



# Development of a Model of Activity-Travel Well-Being to Assess Impacts of System Changes on Quality of Life

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<http://tomnet-utc.org>

<http://mobilityanalytics.org>

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# Introduction

- Close linkage between activity-travel participation and well-being
- Activity-based models output OUT-OF-HOME activity-travel patterns but NOT IN-HOME activity patterns
- **Goal:** Develop a **model of well-being** that accounts for **out-of-home and in-home activity engagement**
- Helpful for equity analysis and policy evaluation

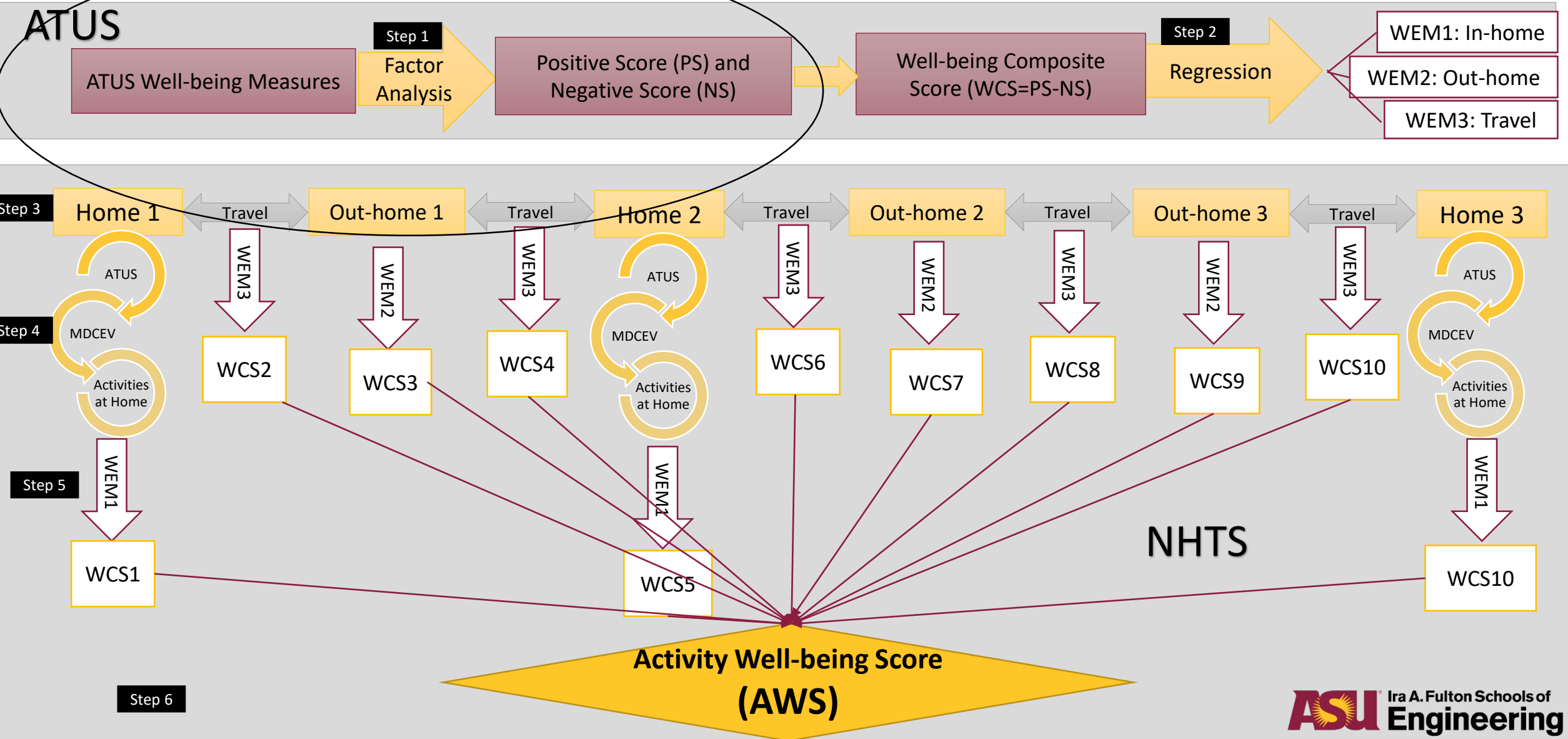


# Data

- **American Time Use Survey (ATUS)** – includes **IN-HOME activity information**
  - **Years:** 2010, 2012, 2013 – includes measures of **WELL-BEING**
  - **Sample size:** 100,000 people
  - **Variables:** Sociodemographic, activity profile, and activity well-being measures
  - **Geographic resolution:** Entire US
- **National Household Travel Survey (NHTS)**
  - **Year:** 2017
  - **Sample size:** Random subsample of 6,000 people
  - **Variables:** Sociodemographic and activity-travel attributes
  - **Geographic resolution:** Entire US



