

# Sampling People, Records, & Networks

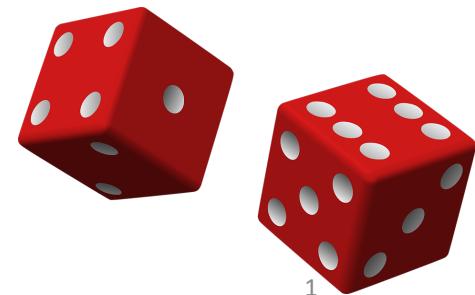
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Professor & Research Professor Emeritus

Institute for Social Research, University of Michigan

Research Professor,

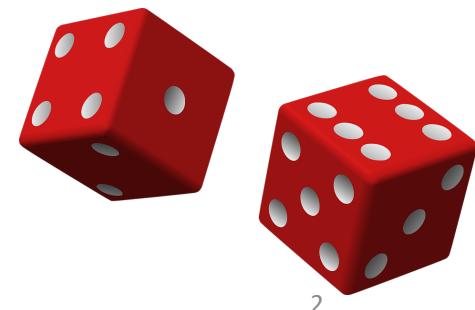
Joint Program in Survey Methodology, University of Maryland



## 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

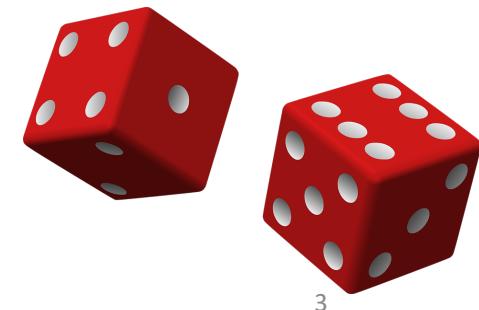
- Unit 1: Sampling as a research tool
- Unit 2: Mere randomization
- Unit 3: Saving money
- Unit 4: Being more efficient
- Unit 5: Simplifying sampling
- Unit 6: Some extensions & applications



## Unit 6

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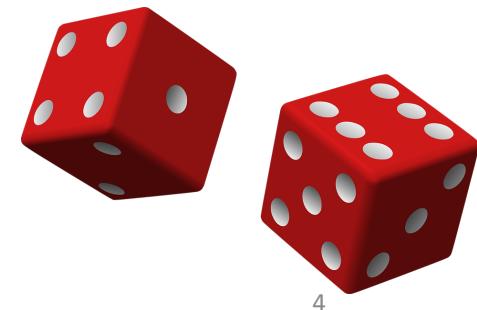
- Unit 1: Sampling as a research tool
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- Unit 3: Saving money
- Unit 4: Being more efficient
- Unit 5: Simplifying sampling
- **Unit 6: Some extensions & applications**
  - 1. Statistical software for sample selection
  - 2. Stratified multistage sampling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



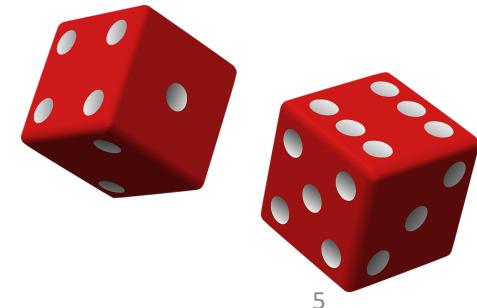
## Unit 6

- 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
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- **Unit 6: Some extensions & applications**
  - 1. Statistical software for sample selection
  - 2. **Stratified multistage sampling**
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  - 4. Nonresponse & noncoverage weighting
  - 5. Sampling networks: multiplicity weighting
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- PSU's
  - Second stage units
  - Housing units
  - Estimation
- Unit 1: Sampling as a research tool
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    3. Weights for over/under sampling
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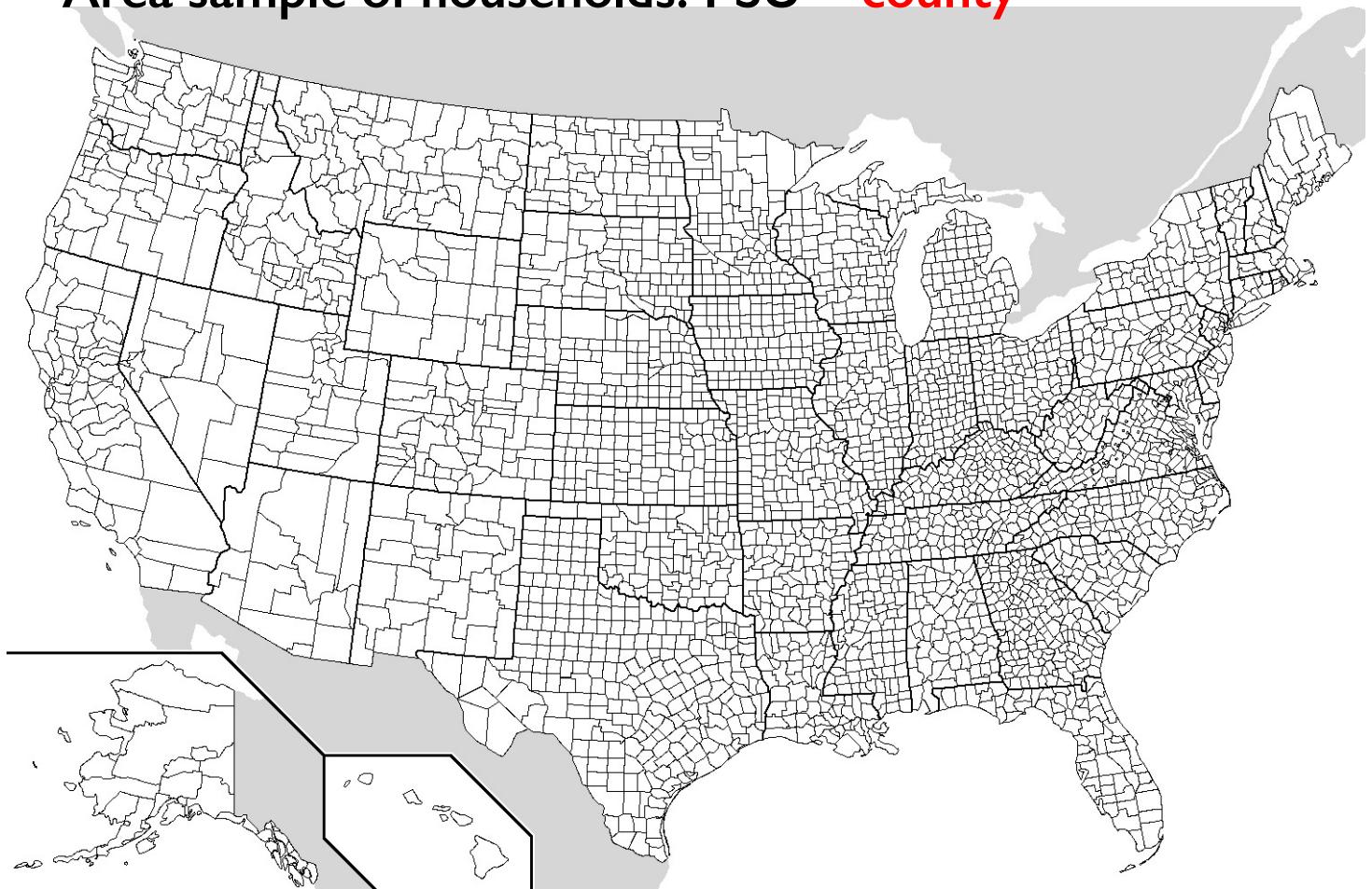


