THE IMPORTANCE OF HOUSING, ACCESSIBILITY, AND TRANSPORTATION CHARACTERISTIC RATINGS ON STATED NEIGHBORHOOD PREFERENCE

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ABSTRACT

The residential location decision process is predicated on transportation, accessibility, and housing characteristics offered by a neighborhood. Consequently, understanding how these myriad characteristics are valued by individuals will inform urban planners and decision makers of their connection to neighborhood preference. Unfortunately, forecasting methods commonly lack the specificity to recognize how dynamic residential environment preferences impact future land use and transportation decisions. Too often, these policy instruments rely on socioeconomic characteristics to measure heterogeneity in revealed location decisions. Using stated preference data collected in Portland, Oregon, this study employed structural equation modeling techniques to examine the influence of these socioeconomic measures and latent constructs of single-family dwelling and non-automotive access importance on stated neighborhood preference. Model results suggested that conventional socioeconomic measures insufficiently explain preference variation and that the two latent constructs were robust predictors of an urban neighborhood preference. This study's findings emphasize the importance of utilizing characteristic ratings and conventional socioeconomic measures in future stated neighborhood preference analyses.

BACKGROUND

The residential location decision-making process has long been an area of investigation in travel behavior research. Such studies generally evaluate the connection between revealed land use or location choices and travel outcomes. The goal has tended to focus on a better representation of household taste variations in travel demand models, understanding of household self-selection into residential environments supportive of their preferred travel behaviors, and explanation of trade-offs in housing location and job accessibility faced by households. Yet, despite improved knowledge gained in these topical areas, travel demand applications and behavioral models still commonly lack the specificity needed to explain how shifting residential environment preferences will influence future housing, land use, and transportation decisions. Often, these policy instruments solely rely on sociodemographic and economic characteristics (e.g., household size) to measure differences in observed residential location choices; when in fact, neighborhood preference explained by certain housing or travel attitudes (e.g., pro-transit) may precede the choice itself *(1)*. Findings from past studies using only socioeconomic status to observe revealed residential location choice variation may therefore prove insufficient in advising the future demand for urban neighborhoods because economic conditions and the housing and travel preferences of emerging market segments are dynamic.

In response, an increased importance to create toolkits capable of providing practitioners with robust and flexible behavioral models for understanding how stated preferences for future residential environments vary within and between individuals has been placed on travel behavior researchers. To address this identified need, our study examines stated neighborhood preference variation predicted by both socioeconomic and subjective measurements to better understand the influence of these determinants in future models of the residential location decision process. Specifically, a stated preference survey was administered to (i) define those housing, accessibility, and transportation characteristics most important to an individual's residential location decision and (ii) test whether importance ratings of these characteristics are stronger predictors of stated neighborhood preference than conventional socioeconomic measures. The first hypothesis being that the rated importance of these characteristics bundle together as latent constructs reflecting an individual's desire for certain housing, accessibility, and transportation features and amenities offered by a neighborhood. The second hypothesis is that the importance of these characteristics is a stronger determinant of unconstrained stated neighborhood preference than an individual's present socioeconomic circumstance. By distinguishing how the rated importance of residential location characteristics bundle together as latent constructs and comparing their relative impact on stated neighborhood preference to that of socioeconomic condition, this study provides fresh insight into the complex residential location decision-making process.

Past stated preference studies have theorized the residential location decision process to be most influenced by housing, accessibility, and transportation characteristics *(2)*. In support, a recent literature review summarized past studies as typically modeling a decision maker's preference in dwelling unit, location, and accessibility as well as socioeconomic status characteristics *(3)*. Other studies have suggested the added benefit of attitudinal measurement in explaining residential location preferences for urban and suburban environments *(4, 5)*.

Arguably, the most explored characteristic in stated residential location choice studies has been dwelling type; however, past studies have also examined physical housing attributes related to property size, dwelling size, and privacy. Hunt *(6)* and Molin and Timmermans *(7)* noted most survey participants preferred single-family detached units when presented an array of distinct dwelling type alternatives. Corroborating these findings, Senior and colleagues *(8)* found that homeowners favored detached and semi-detached dwelling types over terraced homes or apartments. Beyond a singular importance in dwelling type, Olaru et al *(9)* found a latent construct also reflecting property size significantly predicted residential environment choice. Studying image inclusion in preference surveys, Jansen and colleagues *(10)* found that having a detached house, large dwelling and property size, and limited contact with neighbors significantly influenced residential environment preference.

Characteristics of the physical environment surrounding a dwelling unit and accessibility afforded by its proximity to local activities (e.g., shopping) have also been frequently studied. One strategy to explain the physical environment variation has been neighborhood classification along a continuum illustrating the relative distance to, density of, and diversity in accessible activity locations *(8)*. Neighborhood dissonance studies often dichotomize the residential environment as either urban or rural *(11, 12)*; whereas, other studies have assessed the presence of a single activity location such as a local park *(2, 10)*, quality in a nearby service such as a school *(13)*, or distance to urban facility such as a medical center *(9, 14)*. Transportation facility access has also been regularly used to measure variation in stated neighborhood preference. Regarding vehicle infrastructure, Hunt *(6)* found that individuals preferred local streets in front of their dwelling unit over collector roads and local streets with speed bumps; while, Senior and colleagues *(8)* and Walker & Li *(2)* found no meaningful difference in residential preferences for on- and off-street vehicle parking facilities. As for non-automotive transport, transit access was noted as an influential determinant of residential location choice by Lund *(15)* and Hoshino *(14)*. Similarly, Olaru and colleagues *(9)* found relocation decisions were influenced by stated interest in transit station proximity; likewise, most individuals considered walking and bicycling access as an important characteristic. By contrast, Walker & Li *(2)* found bike path access had no significant influence on residential location.

