North Carolina Model Users Group Meeting
Wilmington, NC

Trip Generation Practice for Small Communities in North Carolina

Presented by:
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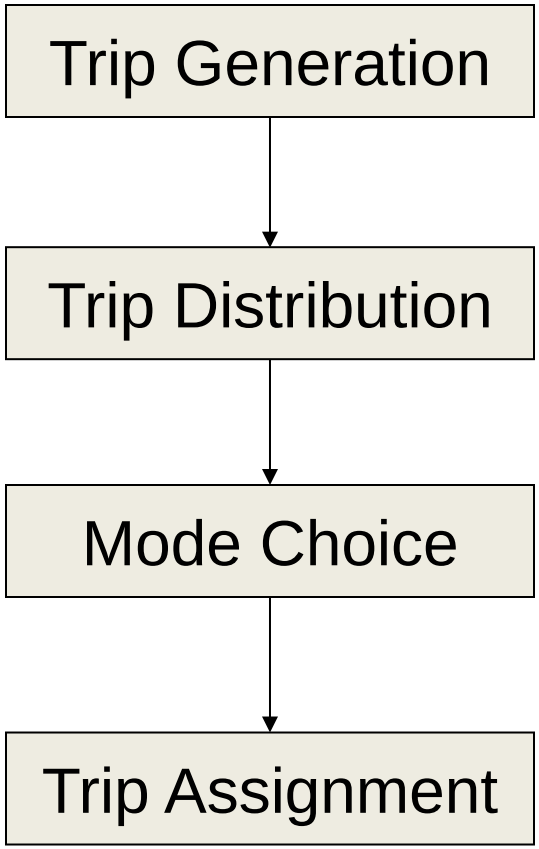
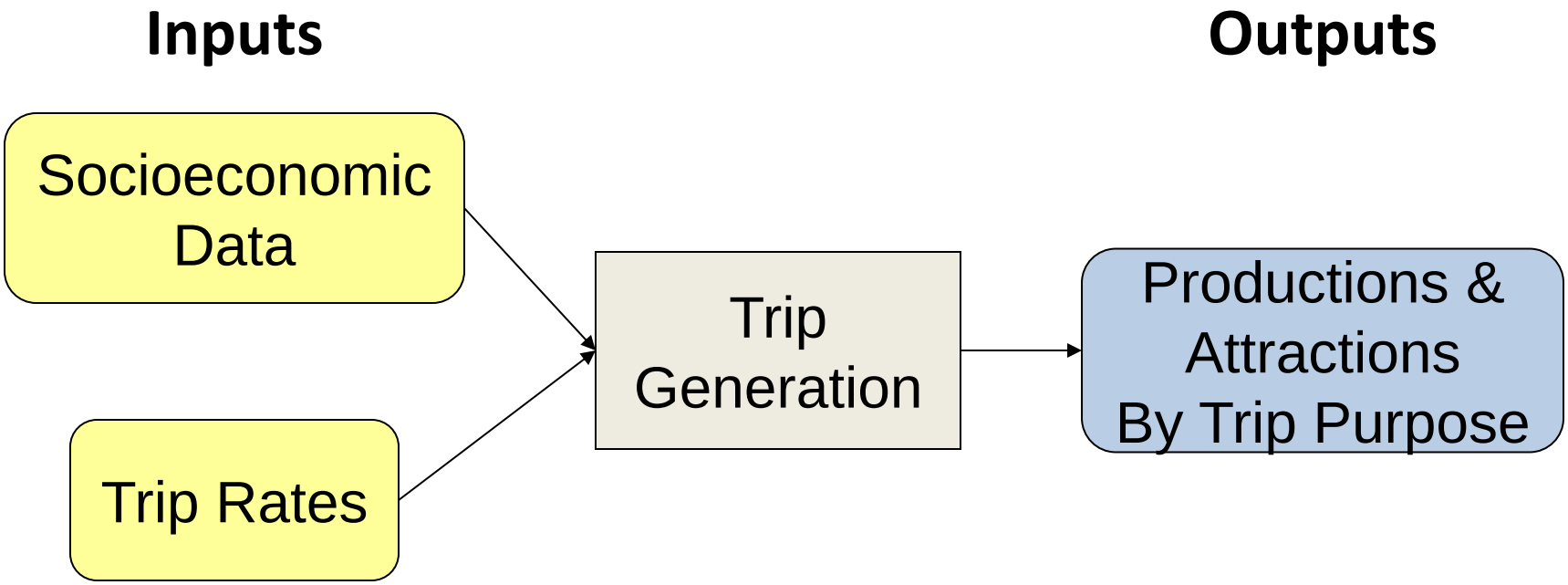
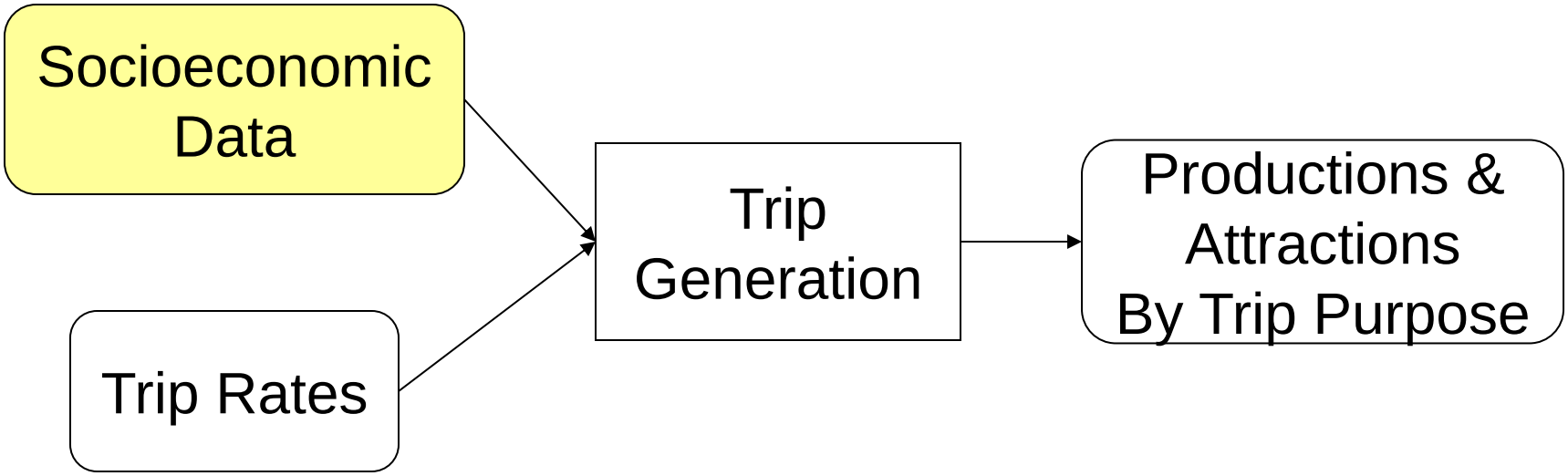
Traditional 4-Step Model Approach



