

TMIP Webinar Series



# Activity-Based Modeling

Session 8: Activity Pattern Generation

The Travel Model  
*Improvement*  
Program

Speakers: Peter Vovsha & John Gliebe

June 28, 2012

# Acknowledgments

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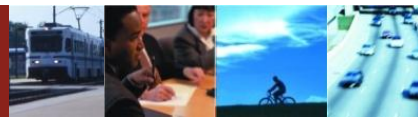
# 2012 Activity-Based Modeling Webinar Series

## Executive and Management Sessions

Executive Perspective	February 2
Institutional Topics for Managers	February 23
Technical Issues for Managers	March 15

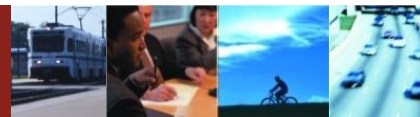
## Technical Sessions

Activity-Based Model Framework	April 5
Population Synthesis and Household Evolution	April 26
Accessibility and Treatment of Space	May 16
Long-Term and Medium Term Mobility Models	June 7
<b>Activity Pattern Generation</b>	<b>June 28</b>
Scheduling and Time of Day Choice	July 19
Tour and Trip Mode, Intermediate Stop Location	August 9
Network Integration	August 30
Forecasting, Performance Measures and Software	September 20



# Where We Are in Series

- Discussed at previous webinars:
  - Overall structure and advantages of activity based modeling
  - Population synthesis
  - Accessibility impacts and treatment of space
  - Long-term and mid-term choices (work, school, car ownership, etc)
- Now we start discussion on how individual travel choices are made on given (modeled) (week)day
- Individual daily activity pattern (DAP) is a central concept of activity based modeling:
  - Replaces trip generation step pertinent to 4-Step
  - Generates activities, tours, and trips with cross-impacts on each other
  - Litmus test on understanding activity based modeling



# Learning Outcomes

- Role and placement of DAP model in activity based modeling
- Structure of DAP choice model and alternatives in the choice set
- Advantages of DAP vs. traditional trip and tour generation models
- How integrity of DAP can be achieved:
  - For each person, between number of activities, trips, and tours for different purposes
  - Across household members, including joint activity and travel
- Two main operational approaches to implement DAP
  - Individual person daily activity pattern (IDAP)
  - Coordinated household daily activity pattern (CDAP)
- The main factors and variables explaining individual choice of DAP



# Outline

- Basic terminology
- Definition of DAP
- Role and placement of DAP in activity based modeling, linkage with the other models
- Relation of DAP to trip and tour generation models in 4-step framework
- Individual DAP (IDAP) implemented for each person independently
- Coordinated DAP (CDAP) implemented for all household members
- Ongoing research, main directions, and challenges





# Terminology

- Main units of activity based modeling analysis:
  - Activity episode
  - Trip
  - Tour
  - Sub-tour
  - Primary activity on tour
  - Half-tour by direction (outbound, inbound)
  - Daily activity pattern



# Classification of Activities

- Type/purpose
  - mandatory, maintenance, discretionary
- Location
  - at-home vs. out-of-home
- Priority on the tour
  - primary activity/destination vs. secondary activity/stop
- Intra-household interaction
  - individual, joint, allocated





# Daily Activity Patterns

- Joint frequency choice of daily activities, tours, and trips/stops by purpose
- Individual daily activity pattern (IDAP)
  - A single person's day of activity and travel, usually defined by tours of particular purposes
- Coordinated daily activity pattern (CDAP)
  - A single household pattern implying joint occurrence of IDAPs for each household member
  - May include implied interactions not included in IDAPs



# Out-of-Home Activities / Travel Purposes

- Mandatory:
  - Work/Business
  - School/College/University
- Maintenance:
  - Escort Passenger(s)
  - Shopping
  - Personal Business (e.g., Medical)
- Discretionary:
  - Eating out
  - Visiting relatives and friends
  - Social/Recreational

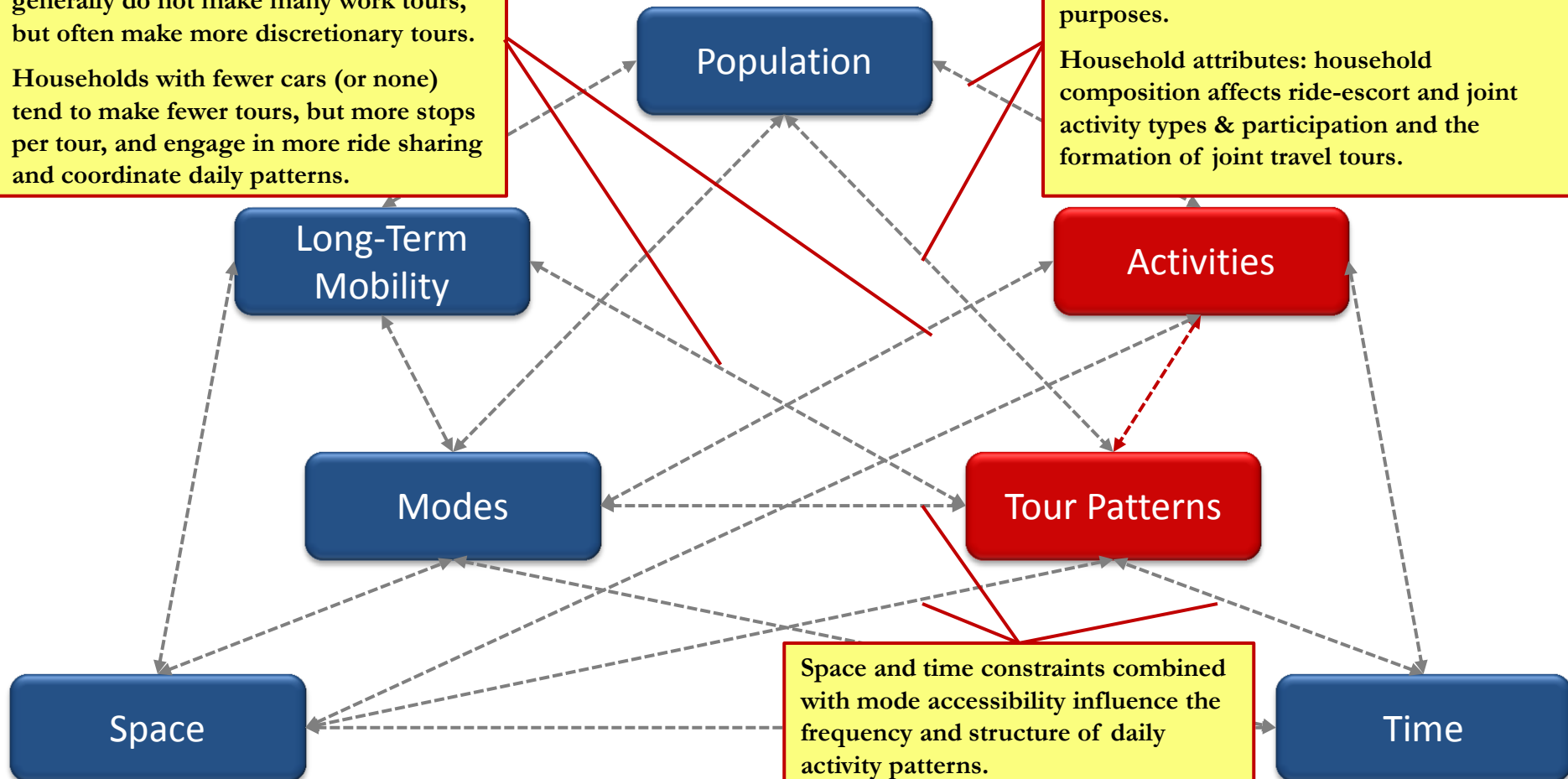


# Relations between activity model design elements

Long-term mobility decisions, such as whether to work from home, affect tour generation. People who work from home generally do not make many work tours, but often make more discretionary tours. Households with fewer cars (or none) tend to make fewer tours, but more stops per tour, and engage in more ride sharing and coordinate daily patterns.

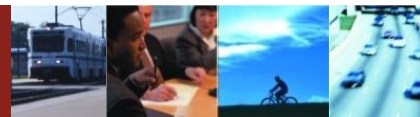
Person attributes: worker, student status determine availability of work and school activities and home-based tours for these purposes.

Household attributes: household composition affects ride-escort and joint activity types & participation and the formation of joint travel tours.



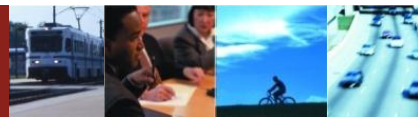
# Bridge Expansion Example

- No Build Alternative
  - 4 lanes (2 in each direction, no occupancy restrictions)
  - No tolls
  - Regional transit prices do not change by time of day
- Build Alternative(s)
  - Add 1 lane in each direction (total of 6)
  - New lanes will be HOV (peak period or all day?)
  - Tolling (flat rate or time/congestion-based)
  - Regional transit fares priced higher during peak periods

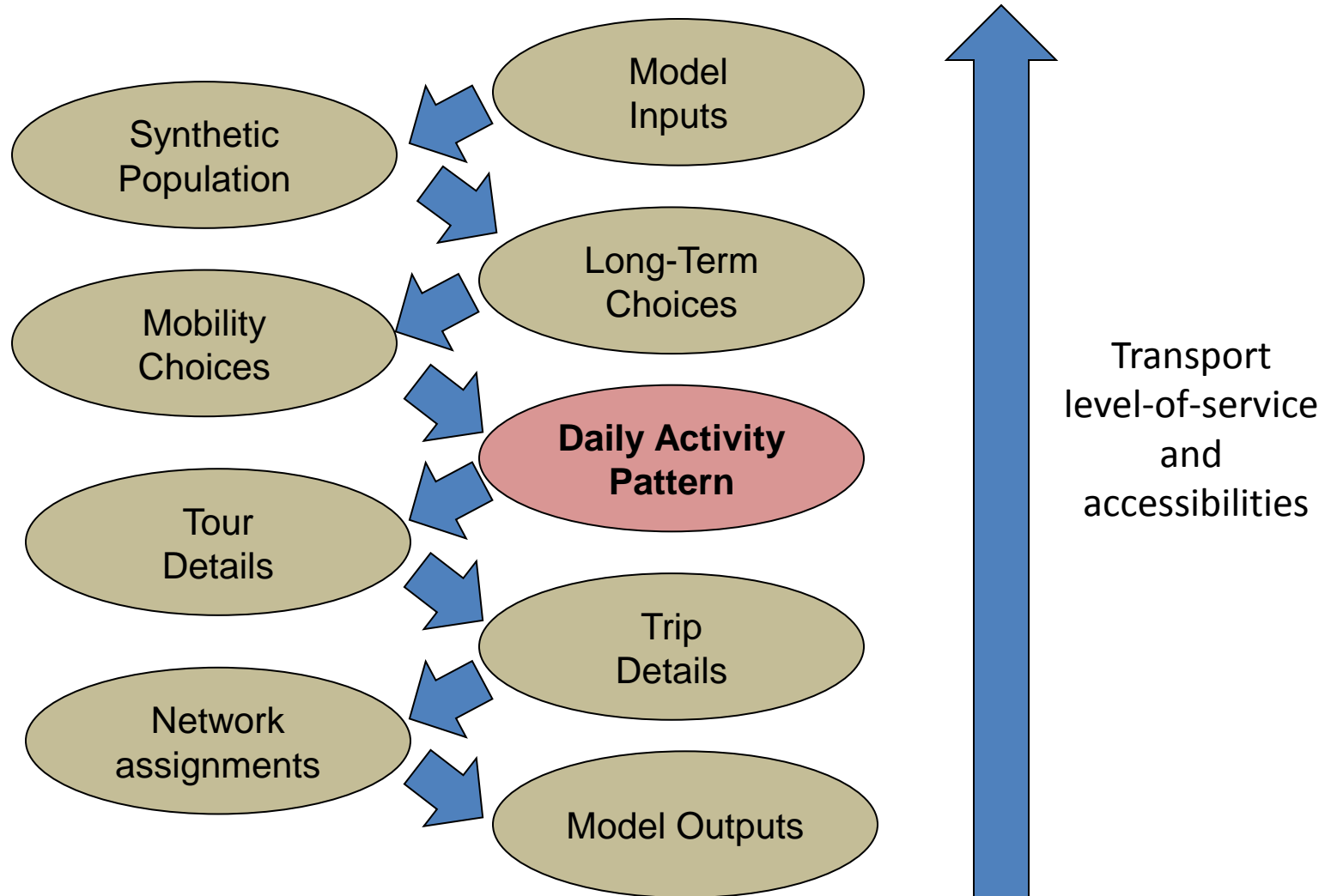


# Bridge Expansion Example—Relevance to Daily Activity Pattern Generation

- Accessibility increases may lead to a greater frequency of activities
  - More discretionary activities, possibly more tours
- Potential increase in intra-household ridesharing to take advantage of HOV
  - Affects tour type choice—coordination between household members for commutes
    - More joint tours/fewer independent tours
    - May result in more joint activities—joint discretionary stops before/after work



# Placement of DAP in activity based modeling

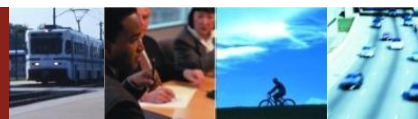




# Evolution of Travel Generation Models

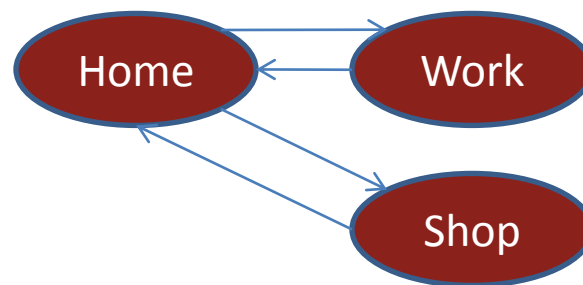
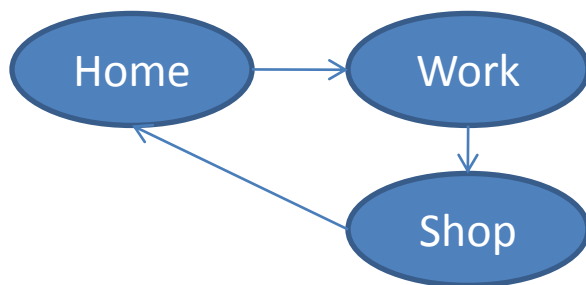
- **Trip production rates** (trips per HH segmented by purpose and HH types)
- **Trip production regression model** (trips by purpose per HH as a function of HH & other variables)
- **Trip frequency choice model** (probability of 0,1,2... trips by purpose per HH/person as a function of HH & other variables)
- **Daily activity-travel pattern model** (simultaneous trip/tour/activity frequency choice model for all purposes)

