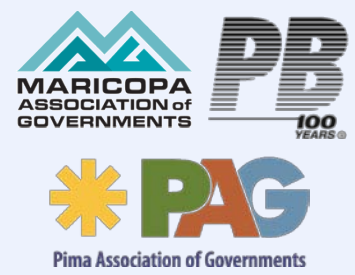


Building a Database for Estimation of an Advanced Activity-Based Travel Model from the NHTS

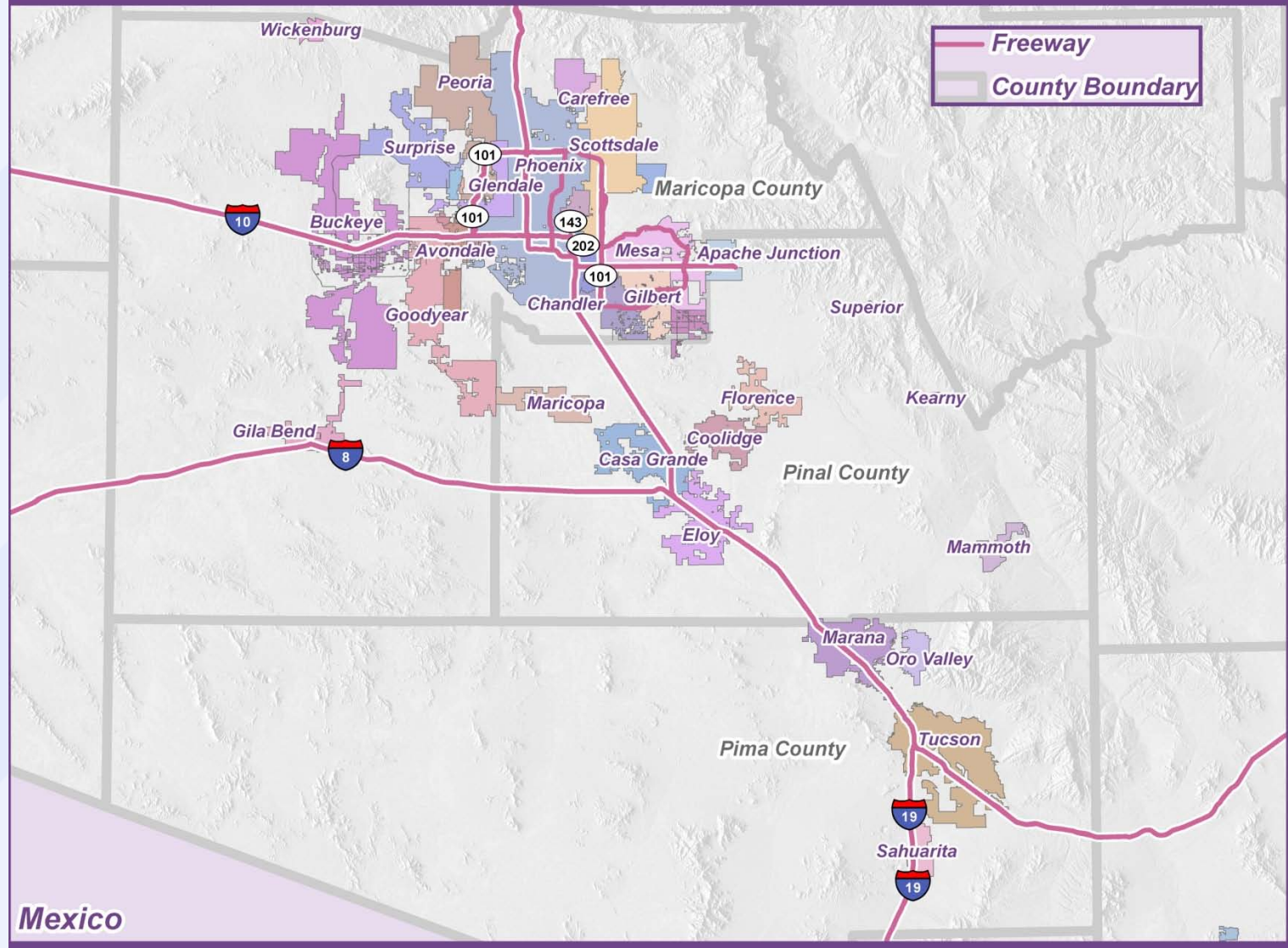
Petya Maneva (Presenter), Vladimir Livshits
Maricopa Association of Governments (MAG), Phoenix, AZ
Aichong Sun (PAG), Tuscon, AZ

