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ACS Data in Population Estimates and Forecasts: Practical Considerations and Extensions

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ACS Data Users Group

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Estimates overview

How many **housing units**? → How many **households**? → How many **people**?

Housing units in 2010

+

Changes to housing stock since 2010

×

Occupancy rate

×

Average household size

(Persons per household [PPH])

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Estimating occupancy rates

Challenge #1: ACS five-year estimates may not reflect current housing market conditions

Solution: Apply region-wide adjustments to approximate current housing market conditions

ACS 2011-2015 → ACS 2015 → 2016 estimate

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Estimating occupancy rates

Challenge #2: ACS sampling error may yield unreliable occupancy rates

Solution: Reconcile each community's ACS-based occupancy rate with occupancy rates from complete-count data

		Lower the weight when:	Mpls.	New Trier
Final occupancy rate estimate	ACS	Margins of error are wider	35%	0%
	2010 Census	Large change in housing stock mix	5%	93%
	2010 Census w/ USPS trend	Tract geography does not fit city borders well	60%	7%

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Estimating average HH size

Challenge #3: ACS sampling error may yield unreliable PPH

Solution: Reconcile ACS-based PPH figures with PPH from complete-count data

		Lower the weight when:	Mpls.	New Trier
Final average household size estimate	ACS	Margins of error are wider	73%	0%
	2010 Census	Large change in housing stock mix	9%	33.3%
	2000-2010 trend		9%	33.3%
	2010 with county trend in 1-yr ACS		9%	33.3%

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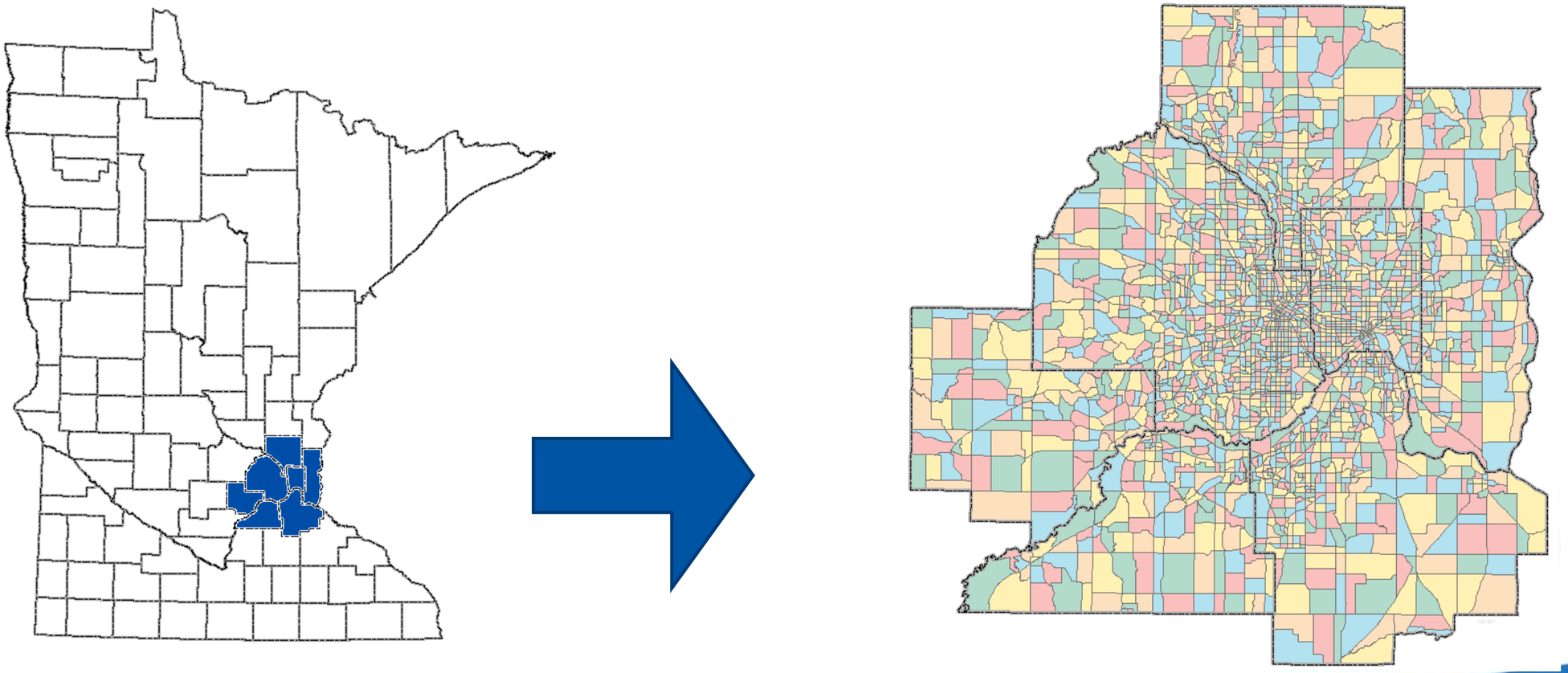
Forecasts overview

