Chittenden County Housing Location Dissonance Study

January 29, 2024

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Table of Contents

List of Figures

List of Tables

1. Introduction

This study focuses on understanding the potential impacts of Autonomous Vehicles (AVs), Electric Vehicles (EVs), and the burgeoning trend of remote work on individuals' housing location choices and travel behavior. The central question we evaluate is if AVs, EVs, and remote work are likely to increase or decrease travel demand in Chittenden County.

To address this question, our research employs the theoretical construct of "housing dissonance." This notion encapsulates the prevailing dissatisfaction that individuals frequently encounter with their current housing, including the structure itself and the surrounding community. This analytical framework functions as a perspective through which to investigate how the merging of AVs, EVs, and remote work might have the potential to mitigate this dissatisfaction by reducing travel related constraints on housing location choice, thereby empowering individuals to shift toward living situations that more closely resonate with their aspirations.

2. Literature Review

As demonstrated by research in the field of housing studies, the decision-making process for residential location choice involves a complex negotiation of various individual and household needs and preferences (*1*). During this process, households may have to make trade-offs among desired qualities of the residential environment, prioritizing certain attributes that hold higher perceived value over others (*2*). The current residential neighborhood type (e.g., urban, suburban, or rural) of a household may not necessarily align with its preferences. This disparity can be attributed to the prominence of other influential factors in the household's decision-making process, such as travel time to work or the size of the dwelling. These factors may hold greater significance for the household's residential location choice compared to the physical characteristics of the neighborhood (*3*). Dissonance in this context is defined as the level of mismatch between a household’s preferred housing location and the housing location choice they have made.

Many competing factors figure into a household’s location choice and it is often not possible to satisfy all preferences (*4*). Therefore, some level of dissonance is usually present. Certain factors, such as income levels or distance to work, can act as constraints in the housing location decision-making process, leading to a dissonance between the preferred neighborhood type and a household’s current location. This disparity is typically more pronounced among households with lower incomes, as they often face financial limitations that prevent them from residing in more preferred locations (*5*). Dissonance in neighborhood choice may also arise due to differing preferences within households. Given that residential location choices are often made collectively within households, disagreements among household members can lead to individual or household-level residential dissonance (*6*).

The most basic models of housing location choice are based on the tradeoff between the cost of commuting and the cost of housing, with housing and commuting costs generally having a reciprocal relationship. The larger area a household is willing to search for housing over, the more likely they are to satisfy their housing preferences. The choice of housing, however, is constrained by the increasing cost of commuting as the search area increases. EVs, AVs and the increased ability to work, learn and conduct a wide range of other activities remotely since the COVID-19 pandemic can reduce the cost or even the need for commuting and other trips. These factors can

therefore disrupt the current equilibrium and cause households to move to locations that better satisfy their housing preferences. Households with greater dissonance are more likely to move when transportation or housing costs are reduced.

Household location choice is driven by much more than housing and commuting costs. How a household prefers to travel is also an important factor (*7*). Previous studies have utilized the concept of dissonance in housing location choice to investigate the influence of built environment factors and land use characteristics on travel behavior (*3*, *4*, *8–11*). Schwanen and Mokhtarian conducted a survey of 1,358 commuters in three neighborhoods in the San Francisco Bay Area and estimated the overall percentage of mismatch between preferred neighborhood types and current location to be 23.6%. De Vos et al., investigated the impact of housing location dissonance on mode choice behavior among 1,657 staff and students of the University of Antwerp, utilizing multinomial logit models. They found that 51.4% of households were location dissonant, a much higher percentage than prior studies. This study further found that urban dissonant are more inclined to use private vehicles for commuting compared to urban consonant, though their likelihood of doing so is not as high as that of suburban consonant. Through an analysis of panel data spanning nine years in Australian Transit-Oriented Developments (TODs), half of dissonant individuals were found to have undergone a transition and adopt the characteristics of consonant households within a relatively short period of four years (*12*). These studies have measured the level of housing location dissonance using responses to stated preference questions, wherein respondents are asked about their preferences for various land use characteristics. For example, those who score high on pro-density preferences are categorized as individuals who prefer urban areas.