*Suitable for microsimulation*

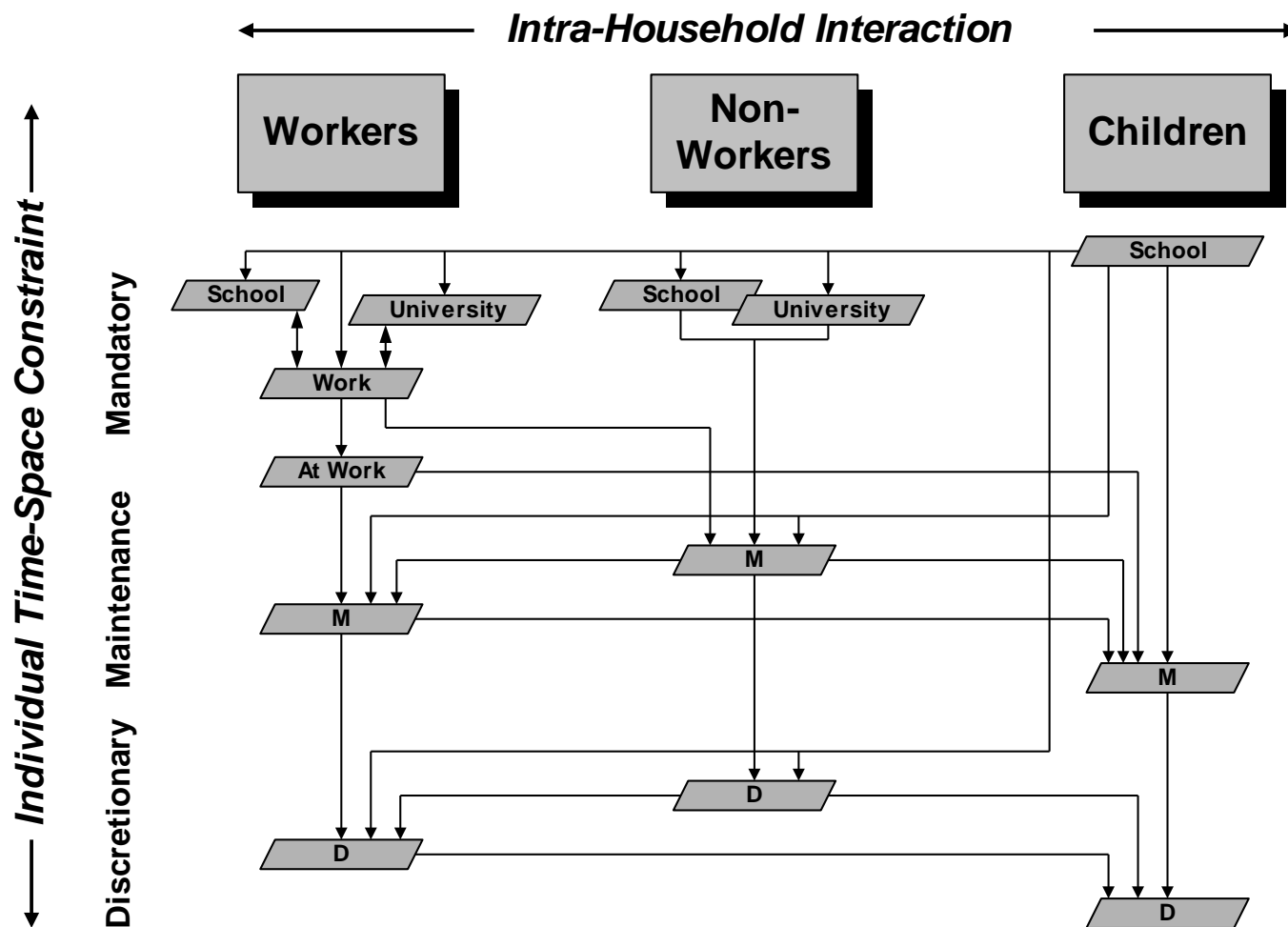


# Why model trips for different purposes jointly?

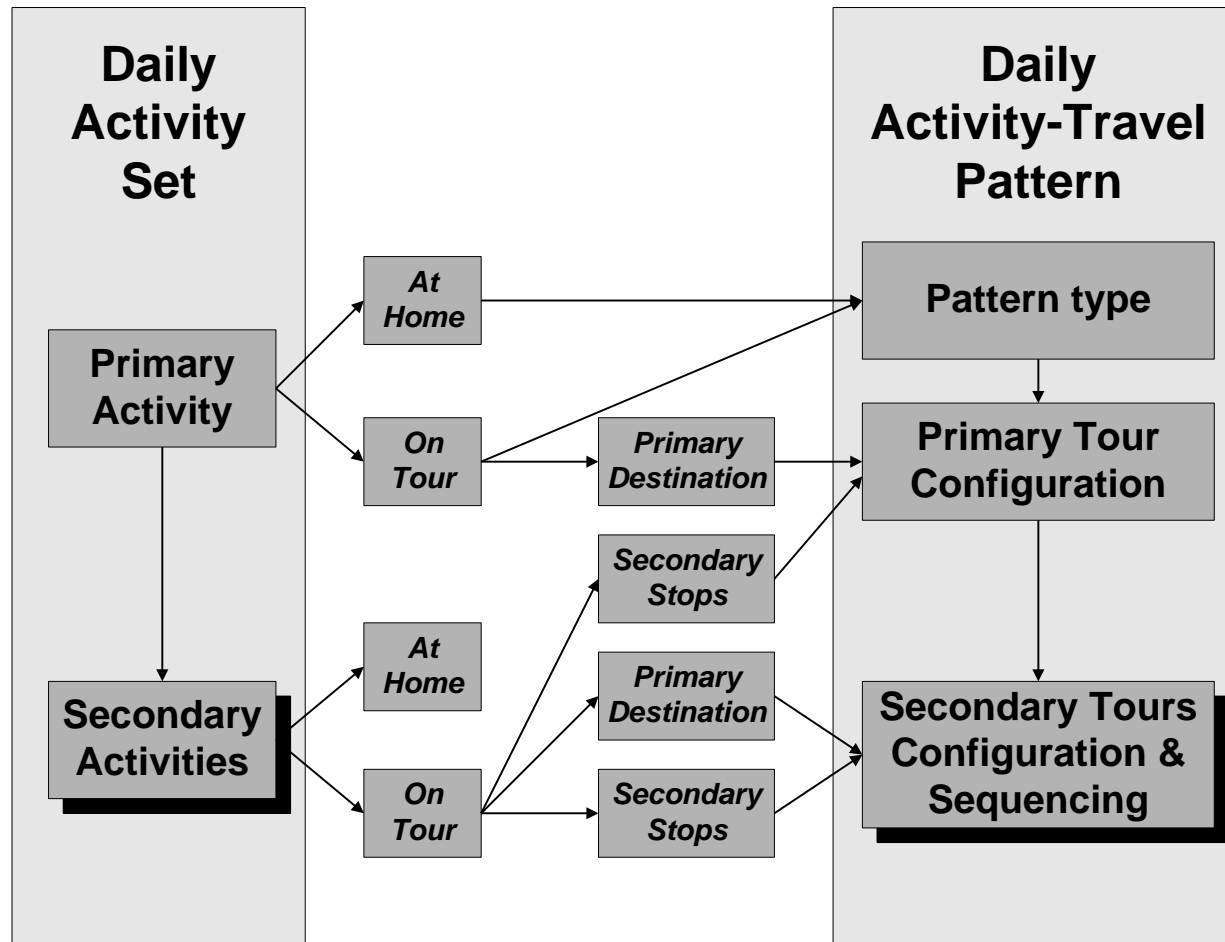
- Tour/trip generation for **different purposes** for the same person and HH **are not independent**:
  - Time-space constraints and interactions between persons dictate many trade-offs
  - Tour formation has strong impact on trip purposes with the same set of activity episodes (Work, Shop):



# Linked Tour-Frequency Model (New York MTC)

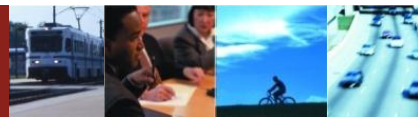


# Daily Activity-Travel Pattern (Bowman 1995)



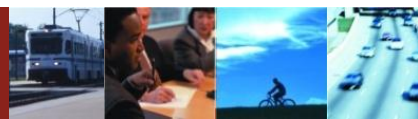
# Person Individual DAP (IDAP) Dimensions

- Pattern type (main characteristic of entire day; most important determinants of person travel behavior; strongly constrains generation of tours by purpose)
- Set of tours (by primary activity and primary destination)
- Secondary activities (stops) on the way to and from primary destinations



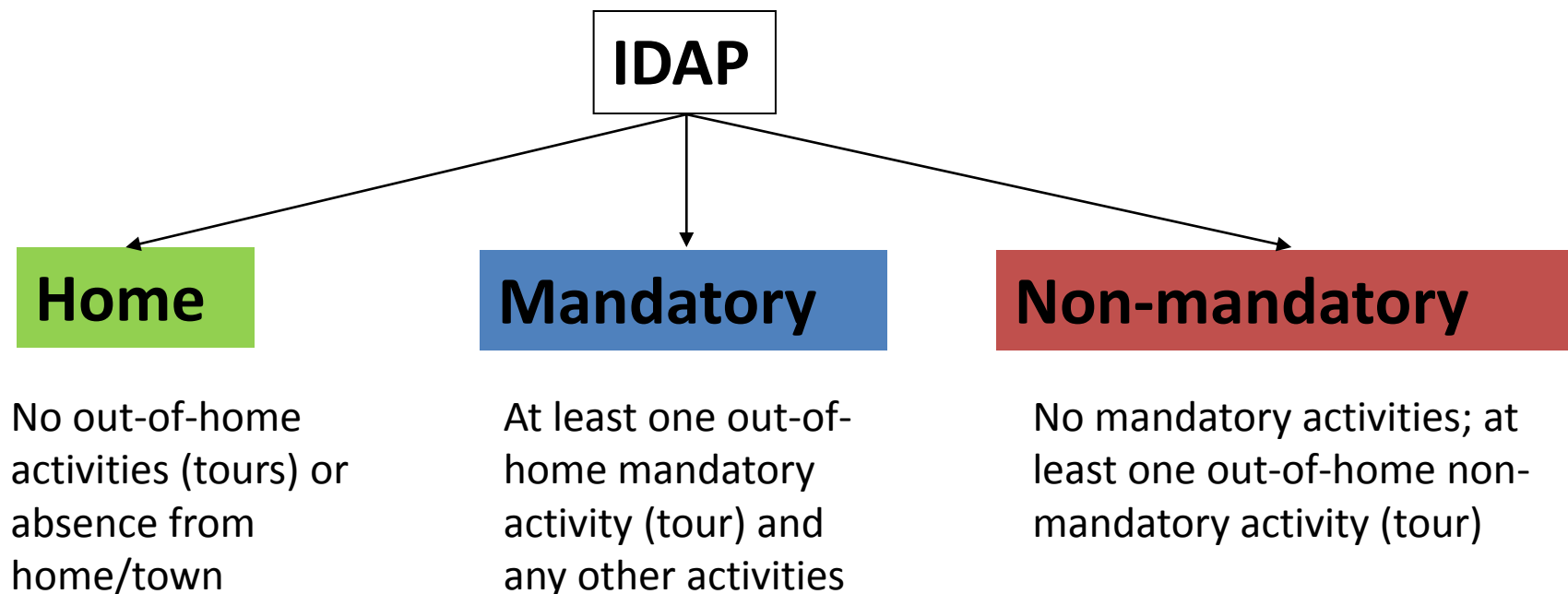
# Main Person Types

<i>Type</i>	<i>Age</i>	<i>Work stat</i>	<i>Stud stat</i>
Full-time worker	18+	Full	Part
Part-time worker	18+	Part	Part
University student	18+	Part	Full U
Non-worker	18-64		Part
Retired	65+		
Driving school child	16+	Part	Full S
Pre-driving school child	6-15		Full S
Pre-school child	U6		Full S