Peter Vovsha, Surabhi Gupta
Parsons Brinckerhoff, New York, NY





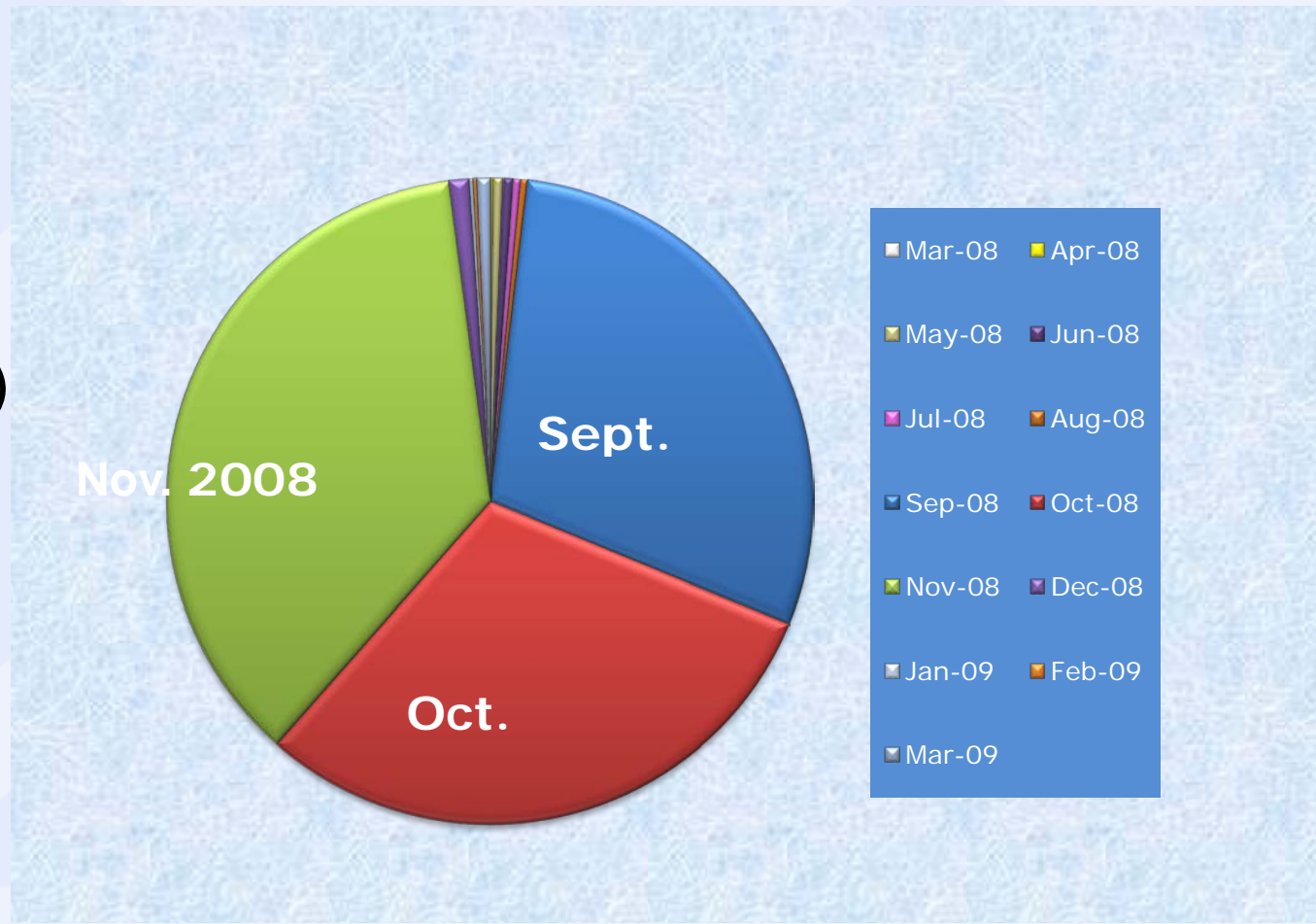
Study Area of 2008 - 2009 National Household Travel Survey





Survey Time Line

7,068 HH,
 Single day
 Weekday Travel
 5,067 HH
 (615 incomplete)
 10,956 Persons
 41,444 Trips





Quality Checks: Half-Tour and Tour Mode

Mode	Which Trips?	Half- Tour Mode	Tour Mode
Unknown	Some Trips on Half-Tour	Can Identify	Can Identify
	All Trips on Half-Tour	Can not identify	From other half-tour (Symmetry)
	All Trips on Tour	Can not identify	Can not identify
Known, Not Available	Some or All Trips	Not Available	Not Available



Quality Check: Start/End at Home

Completeness of tours in terms of starting and ending at home; the following cases are distinguished:

Start/End	Example	Validity	Remark
Start not from Home	Trip from Airport/Outside of Region	Valid reason	
	Missing previous Trip	Invalid reason	Frequent Case
End not at Home	Trip to Airport/ Outside of Region	Valid reason	
	Missing last trip	Invalid reason	Frequent Case



Quality Checks

■ Consistency of time-related tour attributes

- Missing Departure / Arrival Trip Time
- Conflicting trip/activity time chain
 - Arrival time before departure time
 - Moving backward in daily schedule
- Unrealistic reported trip duration vs. mode-specific skims from model

■ Fullness of trip destination coding

- Missing/unknown destination zones
- Destination outside the modeled region (intercity trips)



Imputing Trips for Household Members – under 5 years

- Identify HH members age less than 5 years
- Extract joint trips of other HH members with kids under 5 years reported
- Is trip part of fully and partially joint tours ?
 - Fully Joint Tour – same trip information
 - Partially Joint Tour - identify drop off or pick up?
 - Drop-off – set destination purpose to school*
 - Pick-up – set origin purpose to school*
- Imputed Trips = 1,961, Tours = 828