In prior housing dissonance and travel behavior research, study respondents were not asked directly about their neighborhood type or location preferences. Furthermore, most of the housing location dissonance and travel behavior literature has focused on urban areas and their surrounding suburbs. There is limited research on residential dissonance across a wider range of communities, including smaller cities, towns and rural communities. While prior studies have explored the impact of housing location on travel behavior and mode choice, there has been little consideration of other factors that influence housing location choice that may explain high levels of apparent location dissonance and reveal opportunities for households to choose more transportation efficient locations.

3. Methods

The primary objective of this paper is to investigate whether the implementation of EVs, AVs, and remote working options could facilitate and support people in relocating to the desired locations they prefer. We seek to do this by assessing the dissonance between housing preferences and actual household choices and identifying the factors that cause the most dissonance, with a particular emphasis on transportation-related factors that could potentially be influenced by the adoption of EVs, AVs, and remote work.

We collected data from households in Chittenden County, Vermont using an internet-based survey. The primary objective of the survey was to enable respondents to compare their current place of residence with their ideal or preferred residence, allowing us to gauge their current level of housing dissonance, including housing location dissonance. We include questions about current and preferred neighborhood and household attributes, including questions related to travel.

Responses about where respondents currently live and where they would prefer to live were used to evaluate housing location dissonance. We provided respondents with short descriptions and photographs of different neighborhood types (rural, suburban, town center, and urban) and asked them to indicate which type of neighborhood they currently live in and which they would prefer to live in (Figure 1). This approach allowed us to establish a standardized and consistent definition of neighborhood types for all respondents.

We then evaluated overall housing dissonance and factors contributing to it. Respondents were asked to rate the importance of various housing attributes including, questions that focus on neighborhood characteristics, transportation, employment, access to amenities, and cost on a 1 (not important) to 5 (very important) Likert scale. Respondents were also asked to indicate how satisfied they are with the same attributes of their current home on a scale from -2 (unsatisfied) to 2 (satisfied). We asked respondents to rank several statements on their driving attitudes from 1 (not true) to 5 (very true) to understand whether they enjoy driving or not. Additionally, we asked about current intentions to move and collected information about the socioeconomic characteristics of the respondents and their households.

This information is then used to evaluate the level of housing dissonance and consider how the adoption of AVs, EVs and remote work could facilitate households in transitioning to their preferred neighborhood types and the possible implications on travel demand in Chittenden County. For instance, we asked questions about the importance and satisfaction with travel related factors such as the distance to commute to work. AVs might reduce the burden of longer commutes while remote work could eliminate it entirely. Loosening travel constraints may allow dissonant households to reconsider their current housing tradeoffs and possibly move somewhere that is more satisfying. A reduction in travel burdens and costs for dissonant households is generally expected to result in a move to less transportation efficient locations and result in increasing travel demand.

