

# Sampling strategies and Longitudinal Study Design

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RSM 321 (Lecture 11 & 12)

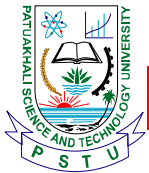
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Jennifer Barrett (WUR)



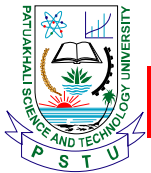
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Date: 29 SEP. 2013

# Outline

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- ❖ Sampling strategies
- ❖ Longitudinal Study Design



# Sampling (Kumar chapter 12)

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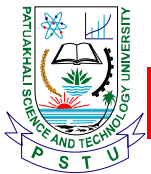
What is sampling?

- ❖ Sampling is the selection of research units from a population

Why sampling?

- ❖ Sampling is necessary because 'you cannot study everyone everywhere doing everything'

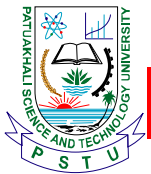
- ❖ Sampling in quantitative research may mean 'people sampling', 'sampling of enterprises', 'sampling of soil', etc.



# Sampling plan (four steps)

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1. The definition of the research unit and population (i.e. target population)
2. The finding of a sampling frame (i.e. study population)
3. The choice for a particular method of sampling (Kumar: sampling design or sampling strategy)
4. The decision about the sample size

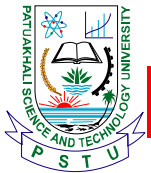


# 1. Definition of the population

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Target population:

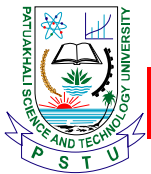
- ❖ Population to which you want to generalize the results
  - Example 1: all home based tapioca producing enterprises in Ho Chi Minh city (Vietnam)
  - Example 2: all habitats where bees live in a country or region



## 2. Sampling frame

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- Ideally, the sampling frame would list every research unit in the target population separately and only once
- In practice, such lists can seldom be constructed, and we end up with an incomplete list or a list with superfluous units (the study population)
  - Example 1: the list of all home based tapioca producing enterprises in HCM city (Chamber of Commerce?)
  - Example 2: the surface (e.g. all elements of a grid) of one specific National Park (with mowed and unmowed area) where bees live



# 3. Sampling designs

## Random (= probability) sampling

- All elements in the population have a nonzero and known chance of being selected
- Types: simple random, systematic, stratified random, cluster

### Purpose:

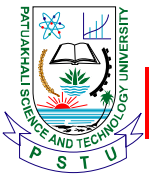
- To avoid bias  
→ representativeness

## Non-random (= non-probability) sampling

- Selection (partly) based on the judgement of the interviewer or researcher
- Types: quota, accidental/convenience, judgemental/purposive, snowball

### Purpose:

- to obtain a workable sample when developing a sampling frame is near impossible or too time consuming  
→ representativeness..?

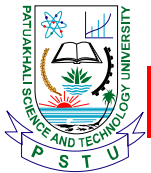




# Random sampling designs (1)

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- Simple random sampling
  - Lottery system
    - fishbowl, random number table (Kumar p. 201!), random number generator (computer program)
- Systematic sampling
  - Every k-th number from a list or map (Kumar calls this: mixed design – p. 208-9!)
  
  - Examples:
    - From a list of the Chamber of Commerce, from a telephone guide
    - From a grid of squares



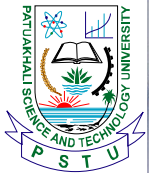


# Random sampling designs (2)

CHAPTER 12: SELECTING A SAMPLE 201

TABLE 12.3 Selecting a sample using a table for random numbers

	1	2	3	4	5	6	7	8	9	10
1	48461	14952	72619	73689	52059	37086	60050	86192	67049	64739
2	76534	38149	49692	31366	52093	15422	20498	33901	10319	43397
3	70437	25861	38504	14752	23757	29660	67844	78815	23758	86814
4	59584	03370	42806	11393	71722	93804	09095	07856	55589	46820
5	04285	58554	16085	51555	27501	73883	33427	33343	45507	50063
6	77340	10412	69189	85171	29802	44785	86368	02583	96483	76553
7	59183	62687	91778	80354	23512	97219	65921	02035	59487	91403
8	91800	04281	39979	03927	82564	28777	59049	97532	54540	79472
9	12066	24817	81099	48940	69554	55925	48379	12866	41232	21580
10	69907	91751	53512	23748	65906	91385	84983	27915	48491	91068
11	80467	04873	54053	25955	48518	13815	37707	68687	15570	08890
12	78057	67835	28302	45048	56761	97725	58438	91529	24645	18544
13	05648	39387	78191	88415	60269	94880	58812	42931	71898	61534
14	22304	39246	01350	99451	61862	78688	30339	60222	74052	25740
15	61346	50269	67005	40442	33100	16742	61640	21046	31909	72641
16	56793	37696	27965	30459	91011	51426	31006	77468	61029	57108
17	56411	48609	36698	42453	85061	43769	39948	87031	30767	13953
18	62098	12825	81744	28882	27369	88185	65846	92545	09065	22653
19	68775	06261	54265	16203	23340	84750	16317	88686	86842	00879
20	52679	19599	13687	74872	89181	01939	18447	10787	76246	80072
21	84096	87152	20719	25215	04349	54434	72344	93008	83282	31670
22	83964	55937	21417	49944	38356	98404	14850	17994	17161	98981
23	31191	75131	72386	11689	95727	05414	88727	45583	22568	77700
24	30545	68523	29850	67833	05622	89975	79042	27142	99257	32349
25	52573	91001	52315	26430	54175	30122	31796	98842	37600	26025
26	16586	81842	01076	99414	31574	94719	34656	80018	86988	79234
27	81841	88481	61191	25013	30272	23388	22463	65774	10029	58376
28	43563	66829	72838	08074	57080	15446	11034	98143	74989	26885
29	19945	84193	57581	77252	85604	45412	43556	27518	90572	00563
30	79374	23796	16919	99691	80276	32818	62953	78831	54395	30705
31	48503	26615	43980	09810	38289	66679	73799	48418	12647	40044
32	32049	65541	37937	41105	70106	89706	40829	40789	59547	00783
33	18547	71562	95493	34112	76895	46766	96395	31718	48302	45893
34	03180	96742	61486	43305	84183	99605	67803	13491	09243	29557
35	94822	24738	67749	83748	59799	25210	31093	62925	72061	69991
36	04330	60599	85828	19152	68499	27977	35611	96240	62747	89529
37	43770	81537	59527	95674	76692	86420	69930	10020	72881	12532
38	56908	77192	50623	41215	14311	42834	80651	93750	59957	31211
39	32787	07189	80539	75927	75475	73965	11796	72140	48944	74156
40	52441	78392	11733	57703	29133	71164	55355	31006	25526	55790
41	22377	54723	18227	28449	04570	18882	00023	67101	06895	08915
42	18376	73460	88841	39602	34049	20589	05701	08249	74213	25220
		28610	87957	21497	64729	64983	71551	99016	87903	63875
							11964	44134	00273	76358