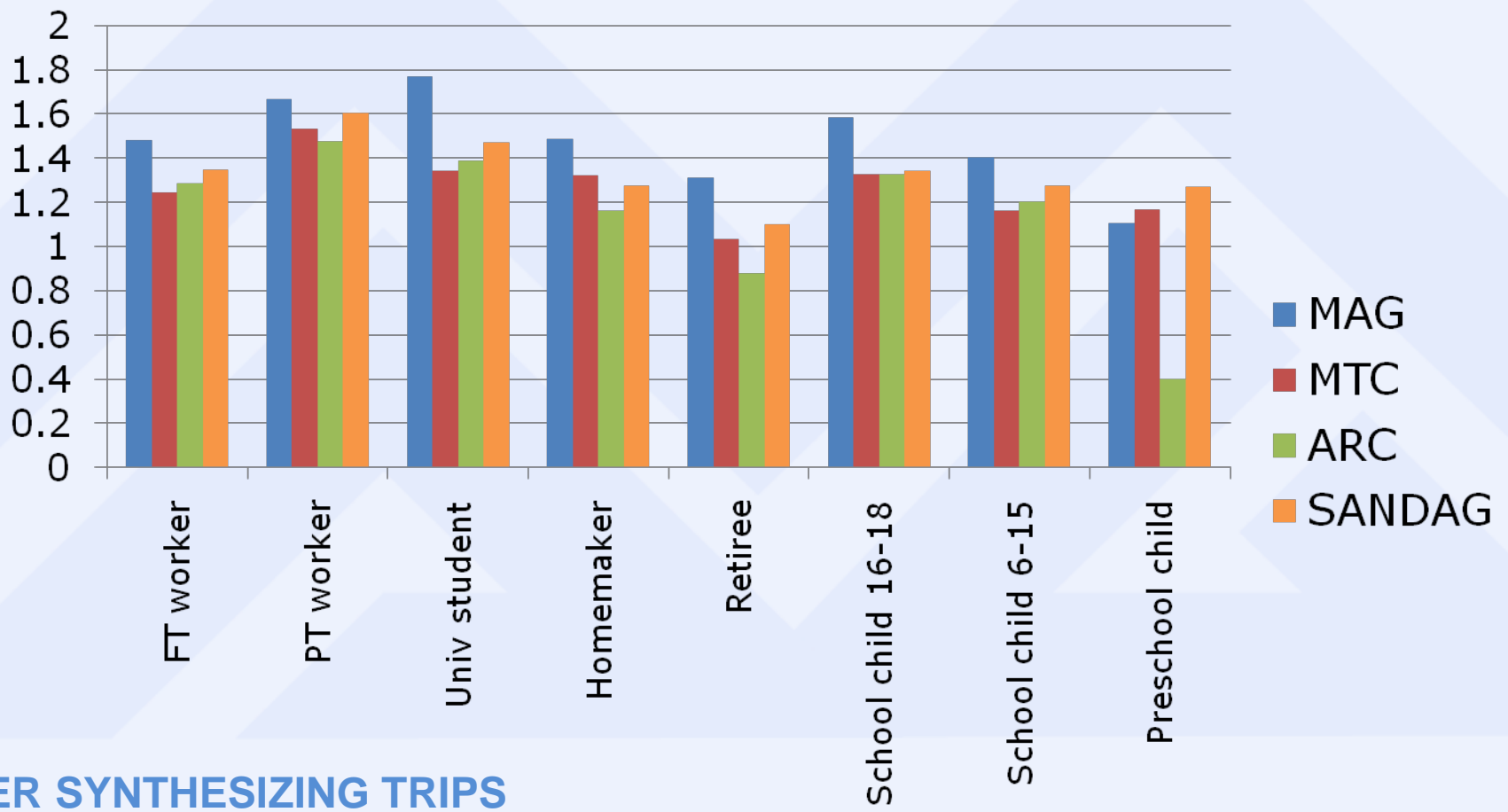


Joint Activities

- **Consistency of reported joint activities**
- **Resolving data conflicts and creating a consistent entire-household pattern was developed and applied.**
- **Impute Trips for Adults**
 - Only for Fully Joint Tours
 - No conflict of schedule with other reported trips
 - 292 trips, 127 Tours imputed



Daily Tour Rate by Person Type



AFTER SYNTHESIZING TRIPS



Reconcile Trip Records with Land Use at Destination

■ Logical checks

- Jobs (for worker occupation) available in Work location TAZ?
- Workers are classified by 5 occupation categories
 - Sales, marketing
 - Clerical, administrative, retail,
 - Production, construction, farming, transport
 - Professional, managerial, technical
 - Personal care or services
- Jobs in each TAZ are classified by 2-digit NAICS codes (26 categories) – correspond to 5 occupation categories
- Students – student type (k-8, high school, college) vs. enrollment