Finally, a recent stream of travel behavior research has evaluated revealed neighborhood decisions, supplemented with attitudinal measures, to better understand the residential location decision-making process. Khattak and Rodriguez *(16)* found the stated importance of nearby shops and services, adjacency to sidewalks, and proximity to neighbors positively influenced the current decision to reside in a neo-traditional neighborhood. Using structural equation modeling, Bagley and Mokhtarian *(4)* found increased household size, respondent age, and scores for a set of latent attitudinal constructs (e.g., pro-alternatives) positively predicted the revealed choice of a traditional neighborhood. However, revealed neighborhood had a negligible effect on travel behavior after accounting for socioeconomic and attitudinal measures. Such attitudinal measures help to explain heterogeneity in location choices not exclusively accounted for by socioeconomic status *(2, 9, 12)*. This study extends the evidence base by explaining variation in the stated preference for residential environments with both socioeconomic and attitudinal measurement. Drawing from past research, we theorize that latent constructs will be reflected by items intended to assess the importance of housing, accessibility, and transportation characteristics, and that these constructs will significantly contribute to stated neighborhood preference.

METHODS

Research Design and Data Collection

An online cross-sectional survey of a probability sample was used to determine the importance of housing, accessibility, and transportation characteristic ratings on stated neighborhood preferences. The survey instrument had three sections designed to (i) collect participant background information, (ii) measure the importance level a participant places on a set of characteristics possibly impacting his/her decision process, and (iii) conduct a choice-based conjoint experiment of neighborhood- and commute-based trade-offs (not analyzed in this study). In the first section, participants provided information about their socioeconomic status and current transportation and housing circumstances. To understand participants' preferences for various types of residential environments, a set of visual images with descriptive text was utilized to provide a richer illustration of the physical characteristics for the four neighborhood concepts (FIGURE 1). Participants were then asked to examine 17 items related to different housing, accessibility, and transportation characteristics and rate the importance level (*very important*, *somewhat important*, or *not at all important*) that each characteristic has in his/her residential location decision-making process.

Participants were recruited from Portland, Oregon in two waves by mailing postcards with a link to the survey website. In the first wave, postcards were mailed to 8,000 randomly selected individuals from 201,444 home addresses in the metropolitan region during June 2014. In November 2014, a second wave of postcards was sent to 1,982 downtown residents. Participants of the Neighborhood Transportation Study were invited to enter their name for a chance to win a gift card to an electronic commerce company. Response rate was 6.3% for the first recruitment wave and 8.1% for the second wave.

TABLE 1 Descriptive statistics for sociodemographic and economic variables in sample and study area

	Sample		Relative	Portland Metro Region	
Observed Variable	n	%	Difference	n	%
Household Size					
1 member	132	0.24	0.80	180,454	0.30
2 members	212	0.38	1.12	207,758	0.34
3 members	105	0.19	1.27	92,001	0.15
4 or members	105	0.19	0.90	126,677	0.21
Annual Household Income					
$0 - $24,999	62	0.12	0.57	124,519	0.21
$25,000 - $49,999	113	0.21	0.88	143,007	0.24
$50,000 - $99,999	185	0.35	1.09	194,782	0.32
$100,000 or more	174	0.33	1.38	144,582	0.24
Respondent Age					
18 - 34 years	145	0.26	0.79	382,343	0.33
35 - 44 years	117	0.21	1.05	229,130	0.20
45 - 64 years	209	0.38	1.12	395,560	0.34
65 or more years	78	0.14	1.00	163,587	0.14
Respondent Gender					
Female	276	0.50	0.98	600,138	0.51
Male	267	0.48	0.98	570,482	0.49

Note: Portland Metro Region summary statistics were calculated from 2007-2011 American Community Survey.

Survey Participants

In total, 654 participants from the Portland metropolitan region completed the survey. The study sample consisted of 554 individuals, who provided sufficient information to examine the measures of interest. TABLE 1 summarizes select socioeconomic measures for the study sample. Inspection of stratified levels revealed a majority of participants reported a household size of 2 members, with a similar sample proportion having a household size of three or more members. One-third of the sample earned an annual household income from $50,000-$99,999. A majority of participants reported being over 45 years old, while half the sample stated they were female. Although average household size of the sample (2.46) was equivalent to the study area, a further comparison of the sample to the metropolitan region revealed the average survey participant was more likely to earn a higher annual household income and be older than the average Portland resident.