- PSU's
  - Second stage units
  - Housing units
  - Estimation
- First, identify sampling units:
    - PSU
    - Secondary units within PSU, etc.



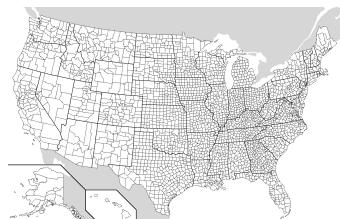
- PSU's
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- Area sample of households: PSU = **county**

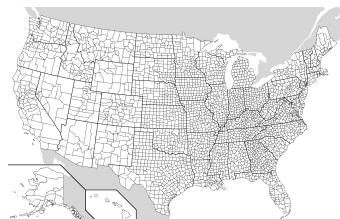


- PSU's
- Second stage units
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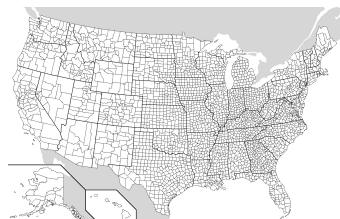
- First, identify sampling units:
  - PSU
  - Secondary units within PSU, etc.
- Then stratify at each stage
  - Stratification as a general purpose tool ...
  - Assure representation
  - Potentially provide gains in precision



- PSU's
  - Second stage units
  - Housing units
  - Estimation
- For example, PSU stratification
  - Follows principles similar to element stratification
    - Use cluster characteristics to **create** homogeneous, mutually exclusive, exhaustive **groups**

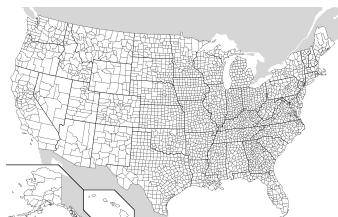


- PSU's
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- For example, PSU stratification
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    - Use cluster characteristics to create homogeneous, mutually exclusive, exhaustive groups
    - Stratifying variables, boundaries, etc., follow element sampling stratification principles

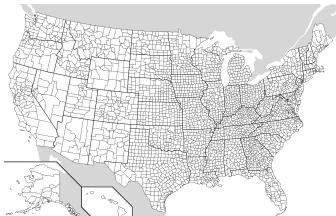


- PSU's
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- For example, PSU stratification
- Follows principles similar to element stratification
  - Use cluster characteristics to create homogeneous, mutually exclusive, exhaustive groups
  - Stratifying variables, boundaries, etc., follow element sampling stratification principles
  - Allocate sample clusters across strata: Proportionate, paired, equal, other (Neyman or minimum variance unusual)



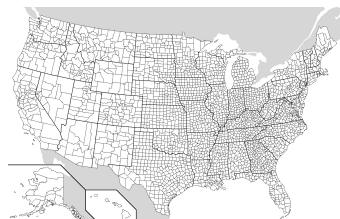
- PSU's
  - Second stage units
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- For example, PSU stratification
  - Follows principles similar to element stratification
    - Use cluster characteristics to create homogeneous, mutually exclusive, exhaustive groups
    - Stratifying variables, boundaries, etc., follow element sampling stratification principles
    - Allocate sample clusters across strata: Proportionate, paired, equal, other (Neyman or minimum variance unusual)
    - Select samples from each group
    - Later, after data collection, compute estimates separately for each group – statistic and sampling variance
    - **Combine** results across groups