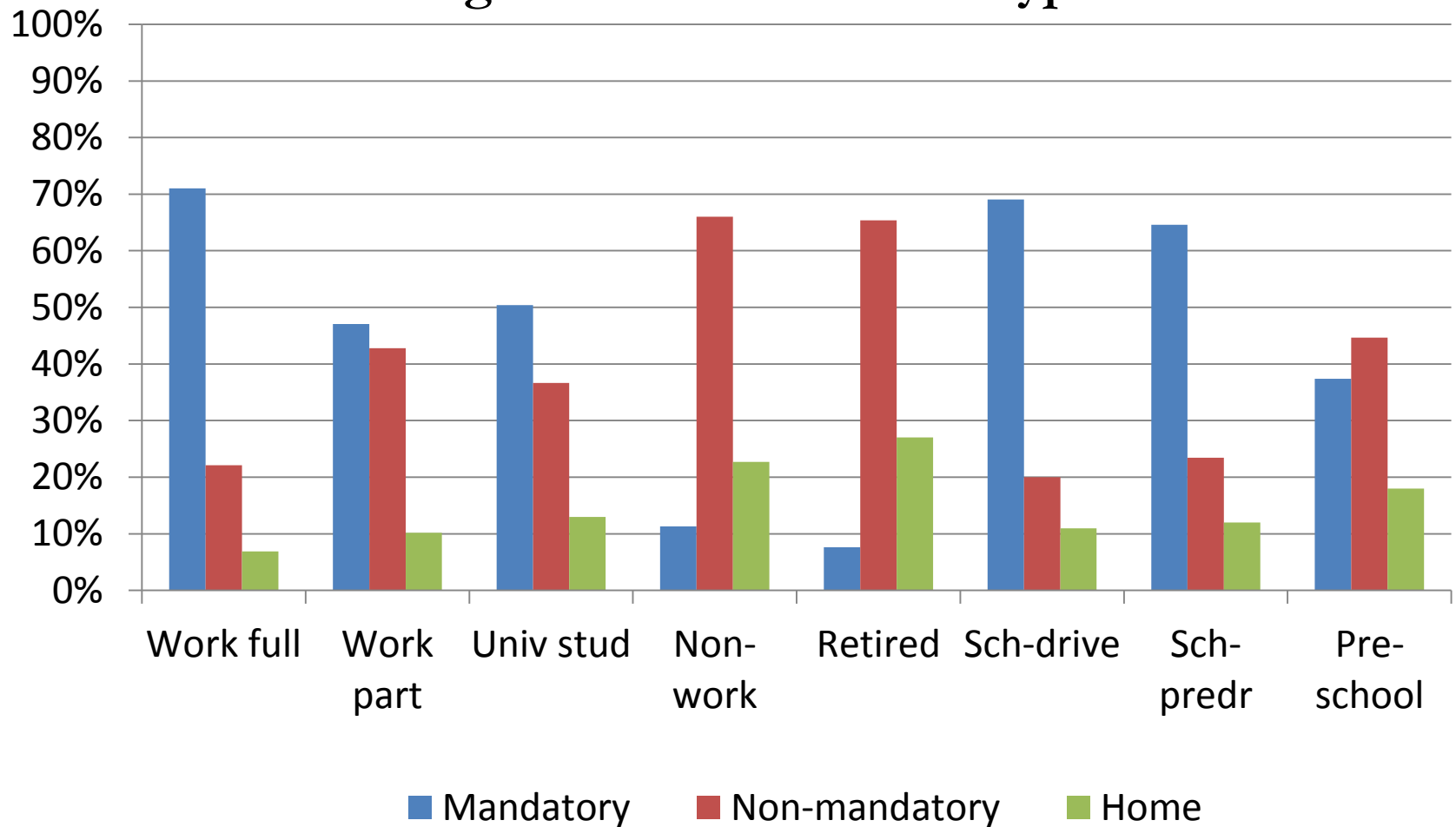


# Individual Daily Activity Pattern Type

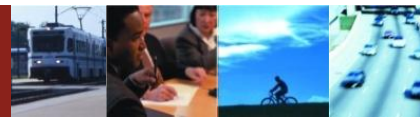
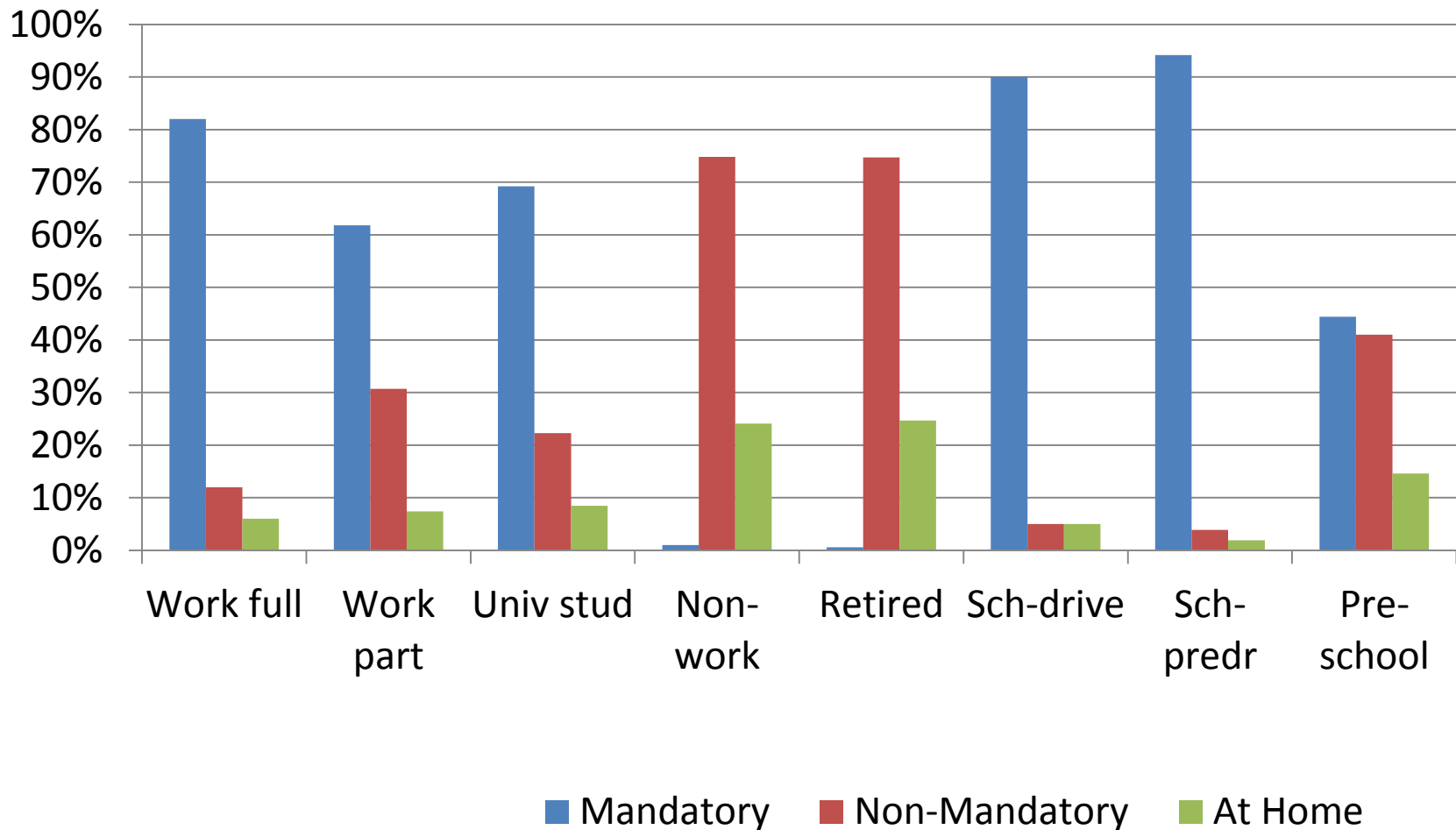


# Observed Individual DAP (Bay Area, 2000):

## Strong Function of Person Type

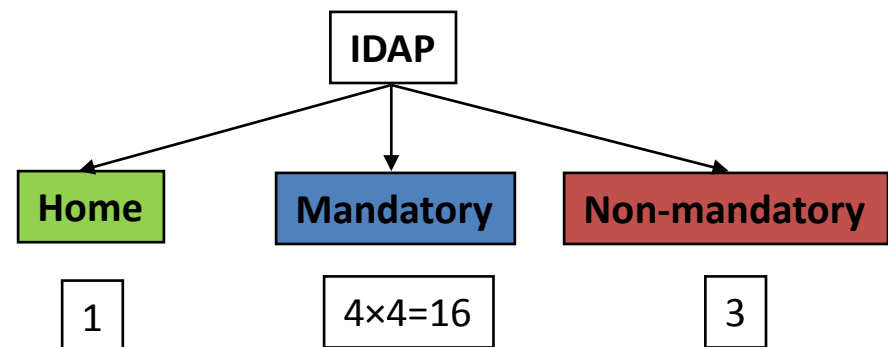


# Observed Individual DAP (San Diego, 2007): Similar Distribution



# Simplified IDAP Choice Example

- Possible frequency of work/school tours:
  - 0 tours
  - 1 work
  - 2+ work
  - 1+ work & 1+ school/university
  - 1+ school/university
- Possible frequency of other tours:
  - 0 tours
  - 1+ shopping/escort/maintenance
  - 1+ eating/visiting/discretionary
  - 1+ shopping/escort/maintenance & 1+ eating/visiting/discretionary
- Total combinations  $5 \times 4 = 20$



# Daily Activity Patterns

DAP Type	Mandatory Tours	Non-Mandatory Tours	DAP alternative
Home	0	0	1
Mandatory	1 Work	0	2
		1+ Escort/Shop/Maintenance	3
		1+ Eating/Visit/Discretion	4
		1+ Maintenance & 1+ Discretion	5
	2+ Work	0	6
		1+ Escort/Shop/Maintenance	7
		1+ Eating/Visit/Discretion	8
		1+ Maintenance & 1+ Discretion	9
	1+ Work & 1+ School/University	0	10
		1+ Escort/Shop/Maintenance	11
		1+ Eating/Visit/Discretion	12
		1+ Maintenance & 1+ Discretion	13
	1+ School/University	0	14
		1+ Escort/Shop/Maintenance	15
		1+ Eating/Visit/Discretion	16
		1+ Maintenance & 1+ Discretion	17
Non-Mandatory	0	1+ Escort/Shop/Maintenance	18
		1+ Eating/Visit/Discretion	19
		1+ Maintenance & 1+ Discretion	20



# Observed Frequency for Workers: Your Guess?

## Bay Area Transportation Survey (2000)

IDAP Type	Mandatory Tours	
Home	0	7.4%
Mandatory	1 Work	60.8%
	2+ Work	3.1%
	1+ Work & 1+School/University	1.2%
	1+ School/University	3.1%
Non-Mandatory	0	24.5%



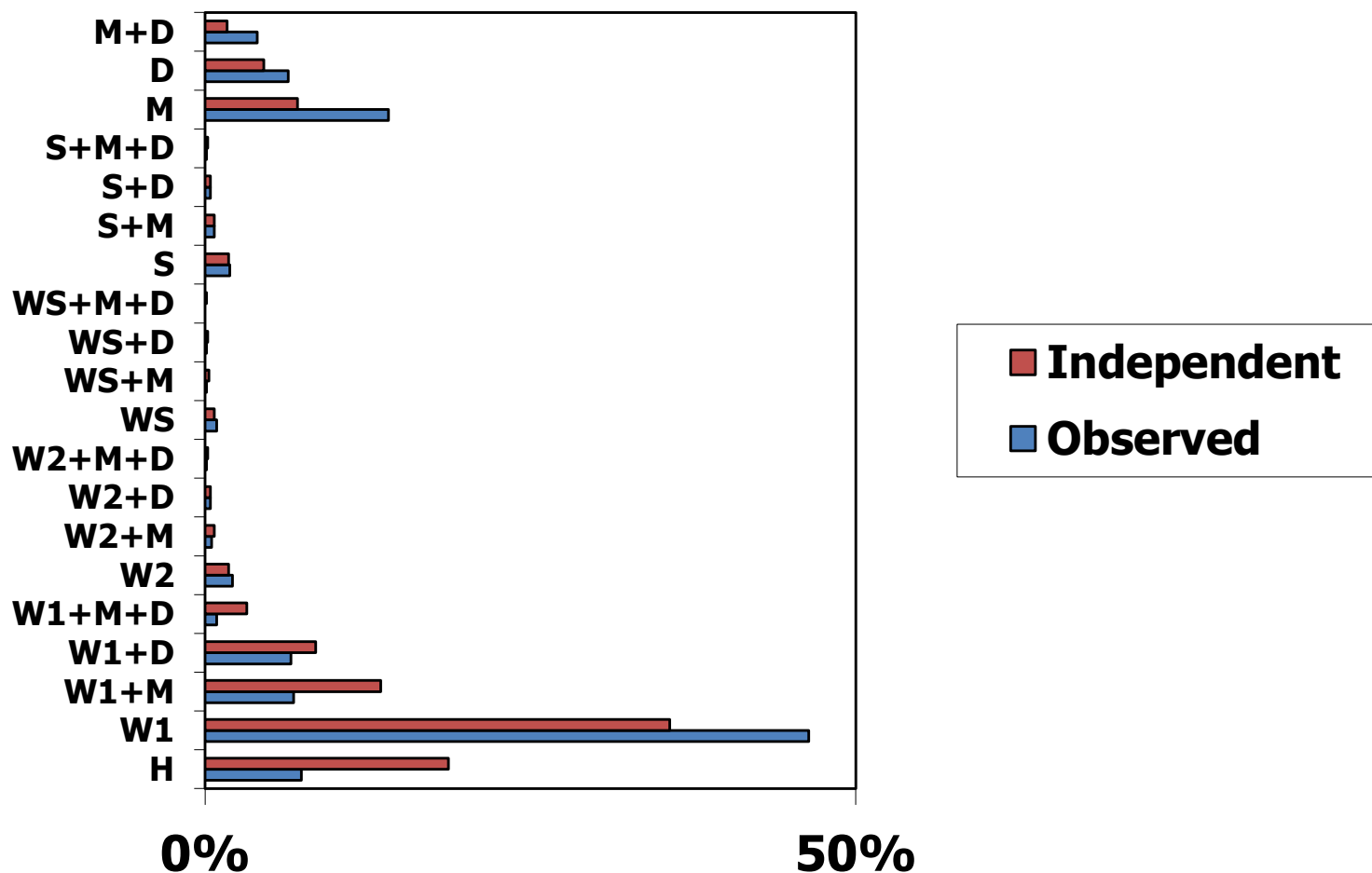


# Observed Frequency for Workers: Your Guess?

Non-Mandatory Tours	
0	58.7%
1+ Escort/Shopping/Maintenance	22.2%
1+ Eating/Visiting/Discretionary	14.0%
1+ Escort/Shopping/Maintenance & 1+ Eating/Visiting/Discretionary	5.2%



# Observed IDAP Frequency vs. Independent Calculation by Tour Purpose



# Utility Formation Examples

<b>DAP=3</b> (1 Work + Maintenance)	W1 (pattern) + W (tour) + M (tour)
<b>DAP=13</b> (Work + School + Maintenance + Discret)	WS (pattern) + W (tour) + S (tour) M (tour) + D (tour)
<b>DAP=19</b> (Discretionary)	N (pattern) + D (tour)

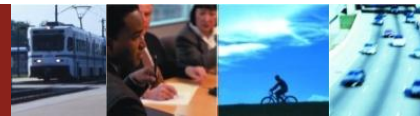
# IDAP Example from Sacramento activity based modeling

- Further on, we will consider example of IDAP applied in Sacramento, CA (SACOG) activity based modeling (DaySim) in detail
- Similar structures successfully applied in many activity based models in practice:
  - San Francisco, CA (SFCTA)
  - Denver, CO (DRCOG)
  - Seattle, WA (PSRC)
  - Jacksonville, FL (NFTPO)
  - Fresno County and San Joaquin Valley, CA