Total region population

- Regional economic model → migration
- Natural increase

Local forecasts

- 2,485 Transportation Analysis Zones (TAZs)
- Land use model



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Elaborating on forecasts: PUMS

Forecast model produces households by:

Size	Race	Householder age			
		15-34	35-49	50-64	65+
1-2	White				
	Of color				
3+	White				
	Of color				

Our transportation planners need:

- Households by:
  - Size (8 categories)
  - Income (4 categories)
- People by:
  - Gender (M/F)
  - Employment (FT/PT/None)
  - Student status (Y/N)
  - Age (10 categories)

ACS PUMS distributions

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Elaborating on forecasts: PUMS

For example, we multiply these household forecasts:

Size	Race	Householder age			
		15-34	35-49	50-64	65+
1-2	White	20	25	30	40
	Of color	40	40	20	10
3+	White	30	40	20	10
	Of color	50	40	10	5

By these PUMS percentages of such households that have an income under $35K:

Size	Race	Householder age			
		15-34	35-49	50-64	65+
1-2	White	15%	20%	10%	10%
	Of color	20%	20%	10%	20%
3+	White	10%	10%	10%	10%
	Of color	16%	15%	20%	20%

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Elaborating on forecasts: PUMS

And get these numbers of households with income under $35K:

Size	Race	Householder age			
		15-34	35-49	50-64	65+
1-2	White	3	5	3	4
	Of color	8	8	2	2
3+	White	3	4	2	1
	Of color	8	6	2	1

- 62 total households with income under $35K in this TAZ
- Repeat for other income categories, then all other characteristics

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Refinements to elaborations

- Raking to the forecasted age distribution (reflecting an aging population)

- Implement age-specific distributions for employment and student status (also reflecting an aging population)

- Have to make sure that the resulting household size distribution multiplies out to the population in households!

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Refinements to elaborations

Let's say our forecasts yield 50 households and 150 people in households in a TAZ. PUMS breakdown yields:

(A) Household size	(B) Households (broken down with PUMS)	Implied people in households (A × B)
1 person	5	5
2 people	13	26
3 people	10	30
4 people	15	60
5 people	4	20
6 people	2	12
7 people	1	7
8+ people	0	0
Total	**50**	**160**

The PUMS distributions may create household sizes that are inconsistent with the population in households!

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Refinements to elaborations

Shuffle households to have them multiply out to 150 people:

(A) Household size	(B) Households (broken down with PUMS)	(C) Households (adjusted from PUMS)	(D) Implied people in households (A × C)
1 person	5 *+1*	6	~~5~~ 6 (+1)
2 people	13	13	26
3 people	10	10	30
4 people	15	15	60
5 people	4 *-1*	3	~~20~~ 15 (-5)
6 people	2	2	12
7 people	1	1	7
8+ people	0	0	0
Total	50	50	~~160~~ 156 (-4)

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Refinements to elaborations

Shuffle households to have them multiply out to 150 people:

(A) Household size	(B) Households (broken down with PUMS)	(C) Households (adjusted from PUMS)	(D) Implied people in households (A × C)
1 person	5	6	6
2 people	13 +4	17	~~26~~ 34 (+8)
3 people	10 -2	8	~~30~~ 24 (-6)
4 people	15 -2	13	~~60~~ 52 (-8)
5 people	4	3	15
6 people	2	2	12
7 people	1	1	7
8+ people	0	0	0
Total	50	50	~~156~~ 150 (-6)

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Questions?

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