- PSU's
- Second stage units
- Housing units
- Estimation

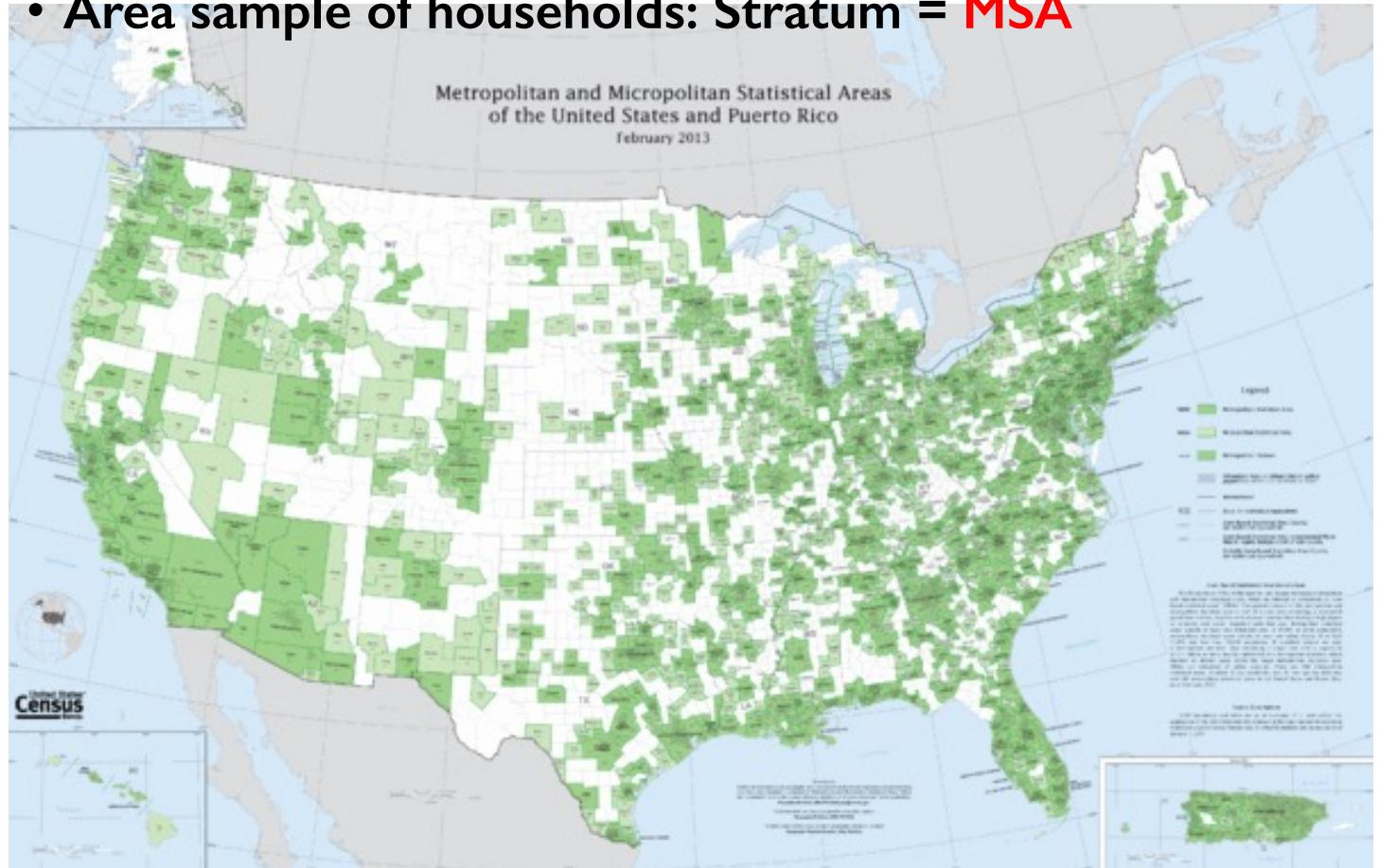
- **Purpose?**

- Control the distribution of the sample
- Decrease sampling variance



- PSU's
- Second stage units
- Housing units
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- Area sample of households: Stratum = MSA



- PSU's
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- Area sample of households: Stratification = **implicit**