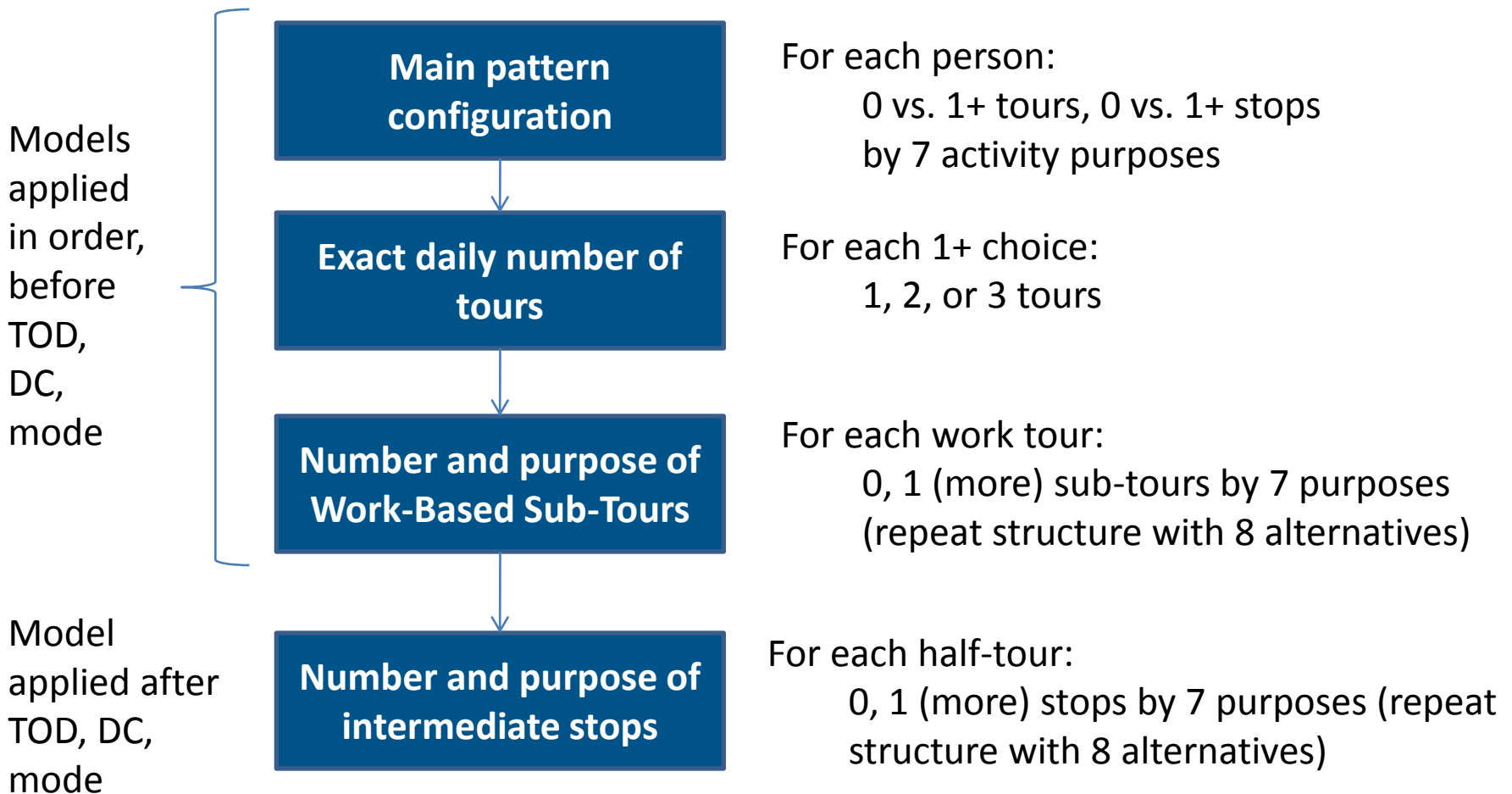


# IDAP Main Features

- Predicts for each person:
  - Tours by purpose
  - Purposes for which intermediate stops occur during the day
- High level of intra-person consistency of the day's tours and stops for seven different purposes
- Relatively simple and possible to enumerate all main IDAPs although results in thousands of alternatives
- Intra-household interactions not modeled explicitly but somewhat accounted implicitly through household variables



# IDAP Dimensions and Sub-Models

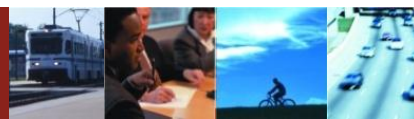




# IDAP Main Pattern Configuration

Purpose	Possible # tours		Possible # additional stops	
1=Work	0	1+	0	1+
2=School	0	1+	0	1+
3=Escort	0	1+	0	1+
4=Personal business	0	1+	0	1+
5=Shopping	0	1+	0	1+
6=Eating out	0	1+	0	1+
7=Social & recreational	0	1+	0	1+

- $2^{14}=16,384$  possible combinations
- Truncation by max of 3 tour purposes, 4 stop purposes, 5 total purposes
- Exclusion of unobserved and infrequent combinations
- 2,080 realistic choice alternatives



# IDAP Main Pattern Utility Function

- Parsimonious **component-wise** structure:
  - More than 2,000 alternatives
  - Only 100 coefficients to estimate
- Main utility components:
  - **Nominal** utility component for tour ( $T_x$ ) and stop ( $S_x$ ) by purpose ( $x$ )
  - Tour & stop **frequency** related components ( $NT_x$ ,  $NS_x$ ,  $NT_x+NS_x$ ) by purpose
  - **Interaction** terms ensuring intra-person consistency and trade-offs between tours and stops by purpose ( $IT_{xy}$ ,  $IS_{xy}$ ,  $ITS_{xy}$ ) by pairs of purposes

# IDAP Main Pattern Utility Examples

IDAP	Tour component	Stop Component	Interaction term
Work tour + shopping tour	(work) + (shop)		(work, shop)
Work tour w/shopping stop	(work)	(shop)	(work, shop)
Work tour + school tour + recreational stop	(work) + (school)	(recreational)	(work, school) + (work, recreational) + (school, recreational)
Recreational tour	(recreational)		
2 shopping tours	(shop) + (shop)		

# Formulation of Component-Wise Utilities

- Form a utility by components for IDAP that includes work tour and shopping tour:
  - Component that measures the utility for total number of 1+ tours
  - Component that measures utility for 1+ tours for a particular purpose
  - Component that measures the joint utility of 2 tours of different purpose

$$Utility_{1+work, 1+shop} = Utility_{1+work} + Utility_{1+shop} + Utility_{2+ tours} + Utility_{1+work \& 1+ shop}$$

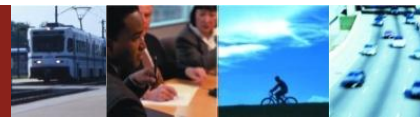
- Where:

- $Utility_{1+work} = 2.5 + -0.2*(0,1)_{\text{part-time worker}} + 0.5*work\_MC\_logsum_{\text{home-work}}$
- $Utility_{1+ shop} = -0.3 + 2*(0,1)_{\text{high-income hh}} + 1.5*hh\_size + 0.5*shop\_DC\_logsum_{\text{home}}$
- $Utility_{2+ tours} = -1.0$
- $Utility_{1+work \& 1+shop} = -0.18$

Constants

Household and person variables

Accessibility information

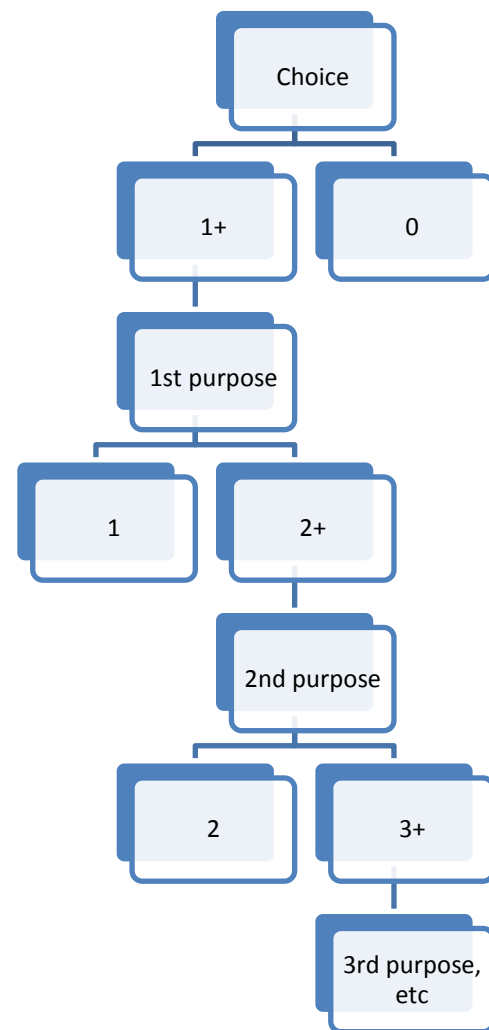


# IDAP Exact Number Tours: e.g., Shopping

Main variables	1 tour	2 tours	3 tours
Constant	0	-7.469	-14.18
Accessibility to shops		0.5011	0.9517
Full-time worker		0.5642	0.5642
School child age 5-15		-0.6396	-0.6396
Adult age group 26-35		-1.661	-1.661
Male w/children of age 5-15		1.105	1.105
Female w/children of age 5-15		0.5436	0.5436
Only adult in HH		0.5404	0.5404
HH Income 75K+		0.3538	0.3538
Work at home		0.4937	0.4937
# work tours		-2.443	-2.443
# personal business tours		-0.2152	-0.2152

# IDAP Exact Number of Stops

- Separate choice model for each purpose by half-tour with frequency alternatives 1, 2, 3, 4, 5
- Stop-and-go structure
- Controlled by total number of secondary stop purposes predicted by main IDAP configuration





# Questions and Answers

The **Travel** Model  
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Program



# Coordinated DAP (CDAP)

- Further development and generalization of IDAP concept to account for intra-household interactions
- Successfully applied in many activity based models of CT-RAMP family in practice:
  - Columbus, OH (MORPC)
  - Lake Tahoe, NV (TMPO)
  - Atlanta, GA (ARC)
  - Bay Area, CA (MTC)
  - San Diego, CA (SANDAG)
  - Phoenix, AZ (MAG)
  - Chicago, IL (CMAP)
  - Miami, FL (SERPM)





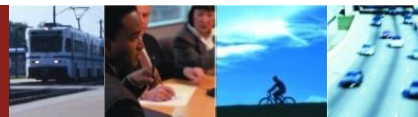
# Importance of Intra-Household Interactions

- For understanding and modeling travel behavior:
  - More than 30% of activities and trip implemented jointly
  - More than 50% of activity schedules affected by schedules of other persons
- For modeling practical policies:
  - HOV and joint travel (not mode choice!)
  - Impact of changing demographics
  - Reluctance to switch to transit and give up car



# Micro-simulation aggravates intra-household inconsistency

HH members	Daily pattern		
	Work, School	Non-mandatory	Stay at home / vacation
<i>Fractional probability:</i>			
1 <sup>st</sup> Worker	0.70	0.15	0.15
2 <sup>nd</sup> Worker	0.60	0.25	0.15
Child	0.65	0.05	0.30
<i>"Crisp" choices:</i>			
1 <sup>st</sup> Worker	Go to work		
2 <sup>nd</sup> Worker		Major shopping	
Child			Sick at home



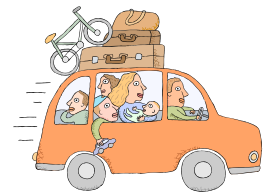
# Simple Numeric Example

- For each worker:
  - 80% probability of going to work
  - 20% probability of non-going to work
- In 2-worker HH following IDAP:
  - $64\% = 80\% \times 80\%$  - both workers going to work
  - $4\% = 20\% \times 20\%$  - neither of workers going to work
  - 32% - one of workers going to work
- In 2-worker HH (observed and CDAP):
  - 72% - both workers going to work
  - 10% - neither of workers going to work
  - 18% - one of workers going to work

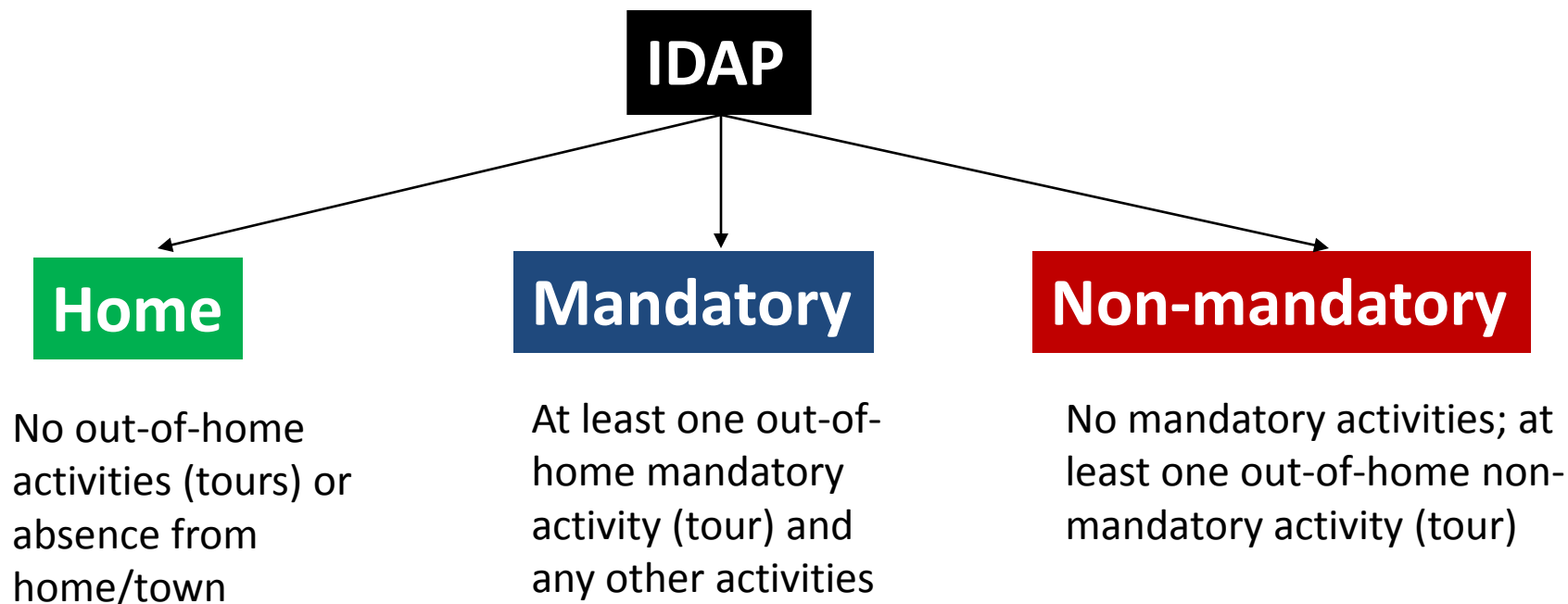


# Main Intra-Household Interactions

- Entire-day level:
  - Staying at home / absent together (vacation, indoor family event, care of sick child)
  - Non-mandatory DAP together (day-off for major shopping, outdoor family event)
- Episode level:
  - Shared activity and joint travel (sporting event)
  - Escorting (children to school)
  - Allocation of maintenance tasks (shopping, banking)
  - Car allocation