FIGURE 1 Preferred neighborhood concepts in the Neighborhood Transportation Study

Measures

In the survey instrument, visual collages of nine images complemented with text descriptions exemplified four independent concepts of neighborhood types: central district, urban residential district, urban neighborhood, and suburban neighborhood. Images selected to visualize the concepts were collected from an assortment of Google Street View *(17)* screenshots. Image location was chosen from an aggregation of objectively defined neighborhood types based on measurement of the activity density, employment entropy, and intersection density of the built environment in the study area. Detailed description of the overall visualization process, comprising the objective definition of neighborhood types, adoption criteria for image selection, and validation of neighborhood concepts is offered elsewhere *(18)*.

Neighborhood preference was measured by the participant's response to a question asking him/her to examine four image collages with text descriptions and select the neighborhood where he/she would most prefer to live. Text descriptions illustrated a bundle of neighborhood attributes related to the typical dwelling type and living space; likely home ownership status; distance to retail, services, and entertainment activities; vehicle parking availability; and public transit access to regional centers that were objectively measured and visualized to be at different levels across the concepts. Each neighborhood exists along an urban continuum. In the study sample, 49 (9%) respondents preferred the central district, 99 (18%) preferred an urban residential district, 220 (40%) preferred an urban neighborhood, and the remaining 186 (34%) respondents preferred the suburban neighborhood concept.

TABLE 2 Importance ratings for various housing, accessibility, and transport characteristics

		Level of Importance					
		Very		Somewhat		Not at All	
Observed Characteristic	n	n	%	n	%	n	%
1: Owning a house/condo	540	**343**	**0.64**	133	0.25	64	0.12
2: Living in a home with a large living space	534	137	0.26	**226**	**0.42**	171	0.32
3: Living in a detached single-family home	536	**233**	**0.43**	172	0.32	131	0.24
4: Having a private yard	539	**262**	**0.48**	175	0.32	102	0.19
5: Having privacy from my neighbors	535	**278**	**0.52**	227	0.42	30	0.06
6: Living at the 'center of it all'	538	81	0.15	213	0.40	**244**	**0.45**
7: Having access to highways/freeways	534	119	0.22	**271**	**0.51**	144	0.27
8: Having a variety of transportation options	540	**251**	**0.46**	228	0.42	61	0.11
9: Walking to bus and/or rail stops	542	**257**	**0.47**	186	0.34	99	0.18
10: Having off-street parking at local destinations	529	98	0.19	**263**	**0.50**	168	0.32
11: Having dedicated parking at your residence	540	**362**	**0.67**	115	0.21	63	0.12
12: Having access to parks and recreational areas	541	**320**	**0.59**	196	0.36	25	0.05
13: Walking to nearby places	538	**352**	**0.65**	146	0.27	40	0.07
14: Biking to nearby places	536	155	0.29	185	0.35	**196**	**0.37**
15: Being near high-quality public schools	536	152	0.28	110	0.21	**274**	**0.51**
16: Living near established, older homes	531	76	0.14	188	0.35	**267**	**0.50**
17: Having a commute that takes 25 minutes or less	538	**320**	**0.59**	147	0.27	71	0.13

Note: The most frequently stated level of importance for each characteristic is shown in bold.

After selecting a preferred neighborhood, participants were then asked to examine a set of 17 housing, accessibility, and transport characteristics and state whether each item was very, somewhat, or not at all important. TABLE 2 shows the importance level that respondents selected for each residential location characteristic. Examination of survey responses revealed that sampled residents placed the greatest importance on having dedicated parking at their residence (67%), walking to nearby places (65%), owning their residence (64%), having a 25 minute or less commute (59%), and accessing parks and recreational areas (59%). In contrast, respondents stated being near high-quality public schools (51%), living near older homes (50%), living at the 'center of it all' (45%), biking to nearby places (37%), and living in a home with a large living space (32%) bared no importance on their residential decision making process.

Statistical Analyses

A two-part analytic plan composed of (i) exploratory factor analysis (EFA) of rated importance characteristics and (ii) structural equation model (SEM) to determine associations between latent importance rating constructs and stated neighborhood concept preference was employed. The EFA technique was used to help generate a theoretic understanding of the internal structure of how observed importance characteristic ratings may improve construct measurement *(19)*. An assumption being that factors shaped by this exploratory technique may also be useful as operational descriptions. To test whether these operational descriptions also represent theoretical constructs, SEM was then used—informed by both the EFA results and past literature of how various characteristics may bundle together—to predict stated neighborhood preference. Sample size restrictions prohibited splitting the collected data into subsamples to independently conduct the two analyses.

EFA was performed in sequential steps centered on three decisions related to selection of a factor model approach, extraction scheme, and rotation method *(20)*. Principal components analysis was selected as a modeling strategy to form uncorrelated linear combinations of the importance rating characteristics. Inspection of eigenvalues associated with each resulting factor and their scree plot display guided the factor extraction *(21)*. Principal axis factoring was employed since this method has generally outperformed other extraction methods in recovering factors with low loadings, providing solutions with stable loadings, and isolating correlated factors *(22)*. Promax rotation, which allows correlation between extracted factors, was adopted as a rotation method leading to a final factor model.