# Methodology



# ATUS Activity Well-Being Measures

From minimum of 0 to maximum of 6

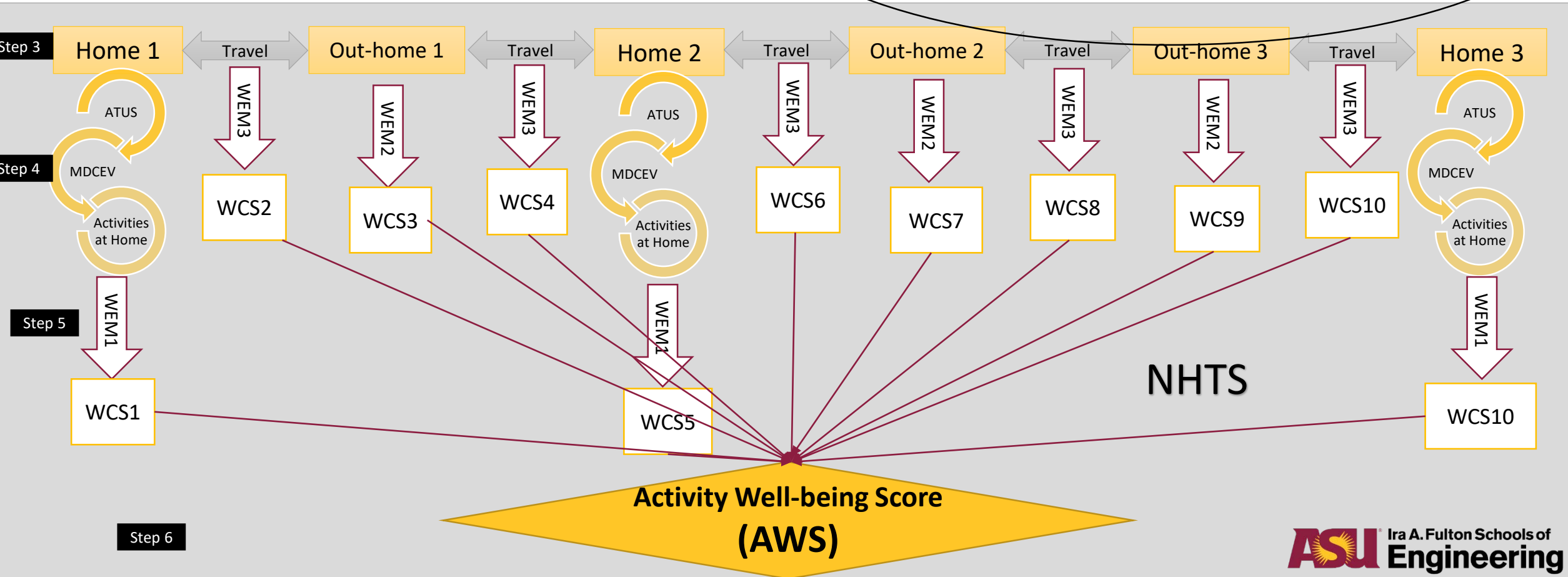
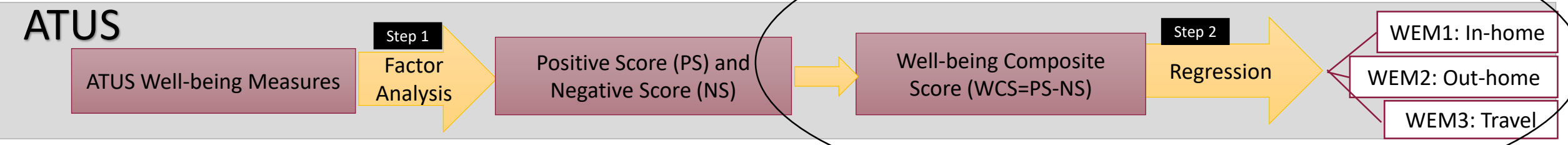
- Positive score
  - Happiness
  - Meaningfulness
- Negative score
  - Painfulness
  - Sadness
  - Stressfulness
  - Tiredness