Trip Generation



Trip Generation



Common Socioeconomic Data Attributes Used in North Carolina Small Area Models

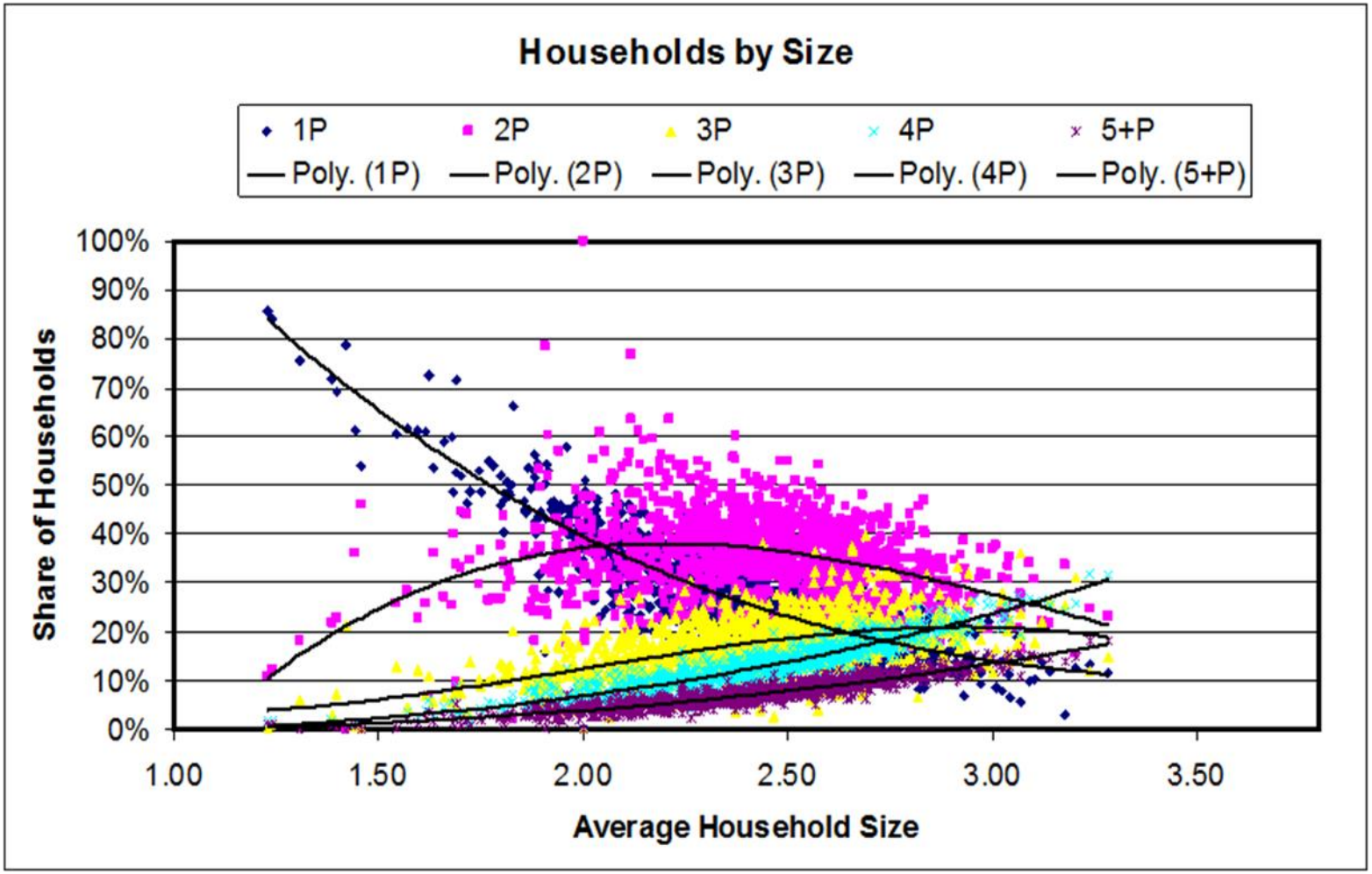
- Population
- Occupied Dwelling Units
- Number of Vehicles
- Student Enrollment
- Employment Data
  - Industrial
  - Retail
  - Highway Retail
  - Service
  - Office
- Commercial Vehicles