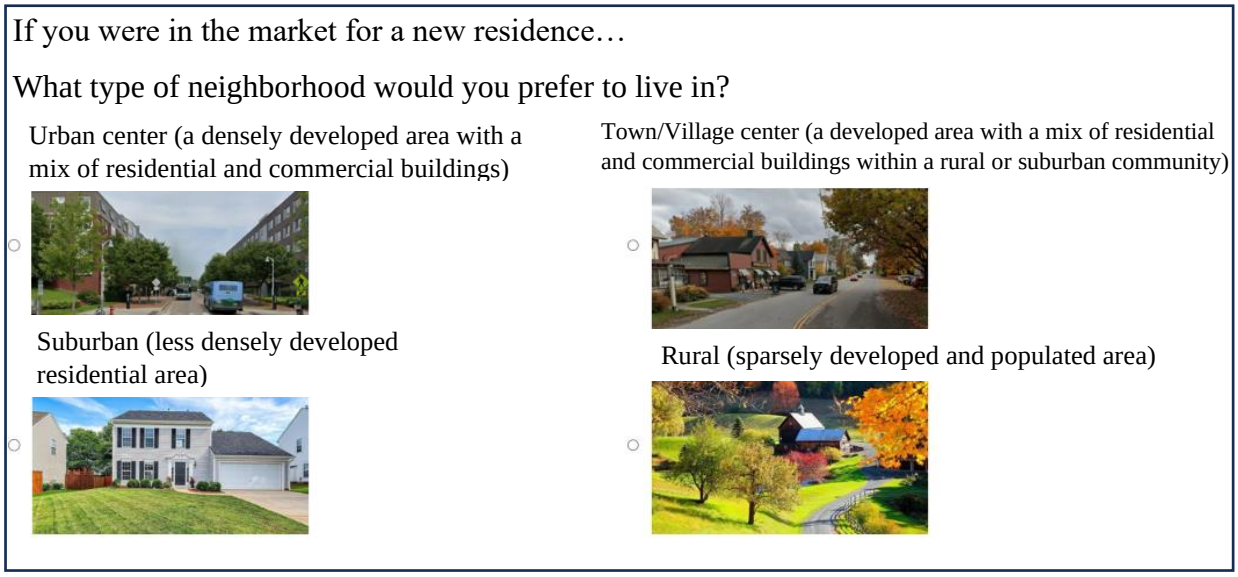

Figure 1 Example of survey's question[1]

3.1. Survey Recruitment

We began by recruiting respondents from Chittenden County using Front Porch Forum. Front Porch Forum is a free community-networking service that helps neighbors connect and build community by hosting regional networks of online neighborhood forums. The sample collected from this recruitment method exhibited a higher proportion of female, older and more educated respondents compared to the overall population of Chittenden County but was otherwise broadly representative. We therefore recruited additional respondents through Facebook and Instagram advertisements[2] with the intention of reaching a younger audience. Respondents recruited from Facebook and Instagram were on average 10 years younger than those recruited through Front Porch Forum. The survey was distributed in January 2023 and received 842 responses. Approximately 60% of the responses were from Front Portch Forum and the remainder from Facebook and Instagram. After filtering out surveys that were less than 50% complete (these were mostly surveys that were started but never completed), the final size of the sample used in our analysis was 721. Table 1 presents descriptive statistics of the socio-economic characteristics of survey respondents and compares them with US Census Bureau American Community Survey (ACS) data from Chittenden County. Based on this comparison our sample is somewhat representative of Chittenden County's adult population. The largest difference is that females remain overrepresented in our sample compared to the general population. This observation may indicate a higher level of interest or appeal towards the topic of residential dissonance among females.

[1] A copy of the full questionnaire can be found in appendix A

[2] A copy of media advertisement can be found in appendix B

Table 1 Descriptive statistics of sample Data (Sample size =721)

		Survey Respondents		Chittenden County [a]
		n	%	%
Gender	Female	593	82	51
	Male	100	14	49
	Other	28	3.8	-
Age (Years)	18-34	136	19	25
	35-54	241	33	24
	55-64	145	20	13
	>65	199	28	15
Ethnicity	Hispanic or Latino	18	2.5	2.5
	Non - Hispanic or Latino	703	97.5	97.5
Race	White	681	94	89
	Black or African American	4	0.6	2.6
	American Indian and Alaska Native	2	0.2	0.1
	Asian	15	2.1	4.0
	Other	19	2.5	4.5
Annual income	Less than $20,000	45	6.2	10
	$20,000 to $34,999	67	9.3	10
	$35,000 to $49,999	94	13	9.6
	$50,000 to $74,999	142	20	16
	$75,000 to $99,999	123	17	13
	$100,000 to $149,999	132	18	19
	$150,000 to $199,999	71	9.8	9.2
	More than $200,000	47	6.5	12
Employment Status	Employed	473	66	67
	Unemployed	19	2.6	2.6
	Not in labor force	229	32	30
Level of Education	12th grade –no diploma	3	0.4	5.0
	High school graduate	24	3.3	18
	Some college, no degree	66	9.1	14
	Associates degree	44	6.1	8.8
	Bachelor's degree	266	37	32
	Graduate or professional degree	318	44	22
Number of Vehicles	No vehicles available	29	4.0	7.4
	1 vehicle available	306	42	35
	2 vehicles available	307	43	41
	3 or more vehicles available	79	11	16
Number of Children	No Children	538	75	77
	At least one child under 18	183	25	23

[a] Data for regional demographics sourced from US Census Bureau American Community Survey 5-year estimates(*13*).