330	26029	26 029	CHARLEVOIX, MI	CHARLEVOIX CO, MI	8243	8243	48138
330	26031	26 031	CHEBOYGAN, MI	CHEBOYGAN CO, MI	8201	8201	56339
330	26033	26 033	CHIPPEWA, MI	CHIPPEWA CO, MI	11541	11541	67880
330	26035	26 035	CLARE, MI	CLARE CO, MI	9698	9698	77578
330	26039	26 039	CRAWFORD, MI	CRAWFORD CO, MI	4441	4441	82019
330	26041	26 041	DELTA, MI	DELTA CO, MI	14531	14531	96550
330	26043	26 043	DICKINSON, MI	DICKINSON CO, MI	10633	10633	107183
330	26047	26 047	EMMET, MI	EMMET CO, MI	9516	9516	116699
330	26051	26 051	GLADWIN, MI	GLADWIN CO, MI	8357	8357	125056
330	26053	26 053	GOGEBIC, MI	GOGEBIC CO, MI	7449	7449	132505
330	26055	26 055	GRAND TRAVERSE, MI	GRAND TRAVERSE CO, MI	23965	23965	156470
330	26061	26 061	HOUGHTON, MI	HOUGHTON, MI	13172	13949	169642
330	26061	26 083	KEWEENAW, MI		777		170419
330	26069	26 069	IOSCO, MI	IOSCO CO, MI	11588	11588	182007
330	26071	26 071	IRON, MI	IRON CO, MI	5655	5655	187662
330	26079	26 079	KALKASKA, MI	KALKASKA CO, MI	4934	4934	192596
330	26085	26 085	LAKE, MI	LAKE CO, MI	3536	3536	196132
330	26089	26 089	LEELANAU, MI	LEELANAU CO, MI	6274	6274	202406
330	26095	26 095	LUCE, MI	LUCE CO, MI	2154	2154	204560
330	26097	26 097	MACKINAC, MI	MACKINAC CO, MI	4240	4240	208800
330	26101	26 101	MANISTEE, MI	MANISTEE CO, MI	8580	8580	217380
330	26103	26 103	MARQUETTE, MI	MARQUETTE CO, MI	25435	25435	242815
330	26105	26 105	MASON, MI	MASON CO, MI	9984	9984	252799
330	26109	26 109	MENOMINEE, MI	MENOMINEE CO, MI	9766	9766	262565
330	26113	26 113	MISSAUKEE, MI	MISSAUKEE CO, MI	4389	4389	266954
330	26119	26 119	MONTMORENCY, MI	MONTMORENCY CO, MI	3600	3600	270554
330	26129	26 129	OGEMAW, MI	OGEMAW CO, MI	7190	7190	277744
330	26131	26 131	ONTONAGON, MI	ONTONAGON CO, MI	3641	3641	281385
330	26133	26 133	OSCEOLA, MI	OSCEOLA CO, MI	7347	7347	288732
330	26135	26 135	OSCODA, MI	OSCODA CO, MI	3160	3160	291892
330	26137	26 137	OTSEGO, MI	OTSEGO CO, MI	6522	6522	298414
330	26141	26 141	PRESQUE ISLE, MI	PRESQUE ISLE CO, MI	5376	5376	303790
330	26143	26 143	ROSCOMMON, MI	ROSCOMMON CO, MI	8516	8516	312306
330	26153	26 153	SCHOOLCRAFT, MI	SCHOOLCRAFT CO, MI	3294	3294	315600
330	26165	26 165	WEXFORD, MI	WEXFORD CO, MI	9923	9923	325523
330	55001	55 001	ADAMS, WI	ADAMS CO, WI	5972	5972	331495
330	55003	55 003	ASHLAND, WI	ASHLAND CO, WI	6255	6255	337750



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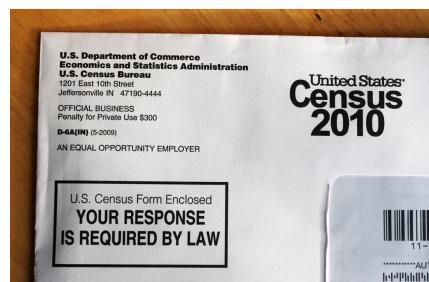
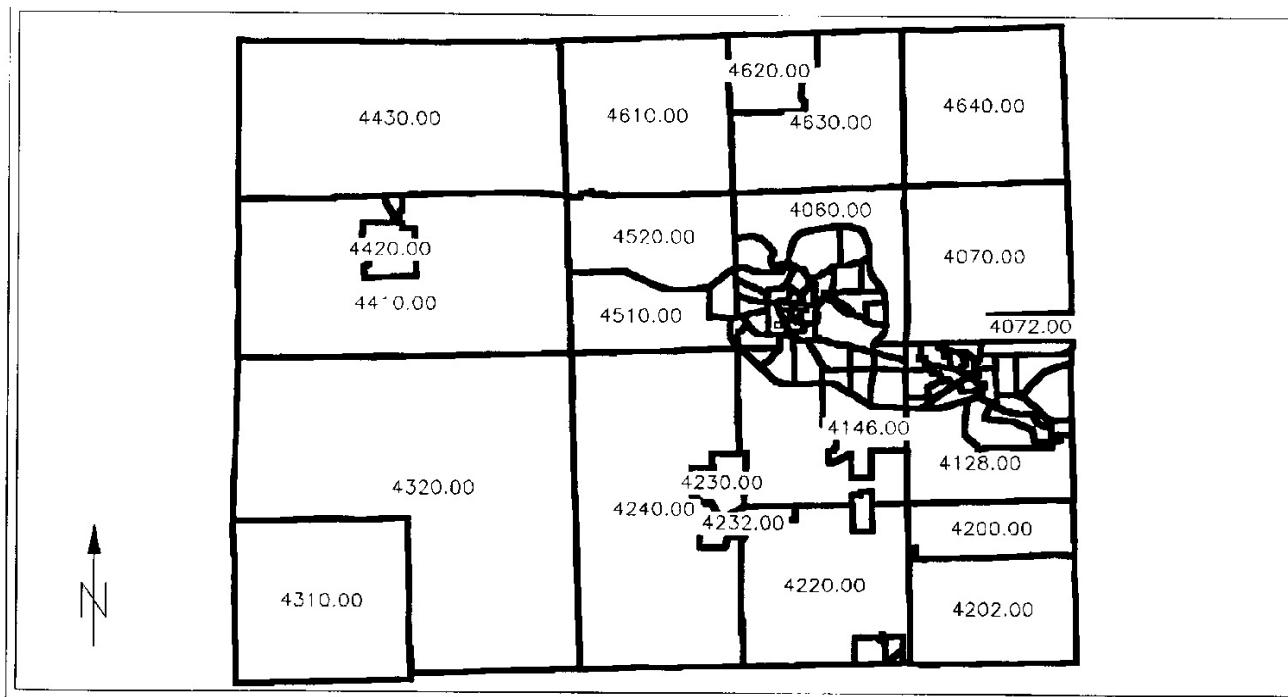
- Area sample of households: Stratification = **implicit**
- Systematic selection from geographically ordered list