- **Well-being Composite Score (WCS) = Positive score – Negative score**



# Methodology



# Regression Models of Well-being Composite Score (WCS)

Attribute		In-home	Outside-home	Travel
<b>Gender</b>	Female		+	+
<b>Age</b>	31-49 years old		-	-
	50-64 years old	-	-	-
<b>Income</b>	less than \$25,000		-	-
<b>Activity Attributes</b>				
<b>Activity</b>	Home			+
<b>Type</b>	Recreation and Social	+	+	+
<b>(Base: Work)</b>	Shopping	+	+	+
	Religious	+	+	+
<b>Accompaniment</b>				
			+	+
<b>Time</b>	Night			
<b>Travel Modes</b>	HOV Driver			+
	HOV Passenger			+
<b>Duration</b>	Up to 30 min			+
	Up to 60 min		-	
	Up to 4 hours	+		

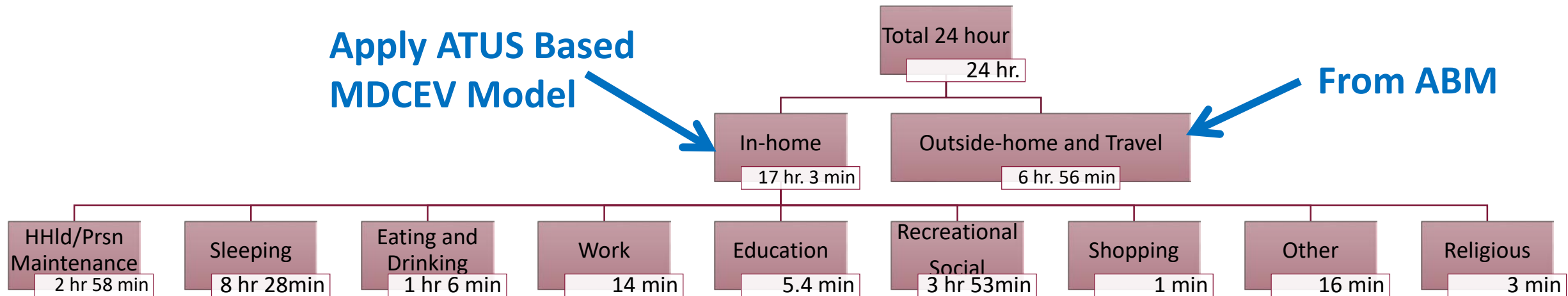


# Daily Activity Engagement

- Well-being derived from out-of-home and in-home activities
- Estimate in-home activity-time allocation model using ATUS data
- Model takes the form of a multiple discrete-continuous extreme value (MDCEV) model
- Apply model to output of activity-based model to obtain full activity-time allocation profile of individual

Apply ATUS Based  
MDCEV Model

From ABM



Apply WCS Regression Models to Out-of-Home Activities, In-Home Activities, and Travel Episodes