What Can Be Improved

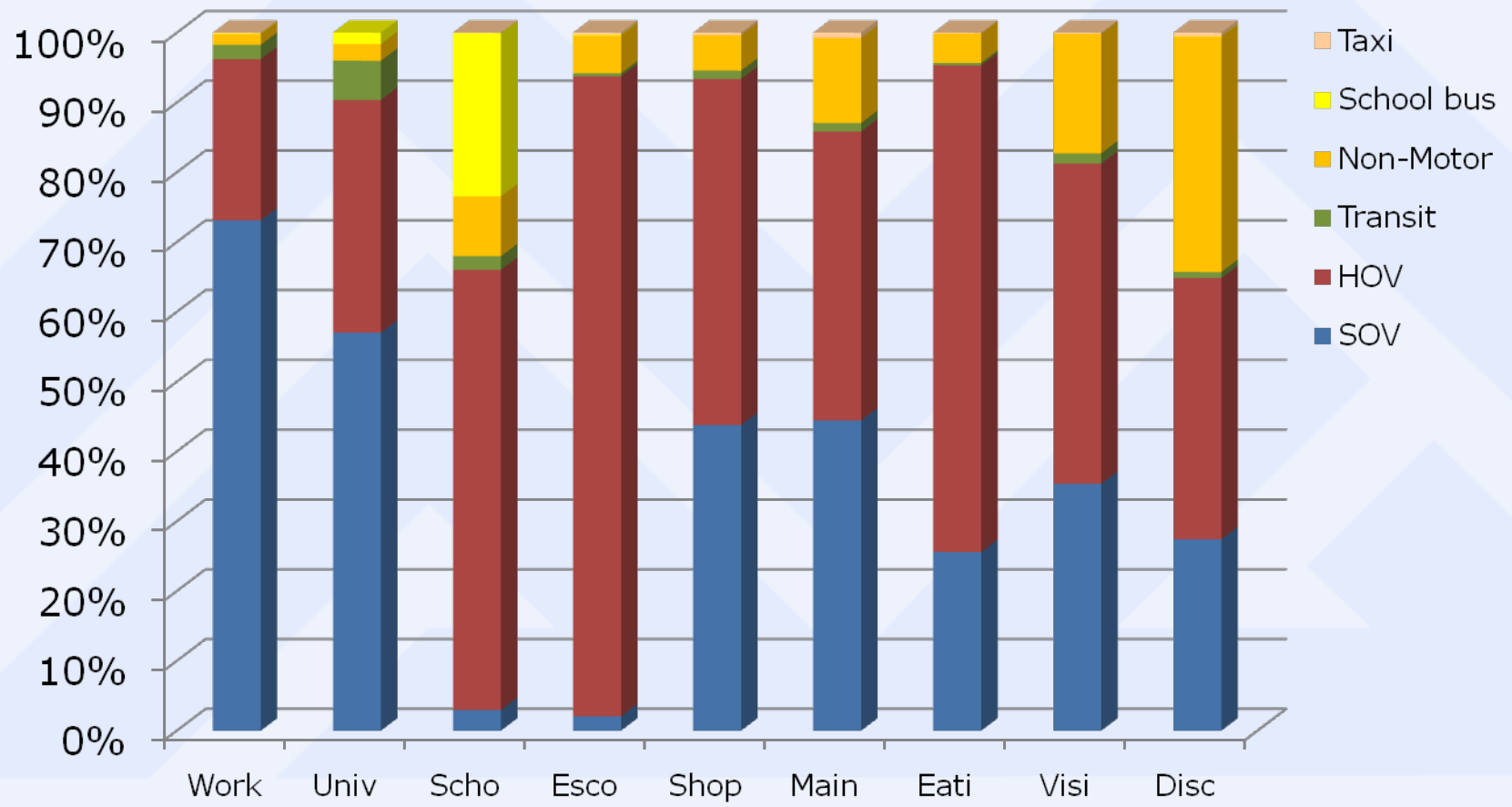
■ Sampling:

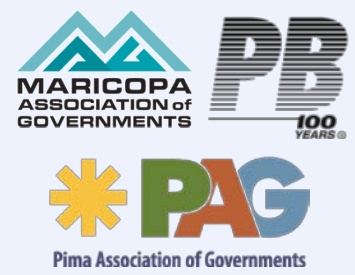
- Conduct interviews by cell phone and Internet
- Better represent respondents by age
- Better represent Hispanics

Household Ethnicity	2008 NHTS Weighted	2008 ACS
Hispanic	10.50%	30.87%
White	77.50%	58.63%
Black/African American	4.60%	4.10%
American Indian	2.90%	1.86%
Asian/Pacific Islander	1.10%	2.86%
Other, Refused, etc.	3.40%	1.68%