Items loading in the chosen factor solution were assessed in tandem with theory to identify latent construct indicators related to the stated importance of housing, accessibility, and transportation characteristics in residential location decisions. Using a two-step approach, a measurement model positing a relationship between a set of these observed characteristics to a latent construct(s) was estimated through confirmatory factor analysis (CFA) prior to assessing a structural model with path assignments *(23)*. Structural equation modeling has been firmly established as an analytic strategy in which a set of equations consisting of a measurement model for exogenous variables may be concurrently estimated in a structural model identifying associations between endogenous and exogenous variables. An SEM analysis has several advantages over conventional multivariate regression methods, including an ability to: (i) simultaneously test direct/indirect effects and bidirectional relationships across different paths, (ii) correct for measurement error in observed variables, and (iii) assess latent constructs of multiple indicators *(24)*. Accordingly, adopting SEM enabled latent constructs reflecting the importance of residential location characteristic ratings to be simultaneously estimated free of measurement error and predictive of stated neighborhood preference, while accounting for direct and indirect paths with self-reported socioeconomic variables.

RESULTS

Exploratory Factor Analysis

Correlations between importance characteristics were analyzed prior to the EFA. The importance characteristics, reflecting the participant rating of 17 items describing their residential location decision process, were coded 3 for very important, 2 for somewhat important, and 1 for not at all important. TABLE 3 shows a zero-order correlation matrix of the 14 retained rating items. Measures linked to being near high-quality public schools, living near older homes, and having a 25 minute or less commute were removed from this, and subsequent, analyses due to either item misconstruction or lack of item response variation within the study sample.

TABLE 3 Zero-order correlation matrix of importance rating characteristics

Observed Importance Rating Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1: Owning a house/condo	---													
2: … home with a large living space	.18	---												
3: Living in a detached single-family home	.34	.26	---											
4: Having a private yard	.28	.26	**.68**	---										
5: Having privacy from my neighbors	.17	.20	.35	.33	---									
6: Living at the 'center of it all'	-.16	-.14	**-.43**	**-.40**	-.34	---								
7: Having access to highways/freeways	.19	.18	.11	.07	.12	-.11	---							
8: … variety of transportation options	-.22	-.20	-.36	-.31	-.27	.33	-.11	---						
9: Walking to bus and/or rail stops	-.28	-.17	**-.41**	-.36	-.25	.32	-.14	**.57**	---					
10: … off-street parking …	.12	.17	.14	.11	.19	-.11	.25	-.15	-.18	---				
11: … dedicated parking at your residence	.32	.18	.27	.23	.26	-.23	.30	-.27	-.25	.36	---			
12: … access to parks …	-.07	-.08	-.11	-.09	-.10	.10	-.02	.23	.13	-.01	-.05	---		
13: Walking to nearby places	-.23	-.22	**.40**	-.33	-.30	**.41**	-.16	**.50**	**.50**	-.16	-.30	.24	---	
14: Biking to nearby places	-.08	-.15	-.04	-.04	-.13	.06	-.16	.24	.18	-.12	-.19	.32	.31	---

Note: Kendall rank correlation coefficients over 0.40 or under -0.40 appear in bold.

An EFA was next conducted to advise the development of theoretical constructs related to the importance of housing, accessibility, and transportation characteristics to residential location decisions. Provided the subjectivity of EFA, TABLE 4 shows three possible factor solutions in line with the rule of eigenvalues above one *(25)*. The two-factor solution represented the best balance between a priori theory and an empirical description of the data ($\chi 2$ (64) = 292.75, $p < 0.01$). Four items on Factor 2A with salient loadings described the transportation characteristics related to the residential location decision-making process; whereas, each of the three high loading items on Factor 2B conceptually reflected housing and accessibility features. Factor 2A was driven by importance in having a variety of transportation options, walking to nearby places, walking to bus and/or rail stops, biking to nearby places, and having access to parks and recreational areas. In turn, the items reflecting Factor 2B included the importance of living in a detached single-family home, having a private yard, and living at the ‘center of it all.’ In general, the eight items in the two-factor solution with strong factor loaded on a distinct factor with the clear exception being the importance of biking to nearby places. Also of note, living at the ‘center of it all’ was the only characteristic with a strong negative loading. All seven items with strong loadings in the two-factor solution were retained for the CFA as were those items with a factor loading greater than 0.30 or less than -0.30 on either factor.

TABLE 4 Summary of three exploratory factor analyses for importance rating characteristics