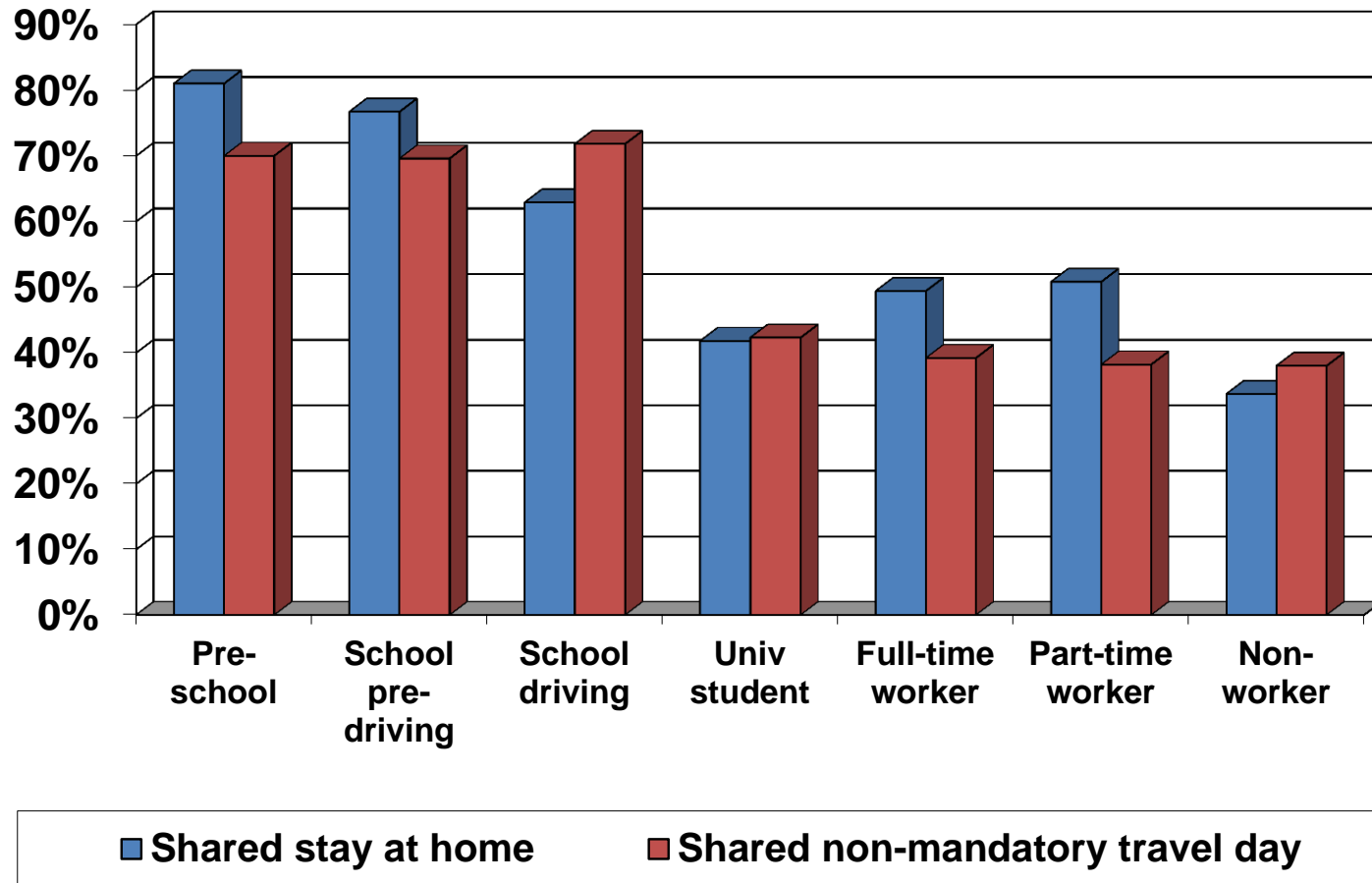


# Daily Activity Pattern Type (Reminder)

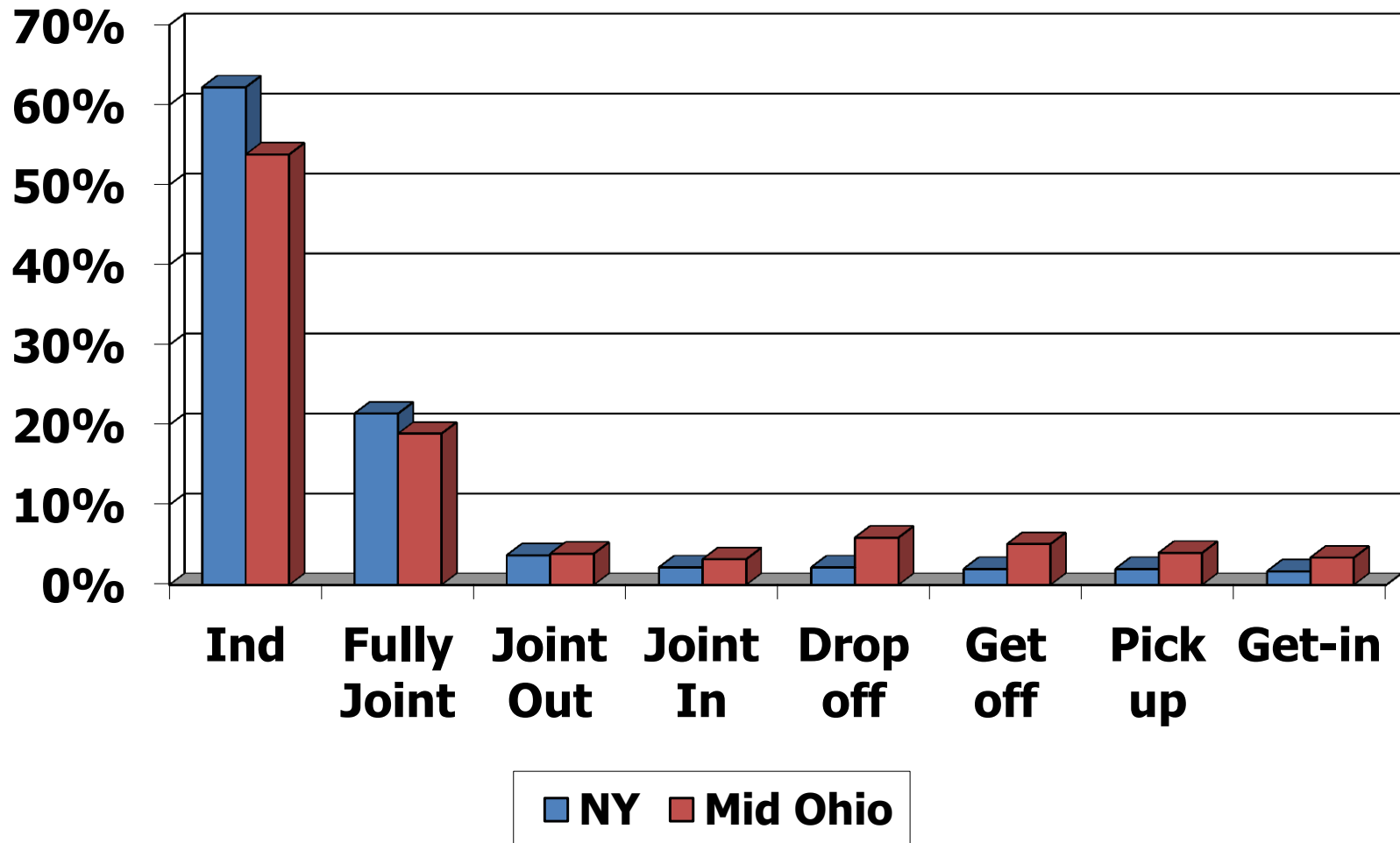


We will consider now several household members making this choice

# Observed DAP Type Sharing, Atlanta, 2001



# Travel Tours by Type



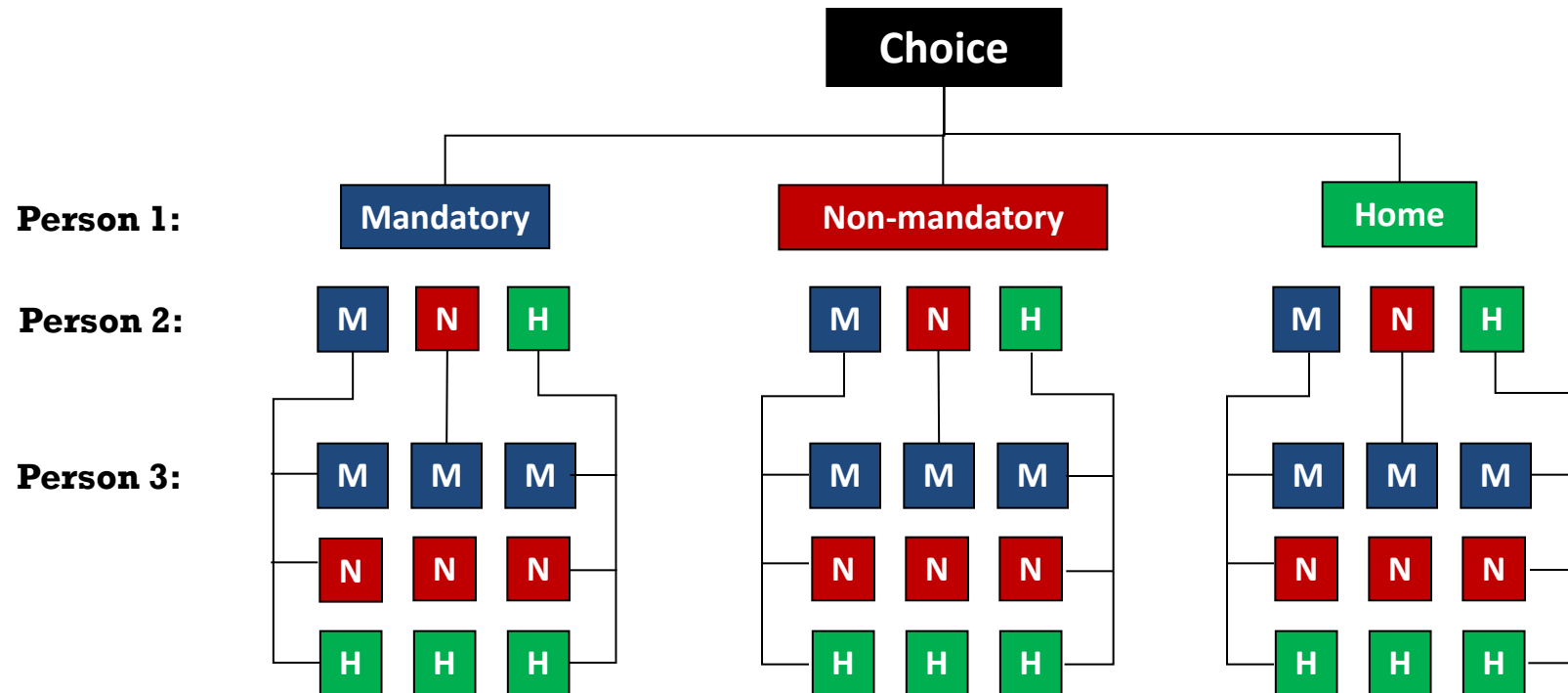
# Basic Choice Structure for CDAP

- Simultaneous rather than sequential modeling of all HH members
- 363 alternative combinations of individual trinary choices for  $HH \leq 5$  (98%):
  - 1 person: 3 alternatives
  - 2 persons:  $3 \times 3 = 9$  alternatives
  - 3 persons:  $3 \times 3 \times 3 = 27$  alternatives
  - 4 persons:  $3 \times 3 \times 3 \times 3 = 81$  alternatives
  - 5 persons:  $3 \times 3 \times 3 \times 3 \times 3 = 243$  alternatives