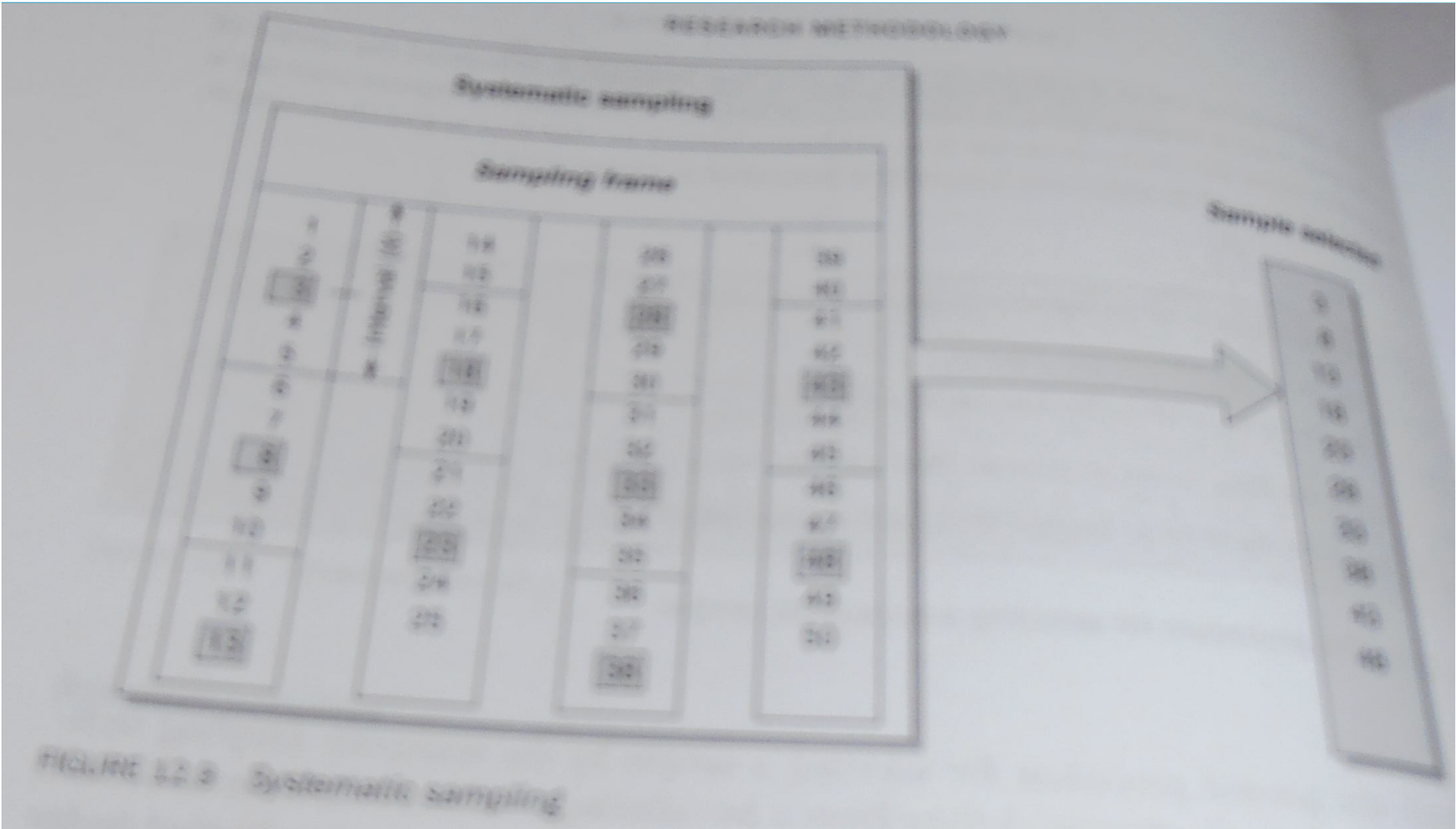
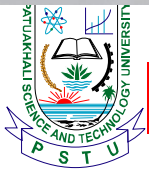
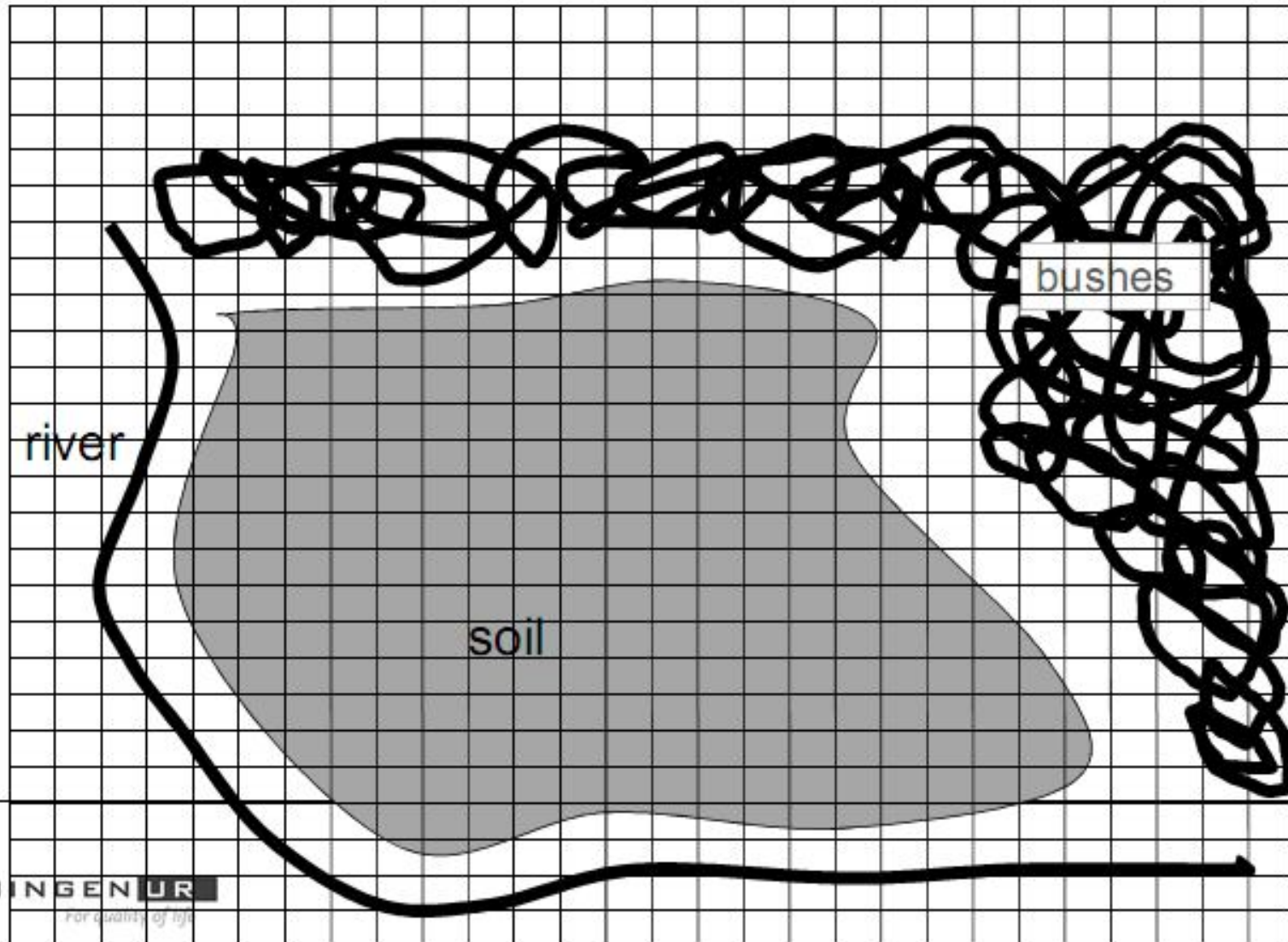