Factor Solution:	One	Two		Three		
Factor Number:	1A	2A	2B	3A	3B	3C
Observed Importance Rating Measure						
1: Owning a house/condo	**0.42**	-0.16	0.30		0.24	0.33
2: … home with a large living space	0.38	-0.20	0.22		0.19	0.21
3: Living in a detached single-family home	**0.73**		**0.91**		**0.88**	
4: Having a private yard	**0.66**		**0.87**		**0.85**	
5: Having privacy from my neighbors	**0.49**	-0.21	0.32	-0.12	0.29	0.17
6: Living at the 'center of it all'	**-0.58**	0.19	**-0.44**	0.21	**-0.44**	
7: Having access to highways/freeways	0.25	-0.28			-0.11	**0.57**
8: … variety of transportation options	**-0.66**	**0.75**		**0.79**		
9: Walking to bus and/or rail stops	**-0.69**	**0.64**	-0.13	**0.65**	-0.15	
10: … off-street parking …	0.28	-0.29				**0.57**
11: … dedicated parking at your residence	**0.46**	-0.35	0.14			**0.73**
12: … access to parks …	-0.24	**0.42**	0.13	**0.46**		0.11
13: Walking to nearby places	**0.68**	**0.70**		**0.69**		
14: Biking to nearby places	-0.27	**0.63**	0.33	**0.50**	0.31	-0.17
Eigenvalue	3.72	2.47	2.18	2.06	2.02	1.40
Percent of Variance Explained	0.27	0.18	0.16	0.15	0.14	0.10

Note: Factor loadings over 0.40 or under -0.40 appear in bold; Factor loadings between -0.10 and 0.10 not shown.

Structural Equation Model

Guided by the empirically-driven EFA results and a priori hypotheses concerning the relationship among importance rating characteristics, a CFA model was specified for the two latent constructs reflecting single-family dwelling and non- automotive access importance to the residential location decision making process. This analysis was conducted in R *(26)* using the 'lavaan' package *(27)*, which enabled use of categorical variables with a robust weighted least squares mean- and variance-adjusted (WLSMV) estimator. Choice of model fit indices and overall performance was guided by recommendations of Hu and Bentler *(28)*, while simulation results *(29)* established that a sample size greater than 500 cases offered sufficient power to reject models with a WLSMV estimator.

Two latent constructs measuring rated single-family dwelling and non-automotive access importance were entered into the final CFA model (TABLE 5). Although, the model chi-square was significant ($\chi2\ (13) = 67.48$, $p < 0.01$) and root mean square error of approximation (RMSEA) was above 0.06; both the comparative fit index (CFI) and Tucker-Lewis Index (TLI) were above 0.95, supporting an acceptable model fit to the sample data. Items for each latent construct were above an acceptable standardized loading ($\beta \geq 0.40$). A significant, negative relationship existed between these two latent constructs.

The final CFA model was identified as a baseline structure to test measurement invariance of the latent constructs. Measurement invariance is centered on the notion of a measuring device functioning differently across varied conditions or market segments, which subsequently produces systematic measurement inaccuracy *(30)*. The objective of a multigroup invariance was to determine if measurement equivalence may be established prior to specification of the two importance rating constructs in a path model predicting neighborhood preference. Multigroup membership was identified by a median-split of the study sample based on household size, annual income, and respondent age. Assessment of factorial invariance across the three divisions followed the procedure for categorical measures introduced by Millsap and Yun-Tein *(31)*. Configural measurement invariance existed when the sample was divided by households with one or two members versus those with at least three members. Similarly, configural invariance was found when a respondent age of 45 years was used to split the sample. In terms of household income, factor loadings were equivalent across groups (weak invariance) when the sample was divided by those households earning more or less than $50,000. Although weak measurement invariance has been reported as a tolerable condition in practice *(32)*, these multigroup invariance test results informed a decision to control for each of the observed HIA measures as socioeconomic covariates in the final path model.

TABLE 5 Confirmatory factor analysis of stated importance constructs (*n*=548)

Parameter Estimates:	B	SE (B)	β	p-value
Construct Variables				
Factor A: Single-family dwelling importance				
3: Living in a detached single-family home	1.00	---	0.95	---
4: Having a private yard	0.54	0.17	0.86	0.00
6: Living at the 'center of it all' *	0.32	0.08	0.70	0.00
Factor B: Non-automotive access importance				
8: Having a variety of transportation options	0.84	0.14	0.83	0.00
9: Walking to bus and/or rail stops	0.90	0.15	0.85	0.00
11: Having dedicated parking at your residence *	0.36	0.07	0.54	0.00
13: Walking to nearby places	1.00	---	0.87	---
Covariances				
Factor A ~~ Factor B	-3.96	1.04	-0.73	0.00

Note: Dashes (---) indicate the standard error was not estimated. A star (*) indicates the measure was reverse-coded. χ^2 (13) = 67.48, p = 0.00. CFI = 0.99, TLI = 0.98, and RMSEA = 0.08.

Prior to inclusion of the HIA measures, a path model predicting the impact of single-family dwelling and non-automotive access importance on an individual's stated preference for one of the four neighborhood concepts was estimated (TABLE 6). Similar to CFA model results, alternative fit indices suggested a satisfactory overall model fit to the data ($\chi2$ (33) = 125.15, $p < 0.01$, CFI = 0.98, TLI = 0.97, RMSEA = 0.07). Single-family dwelling importance negatively predicted preference in central district and urban residential district neighborhood concepts; however, non-automotive access importance had no significant influence on stated preference in these two most urban neighborhood concepts. A direct effect analysis of the importance rating constructs on suburban neighborhood preference revealed single-family dwelling importance had a positive effect ($\beta = 0.56$, $p < 0.01$), while non-automotive access importance had a negative effect ($\beta = -0.37$, $p < 0.01$) on the binary outcome. Of particular interest, single-family dwelling ($\beta = 0.66$, $p < 0.01$) and non-automotive access ($\beta = 0.75$, $p < 0.01$) importance both had a strong positive effect on urban neighborhood preference. This finding suggests a trade-off in single-family dwelling importance may be occurring when an individual contemplates between an urban residential district and urban neighborhood; while, non-automotive importance trade-offs may be occurring when deciding between urban or suburban neighborhoods.