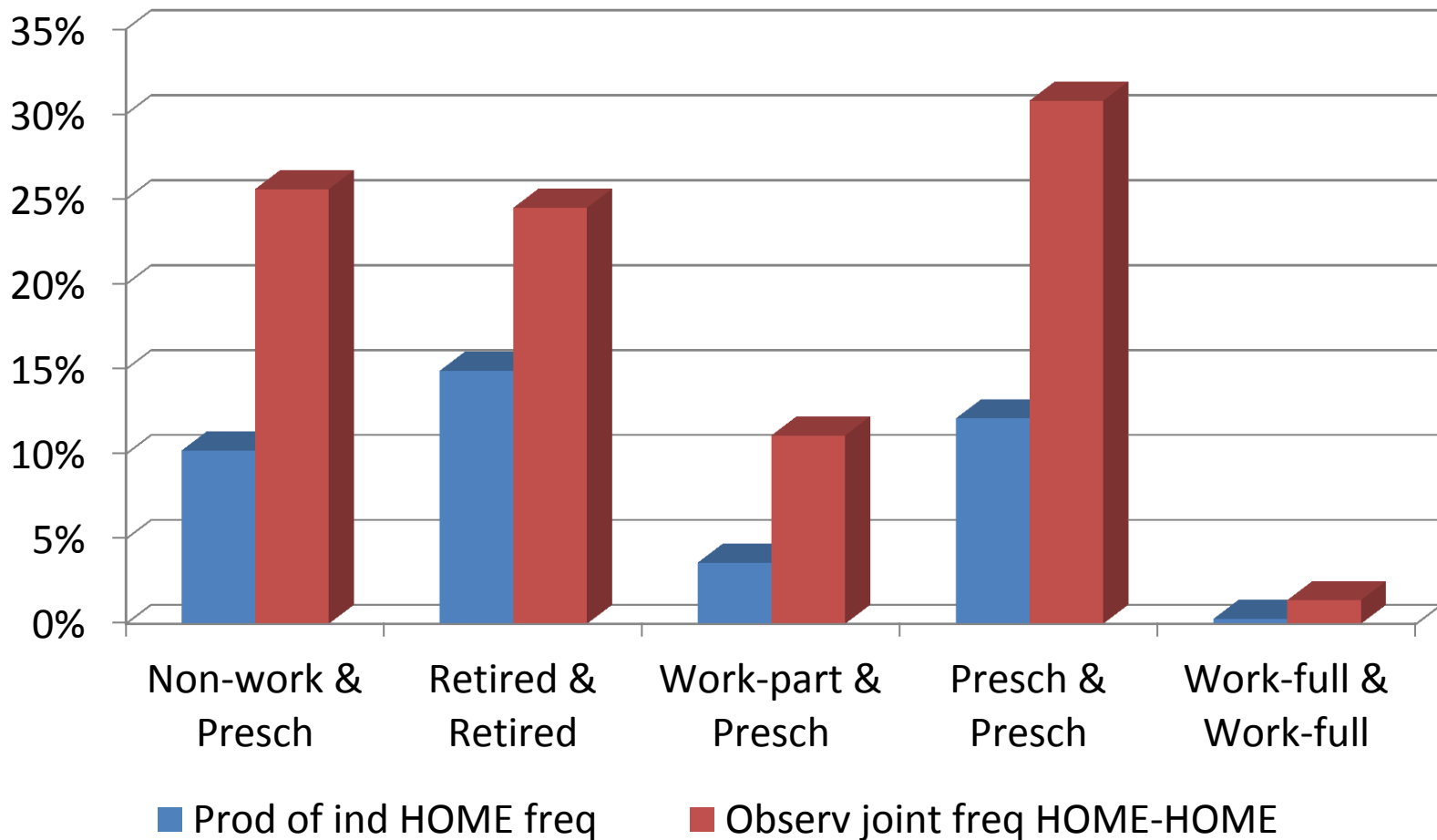
# Coordinated DAP Type – 3 Persons



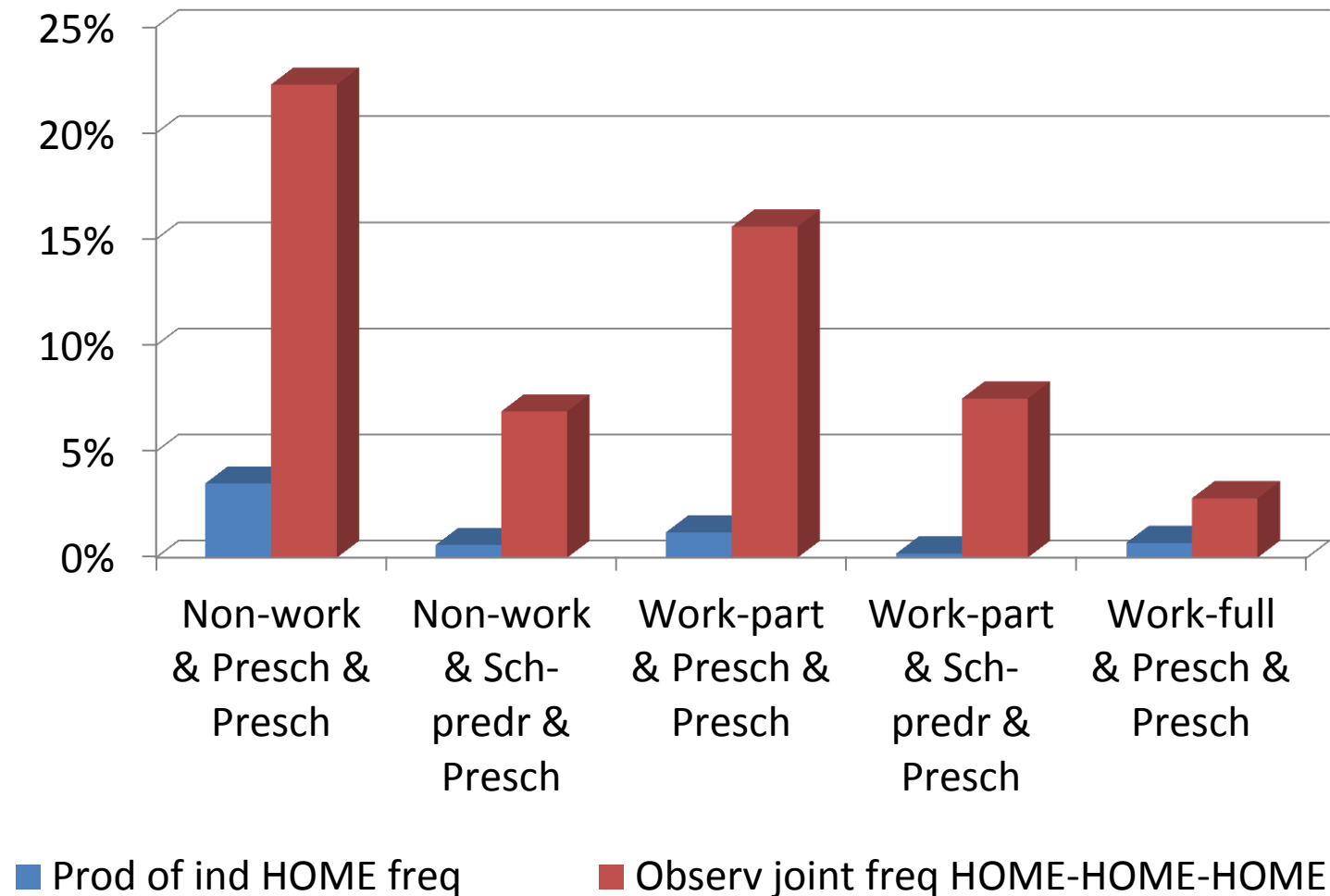
# Is Coordination of DAPs Significant?

- If intra-household interactions are not significant and DAPs independent across persons, frequency of any DAP type combination would be close to product of individual frequencies
- Significant biases in group-wise choice frequency versus products of individual frequencies express intra-household interactions
- All possible 36 pair-wise combinations and 120 three-way combinations of 8 person types were explored with respect to joint NON-MANDATORY and HOME patterns (Atlanta HTS, 2001, 8060 HHs, 2 days)

# Example of Pair-Wise Effects (Home DAP)

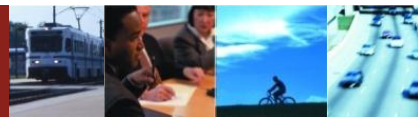


# Example of 3-Way Effects (Home DAP)



# Simplified Version of CDAP

- All HHs are considered
- However, only 3 persons are modeled:
  - 1<sup>st</sup> HH head
  - 2<sup>nd</sup> HH head (if present)
  - Youngest child (if present)
- Skipped person types are the most “individual”:
  - Older school children
  - College/university students
  - Granny living in



# Choice Structure for Training

- 1-person HH (adult HH head):
  - 3 alternatives
- 2-person HH (2 adult HH heads):
  - $3 \times 3 = 9$  alternatives
- 2-person HH (adult HH head+child):
  - $3 \times 3 = 9$  alternatives
- 3-person HH (2 adult HH heads+child):
  - $3 \times 3 \times 3 = 27$  alternatives
- Total:
  - $3 + 9 + 9 + 27 = 48$  alternatives



# Utility Components of CDAP Logit Model

- Individual choice (H, M, N):
  - Adult HH head (gender, age, income, worker status etc)
  - Child (age, school grade, etc)
- 2-way interaction terms (HH, NN, MM):
  - Between HH heads
  - Between HH head and child
- 3-way interaction terms (HHH, NNN, MMM):
  - HH heads + child



# CDAP Utility (1-Person HH)

1 <sup>st</sup> head	2 <sup>nd</sup> head	Child	Alternative	Utility
<b>H</b>	<b>Missing</b>	<b>Missing</b>	<b>1</b>	<b>H1</b>
<b>M</b>	<b>Missing</b>	<b>Missing</b>	<b>2</b>	<b>M1</b>
<b>N</b>	<b>Missing</b>	<b>Missing</b>	<b>3</b>	<b>N1</b>



# CDAP Utility (2 Adults)

1 <sup>st</sup> head	2 <sup>nd</sup> head	Child	Alternative	Utility
H	H	Missing	1	H1+H2+HH12
	M	Missing	2	H1+M2
	N	Missing	3	H1+N2
M	H	Missing	4	M1+H2
	M	Missing	5	M1+M2
	N	Missing	6	M1+N2
N	H	Missing	7	N1+H2
	M	Missing	8	N1+M2
	N	Missing	9	N1+N2+NN12

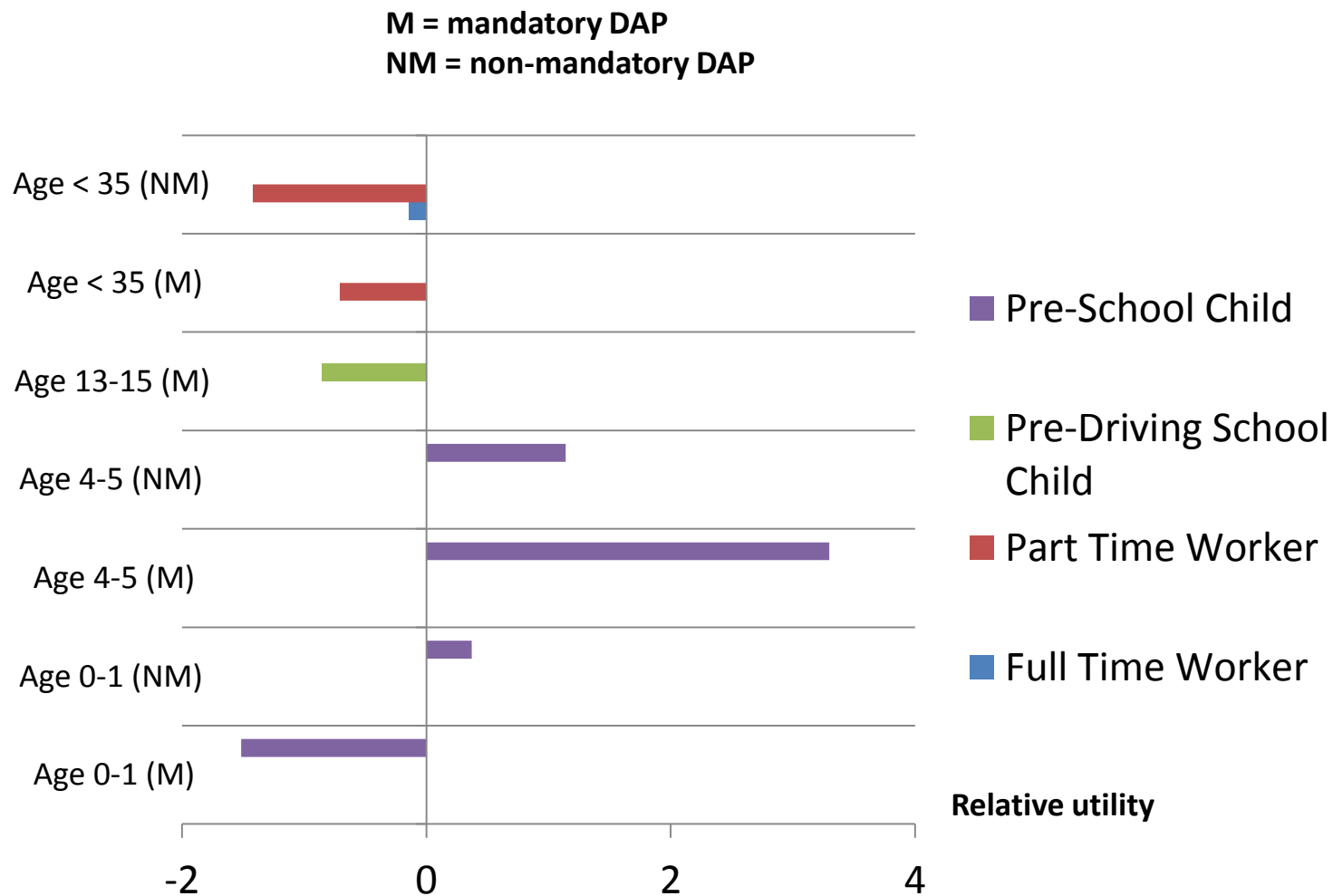
# CDAP Utility (Adult + Child)

1 <sup>st</sup> head	2 <sup>nd</sup> head	Child	Alternative	Utility
H	Missing	H	1	H1+H3+HH13
	Missing	M	2	H1+M3
	Missing	N	3	H1+N3
M	Missing	H	4	M1+H3
	Missing	M	5	M1+M3
	Missing	N	6	M1+N3
N	Missing	H	7	N1+H3
	Missing	M	8	N1+M3
	Missing	N	9	N1+N3+NN13

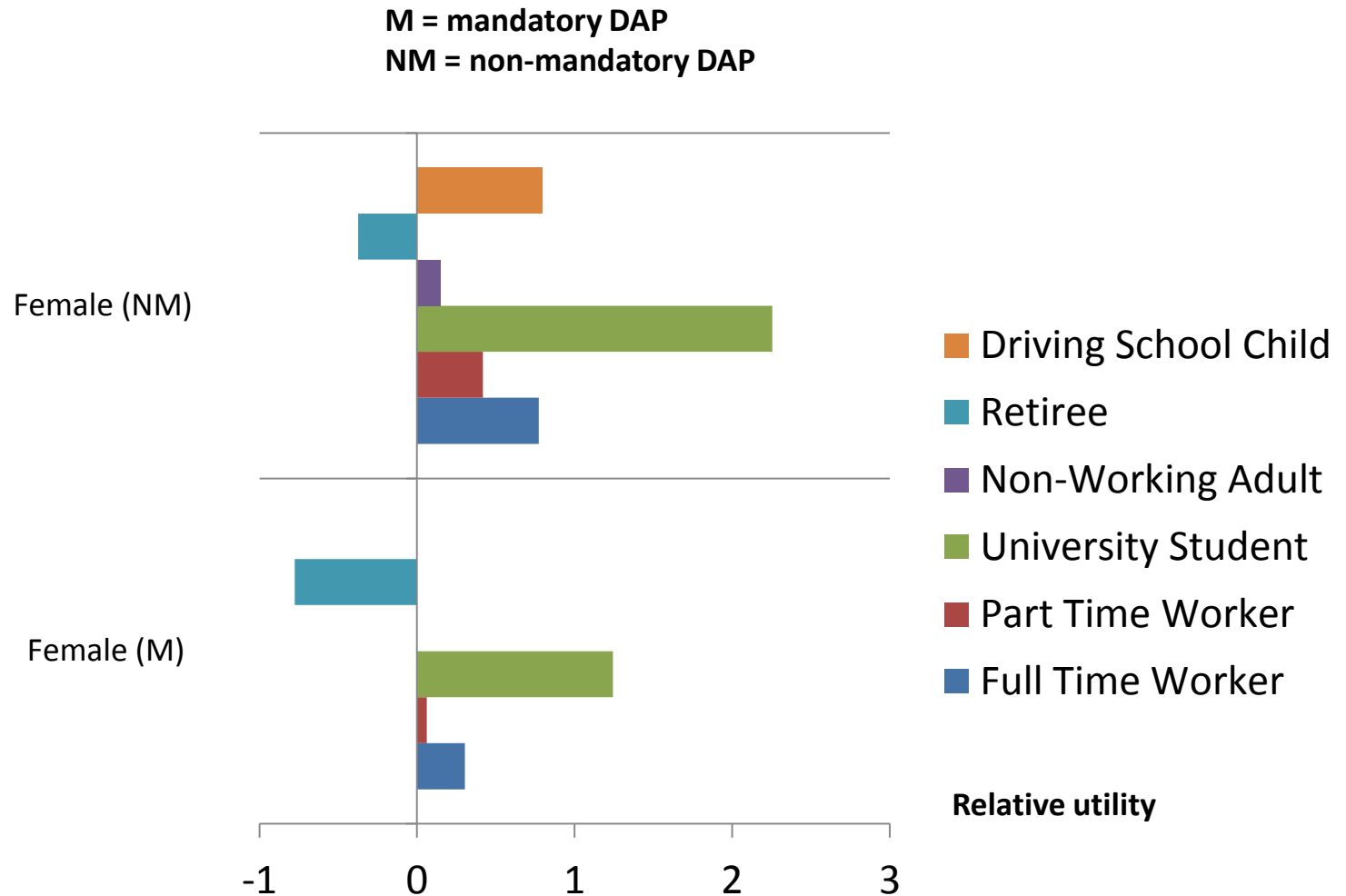
# CDAP Utility (2 Adults + Child)

1 <sup>st</sup> head	2 <sup>nd</sup> head	Child	Alternative	Utility
H	H	H	1	H1+H2+H3+HHH
		M	2	H1+H2+M3+HH12
		N	3	H1+H2+N3+HH12
	M	H	4	H1+M2+H3+HH13
		M	5	H1+M2+M3
		N	6	H1+M2+N3
	N	H	7	H1+N2+H3+HH13
		M	8	H1+N2+M3
		N	9	H1+N2+N3+N23
M	H	H	10	M+H2+H3+HH23
		M	11	M+H2+M3
		N	12	M1+H2+N3
	M	H	13	M1+M2+H3
		M	14	M1+M2+M3
		N	15	M1+M2+N2
	N	H	16	M1+N2+H3
		M	17	M1+N2+M3
		N	18	M1+N2+N3+NN23
N	H	H	19	N1+H2+H3
		M	20	N1+H2+M3
		N	21	N1+H2+N3+N13
	M	H	22	N1+M2+H3
		M	23	N1+M2+M3
		N	24	N1+M2+N3+NN13
	N	H	25	N1+N2+H3
		M	26	N1+N2+M2+NN12
		N	27	N1+N2+N3+NNN