We also compared the geographical distribution of the home location of survey respondents with the distribution of Chittenden County's population. As shown in Table 2, the survey captured a geographically diverse and highly representative sample, with the exception of the UVM campus zip code. Notably, this latter category is not within the scope of our study, as it primarily comprises students who are not permanent residents, predominantly reside on campus and may not have a choice in where they live.

Table 2 Geographical distribution of responses

Zip Code	City	Survey Respondents (%)	Chittenden County [a] (%)
05401	Burington	20.9	19.5
05403	South Burlington	13.2	11.9
05404	Winooski	4.4	4.9
05405	Burlington (University of Vermont + Campus)	0.1	1.2
05408	Burlington	6.7	6.0
05445	Charlotte	1.8	2.3
05446	Colchester	8.1	9.5
05452	Essex Junction	12.9	13.2
05461	Hinesburg	3.4	2.9
05462	Huntington	1.4	1.0
05465	Jericho/Jericho Center	4.1	3.3
05468	Milton	4.7	7.8
05477	Richmond/Bolton Valley	1.8	2.6
05482	Shelburne	5.0	4.6
05489	Underhill	1.3	2.1
05494	Westford	0.6	0.9
05495	Williston/St. George	7.2	6.3

[a] Data for population at zip code sourced from US Census Bureau American Community Survey 5-year estimates(*13*).

Table 3 presents a comprehensive overview of survey results across different communities, focusing on demographics, housing characteristics, vehicle and transportation information, employment status, and intention to move. The findings indicate a notable demographic difference between rural and urban households. A higher proportion of older individuals are found in rural areas, with only 10.3% of respondents aged 18 to 34 compared to 31.3% in urban areas. Moreover, the urban and town center communities have a more racially and ethnically diverse population, in contrast to rural areas. The study also highlights disparities in wealth across various communities. Both rural and suburban respondents exhibit higher levels of wealth compared to their urban and town center counterparts. 20.6% of rural households have an income exceeding $150,000, whereas only 8.2% of urban households reach the same income bracket. Regarding family composition, a majority of respondents in all communities do not have children. However, the town center stands out with the highest percentage (32.5%) of respondents reporting that they have at least one child.

Regarding housing characteristics, a noticeable distinction emerges between respondents from different community types. Rural residents predominantly reside in single family homes, constituting 80.4% of respondents, whereas urban residents are more likely to live in multi-family homes or apartments, accounting for 74.7% of respondents. The survey results also reveal distinct patterns in property ownership among various communities. A large majority of respondents from rural (90.7%), suburban (78.5%), and town center (63.2%) community types own their places of residence compared to urban households (39.6%). These household ownership findings align with 2022 ACS data that show, for example, that only 39.9% of households in Burlington own their residence (*14*).