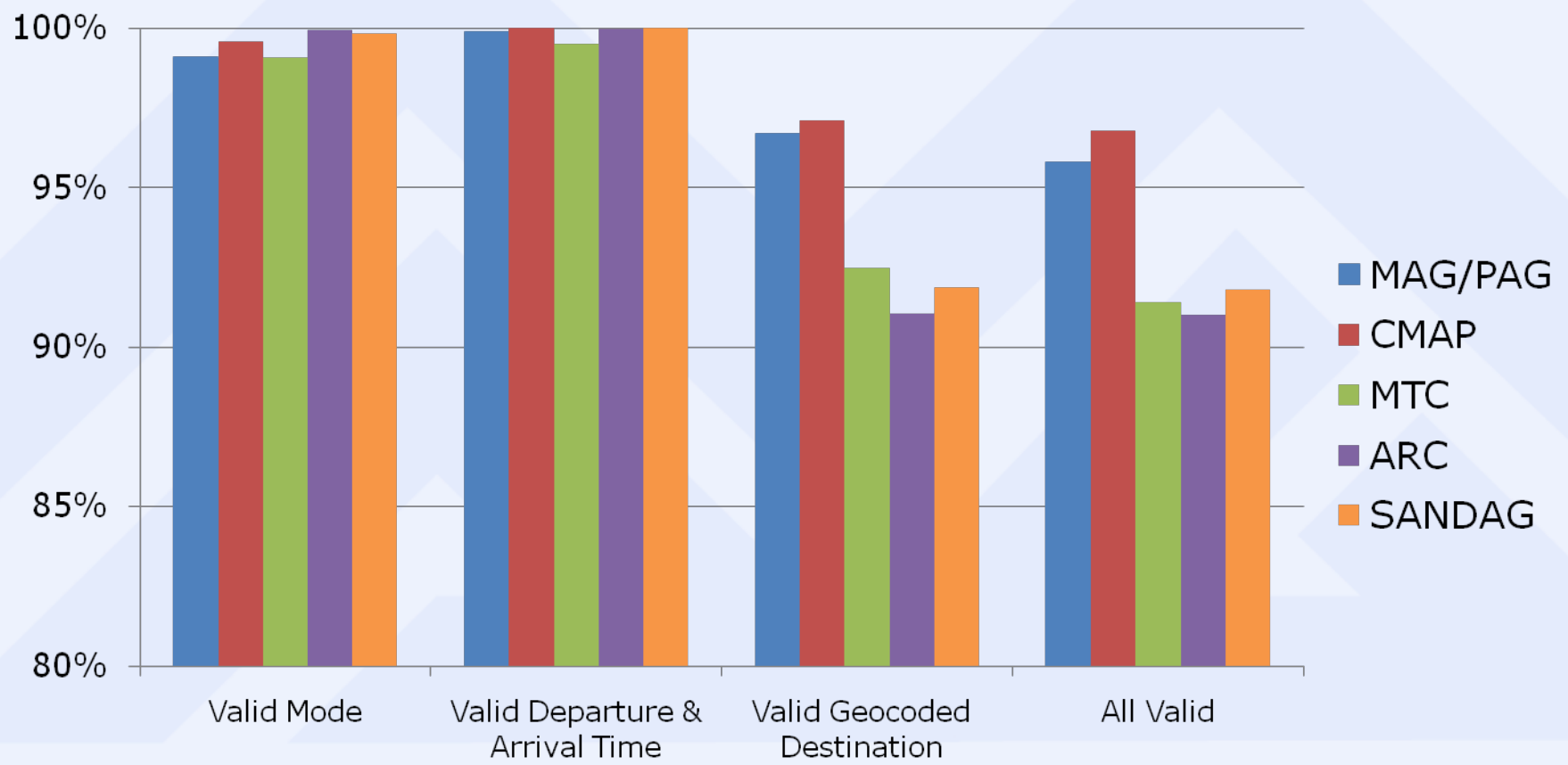


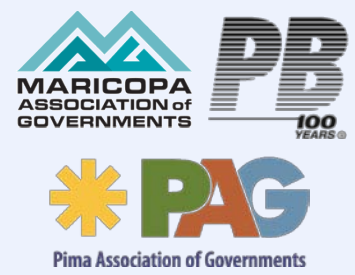
Tours by Purpose & Aggregate Mode (MAG/PAG NHTS)



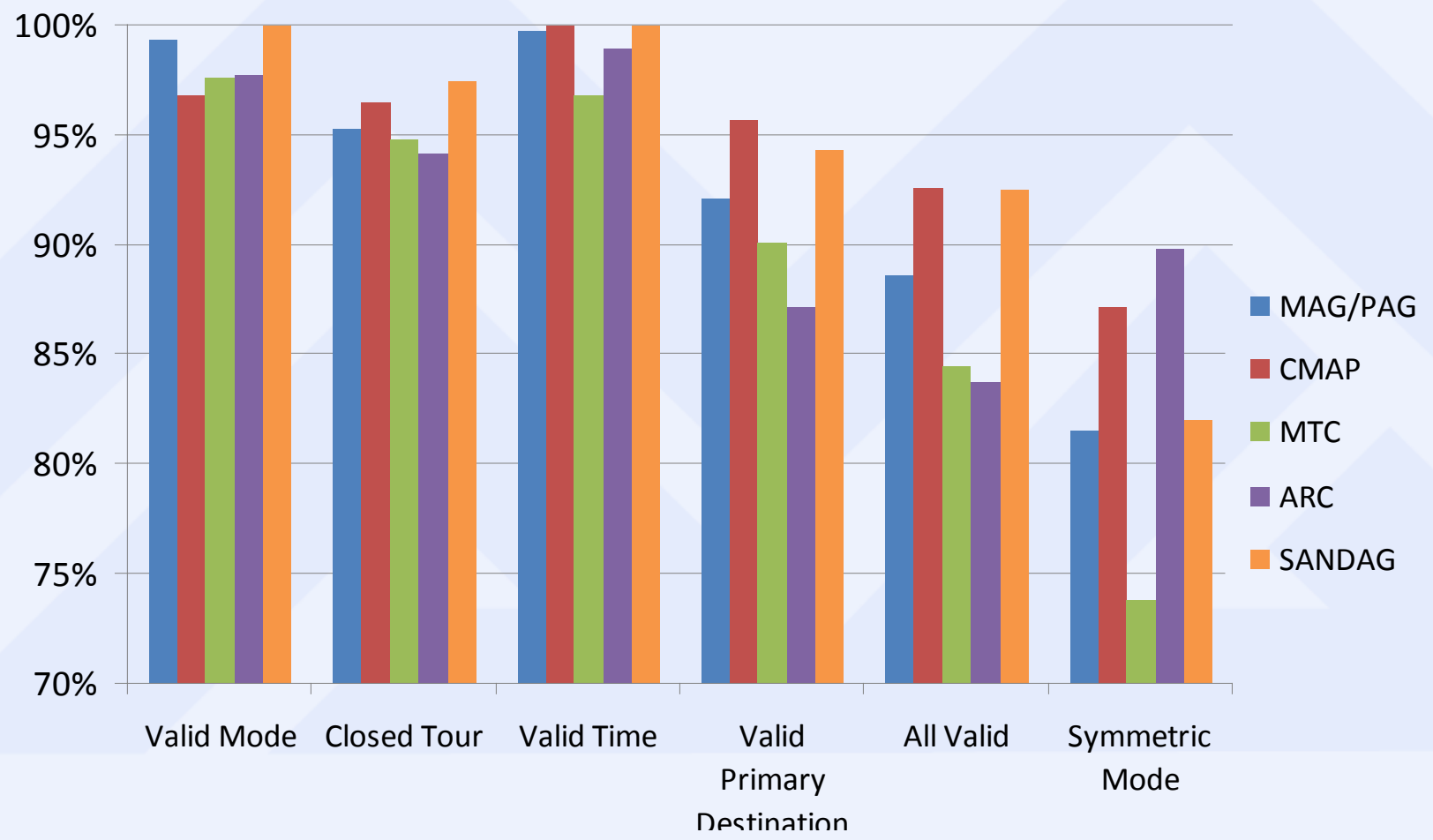


Completeness of Trip Records





Completeness of Tour Records





Conclusions - MAG/PAG NHTS Survey

■ Good quality overall:

- Reasonable trip & tour rates per person & HH comparable to other regions
- Validity and completeness of trip records at the level of other surveys or better
- Can be used for development of advanced ABM but requires processing & imputations



Thank you!

Questions?

pmaneva@azmag.gov



Conclusions - MAG/PAG NHTS Survey

■ Good quality overall:

- Reasonable trip & tour rates per person & HH comparable to other regions
- Validity and completeness of trip records at the level of other surveys or better
- Can be used for development of advanced ABM but requires processing & imputations

■ Lessons learned:

- Incomplete HHs with missing persons – valid survey criteria
- Very small sample of transit users
- Children under 5 are not included
- Inconsistencies between joint travel records (GPS, automatic logic checks)
- Many problems can be fixed by subsequent manual quality control, analysis, complementary data collection and imputation



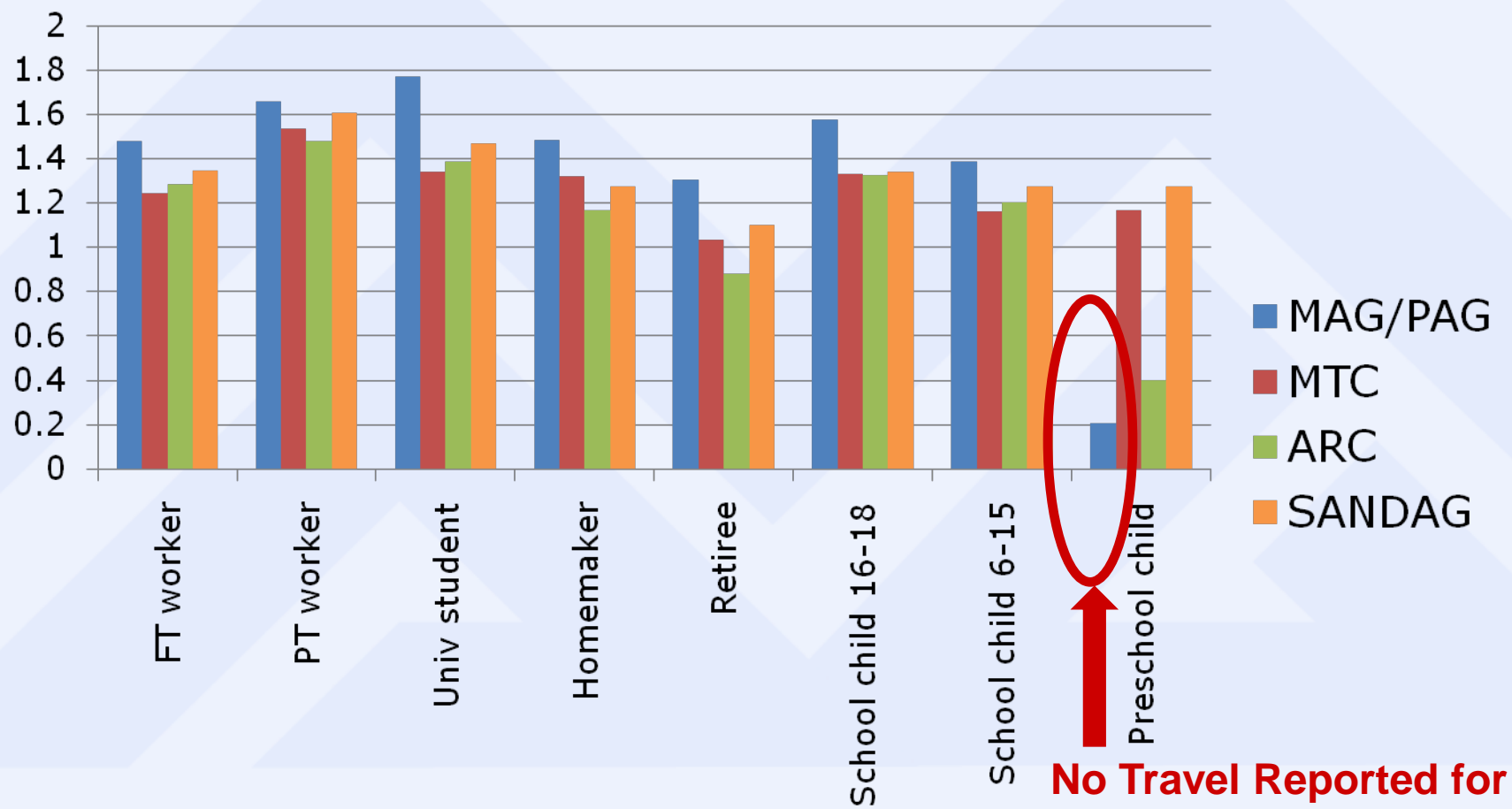
Reconcile Trip Records with Land Use at Destination