FIGURE 1.2.3 Systematic sampling



# Example: sampling from a grid



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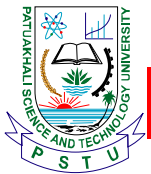
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# Random sampling designs (2)



- Stratified random sampling
  - Study population is grouped in strata on the basis of key variables (e.g., gender × age × rural/urban)
  - Random sample of research units taken from each group, either proportionally or disproportionately
  
- Cluster sampling (one stage)
  - Study population is grouped in natural clusters (e.g., pupils in schools, trees in forests, fish in ponds)
  - Selection of clusters (non-random or random)
  - Selection of research units (non-random, random or census)



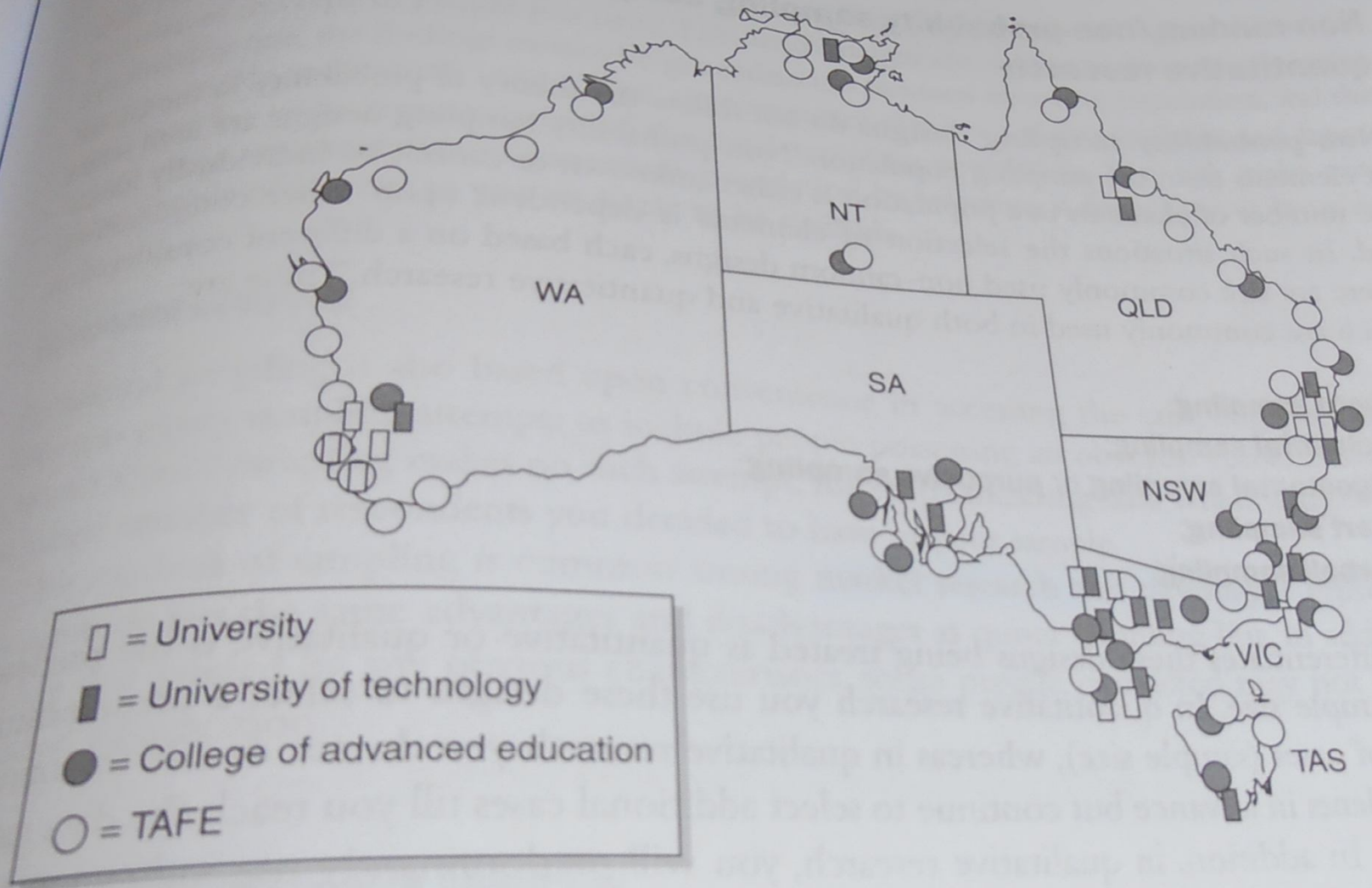


FIGURE 12.6 The concept of cluster sampling

Selecting a sample with snowball sampling

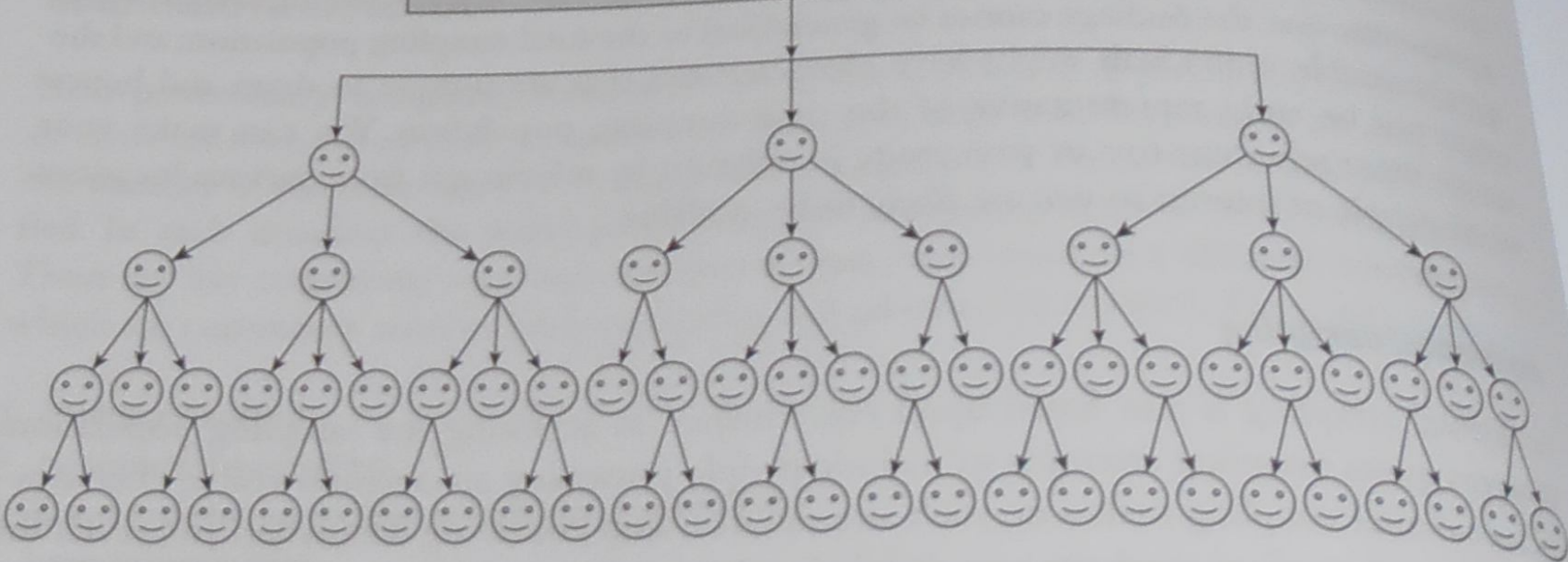
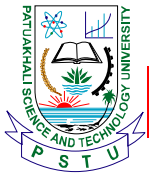


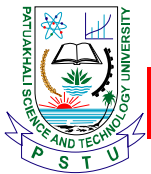
FIGURE 12.7 Snowball sampling



# Example (correlational cross sectional study)

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Bees in areas  
under power lines