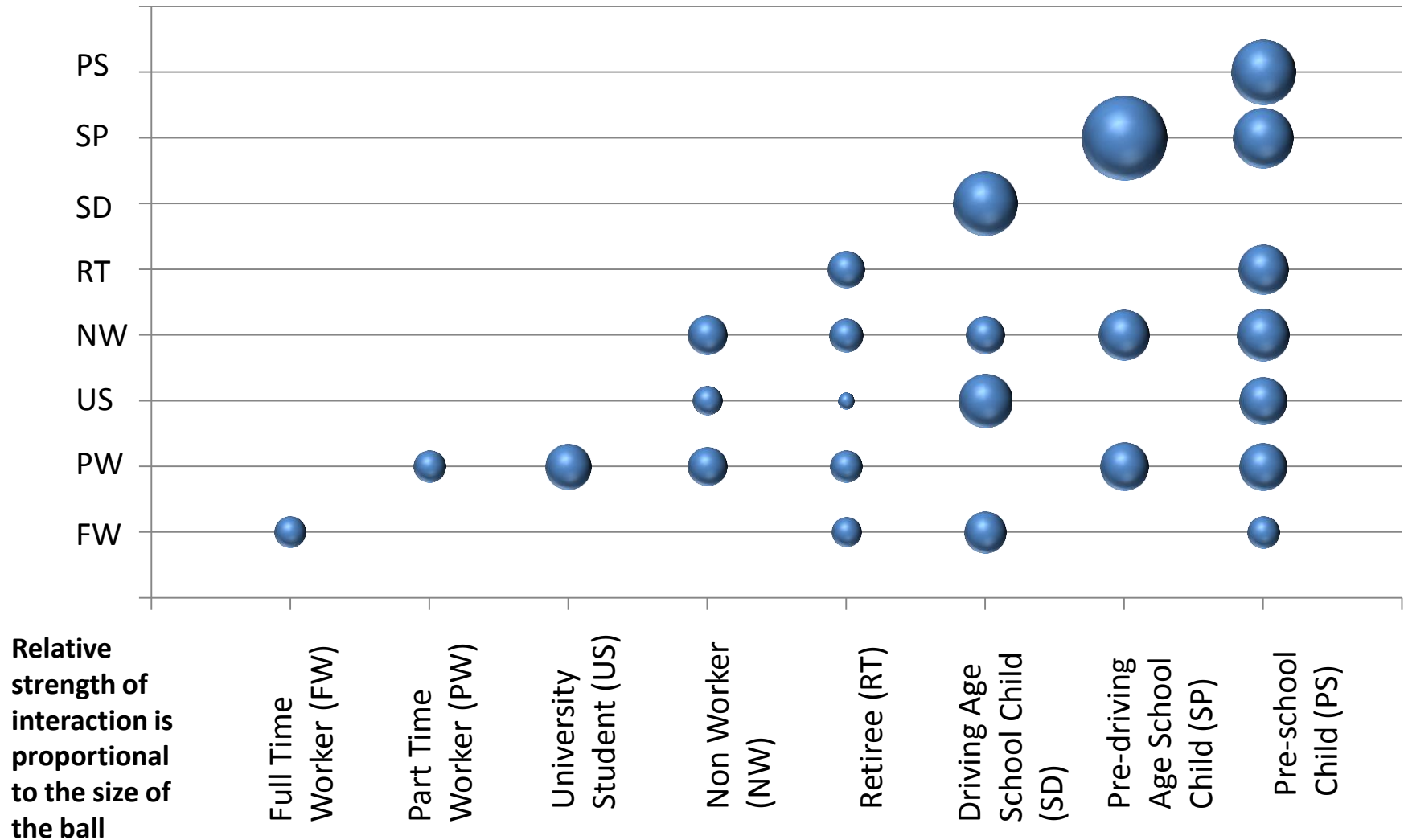
# CDAP Estimation: Person Age Effects



# CDAP Estimation: Gender Effects

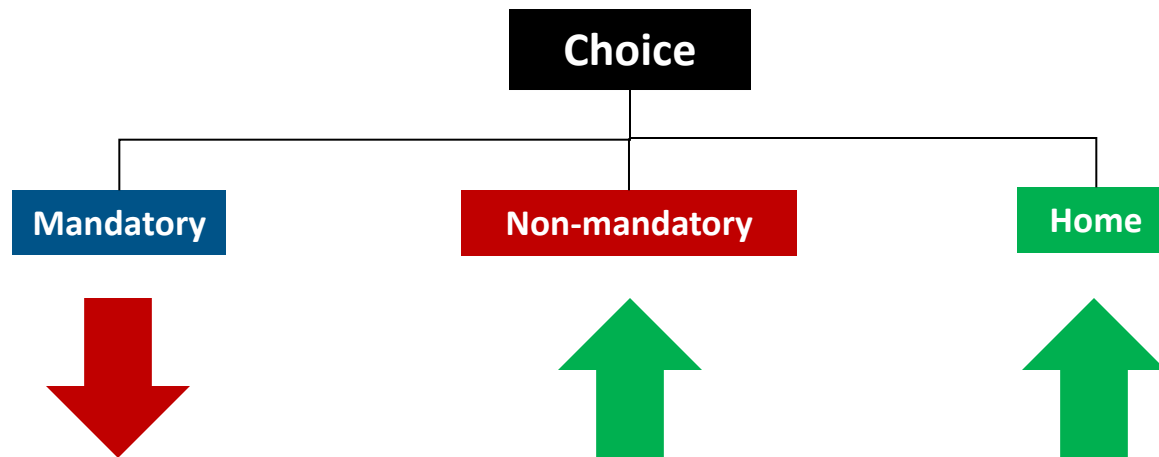


# Pair-Wise Interactions – Stay at Home DAP



# Calibration & Policy Levers

- Increased telecommuting (in addition to work from home regularly)



Adjust DAP constant for workers – fewer mandatory patterns, increases in non-mandatory and stay-at-home patterns

# Calibration Results (DAP Type, San Diego activity based modeling)

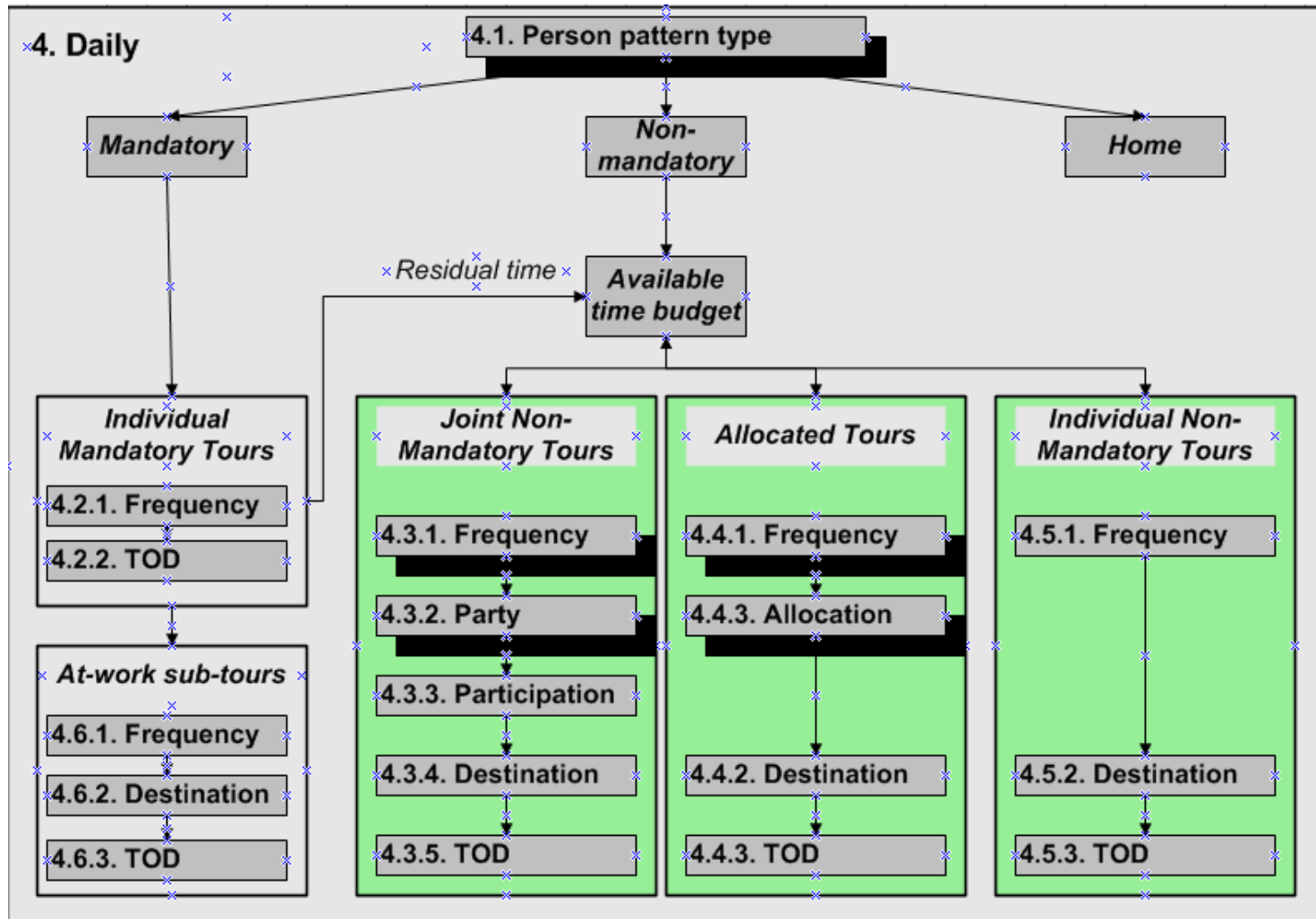
- IDAP and CDAP models are of crucial importance and have to be well-calibrated

Scaled Survey CDAP by Person type	Pattern (observed)				Pattern (modeled)			
Person type	Mandatory	Non Mandatory	Home	Total	Mandatory	Non Mandatory	Home	Total
Full-time worker	87%	8%	5%	100%	87%	8%	5%	100%
Part-time worker	73%	20%	7%	100%	72%	21%	7%	100%
University student	66%	25%	9%	100%	66%	25%	9%	100%
Non-working adult	0%	75%	25%	100%	0%	75%	25%	100%
Non-working senior	0%	73%	27%	100%	0%	73%	27%	100%
Driving age student	91%	4%	5%	100%	91%	4%	5%	100%
Pre-driving student	94%	4%	2%	100%	94%	4%	2%	100%
Pre-school	44%	41%	16%	100%	44%	40%	16%	100%
<b>Total</b>	<b>61%</b>	<b>28%</b>	<b>11%</b>	<b>100%</b>	<b>61%</b>	<b>28%</b>	<b>11%</b>	<b>100%</b>