Table 3 Summary statistics of selected variables across communities

Variables	Rural (n=97)	Suburban (n=279)	Town/village Center (n=163)	Urban (n=182)
Demographics				
Age				
18-34	10.3%	14.0%	18.4%	31.3%
35-54	32.0%	32.6%	40.5%	29.1%
55-64	21.6%	23.7%	17.2%	16.5%
>65	36.1%	29.7%	23.9%	23.1%
Ethnicity				
Hispanic	0	2.9%	1.2%	4.4%
Non-Hispanic	100%	97.1%	98.8%	95.6%
Race				
White	97.9%	94.6%	92.6%	94.0%
Other	2.1%	5.4%	7.4%	6.0%
Income				
Less than $34,999	7.2%	9.7%	19.0%	25.8%
$35,000 to $74,999	29.9%	28.3%	33.1%	40.1%
$75,000 to 149,999	41.2%	39.8%	35.0%	25.8%
Over $150,000	20.6%	22.2%	12.9%	8.2%
Children				
Yes	26.8%	26.5%	32.5%	14.8%
No	73.2%	73.5%	67.5%	85.2%
Number Adults (mean)	2.08	2.02	1.95	1.8
Housing Characteristics				
Type of Residence				
Single family home (no shared walls)	80.4%	68.1%	44.2%	22.5%
Multi-family home /Apartment (shared walls)	13.4%	29.0%	50.9%	74.7%
Other	6.2%	3.0%	4.7%	2.7%
Housing Status				
Rent	8.2%	18.6%	34.4%	58.8%
Own	90.7%	78.5%	63.2%	39.6%
Other	1.0%	2.9%	2.4%	1.6%
Vehicle and Transportation				
Number of Vehicles				
Zero	0	0.7%	4.3%	11.0%
One	26.8%	33.7%	44.2%	62.1%
Two or more	73.2%	65.6%	51.5%	26.9%
Work Mode				
Walk	2.1%	1.1%	4.9%	12.6%
Bike	1.0%	0.7%	0.6%	3.3%
Bus	1.0%	1.4%	1.2%	6.6%
Car	54.6%	57.0%	52.8%	47.3%
Not Applicable	41.2%	39.8%	40.5%	30.2%
Walking Distance to Bus				
Yes	5.2%	58.8%	66.3%	94.0%
Unsure	2.1%	8.6%	8.0%	3.8%
No	92.8%	32.6%	25.8%	2.2%
Driving Attitude(mean)[a]				
I do not like driving when it's dark outside.	3.02	3.08	3.20	3.25
I do not like driving on the highway.	2.28	2.24	2.30	2.43
I do not like driving in the snow or other inclement weather.	2.83	3.10	3.28	3.40
Employment				
Employment Status				
Employed	57.8%	62.7%	69.9%	70.3%
Unemployed	42.2%	37.3%	30.1%	29.7%

[a] *Respondents should have provided a rating on a Likert-scale ranging from 1 (Not true at all) to 5 (Very true)*

Table 3 (Continued)

Variables	Rural (n=97)	Suburban (n=279)	Town/village Center (n=163)	Urban (n=182)
Remote Work [a]				
Yes	50%	56.3%	46%	58.2%
No	50%	43.7%	54%	41.8%
Would/Could Remote Work [b]				
Yes	53.5%	49.3%	46.6%	39.6%
No	46.5%	50.7%	53.4%	60.4%
Intention to Move				
Stay Current Residence				
Not at all important	10.3%	15.1%	15.3%	28.0%
Slightly important	7.2%	14.7%	16.0%	17.6%
Moderately important	19.6%	28.0%	29.4%	20.9%
Very important	25.8%	21.1%	22.1%	16.5%
Extremely important	37.1%	21.1%	17.2%	17.0%
Move within a year				
Yes	6.2%	9.3%	12.3%	22.5%
Maybe	17.5%	24.4%	26.4%	25.8%
No	76.3%	66.3%	61.3%	51.6%

[a] *Percent of Employed (full time and part time) individuals who do or do not remote work.*

[b] *Percent of Employed (full time and part time) individuals that do not remote work and whether they would/could remote work.*

The survey also encompassed questions related to vehicle ownership and transportation preferences among respondents across different communities. In rural areas, all households reported having at least one vehicle, while a small proportion of suburban households (0.7%) and town center households (4.3%) lacked access to a vehicle. In contrast, 11% of urban households did not own a car. This disparity in vehicle ownership aligns with the transportation preferences observed in the survey. Urban households showed a higher inclination towards walking as a mode of travel to work (12.6%), in contrast to rural and suburban households (2.1% and 1.1% respectively). Car usage for commuting was somewhat higher in rural and suburban areas than it was in town centers and urban areas households (54.6%, 57%, 52.8%, 47.3% respectively). Respondents were also asked about their proximity to bus stations and whether they considered it within walking distance of their residence. 58.8% of suburban households claimed to be within walking distance of a bus stop, even though they rarely used the bus for commuting (1.4%), suggesting that there might be factors beyond proximity that influence their mode choice, such as the quality of bus services or individual preferences. While a majority of urban (94%) and town center households (66.3%) indicated being situated within walking distance of the bus station, a minority of rural households (5.2%) expressed the same proximity. Additionally, respondents' attitudes toward driving were explored on scale of 1 to 5, through several questions. On average, urban households (3.02) expressed slightly higher inclination towards disliking driving compared to rural households (2.70).

