    837       2       64
869    869      46       33
919    919     119        2
944    944      18      140
962    962      87      120
973    973      41      234
```

Unit 6

1. Statistical software for sample selection
2. **Stratified multistage sampling**
3. Weights for over/under sampling
4. Nonresponse & noncoverage weighting
5. Sampling networks: multiplicity weighting
6. Non-probability sampling

- Unit 1: Sampling as a research tool
- Unit 2: Mere randomization
- Unit 3: Saving money
- Unit 4: Being more efficient
- Unit 5: Simplifying sampling
- **Unit 6: Some extensions & applications**
  1. Statistical software for sample selection
  2. **Stratified multistage sampling**
  3. Weights for over/under sampling
  4. Nonresponse & noncoverage weighting
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