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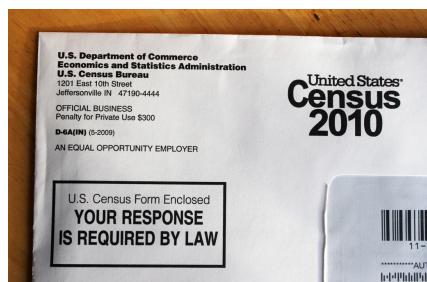
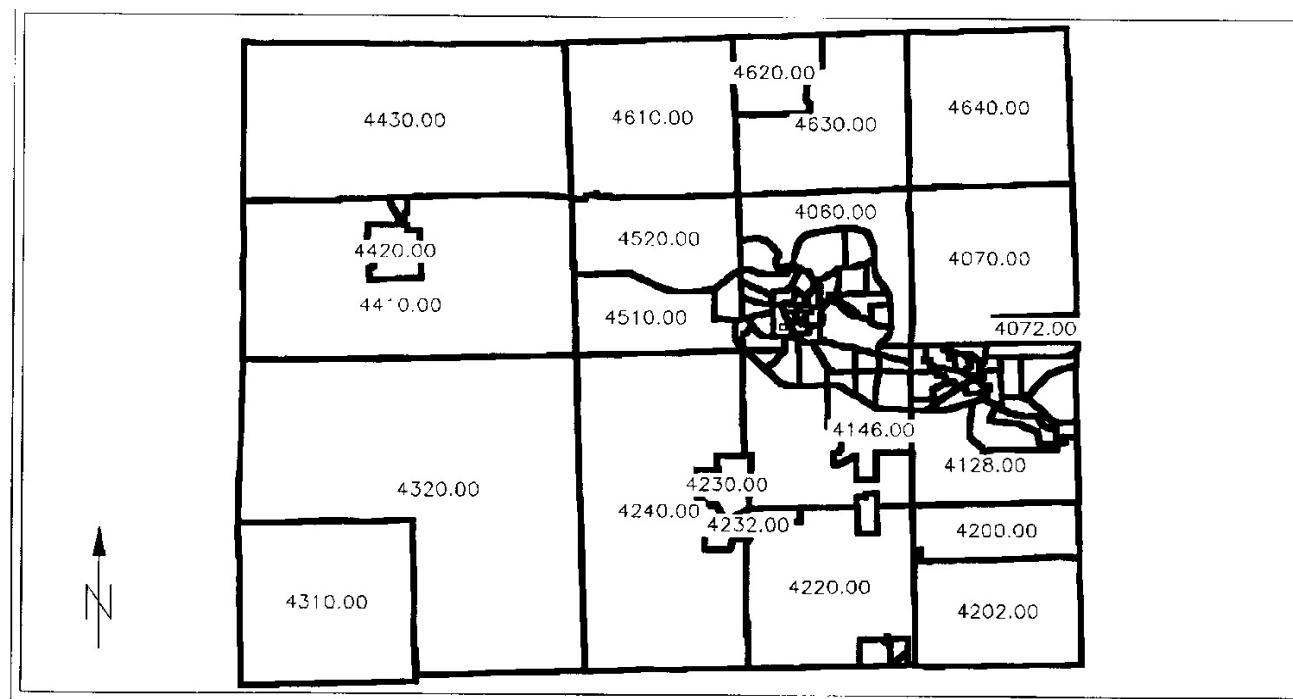
- PSU's
- Second stage units
- Housing units
- Estimation

- Area sample of households: Second stage units



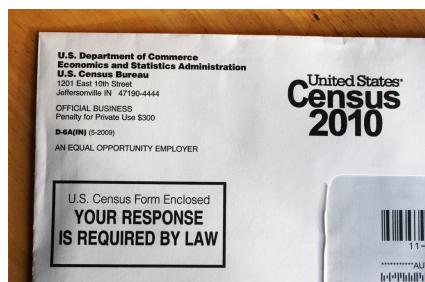
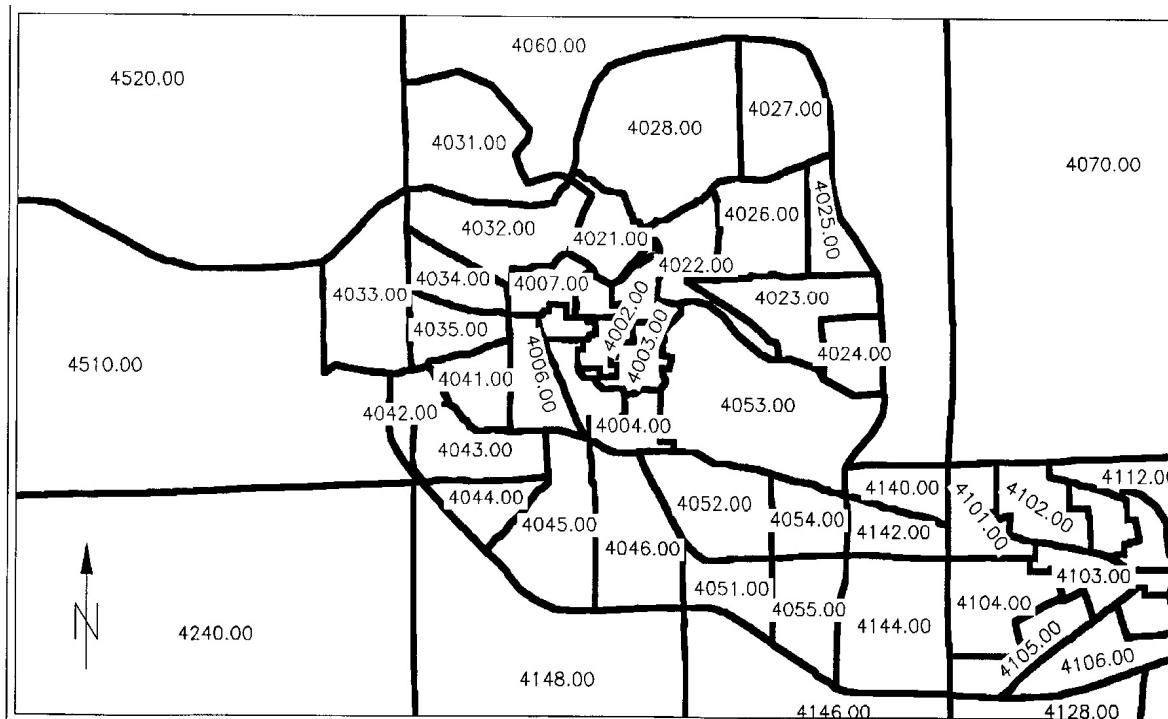
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- Area sample of households: Second stage units
  - Within selected PSU
  - Census tracts across entire selected county?