The employment rate varies significantly across communities. More people were employed in urban areas (70%), town center (69.9%), and suburban areas (62.7%) than rural areas (57.8%). Among employed respondents, approximately half work remotely at least some of the time in each community type, with the highest share in urban areas (58%). Similarly, about half of the respondents who do not currently work remotely express a desire to do so in rural, suburban and town center areas, while somewhat fewer urban respondents expressed a similar desire (40%).

Finally, we explored the respondents' intentions to move and desire to stay in their current home. Overall, respondents from rural, suburban, and town center communities expressed a stronger desire to stay in their current home than those in urban areas. Correspondingly, a smaller percentage of respondents from rural (6.2%), suburban (9.3%), and town center areas (12.3%) expressed an intention to move within the next year, than those in urban areas (22.5%). These trends are consistent with the fact that a majority of the rural population owns their home while many people in urban areas rent. Previous studies show that there is an association between homeownership and residential relocation, with homeowners being less likely to relocate (*15*).

3.2. Residential Dissonance Score

Two types of housing related dissonance were considered. First, we evaluated "location dissonance", a binary indicator centered around a mismatch in community preference. Location dissonance was evaluated by comparing respondents' current residential location with their preferred location type (e.g., rural, urban, suburban, town center). If respondents were residing in a location that did not align with their preferred location, we classified them as experiencing location dissonance.

Dissonant→ Individuals who do not reside in their preferred location.

Consonant→ Individuals who reside in their preferred location.

We also created a continuous dissonance score that we used to evaluate each respondent's level of dissonance with housing and community attributes and their overall housing choice. Housing dissonance scores combined information on the stated preferences and level of satisfaction with a wide range of housing and neighborhood attributes.

Stated preference questions were rated on a 1 (not important) to 5 (very important) Likert scale, while the satisfaction questions were rated on a -2 (unsatisfied) to 2 (satisfied) scale. Housing dissonance scores were created by multiplying the preference and satisfaction scores together for each attribute. These dissonance scores account for differences between respondents in both the importance they place on various attributes along with their level of satisfaction. For instance as shown in Table 4, an individual might be dissatisfied with both the cost of their house and access to park-and-ride infrastructure (both satisfaction scores = -1) but housing costs are much more important to them (preference score = 5) than the distance to park-and-ride infrastructure (preference score = 2). Multiplying the satisfaction score by the preference score (importance), we get the individual's dissonance score for housing cost and distance to park-and-ride infrastructure. The dissonance scores show that housing costs have a greater impact on the individual's overall housing dissonance than the distance to park-and-ride infrastructure.

Table 4 Example of satisfaction, preference, and housing dissonance scores

Statement	Satisfaction	Importance	Housing Dissonance Score
Housing costs (rent, mortgage, utilities, taxes, etc.)	-1	5	-10 -5 0 10
Distance to park-and-ride lot with bus service to work or school	-1	2	-10 -2 0 10

4. Results

4.1. Housing Location Dissonance

We first evaluate the mismatch between the type of community people currently live in and the type of community where they would prefer to live – a concept we call housing location dissonance (Table 5). Our analysis reveals that there is a 54% mismatch between respondents' current and preferred community type. In other words, more than half (54%) of the respondents expressed a preference to live in a different type of neighborhood (rural, urban, suburban, town center) than the type where they currently live. Suburban households exhibited the highest level of location dissonance (69%), followed by urban households (57%). Households in town centers (31%) and rural areas (43%) were least likely to be location dissonant.

Table 5 Location dissonance by community type

Current Location	Location Dissonance (%)
Rural	43%
Suburban	69%
Town Center	31%
Urban	57%
Chittenden County	54%

Next, we evaluated the preferred neighborhood type of location dissonant households (Figure 2). We find that greater than 50% of location dissonant households expressed a preference for living in a town or village center. Town and village centers were overwhelmingly the preferred housing location and those who are currently living in town and village centers were the least location dissonant. Rural areas were the second most preferred housing location while very few dissonant households expressed a desire to live in an urban area.