Complexity to the base SEM specification was tested by adding exogenous HIA variables as both predictors of neighborhood preference and the importance rating constructs. Path model specification was performed with a two-step backward elimination approach in which direct paths into the latent constructs were iteratively removed until only significant paths ($p < 0.05$) remained. Once all direct paths from the HIA variables to the latent constructs met the significance threshold, then direct paths from the HIA measures and latent constructs to the binary stated neighborhood preference outcome were iteratively removed beginning at the highest p-value until only significant paths remained. TABLE 7 provides final model results for stated urban neighborhood preference, which was reasoned to be the neighborhood at which participants were able to suffice the competing importance constructs; while FIGURE 2 offers a path diagram for this model. Model fit indices have suggested a good fit to the data ($\chi 2$ (76) = 109.37, $p < 0.05$, CFI = 0.96, TLI = 0.95, RMSEA = 0.03).

TABLE 6 Structural equation model of neighborhood preference with stated importance constructs (*n*=548)

Parameter Estimates:	B	SE (B)	β	p-value
Measurement Model				
Construct Variables				
Factor A: Single-family dwelling importance				
3: Living in a detached single-family home	1.00	---	0.94	---
4: Having a private yard	0.64	0.14	0.87	0.00
6: Living at the 'center of it all' *	0.41	0.07	0.74	0.00
Factor B: Non-automotive access importance				
8: Having a variety of transportation options	0.65	0.12	0.81	0.00
9: Walking to bus and/or rail stops	0.75	0.14	0.84	0.00
11: Having dedicated parking at your residence *	0.32	0.07	0.56	0.00
13: Walking to nearby places	1.00	---	0.94	---
Covariances				
Factor A ~~ Factor B	-4.11	0.94	-0.72	0.00
Structural Model				
Central District ^ ~ Factor A	-0.46	0.14	-0.79	0.00
Central District ^ ~ Factor B	-0.01	0.12	-0.01	0.96
Urban Residential District ^ ~ Factor A	-0.47	0.11	-0.84	0.00
Urban Residential District ^ ~ Factor B	-0.10	0.09	-0.13	0.26
Urban Neighborhood ^ ~ Factor A	0.29	0.09	0.66	0.00
Urban Neighborhood ^ ~ Factor B	0.42	0.12	0.75	0.00
Suburban Neighborhood ^ ~ Factor A	0.41	0.10	0.56	0.00
Suburban Neighborhood ^ ~ Factor B	-0.34	0.10	-0.37	0.00

Note: Dashes (---) indicate the standard error was not estimated. A star (*) indicates the measure was reverse-coded. A carrot (^) indicates a binary measure. χ^2 (33) = 125.15, p = 0.00. CFI = 0.98, TLI = 0.97, and RMSEA = 0.07.

The latent constructs of non-automotive access ($\beta = 0.70$, $p < 0.05$) and single-family dwelling ($\beta = 0.68$, $p < 0.01$) importance strongly predicted urban neighborhood preference. The direct effect of the theoretical constructs on neighborhood preference outweighed most traditional socioeconomic indicators. Having a household with three members was found to have a significant direct effect on urban neighborhood preference ($\beta = -0.17$, $p < 0.05$), as was having a household with four or more members ($\beta = -0.14$, $p < 0.05$). All binary household size measures significantly predicted the importance of a single-family dwelling to the residential location decision-making process. Having an annual household income between $25,000 and $49,999 significantly predicted a negative stated urban neighborhood preference ($\beta = -0.14$, $p < 0.05$). In regard to the direct effect of income on the two latent constructs, membership in the lowest income bracket positively predicted the importance of non-automotive access ($\beta = 0.17$, $p < 0.05$); whereas, annual household income over $100,000 negatively predicted single-family dwelling importance ($\beta = -0.12$, $p < 0.05$). Affiliation with the youngest age cohort positively predicted stated urban neighborhood preference ($\beta = 0.14$, $p < 0.05$), while this cohort membership negatively predicted single-family dwelling ($\beta = -0.22$, $p < 0.01$) and positively predicted non-automotive access importance ($\beta = 0.23$, $p < 0.05$). Participants aged 65 or more years negatively predicted single-family dwelling importance ($\beta = -0.13$, $p < 0.05$) in the residential location decision process.