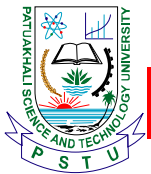




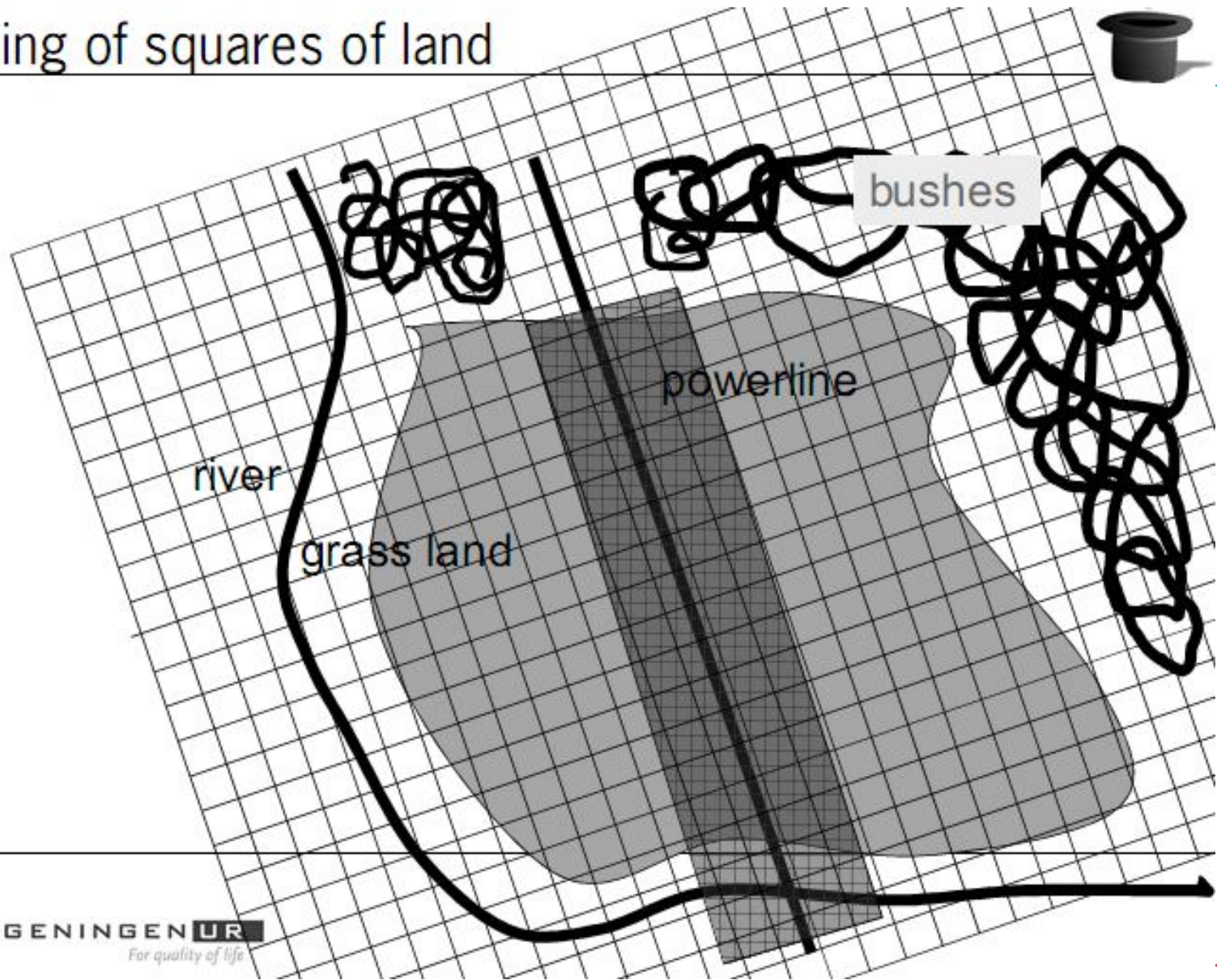
# Example of stratified random sampling of areas

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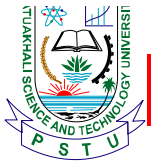
1. Two types of areas distinguished
  - Scrub areas = area under power line
  - Mowed areas = grassland in the vicinity of power line
2. Both areas divided in units of land (e.g., 2 m<sup>2</sup>) by means of a grid
  - Area under power line: 18 units in grid
  - Area in grassland: about 2500 units in grid
3. Random sample of research units from each stratum
  - 10 units from each type of area