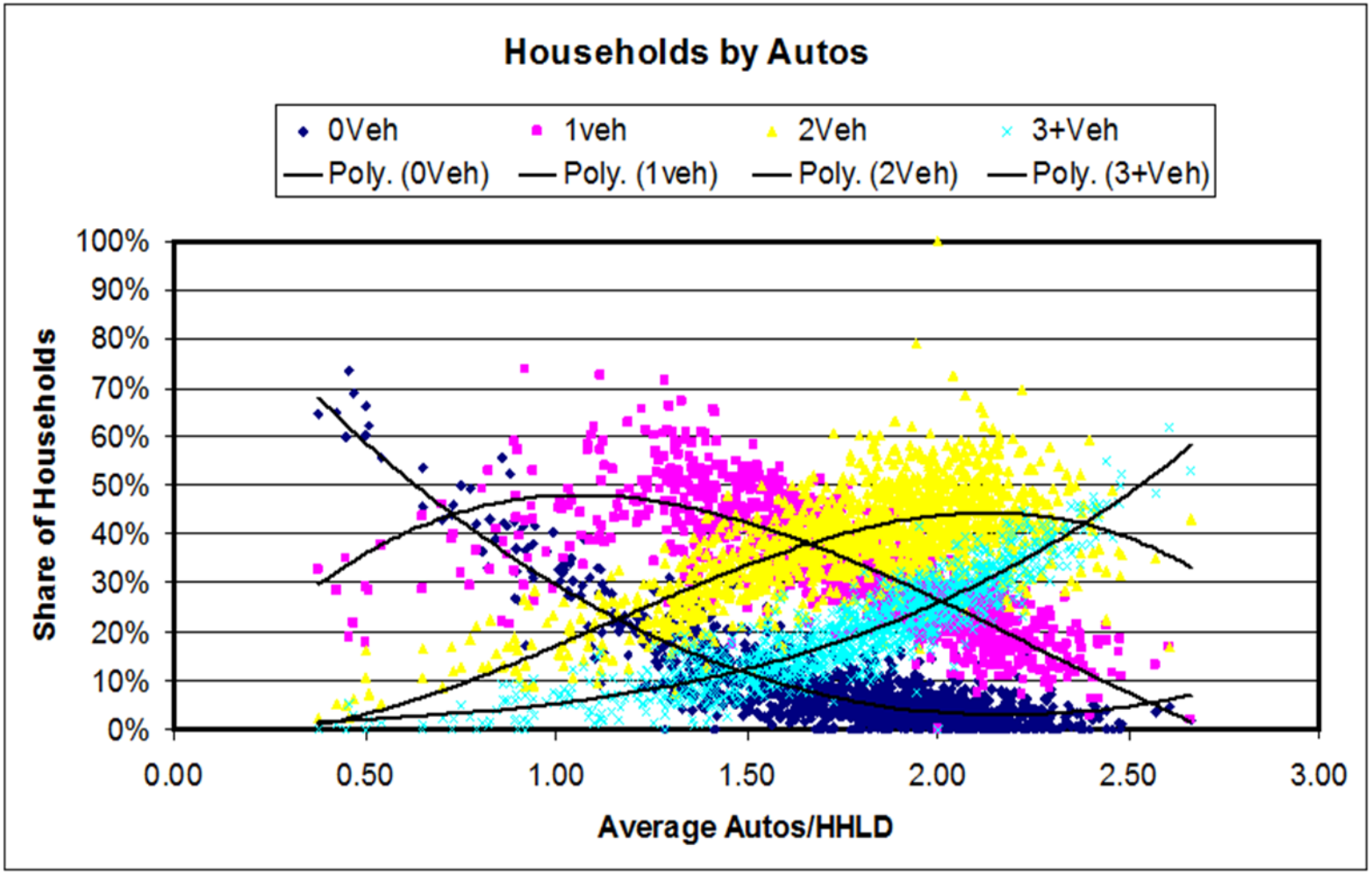
Sources of Production Zonal Data

- U.S. Census
  - Summary Tape Files
    - Population
    - Dwelling Units
    - Vacancy status (occupied DU, vacant DU)
  - American Community Survey (ACS)
    - Auto availability
- Local Planning Departments

Sources of Attraction Zonal Data

- InfoUSA
- Dun and Bradstreet
- Employment Security Commission
- Local Chambers of Commerce
- Woods and Poole
- Local school boards
- Private schools – need to be contacted individually


Households by Size
1P
2P
3P
4P
5+P
Poly. (1P)
Poly. (2P)
Poly. (3P)
Poly. (4P)
Poly. (5+P)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Share of Households
1.00
1.50
2.00
2.50
3.00
3.50
Average Household Size


Households by Autos
0Veh
1veh
2Veh
3+Veh
Poly. (0Veh)
Poly. (1veh)
Poly. (2Veh)
Poly. (3+Veh)
Share of Households
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.00
0.50
1.00
1.50
2.00
2.50
3.00
Average Autos/HHLD

Trip Distribution Seed Matrix

	Autos				
HHS	0	1	2	3+	total
1	4.07%	17.42%	3.90%	0.94%	26.33%
2	1.63%	8.19%	19.15%	7.04%	36.00%
3	0.77%	3.55%	7.21%	5.74%	17.27%
4	0.50%	2.12%	5.90%	4.46%	12.99%
5+	0.29%	1.21%	3.37%	2.55%	7.41%
Total	7.25%	32.48%	39.54%	20.73%	100.00%

Trip Production Rate File

NCPRODRATES.bin

TransCAD (Licensed to NC DOT)

File Edit Dataview Selection Tools Procedures Networks/Paths Route Systems Planning Transit Routing/Logistics Statistics Window Help

All Records

Dataview1 - ncprodrates

persons	autos	R_hbw	R_hbo	R_nhbw	R_nhbo	R_hbsch
1	0	0.222	1.442	0.101	0.638	0.010
1	1	0.777	1.891	0.597	1.009	0.033
1	2	0.777	1.891	0.690	1.009	0.033
1	3	0.777	1.891	0.690	1.009	0.033
2	0	0.609	2.237	0.168	0.933	0.272
2	1	0.801	3.406	0.597	1.590	0.272
2	2	1.540	3.406	0.907	1.590	0.083
2	3	1.540	3.406	1.060	1.590	0.043
3	0	0.971	2.327	0.314	0.933	1.054
3	1	1.077	4.377	0.919	2.018	1.054
3	2	1.647	4.377	1.362	2.018	0.735
3	3	2.211	4.377	1.458	2.018	0.735
4	0	0.971	2.327	0.314	0.933	1.679
4	1	1.439	5.281	0.919	2.097	1.679
4	2	1.647	6.269	1.362	2.929	1.679
4	3	2.211	6.269	1.458	2.929	1.886
5	0	0.971	4.267	0.314	0.933	2.669
5	1	1.439	5.281	0.919	2.097	2.669
5	2	1.647	8.087	1.362	3.545	2.669
5	3	2.211	8.087	1.458	3.545	2.669