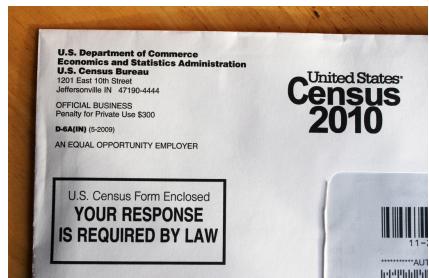
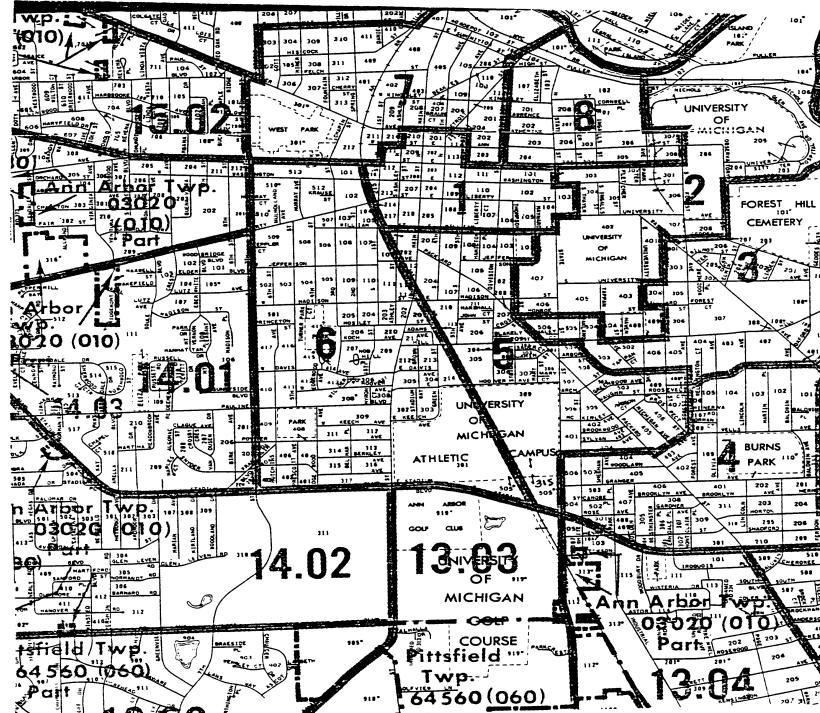
- PSU's
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- Geographically large units in non-metropolitan areas
- Smaller size geographically in metropolitan areas, but approximately same population (households) size

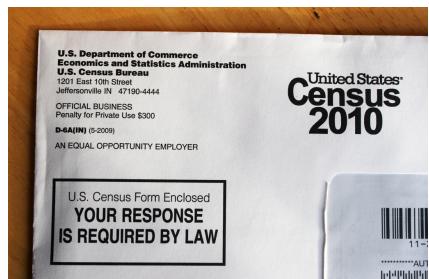
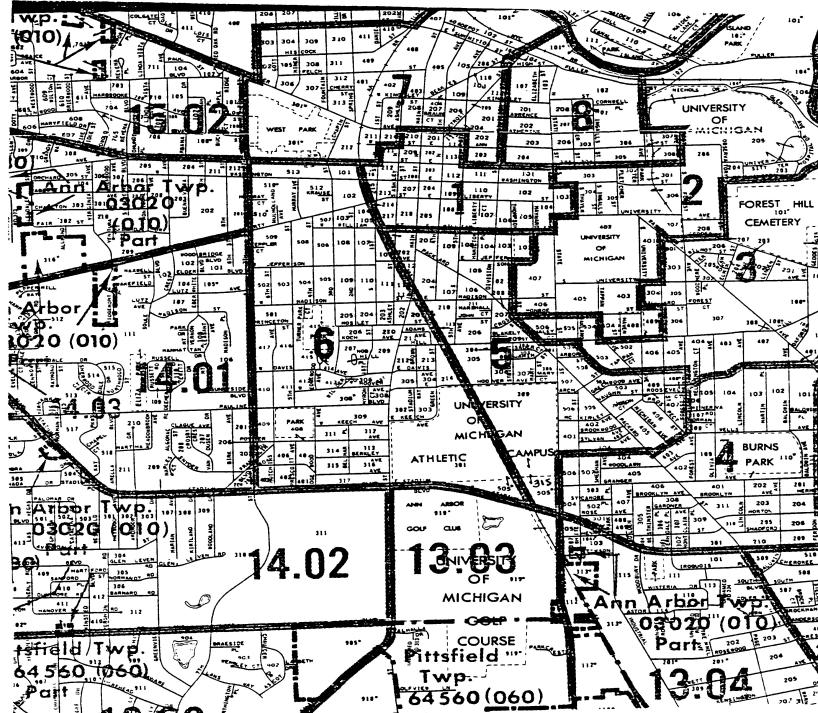