- Logical checks: Non-Mandatory trips by purpose

Employment or Other Land Use	Shopping	Maintenance	Eating Out	Visiting	Discretionary
Retail	√	√	√		√
Information		√			
Real Estate, Renting, Leasing		√			
Health Care, Social Assistance		√		√	
Arts, Entertainment			√		√
Accommodation, Food Services	√		√		√
Public Admin		√			
# Households				√	√



Daily Tour Rate by Person Type



No Travel Reported for Children under 5 years



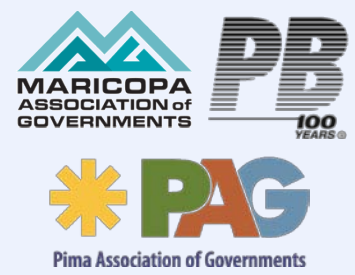
Cross-Region Comparison

	SAN DIE GO (SANDAG)	ATLANTA (ARC)	BAY AREA (MTC)	CHICAGO (CMAP)	PHOENIX – TUCSON (MAG/PAG) NHTS
Survey Year	2006	2001	2000	2007-08	2008
#HHs	3,651	8,069	15,064	14,315	7,068
#Days	1	2	2	1-2	1

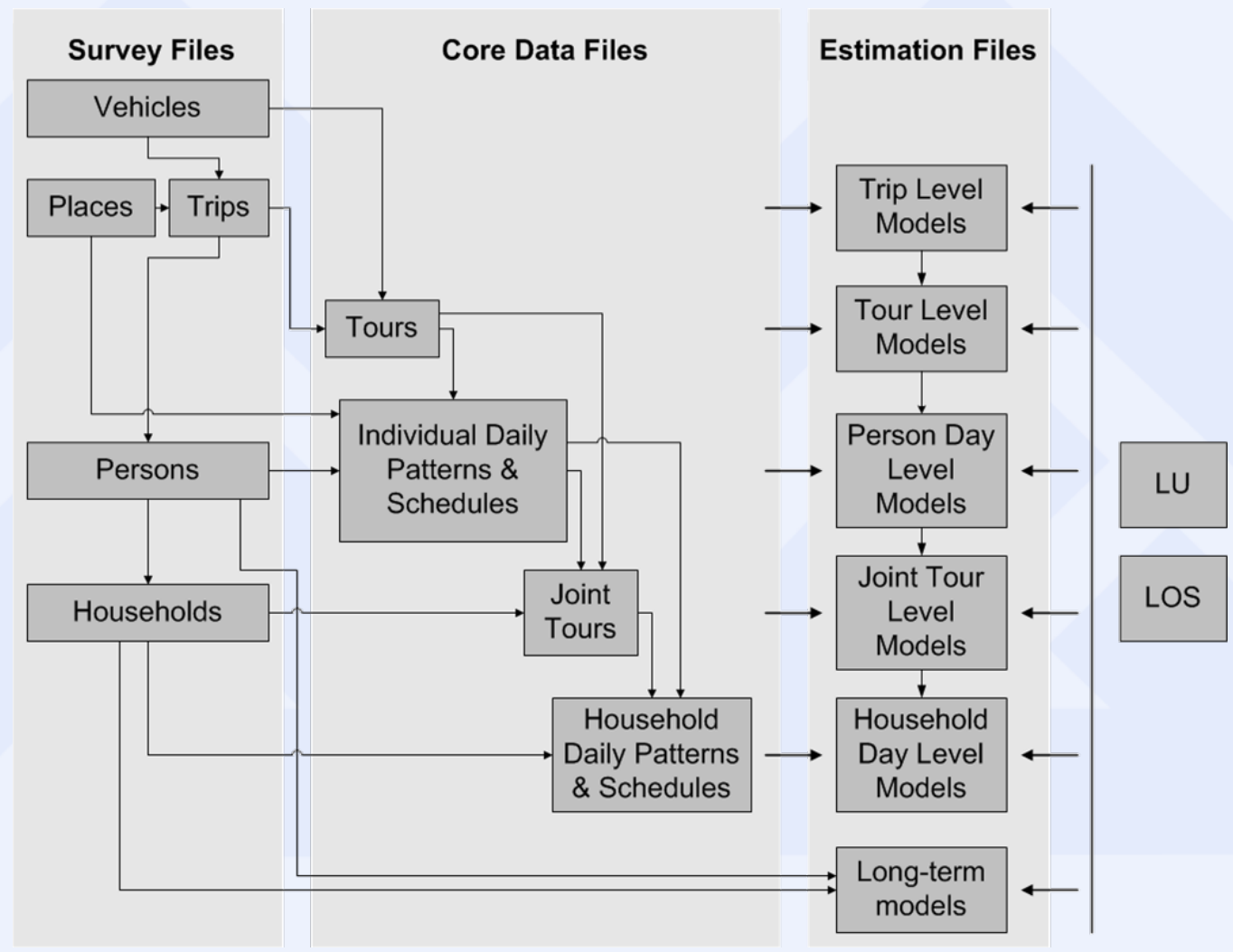


Reconcile Trip Records with Land Use at Destination

- **Analysis of discrepancies & fixes (manual):**
 - Geocoding errors
 - Problem with Land Use data
 - Survey coding errors
 - Worker job type
 - Student type definition



Data Processing





Tours by Purpose & Person Type (MAG/PAG NHTS)