Dataview: Records 1 - 20 of 20

Production Model – HHSize by Autos

HBW Trip Estimation

Trip Rates (HBW)				
	0	**1**	**2**	**3+**
1	0.2	0.8	0.8	0.8
2	0.6	0.8	1.5	1.5
3	1.0	1.1	1.6	2.2
4	1.0	1.4	1.6	2.2
5+	1.0	1.4	1.6	2.2

X

Households (TAZ=23)				
	0	**1**	**2**	**3+**
1	4.4	18.8	4.2	1.0
2	1.8	8.8	20.7	7.6
3	0.8	3.8	7.8	6.2
4	0.5	2.3	6.4	4.8
5+	0.3	1.3	3.6	2.8

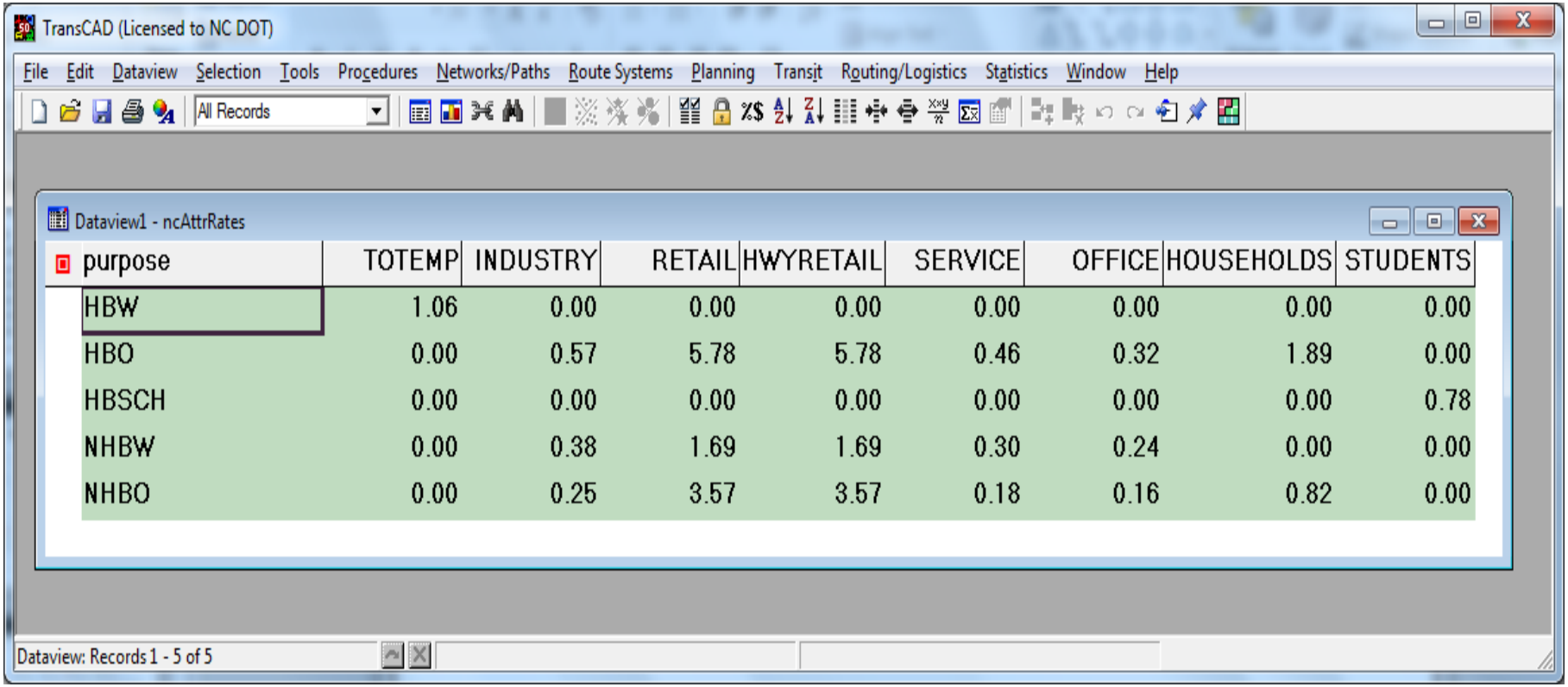
=

HBW Trips

	0	**1**	**2**	**3+**	**Total**
1	0.9	15.1	3.4	0.8	**20.1**
2	1.1	7.1	31.0	11.4	**50.6**
3	0.8	4.2	12.5	13.6	**31.1**
4	0.5	3.2	10.2	10.6	**24.5**
5+	0.3	1.8	5.8	6.1	**14.0**
Total	**3.6**	**31.4**	**62.9**	**42.5**	**140.4**