- PSU's
- Second stage units
- Housing units
- Estimation

## • Census blocks?



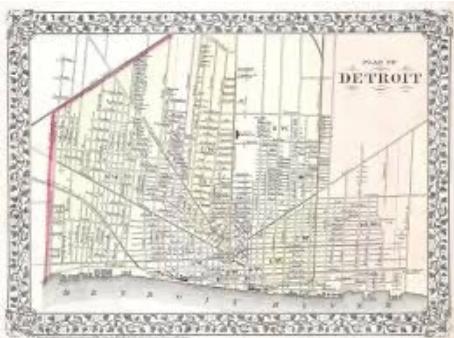
- PSU's
- Second stage units
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- Estimation
- Census blocks?
- Covers all land area, grouped within Census tracts



- PSU's
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- Estimation

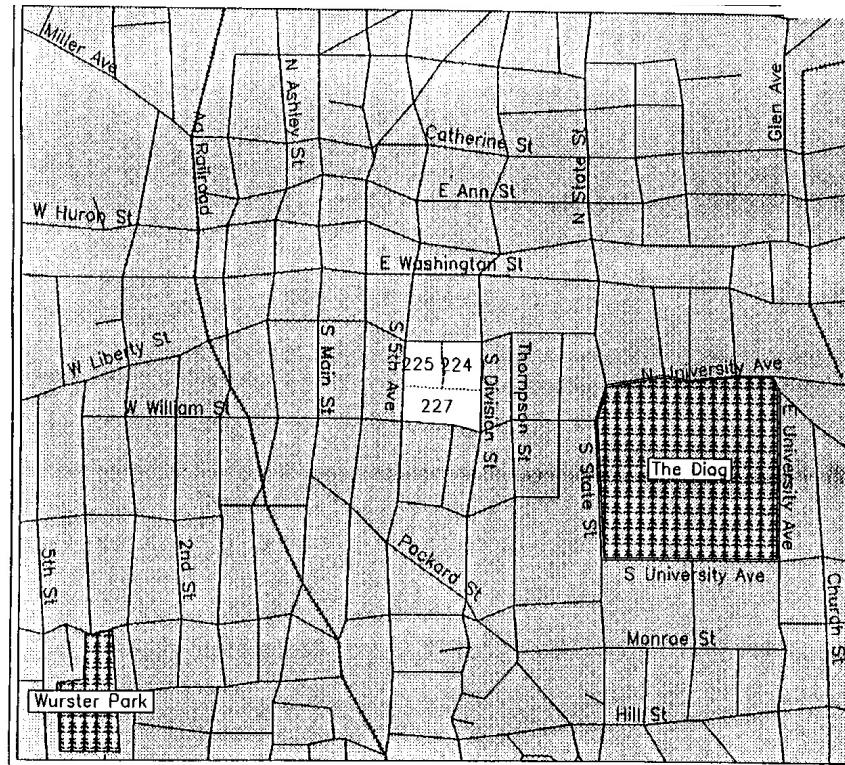
## • Block selection stratification: implicit

OBS	RACEINC	TRACT	BLOCK	MOS	CLUSTNO	CUM
46	1	400200	113	0	7	830
47	1	400200	114	0	7	830
48	1	400200	115	0	7	830
49	1	400200	116	6	7	836
50	1	400200	117	0	7	836
51	1	400200	118	0	7	836
52	1	400200	119	0	7	836
53	1	400200	120	0	7	836
54	1	400200	121	43	7	879
55	1	400200	201	0	9	879
56	1	400200	202	1	9	880
57	1	400200	203	11	9	891
58	1	400200	204	0	9	891
59	1	400200	205	26	8	917
60	1	400200	206	0	8	917
61	1	400200	207	0	8	917
62	1	400200	208	0	8	917
63	1	400200	209	0	8	917
64	1	400300	101	53	8	970
65	1	400300	102	153	12	1123
66	1	400300	103	43	12	1166
67	1	400300	104	15	12	1181
68	1	400300	105	37	11	1218
69	1	400300	106	70	11	1288
70	1	400300	107	85	10	1373
71	1	400300	108	65	9	1438
72	1	400300	109	8	9	1446
73	1	400300	110	38	9	1484
74	1	400300	111	3	9	1487
75	1	400300	201	303	13	1790
76	1	400300	202	0	13	1790
77	1	400300	203	22	13	1812
78	1	400300	301	182	15	1994
79	1	400300	302	25	15	2019
80	1	400300	303	36	15	2055
81	1	400300	304	89	14	2144
82	1	400300	401	10	17	2154
83	1	400300	402	0	17	2154
84	1	400300	403	18	16	2172
85	1	400300	404	65	16	2237
86	1	400300	405	81	18	2318
87	1	400300	406	65	17	2383
88	1	400300	501	36	19	2419
89	1	400300	502	16	19	2435
90	1	400300	503	142	21	2577