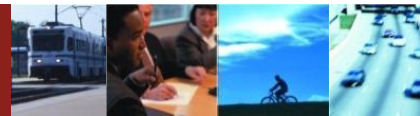


# Generation of Non-Mandatory Tours

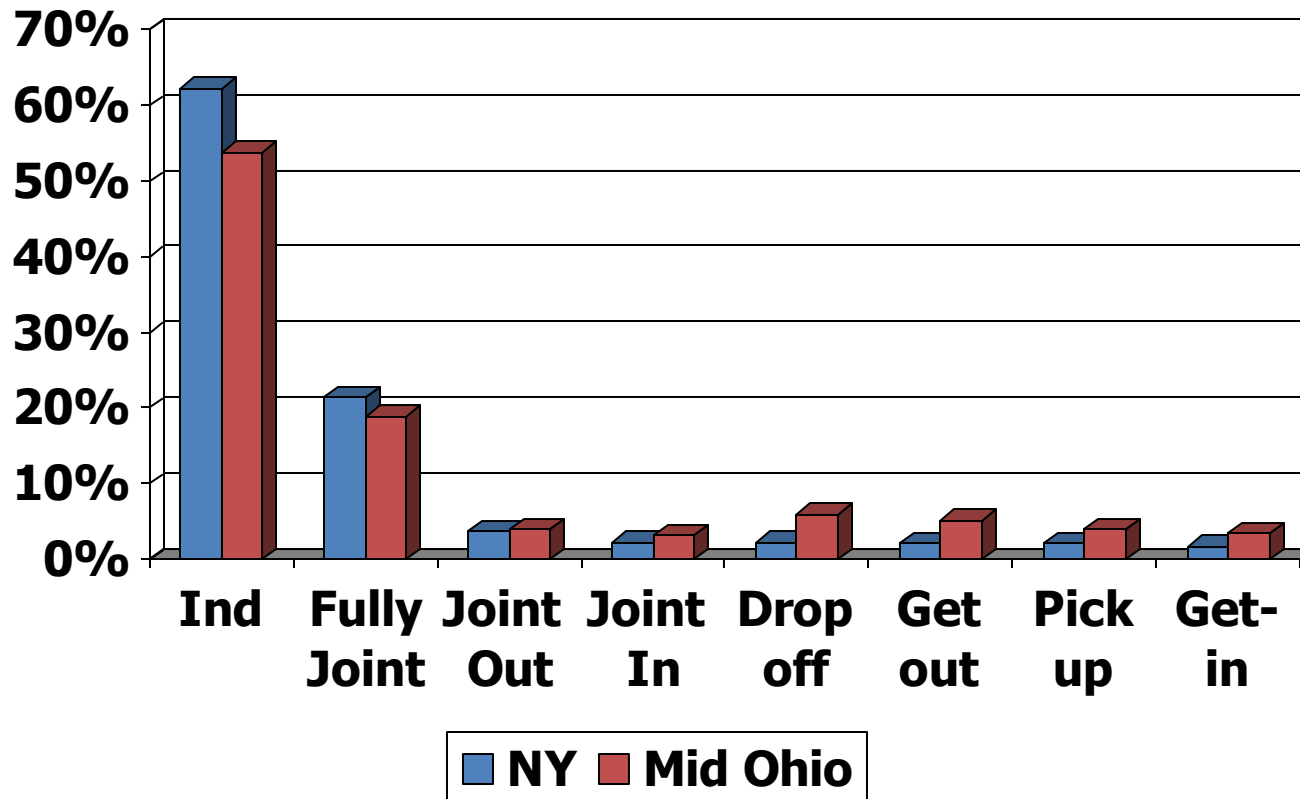


# Types of Joint Travel

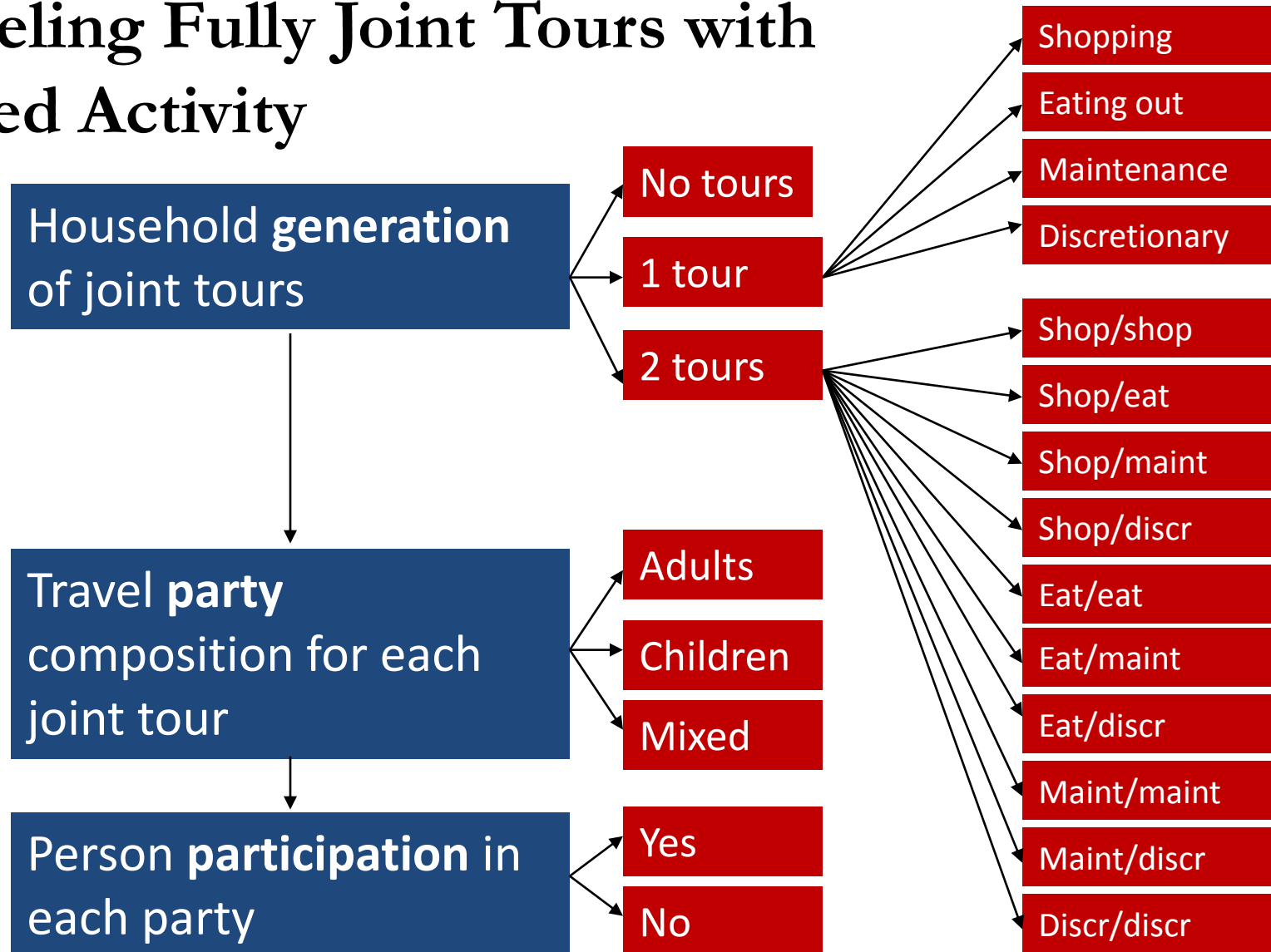
By travel party	By individual
	Individual
Fully-joint tour	
Joint outbound	
Joint inbound	
Drop-off (outbound)	Drop-off
	Get off
Pick-up (inbound)	Pick-up
	Get-in



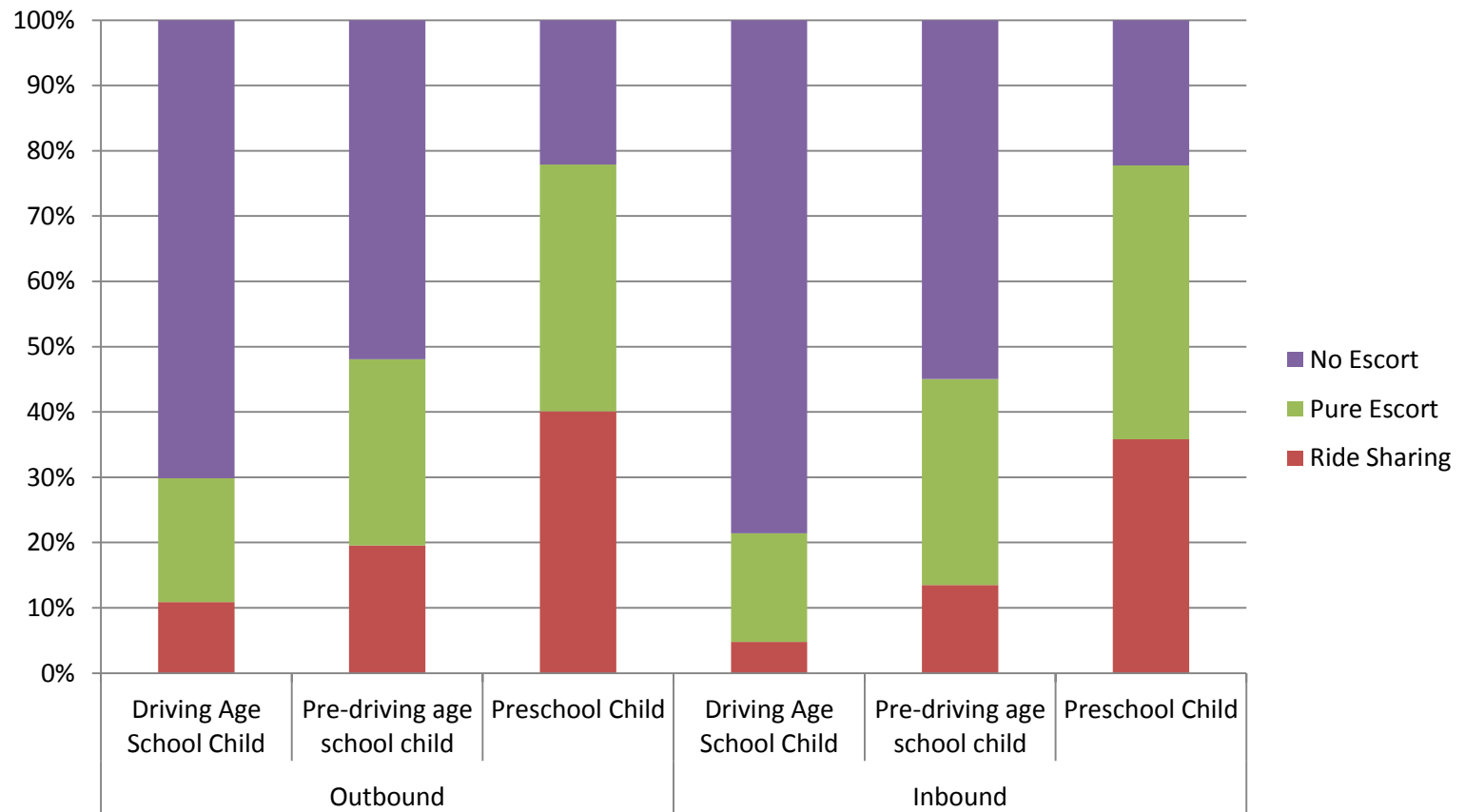
# Travel Tours by Type



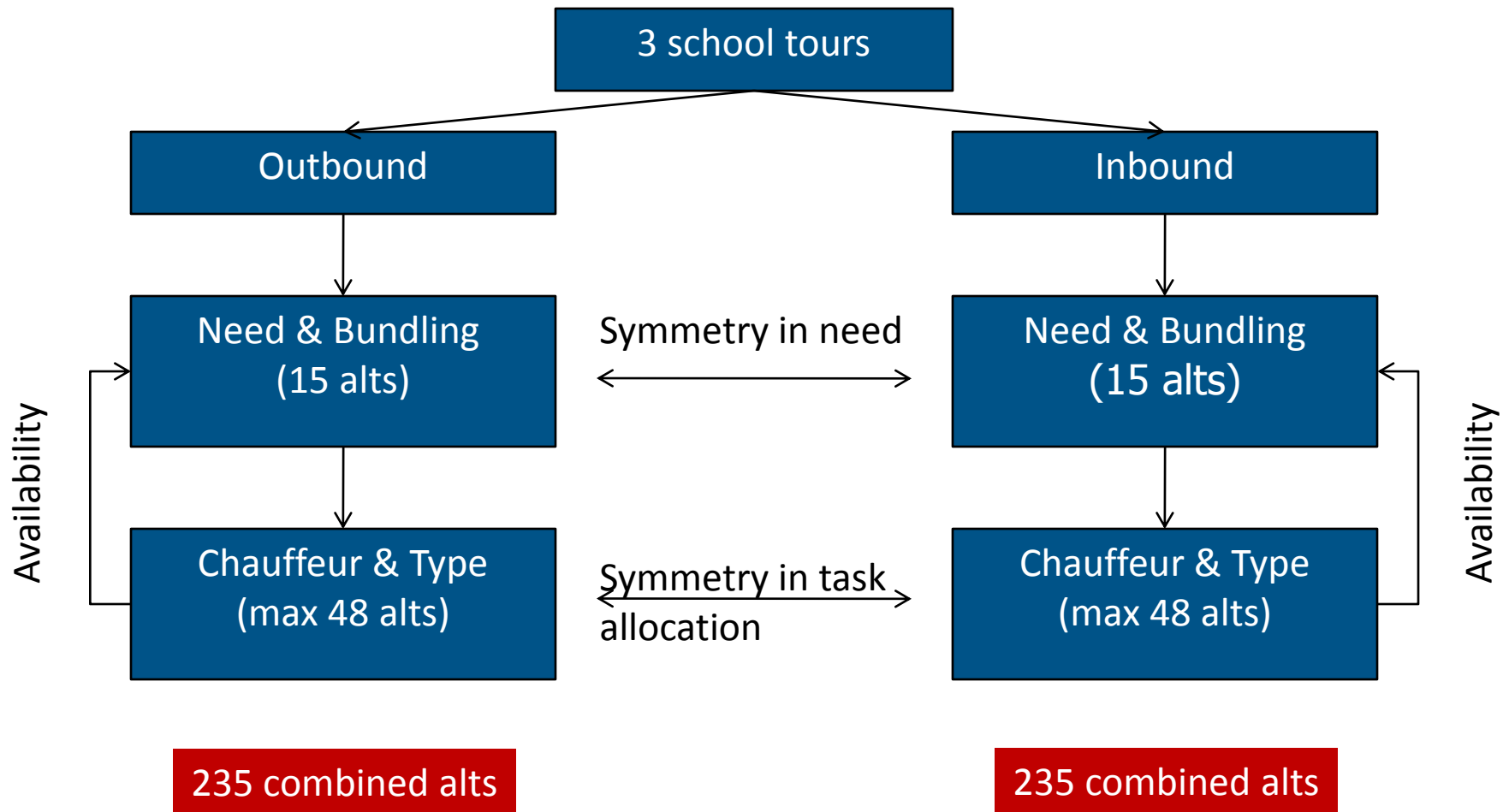
# Modeling Fully Joint Tours with Shared Activity



# Observed School Escorting Frequency (NHTS 2008, Phoenix/Tucson, 5000 HHs)



# Escorting Children to School



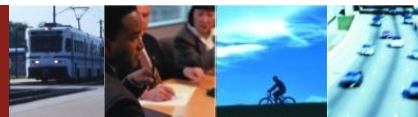
# Stop Frequency Model

- We have to insert intermediate stops in all tours generated for each person:
  - Similar to Exact Number of Stops sub-model for IDAP but we have to consider zero-stop option for CDAP since it is not modeled explicitly at the previous stages
- Predicts for each half-tour (outbound, inbound):
  - Number of stops (0, 1, 2, 3, 4):
    - Up to  $5 \times 5 = 25$  alternatives for work tours
    - Up to  $3 \times 3 = 9$  alternatives for non-work tours
  - Activity purpose for each stop:
    - One of 6 non-mandatory purposes assigned probabilistically conditional upon tour purpose and stop order



# Stop Frequency (IDAP vs. CDAP)

- Interesting comparison:
  - IDAP achieves a great level of consistency between tour and stop generation (joint modeling) but is lack of intra-household interactions
  - CDAP incorporates intra-household interactions but models stops conditional upon tours
  - Search for an approach that would combine the best of both continues
- More details will follow in Session 10:
  - Stop frequency is intertwined with stop location choice and accessibility as well as conditional upon the tour mode





# Beyond IDAP (DaySim) and CDAP (CT-RAMP)

- Many advanced structures:
  - CEMDAP (UTA) – applied in LA (SCAG) activity based modeling
  - FAMOS (UF, ASU)
  - DASH (Portland Metro)
  - TASHA (University of Toronto)
  - ALBATROSS (University of Eindhoven)
  - ADAPTS (UIC)
- Ongoing research and improvements:
  - Integration between activity generation, scheduling, and location (time-space constraints, tour formation)
  - Intra-person and intra-household consistency
  - Trade-offs between in-home and out-of-home activities (telecommuting, teleshopping)



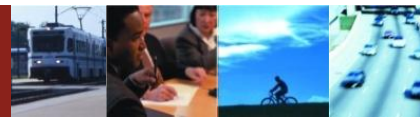


# Questions and Answers

The **Travel** Model  
*Improvement*  
Program

# Summary

- Role and placement of DAP model:
  - Cornerstone and main distinguishing feature of activity based modeling
  - First travel related model that generates activities, tours, and trips for each person and HH
  - Applied after population synthesis, long-term models of work and school locations, and car ownership
  - Applied before tour/trip destination, mode, and TOD choices
- Two main approaches applied in practice:
  - Individual DAP (IDAP) generates activities, tours, and trip in a consistent way for each person independently
  - Coordinated DAP (CDAP) considers interactions between HH members and joint travel explicitly



# Next Webinar

## Executive and Management Sessions

Executive Perspective	February 2
Institutional Topics for Managers	February 23
Technical Issues for Managers	March 15

## Technical Sessions

Activity-Based Model Framework	April 5
Population Synthesis and Household Evolution	April 26
Accessibility and Treatment of Space	May 16
Long-Term and Medium Term Mobility Models	June 7
Activity Pattern Generation	June 28
<b>Scheduling and Time of Day Choice</b>	<b>July 19</b>
Tour and Trip Mode, Intermediate Stop Location	August 9
Network Integration	August 30
Forecasting, Performance Measures and Software	September 20