Trip Attraction Rate File

NCAttrRATES.bin



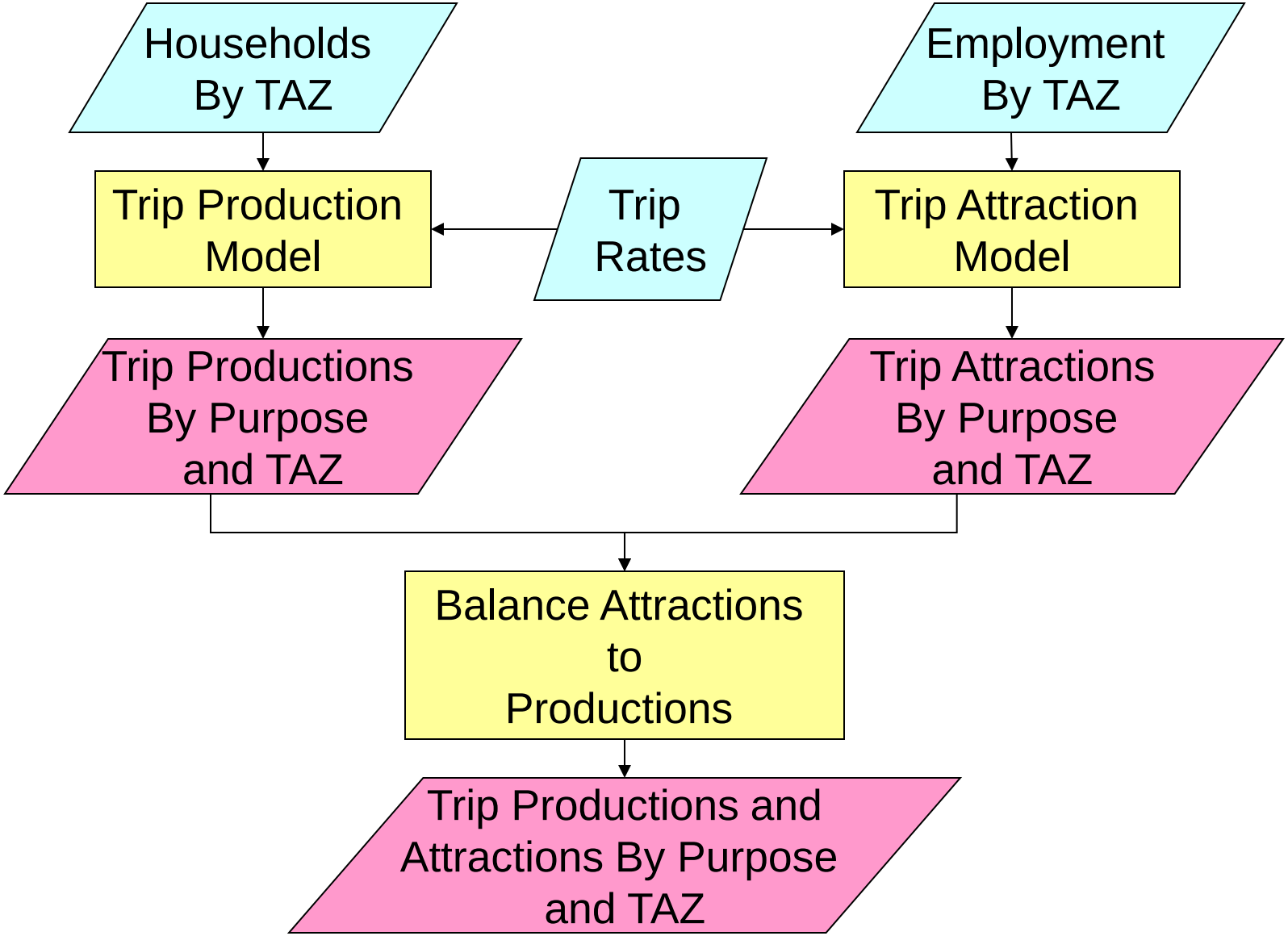
purpose	TOTEMP	INDUSTRY	RETAIL	HWYRETAIL	SERVICE	OFFICE	HOUSEHOLDS	STUDENTS
HBW	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HBO	0.00	0.57	5.78	5.78	0.46	0.32	1.89	0.00
HBSCH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78
NHBW	0.00	0.38	1.69	1.69	0.30	0.24	0.00	0.00
NHBO	0.00	0.25	3.57	3.57	0.18	0.16	0.82	0.00