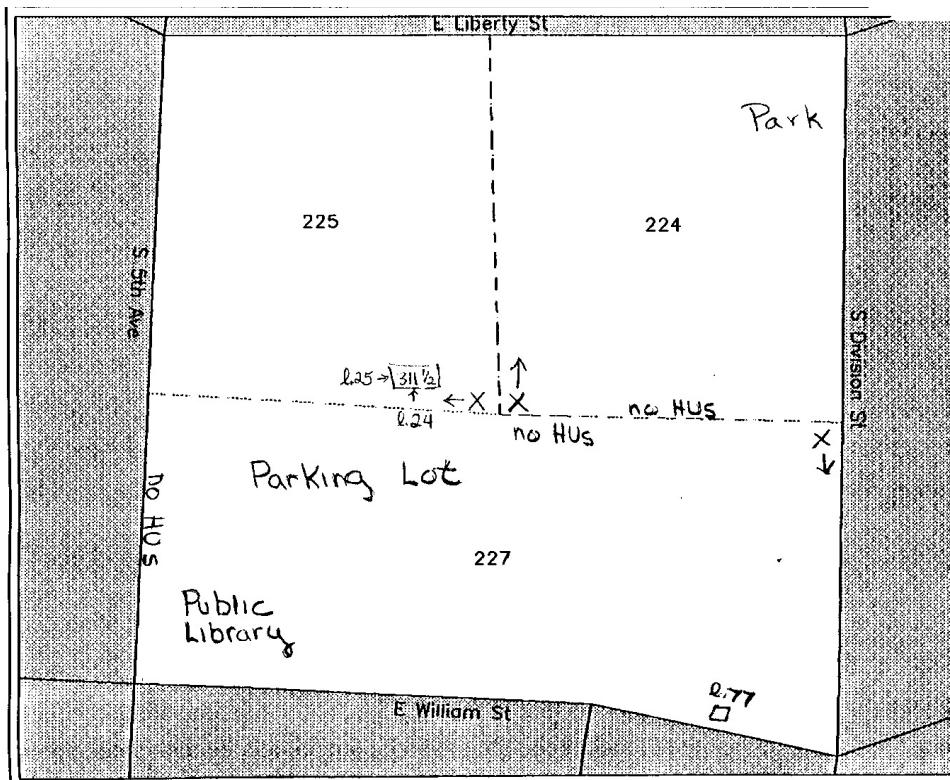
- PSU's
- Second stage units
- **Housing units**
- Estimation

- **Within block unit: housing unit**



- PSU's
- Second stage units
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- May require creation of list: **block map** to orient list application



- PSU's
- Second stage units
- Housing units
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- **Housing unit list, geographically ordered**

MASTER LINE NO (1)	PROJ LINE (2)	ADDRESS (OR DESCRIPTION) OF HOUSING UNIT (3)	TYPE II ADD + (4)	SAMPLE REPLICATE (5)	CENSUS BLOCK (6)
001.000	001	320 E LIBERTY ST APT R1 BEHIND RUG STORE			224
002.000	002	320 E LIBERTY ST APT R2 ABOVE RUG STORE, SIDE DR			224
003.000	003	320 E LIBERTY ST APT R3 ABOVE RUG STORE, 3RD FL			224
004.000	004	320 E LIBERTY ST APT R4 ABOVE RUG STORE, 3RD FL		283	224
005.000	003	320 S DIVISION ST APT 1			224
006.000	006	320 S DIVISION ST APT 2			224
007.000	007	320 S DIVISION ST APT 3			224
008.000	008	320 S DIVISION ST APT 4			224
009.000	009	320 S DIVISION ST APT 5			224
010.000	010	320 S DIVISION ST APT 6			224

PAGE : 1



- PSU's
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- Housing unit list, geographically ordered
- Stratification: implicit

MASTER LINE NO (1)	PROJ LINE (2)	ADDRESS (OR DESCRIPTION) OF HOUSING UNIT (3)	TYPE II ADD + (4)	SAMPLE REPLICATE (5)	CENSUS BLOCK (6)
001.000	001	320 E LIBERTY ST APT R1 BEHIND RUG STORE			224
002.000	002	320 E LIBERTY ST APT R2 ABOVE RUG STORE, SIDE DR			224
003.000	003	320 E LIBERTY ST APT R3 ABOVE RUG STORE, 3RD FL			224
004.000	004	320 E LIBERTY ST APT R4 ABOVE RUG STORE, 3RD FL		283	224
005.000	003	320 S DIVISION ST APT 1			224
006.000	006	320 S DIVISION ST APT 2			224
007.000	007	320 S DIVISION ST APT 3			224
008.000	008	320 S DIVISION ST APT 4			224
009.000	009	320 S DIVISION ST APT 5			224
010.000	010	320 S DIVISION ST APT 6			224

PAGE : 1



- PSU's
- Second stage units
- Housing units
- Estimation
  - **Estimation from stratified multistage samples**
  - **Beyond the scope of this course**

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  - **Estimation from stratified multistage samples**
  - **Beyond the scope of this course**
  - **Subsequent course in specialization addresses**

$\Sigma$

- PSU's
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  - **Estimation from stratified multistage samples**
  - **Beyond the scope of this course**
  - **Subsequent course in specialization addresses**
    - Computing estimates from complex samples
    - Computing estimates of sampling variances from complex samples
    - Drawing inferences to populations from complex samples

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## 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
  - 5. Sampling networks: multiplicity weighting
  - 6. Non-probability sampling