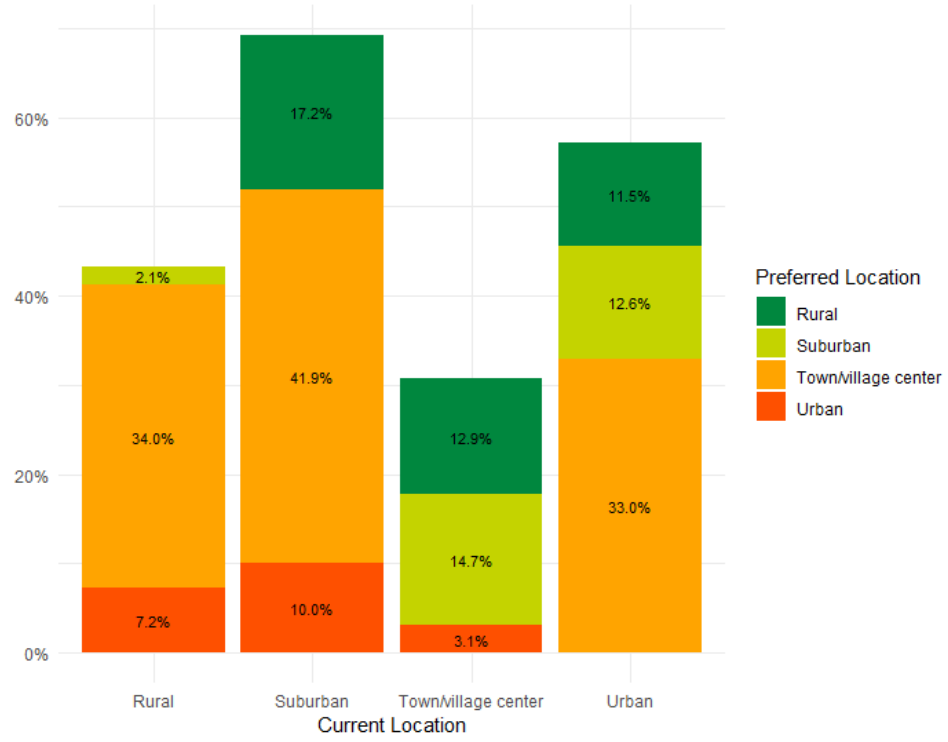

Figure 2 Housing location dissonance by community type

Figure 3 illustrates the percentage of location dissonance across various zip codes in Chittenden County. Among them, Charlotte, Burlington, and Colchester exhibit the highest rates of location dissonance. While Westford, Underhill, Richmond, and Huntington boast the lowest rates of location dissonance. The remaining zip codes demonstrate a moderate level of location dissonance.

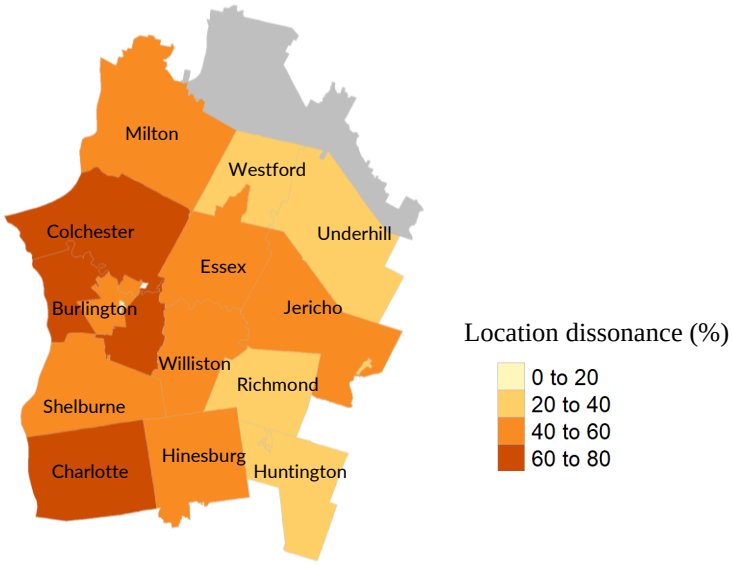

Figure 3 Location Dissonance by Zip Code in Chittenden County

4.2.Housing Preferences and Satisfaction Scores

4.2.1. Preference Scores

Next, we evaluate the preferences and level of satisfaction with various housing and neighborhood attributes to identify factors that may explain the amount of location dissonance in different community types. We break out our analysis of housing and neighborhood attributes by community type (urban, rural, suburban and town/village center) and by respondents who were location dissonant or consonant (i.e., those who were satisfied with the type of neighborhood where they currently live). We sought to understand the importance of various factors on housing choices and how it varies for consonant and dissonant individuals within each geographic area. It's essential to recognize that these factors reflect household preferences in their ideal housing and may not necessarily account for their motivation to relocate to a different area.