Attraction Model – Linear Regression

- HBW = 1.06 * TotEmp
- HBO = (0.57 * Ind) + (5.78 * Ret) + (5.78 * HwyRet) + (0.46 * Ser) + (0.32 * Ofc) + (1.89 * HH)
- HBSch = 0.78 * Students
- NHBW = (0.38 * Ind) + (1.69 * Ret) + (0.30 * Ser)
- NHBO = (0.25 * Ind) + (3.57 * Ret) + (3.57 * HwyRet) + (0.18 * Ser) + (0.16 * Ofc) + (0.82 * HH)

Where: TotEmp = Total Employment
Ind = Industrial Employment
Ret = Retail Employment
HwyRet = Highway Retail Employment
Ser = Service Employment
Ofc = Office Employment
HH = Number of Households

Trip Generation Process



Balancing Home-Based Attractions to Productions

HBW			
TAZ	Computed Productions and Attractions		Adjusted Attractions = Computed Attractions * 0.8636
	Productions	Attractions	
1	25	1,000	864
2	125	350	302
3	350	500	432
4	800	100	86
5	600	250	216
Total	1,900	2,200	1,900

Attractions ≠ Productions

Factor = 1900/2200 = 0.8636

Balancing NHB Productions to Attractions

TAZ	Computed Productions and Attractions		Adjusted Attractions	Adjusted Productions
	Productions	Attractions		
1	31	1,400	1,080	1,080
2	156	490	378	378
3	438	700	540	540
4	1,000	140	108	108
5	750	350	270	270
Total	2,375	3,080	2,375	2,375

Attractions ≠ Productions

Factor = 2375/3080 = 0.7711

Internal/External (IX) Trip Generation

- IX Trip Production Model
  - Based on the external station count minus the through trip volume.

- IX Trip Attraction Model

  - $A = a * HH + b * IND + c * RET + d * HWY + e * SER + f * OFC$

  Where:

A	=	IX trip Attraction by TAZ;
HH	=	Number of Households by TAZ;
IND	=	Industrial Employment by TAZ;
RET	=	Retail Employment by TAZ;
HWY	=	High Traffic Retail Employment by TAZ;
SER	=	Service Employment by TAZ;
OFC	=	Office Employment by TAZ; and
a,b,c,d,e,f	=	IX Trip Attraction Coefficients.