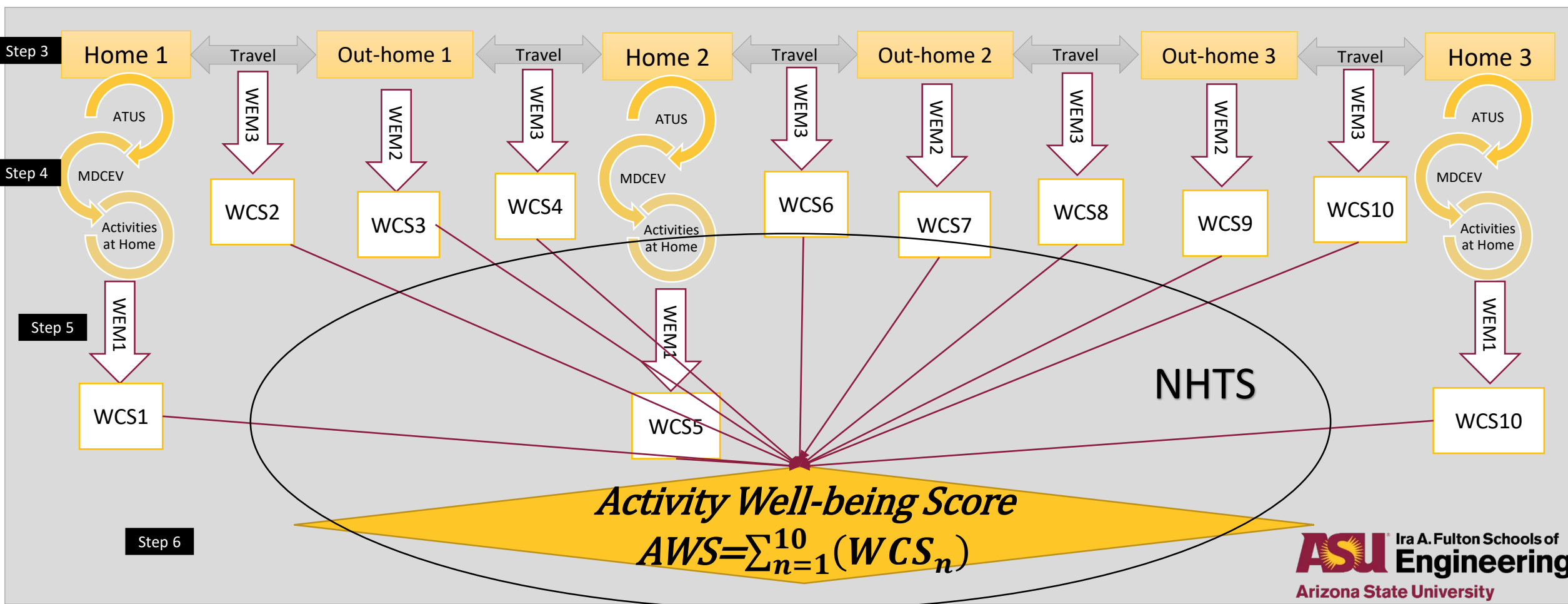
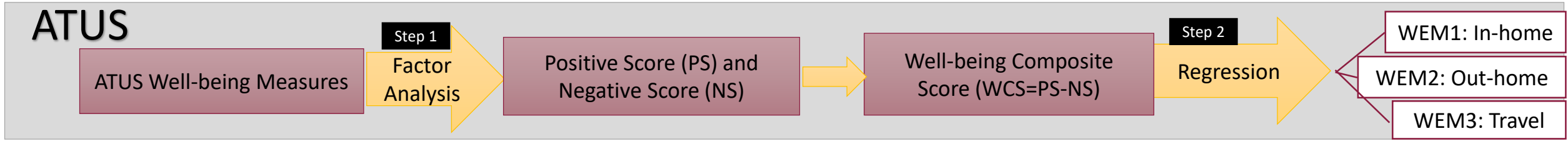


Bhat, C. R., & Eluru, N. (2010, January). The multiple discrete-continuous extreme value (MDCEV) model: formulation and applications. In *Choice Modelling: The State-of-the-art and The State-of-practice: Proceedings from the Inaugural International Choice Modelling Conference* (pp. 71-99). Emerald Group Publishing Limited.