TABLE 7 Structural equation model of urban neighborhood preference with stated importance constructs and observed socioeconomic measures (*n*=530)

Parameter Estimates:	B	SE (B)	β	p-value
Measurement Model				
Construct Variables				
Factor A: Single-family dwelling importance				
3: Living in a detached single-family home	1.00	---	0.95	---
4: Having a private yard	0.57	0.22	0.86	0.01
6: Living at the 'center of it all' *	0.32	0.09	0.69	0.00
Factor B: Non-automotive access importance				
8: Having a variety of transportation options	1.00	---	0.88	---
9: Walking to bus and/or rail stops	0.85	0.23	0.84	0.00
11: Having dedicated parking at your residence *	0.40	0.12	0.60	0.00
13: Walking to nearby places	0.92	0.42	0.86	0.03
Covariances				
Factor A ~~ Factor B	-2.65	1.20	-0.66	0.03
Structural Model				
Urban Neighborhood ^ ~ Factor A	0.28	0.11	0.68	0.01
Urban Neighborhood ^ ~ Factor B	0.52	0.22	0.70	0.02
Urban Neighborhood ^ ~ 3 members ^	-0.53	0.26	-0.17	0.04
Urban Neighborhood ^ ~ 4 or more members ^	-0.46	0.22	-0.14	0.04
Urban Neighborhood ^ ~ $25,000 - $49,999 ^	-0.42	0.19	-0.14	0.03
Urban Neighborhood ^ ~ 18 - 34 years ^	0.40	0.18	0.14	0.03
Factor A ~ 1 member ^	-1.24	0.45	-0.18	0.01
Factor A ~ 3 members ^	1.45	0.55	0.19	0.01
Factor A ~ 4 or more members ^	2.60	0.80	0.34	0.00
Factor A ~ $100,000 or more ^	-0.77	0.35	-0.12	0.03
Factor A ~ 18 - 34 years ^	-1.52	0.50	-0.22	0.00
Factor A ~ 65 or more years ^	-1.16	0.47	-0.13	0.01
Factor B ~ 4 or more members ^	-1.07	0.45	-0.25	0.02
Factor B ~ $0 - $24,999 ^	0.91	0.39	0.17	0.02
Factor B ~ 18 - 34 years ^	0.87	0.35	0.23	0.01
Factor B ~ 35 - 44 years ^	0.62	0.28	0.15	0.03

Note: Dashes (---) indicate the standard error was not estimated. A star (*) indicates the measure was reverse-coded. A carrot (^) indicates a binary measure. χ^2 (76) = 109.37, p = 0.01. CFI = 0.96, TLI = 0.95, and RMSEA = 0.03.

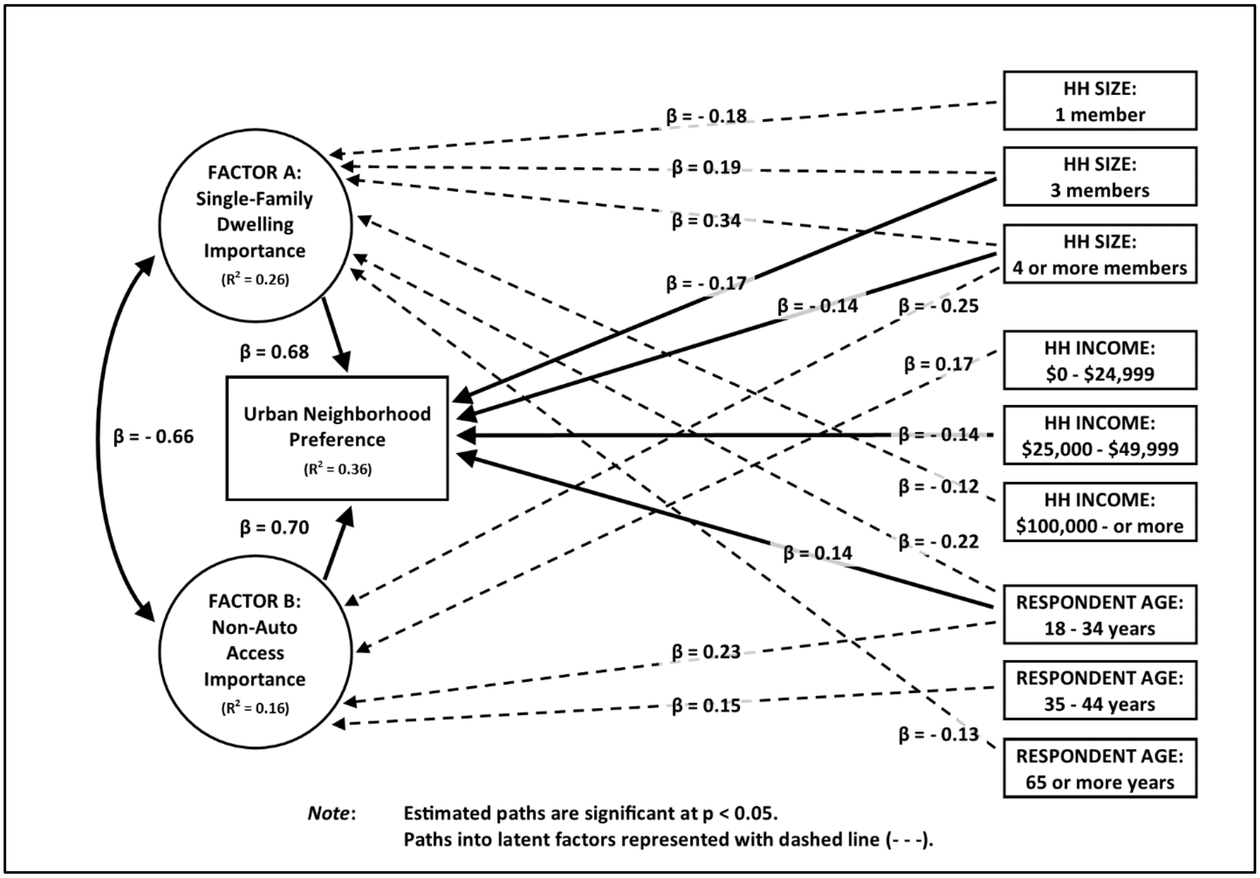

FIGURE 2 Path diagram of urban neighborhood preference with stated importance constructs and observed socioeconomic measures (*n*=530)