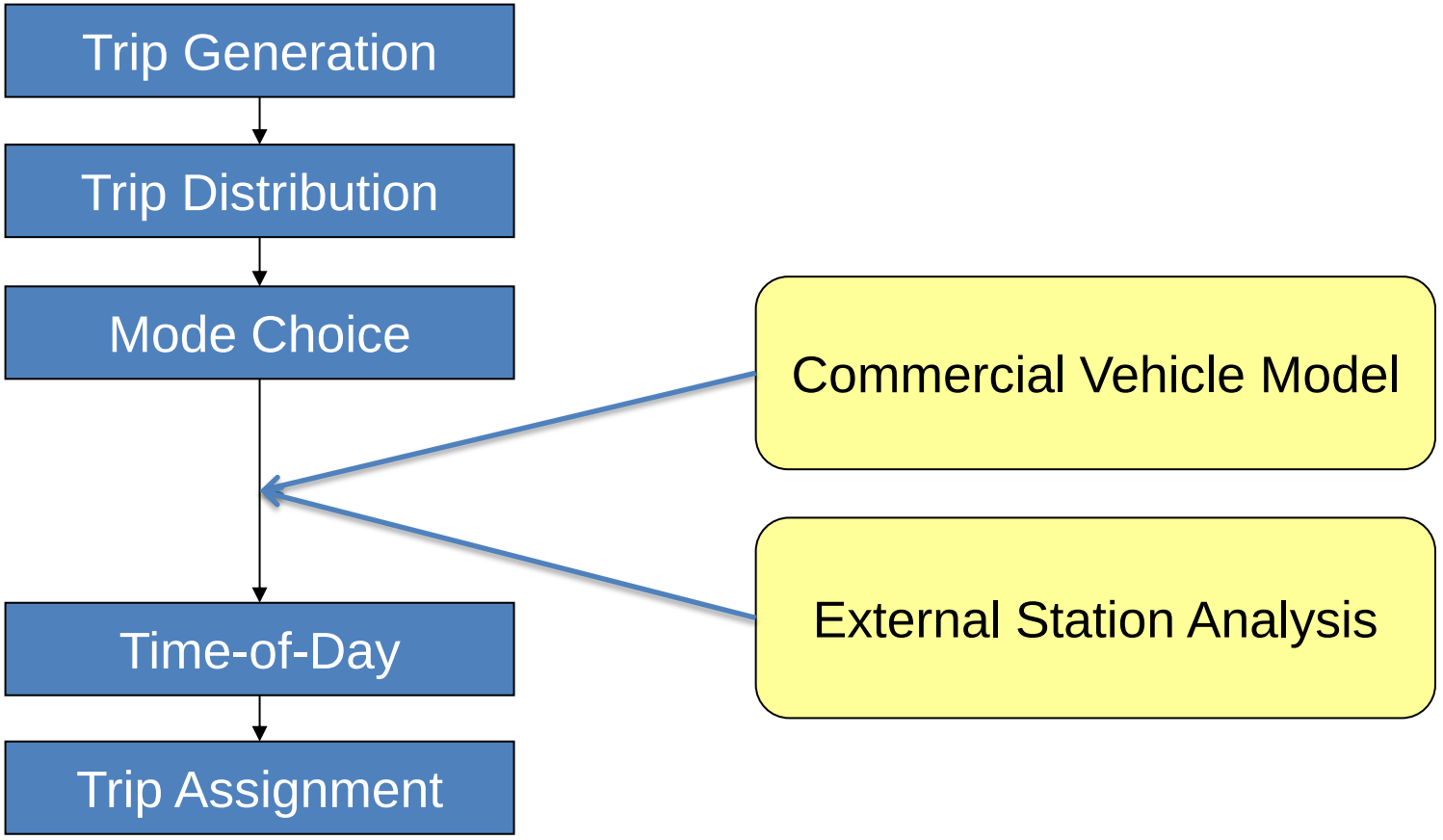
Internal/External (IX) Trip Attraction Coefficients

External Station Attraction Rates						
	Households	Industry	Retail	HwyRetail	Service	Office
IX	0.33	0.34	0.49	0.28	0.28	0.28

Note: Initial coefficients for the small area models are borrowed from work completed in the Triangle Region of North Carolina.

Commercial Vehicle Trip Generation

Commercial Vehicle Model



Commercial Vehicle Production

- Productions are based on commercial vehicles by vehicle type and employment type

$$P_{veh} = \sum_{veh,emptype} r_{veh,emptype} \times CV_{veh,emptype}$$

  - *P*: Production by vehicle type
  - *r*: trip production rate by vehicle type and emp. type
  - *CV*: number of commercial vehicles by vehicle type and by emp. type
  - *veh*: CV1, CV2, and CV3
  - *emptype*: Industry, Retail, HwyRet, Service, and Office

CV Production Rates

Vehicle Type	Industry	Retail	HwyRet	Service	Office
Autos/Vans (CV1)	2.4900	2.8900	2.8900	3.4300	3.4300
Pickups (CV2)	4.1900	5.8100	5.8100	4.3200	4.3200
Trucks (CV3)	6.6200	7.8600	7.8600	7.4400	7.4400

Commercial Vehicle Attraction

- Attractions are based on employees by employment type and households

$$A_{veh} = \sum_{veh,emptype} (r_{veh,emptype} \times Emp_{emptype}) + r_{veh,hh} \times HH$$

- *A*: Attraction by vehicle type
- *r*: trip attraction rate by vehicle type and by emp. type/hh
- *Emp*: number of employees by employment type
- *veh*: CV1, CV2, and CV3
- *emptype*: Industry, Retail, HwyRet, Service, and Office
- *HH*: number of households

CV Attraction Rates

Vehicle Type	Industry	Retail	HwyRet	Service	Office	HH
Autos/Vans (CV1)	0.2000	0.3300	0.2500	0.1000	0.1200	0.0200
Pickups (CV2)	0.3000	0.4000	0.3300	0.2500	0.1300	0.0120
Trucks (CV3)	0.7500	0.6700	0.5000	0.2100	0.2300	0.0390

Questions?

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