# Sampling of squares of land

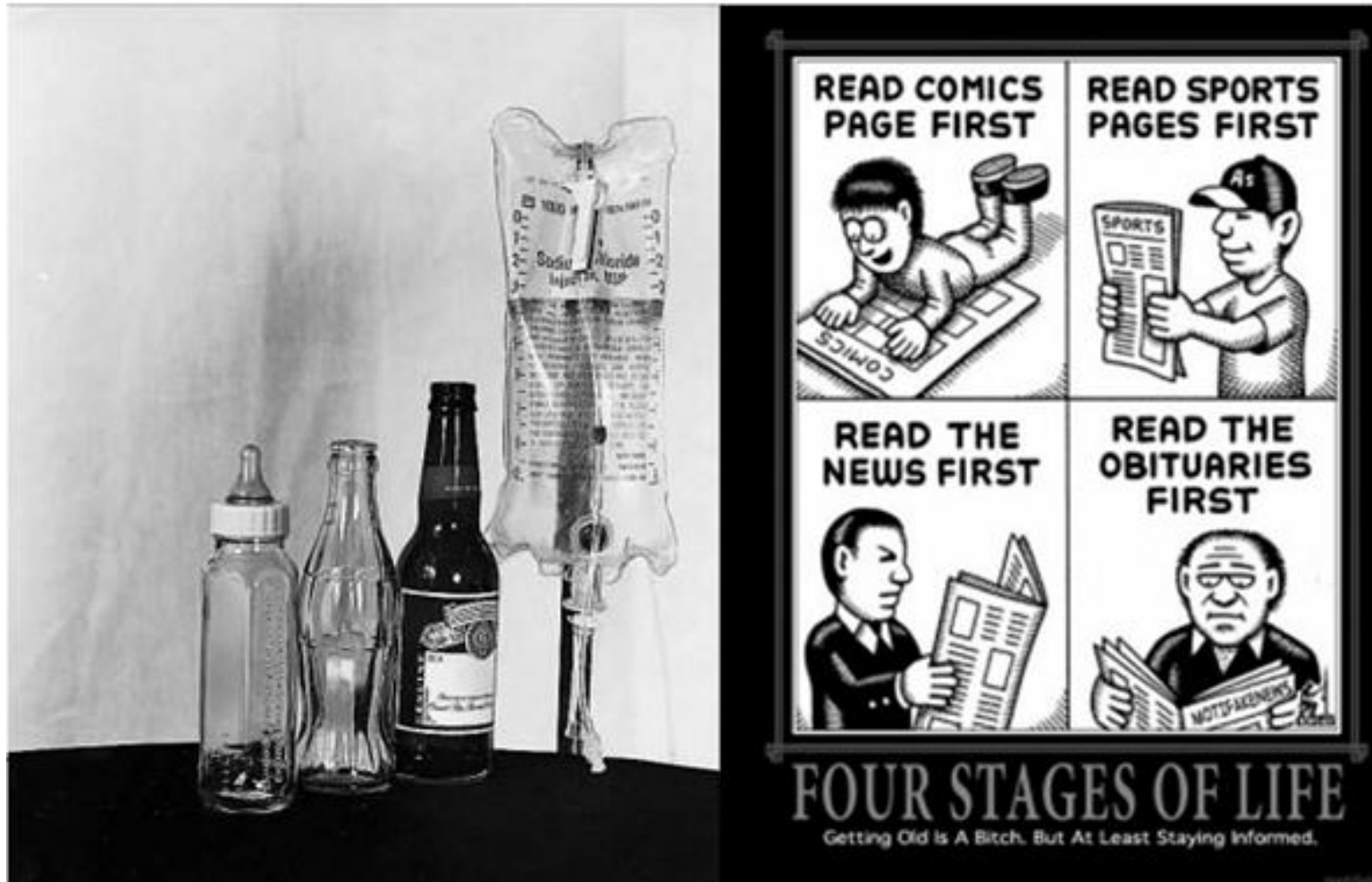


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# Longitudinal study design

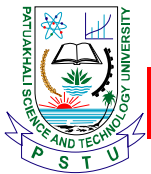


# Longitudinal research

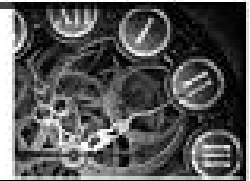


## ■ Three basic types

- Trend study
- Panel study
- Cohort study



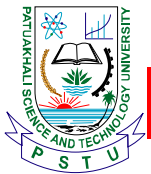




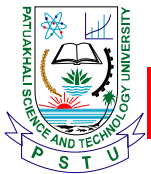
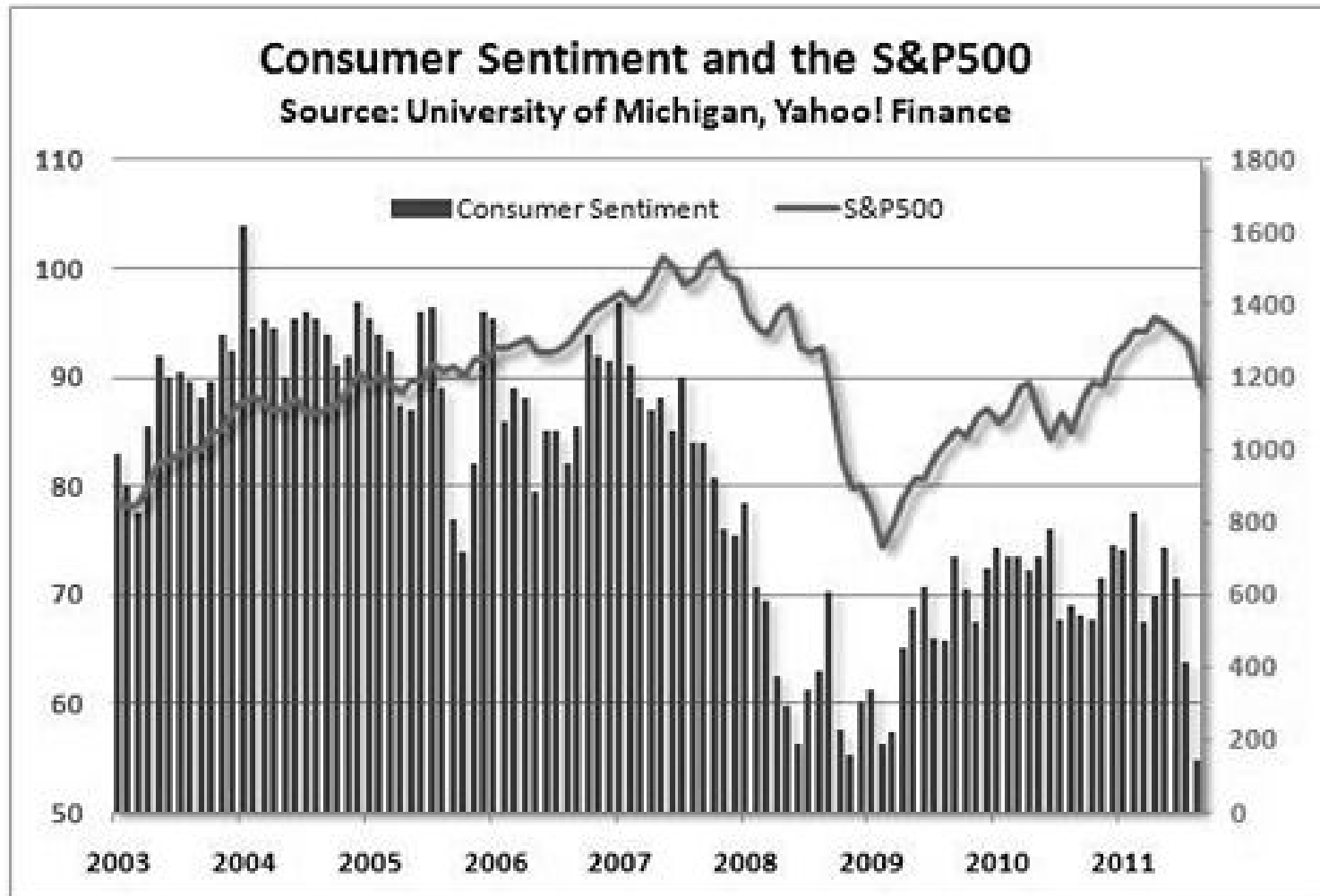
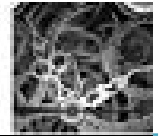
# Longitudinal research (trend)

## ■ Trend study

- Different samples are drawn from the same population at two or more points in time: repeated cross sectional design
- Appropriate if you want to map changes at the level of a population over a period, and/or forecast trends
- Ideally, the same measurement instrument is used. In practice, in long trend studies (e.g., CPI, GDP) often alterations are made