DISCUSSION

The primary contributions of this study were twofold. One contribution was an assessment of the relative importance for different housing, accessibility, and transport characteristic ratings as they relate to stated neighborhood preference. Using exploratory and confirmatory factor analysis, two latent constructs describing the stated importance of single-family dwelling and non-automotive access were identified. A potential third construct related to stated automotive access importance was explored, but not confirmed. While not mutually exclusive, these latent constructs appear to represent competing standpoints of the residential environment characteristics that mattered most to the sampled residents. Study findings also hinted at an ordering of these housing and transport attribute bundles in the stated preference for certain neighborhoods along an urban continuum.

Examination of the traced unstandardized effects *(33)* of the constructs to each neighborhood concept in the base SEM estimation revealed single-family dwelling importance was positively related to suburban neighborhood preferences, but became increasingly negative as respondents' stated preference increased along the urban continuum. Conversely, stated non-automotive access importance negatively predicted suburban preferences and became ever more positive with an increase along this neighborhood continuum. The competing latent constructs both negatively predicted a stated preference for urban neighborhoods; indicating this concept may have reflected the residential environment in which survey participants faced a concession in their unconstrained preference. This trend remained, but with a positive standardized relationship, after controlling for the observed socioeconomic circumstance in the path model.

Reflection on factor construction revealed opportunities for refinement through an addition of housing, accessibility, and transport characteristics to the survey instrument. For instance, the highest indicator of Factor A was the importance of living in a detached single-family home. Is this result based solely on building structure importance or an artefact of living space requirement, some long-term goal of financial stability in retirement, or any other intrinsic meaning tied to the significance in having this specific dwelling type? Clearer insight may also be gained by dividing the accessibility item of living at the 'center of it all' into items expressing proximity to specific activity locations (e.g., restaurant, market). Finally, separating biking to nearby places into items referring to utilitarian and recreational travel may have led the latter characteristic to be a strong indicator of the non-automotive access importance construct.

A second study contribution was an evaluation of whether socioeconomic condition should approximate an unexpressed importance within heterogeneous households for certain housing, accessibility, and transport features in their preferred residential environment. Recent studies have stressed the advantage of including subjective measures in neighborhood preference prediction *(12, 34)*. Travel behavior research has traditionally relied on socioeconomic measures to model neighborhood preference variation; however, findings of this study contribute to the evidence base by demonstrating that objective and subjective measures are required to understand this complex decision making process *(5)*. While household size, income, and respondent age contributed to each importance rating construct within the final path model, these objective HIA measures were generally less predictive than either latent construct in explaining urban neighborhood preference variation.

When tracing the overall unstandardized impact of each socioeconomic characteristic to urban neighborhood preference, the effect of Factor A remained larger than all socioeconomic characteristics with the lone notable exception being that single-person households were less likely to prefer an urban neighborhood. Inspection of the other socioeconomic characteristics revealed nonlinear relationships with the two importance rating constructs. Tracing annual income effects on non-automotive access importance indicated that individuals in households earning between \$50,000 and \$99,999 tended to have the lowest scores on Factor B; whereas, individuals within households in the lowest and highest annual income brackets expressed the greatest importance in non-automotive access. Studying the traced unstandardized effect of age revealed that respondents between 45 and 64 years tended to place the greatest importance on single-family dwelling living, and that the youngest and oldest cohorts had a comparatively negative relationship with Factor A.

While new and informative, results of this study are limited by content and context. Tracing results indicated nonlinearities in the impact of socioeconomic characteristics on neighborhood preference; unfortunately, robust evaluation of interaction effects was limited by sample size. Also, individual preferences were self-reported and likely inaccurately portrayed the joint residential location preferences of a multimember household seeking to best satisfy the needs of all members. Likewise, while structural models are valuable in identifying predictive paths between variables of interest, a choice-based conjoint analysis would enable a rigorous test of residential environment preference free of omitted variable bias *(7)*. Future research efforts will evaluate constrained neighborhood choice and neighborhood dissonance by estimating the impact of the latent importance rating constructs in addition to the socioeconomic attributes within the context of an individual's present circumstance. An initial hypothesis is that conventional socioeconomic characteristics play a more influential role in constrained choice of neighborhood, but that so-called soft measures illuminate some unexplained heterogeneity in emerging market segments. This future research offers an opportunity to build on the contribution of this study that has underlined the importance of attitudinal measurement in better understanding the complexities in the residential location decision making process.

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