# Methodology

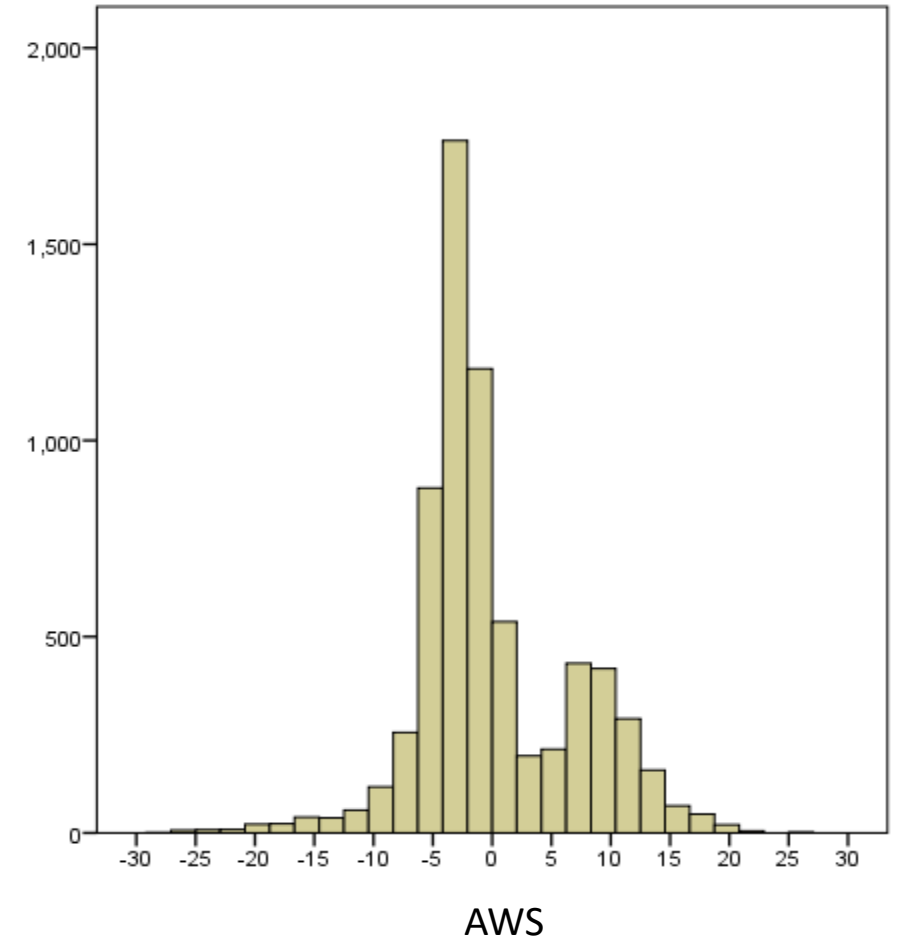
## ATUS



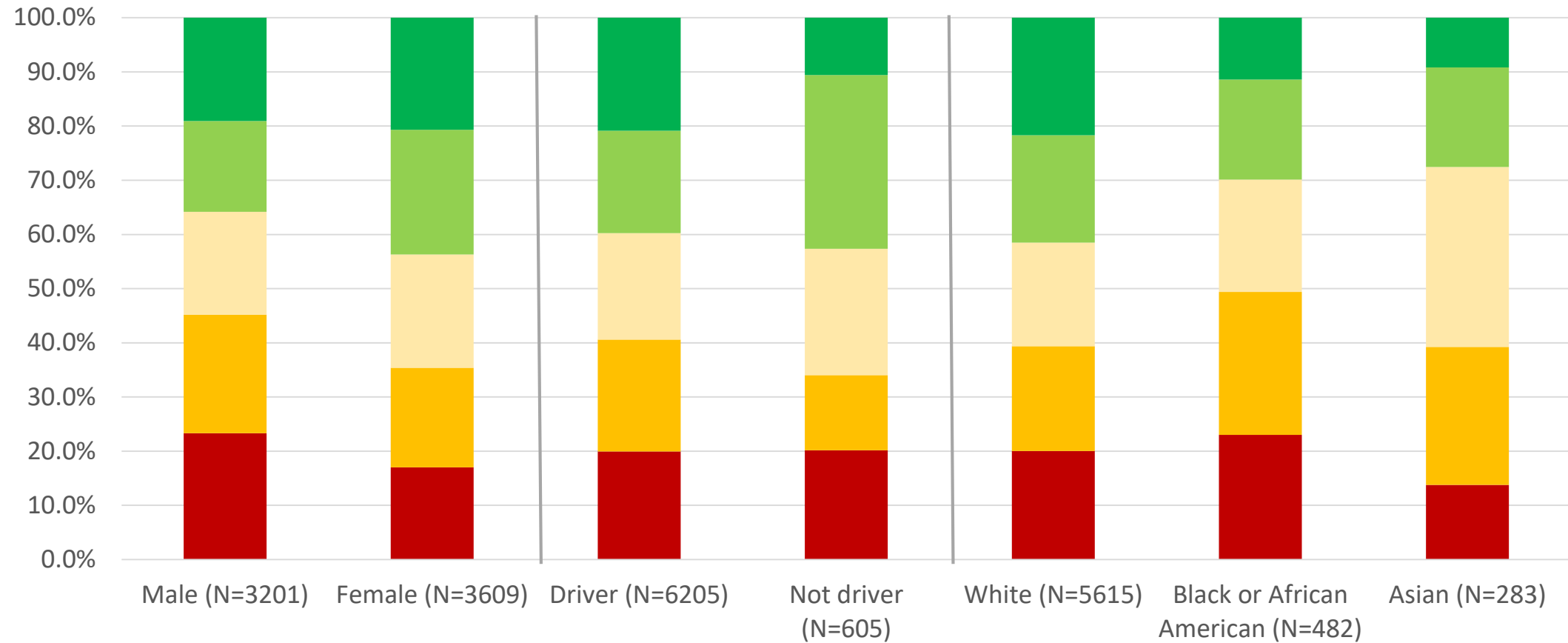
# Personal Activity Well-being Score (AWS)