Person Type	Work	School	University	Others
Full-time worker	2,834	0	4	2,176
Part-time worker	482	0	0	1,048
University student	102	0	249	251
Non-worker	64	4	5	2,636
Retiree	19	0	0	3,046
Driving school child	28	232	0	151
Pre-driving school child	3	1,016	0	616
Pre-school child	0	88	0	53



Reconcile Trip Records with Level-of-Service (LOS) Skims

- **Analysis of discrepancies and fixes (manual):**

- Survey mode coding errors
- Compare reported trip duration to skims

$$\text{Trip Duration} = \beta * \text{Skim}$$

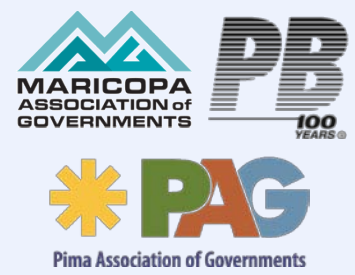
Trip Mode	β (MAG)	β (PAG)
Highway	1.01	1.15
Transit (Bus)	0.85	1.20

- PAG skims are a bit too fast; Revision is underway
- Geocoding fixes for availability of Express/Rapid Bus

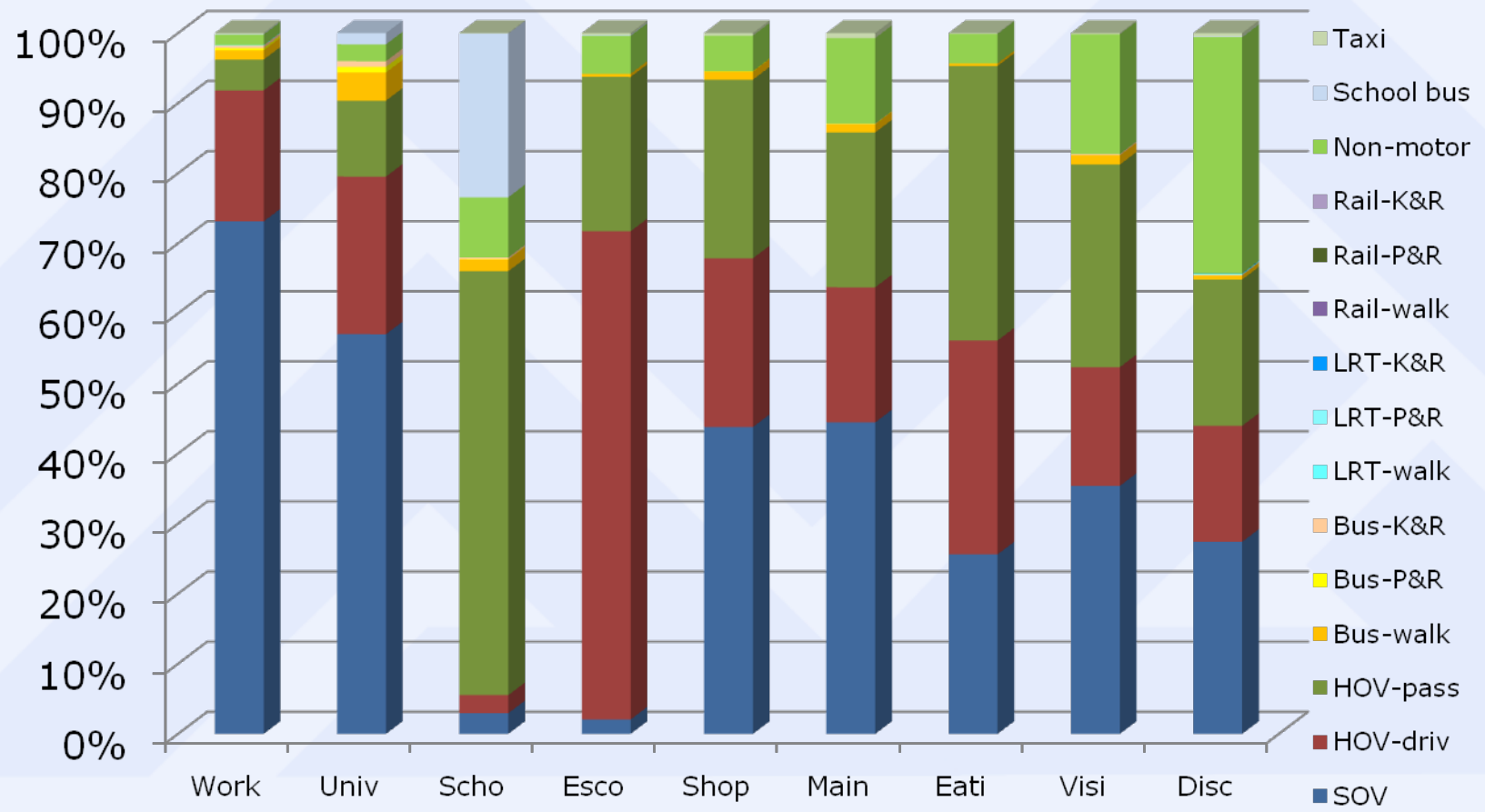


Reconcile Trip Records with Level-of-Service (LOS) Skims

- **Logical checks:**
 - Availability of reported mode
 - Transit IVT = 0 (by mode)
 - Drive option for person under 16 yrs
 - Unrealistic reported trip duration vs. mode-specific skims from model
 - Number of records by modes
 - No valid observations for Commuter Rail & Urban Rail
 - Very few cases for Express/Rapid bus



Tours by Purpose & Mode (MAG/PAG NHTS)





Variation in Respondent Age Distribution

■ 2008 ACS
■ 2008 NHTS