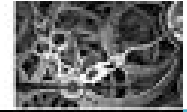


# Longitudinal research (trend)

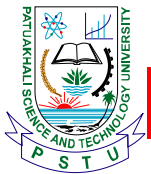


# Longitudinal research (trend)

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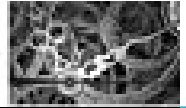
- Problem in trend studies:
  - You can find the trend, but not individual developments
  - All of the limitations of the cross sectional design still apply (e.g., regarding spurious relationships and establishing time order)





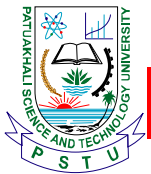
# Longitudinal research (panel)

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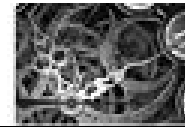


## ■ Panel study

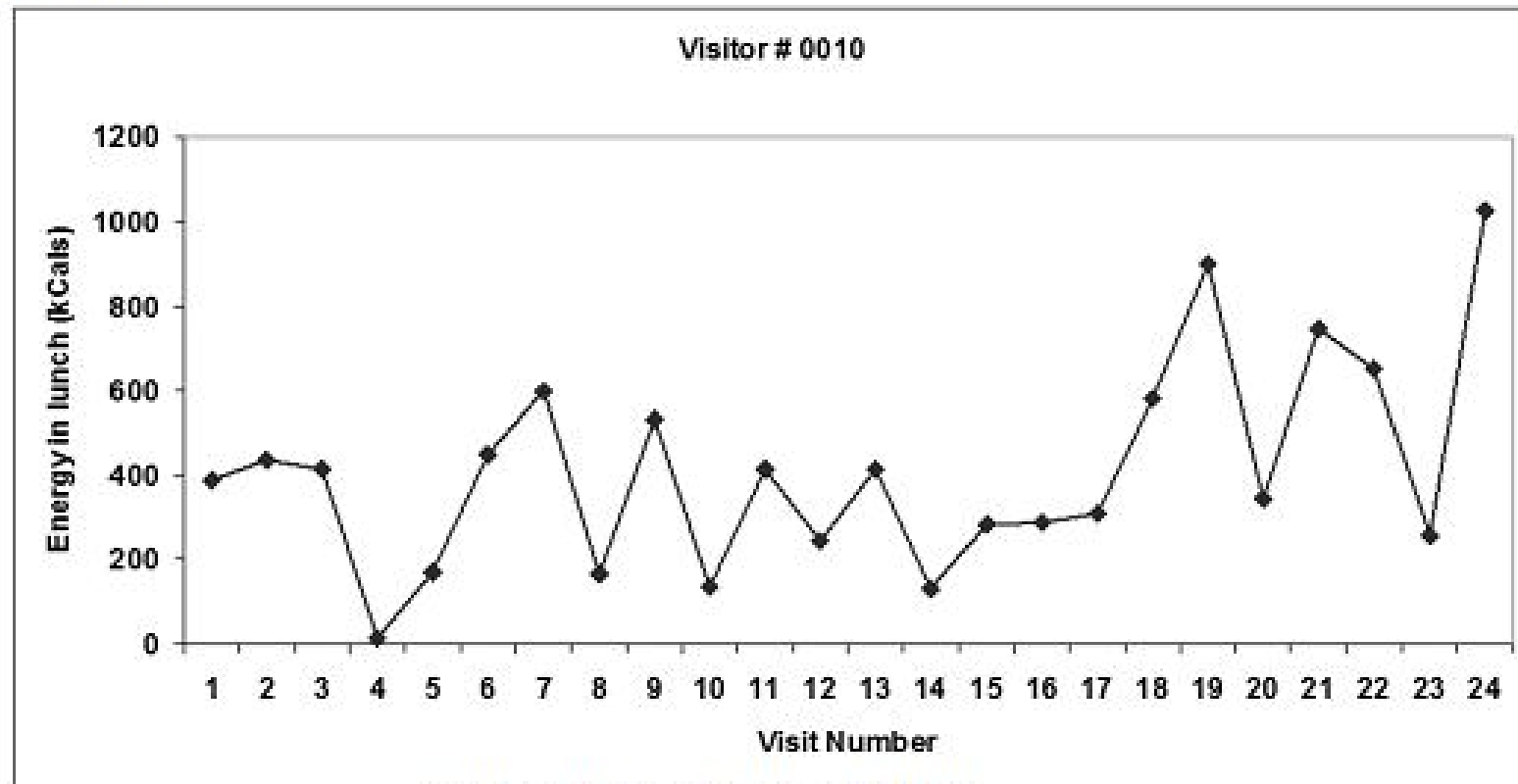
- One sample from the population is measured repeatedly over time (ideally)
- In practice, because of drop-out of research units, the remainder of the initial sample is replenished by new research units (so-called refreshment samples)



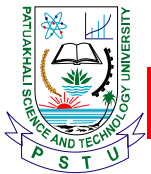
# Longitudinal research (panel)



Example of variation in lunch energy over repeated visits to the Restaurant of the Future



Contact Person: Rene de Wijk



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# Longitudinal research (panel)



- Major problem in panels:
  - Selective drop-out (attrition, mortality)