AWS	
Average	-0.05
Std Dev	6.85
N	6810

AWS Segment	Min AWS	Max AWS	Average	Percent
Very negative	-44.45	-4.32	-7.62	20%
Negative	-4.32	-2.72	-3.47	20%
Neutral	-2.72	-0.85	-1.86	20%
Positive	-0.85	6.55	1.97	20%
Very positive	6.56	67.59	10.76	20%

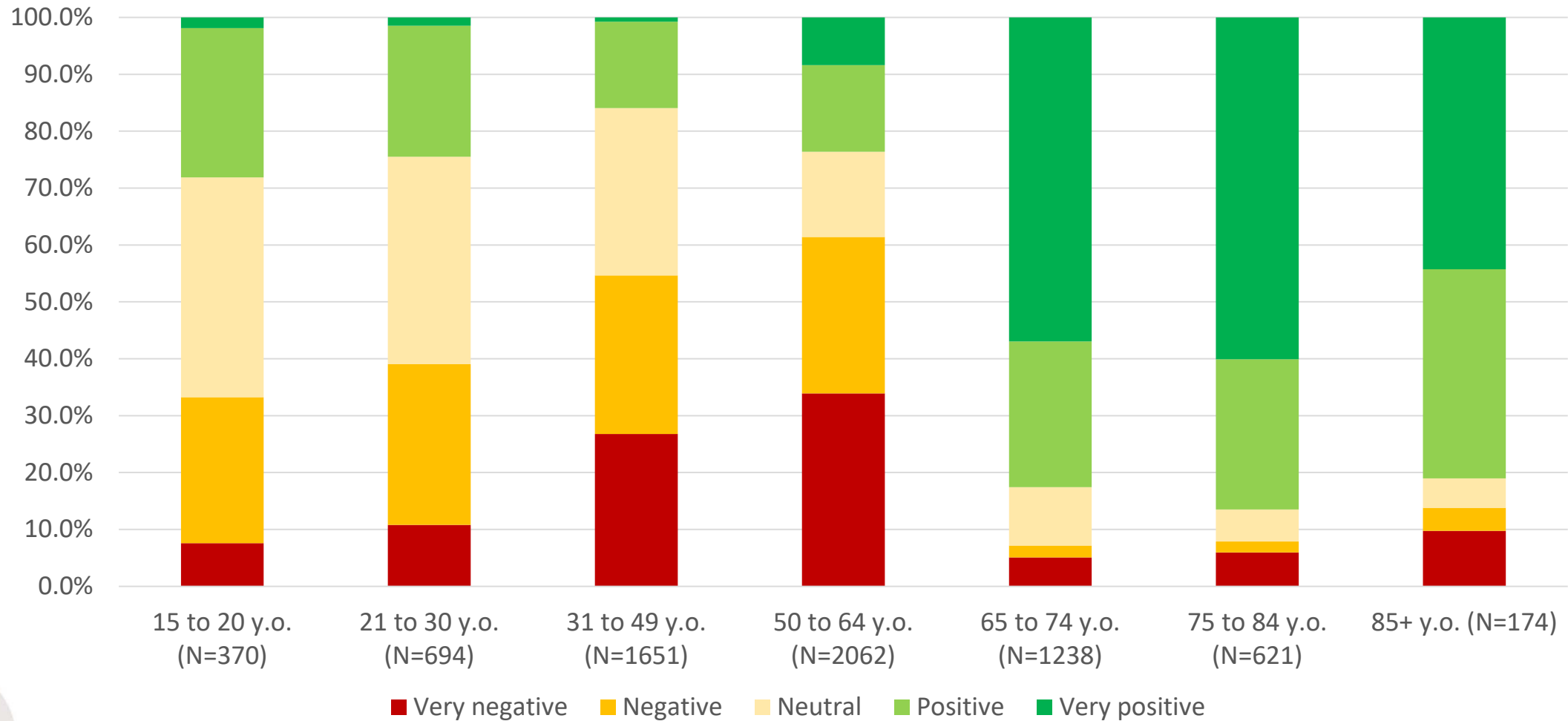


# Market Segmentation: Gender/Driver/Race

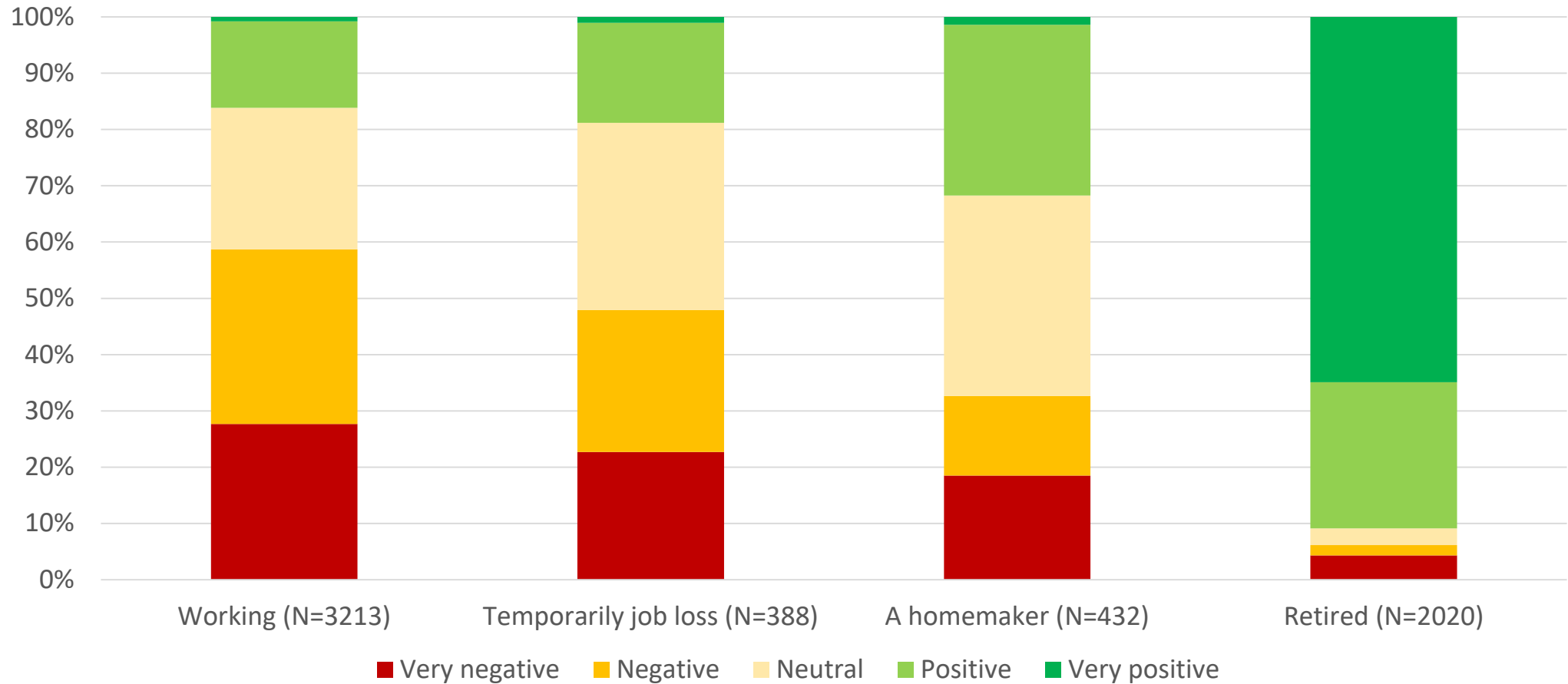


■ Very negative   
 ■ Negative   
 ■ Neutral   
 ■ Positive   
 ■ Very positive

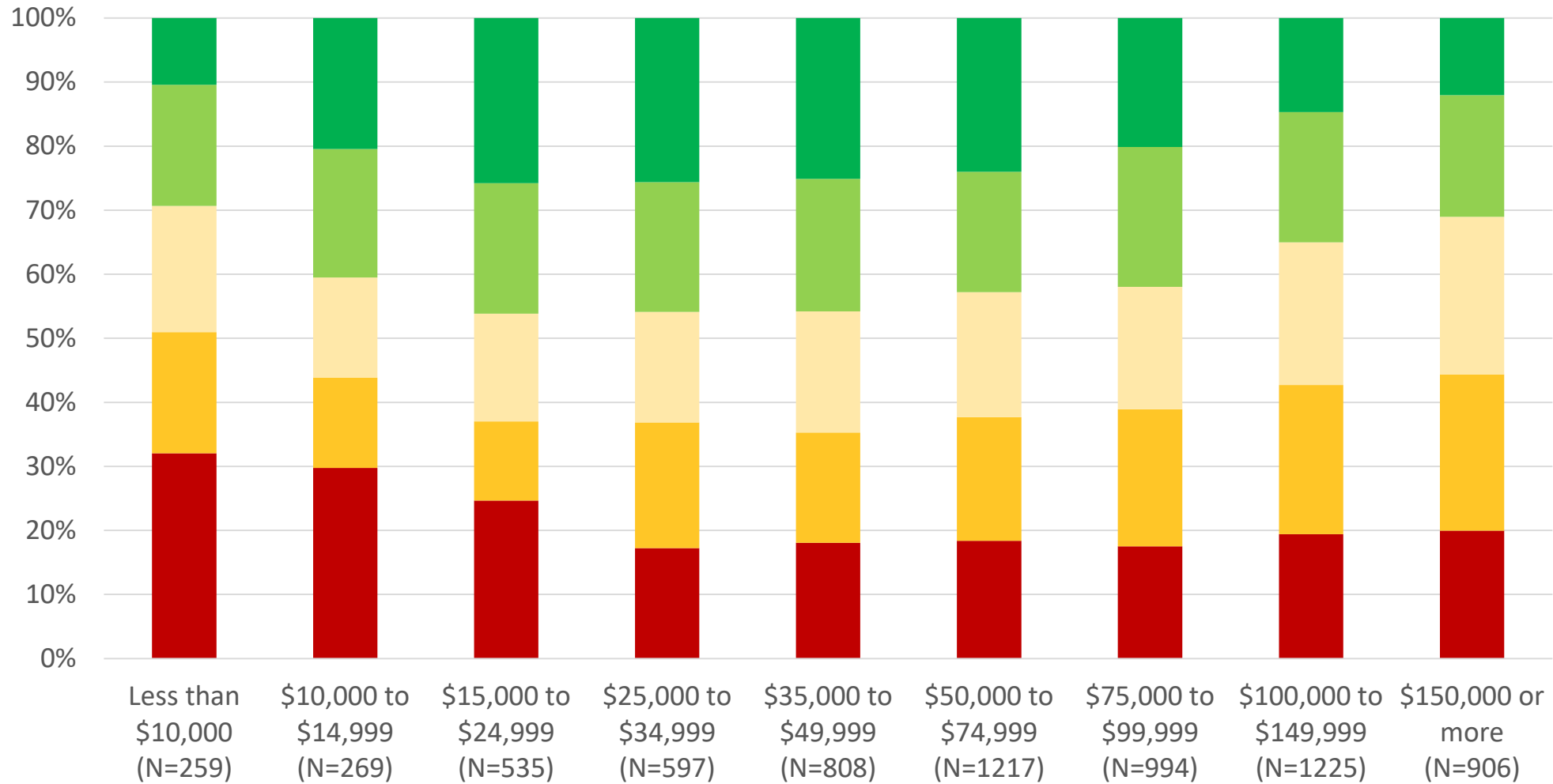
# Market Segmentation: Age



# Market Segmentation: Work Status



# Market Segmentation: Income



■ Very negative   
 ■ Negative   
 ■ Neutral   
 ■ Positive   
 ■ Very positive



# Conclusion

- Developed a tool to compute **person-level activity well-being score**; uses standard output of activity based models
- Incorporates well-being derived from **in-home activity participation**, thus providing more complete assessment of personal well-being
- Can be used/integrated with any activity-based model system as a post-processor to assess impacts of transportation policies

# Thank You

## Contact

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