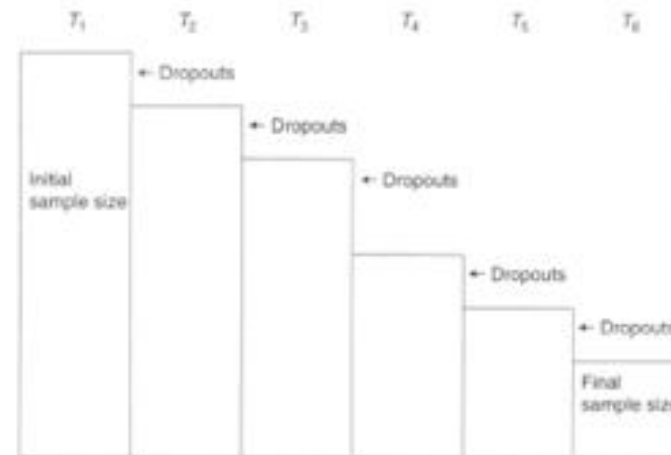
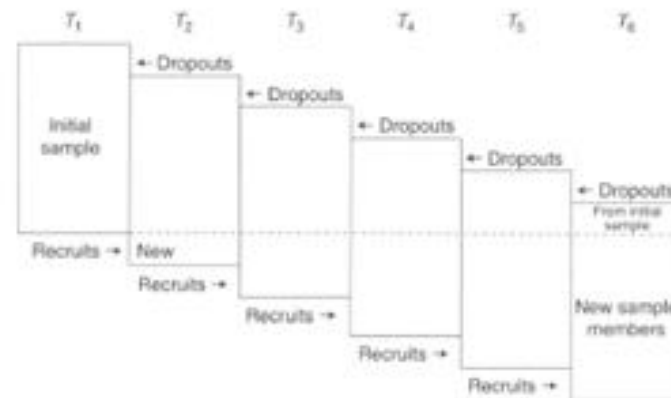
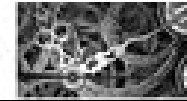


Figure 7.3 Single panel design without replacement



# Longitudinal research (cohort)

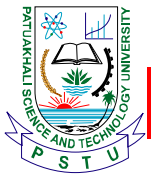
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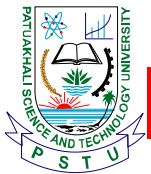
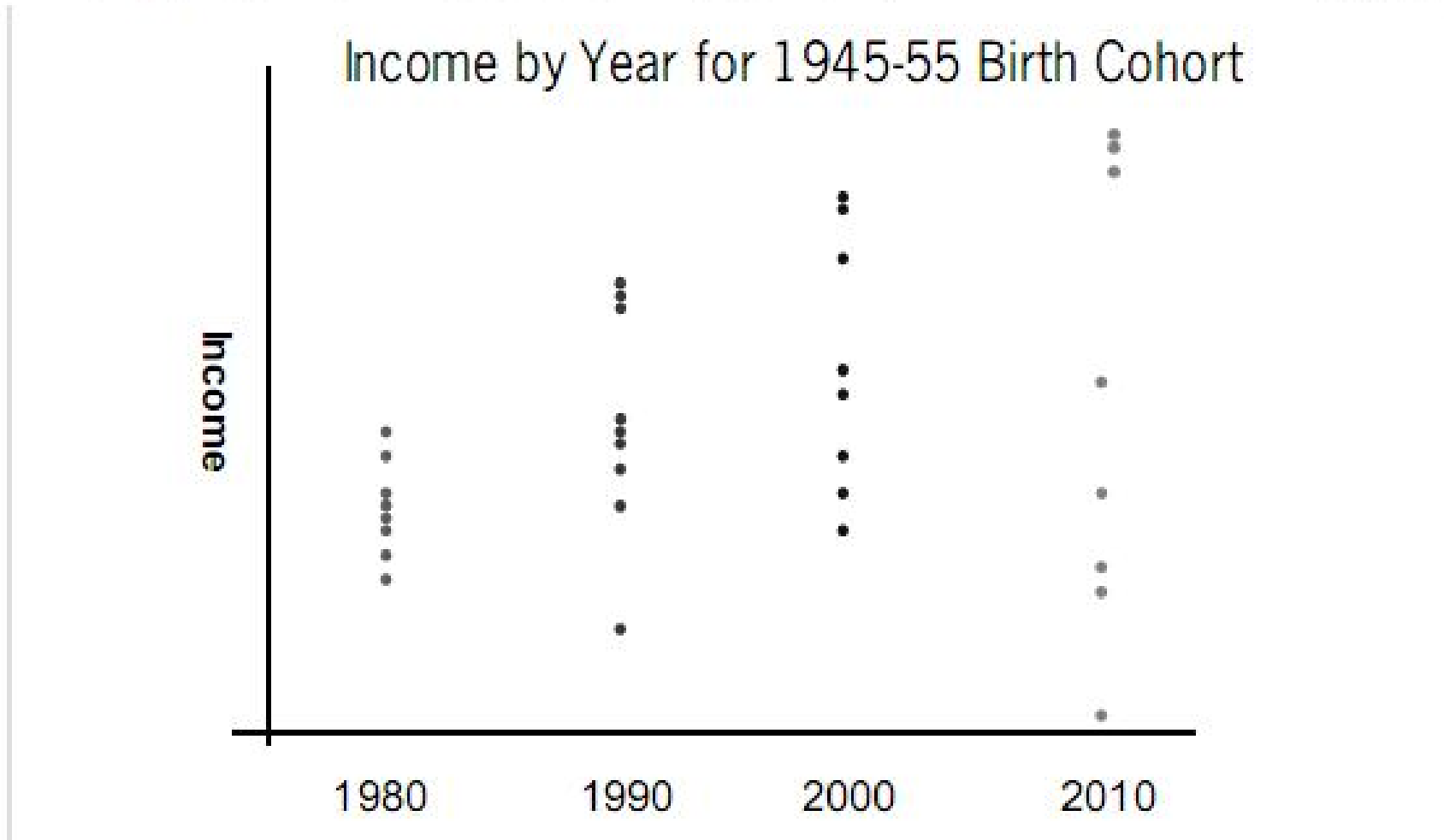
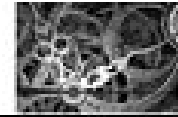
## Income by Year for 1955 Birth Cohort

### ■ Cohort study

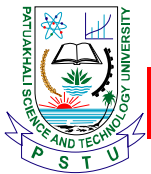
- A trend or panel study of a population that shares a characteristic occurring in a particular time period (e.g., people born during a single year, small businesses formed during the economic crisis of 2009-10, class of 2010 BSc students in Environmental Sciences, zebras born in European zoos in the 1980s, etc.)
- Either the same or a different sample from this specific population is measured at intervals



# Longitudinal research (cohort)



# Thank YOU



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## Questions??