Table 6 presents the average preference scores for dissonant and consonant respondents within each community type. Figure 4 presents the same information as Table 6, but ranks the preferences for each attribute for each community type and dissonance group from most to least preferred and indicates the amount of variability in preferences. Across all communities, having access to internet and cell phone service, housing costs and public safety emerge as top priorities for most respondents. Upon closer examination within each community, notable differences between dissonant and consonant preferences become apparent.

The consonant group in rural areas prioritizes aspects such as having more physical space, proximity to nature and parks, outdoor recreation opportunities, and less congestion. On the other hand, the dissonant group in rural areas places greater importance on availability of parking (abundant and inexpensive in rural areas), housing cost, and proximity to amenities.

In suburban areas, the difference in preferences between the dissonant and consonant groups is not substantial. The consonant suburban households have a somewhat greater preference for school quality and proximity.

In town centers, there are discernible differences in preferences between the dissonant and consonant households. For the dissonant households, having physical space stands out as a more important consideration while access to public transit, availability of buses for errands, and the convenience of walking and biking for both errands and work appear to be less important factors than they are for consonant households in town and village centers.

The most notable disparity in preferences between the dissonant and consonant households is observed in urban areas. For the dissonant households, housing cost emerges as the most important factor, followed by considerations of safety, parking availability, proximity to amenities, and access to local parks. Conversely, consonant households in urban areas place greater importance on amenities, the convenience of using active modes of transportation (walking and biking for various trip purposes), proximity to leisure facilities (e.g., restaurants), and the presence of an exciting and vibrant environment.

Table 6 Average preference scores by community type

	Rural		Suburban		Town Center		Urban	
	C[*]	*D*[*]	*C*	*D*	*C*	*D*	*C*	*D*
Neighborhood Characteristics								
Living in a fast-paced, exciting area	1.3	1.9	2	2.1	2.3	2.1	3	2
Close to natural areas and open space (local parks)	4.2	4.2	4	4.1	4	3.8	4	4
Access to expansive outdoor recreation areas (hiking trails, skiing, mountain biking, etc.)	4	3.7	3	3.6	3.4	3.2	4	4
Living near family	2.9	2.8	3	2.7	2.9	2.8	3	3
Public school quality	3.4	3.5	4	3.1	3.3	3.4	3	3
Close to where you work and/or go to school	2.9	3	4	3.4	3.7	3.4	4	4
Close to where children in your household go to school	2.7	2.5	3	2.5	2.8	3.2	3	3
Close to essential amenities (grocery store, pharmacies, etc.)	3.4	4.2	4	4	4.2	3.9	5	4
Close to leisure and cultural activities (restaurants, playgrounds, cinema, etc.)	2.9	3.8	4	3.6	3.8	3.6	4	4
Being in a kid friendly neighborhood	2.6	3	3	2.9	3.1	3.3	3	3
Housing costs (rent/mortgage, utilities, taxes, etc.)	3.9	4.3	5	4.5	4.4	4.7	5	5
Access to convenient (frequent) and reliable transit	2.1	3.4	3	3.1	3.4	2.5	4	3
Physical separation from my neighbors	4.2	3.3	4	3.6	3.1	3.9	3	3
Reliable high-speed internet access	4.5	4.7	5	4.7	4.4	4.6	5	5
Reliable cell phone service	4.3	4.5	5	4.6	4.5	4.5	5	5
Living in an area where I can minimize my environmental impact	3.7	3.8	4	3.7	3.5	3.3	4	4
Good public safety and low crime	4.5	4.4	5	4.4	4.3	4.4	4	4
Housing Characteristics								
Financial costs related to all energy use (heating, cooling, electricity, etc.)	4	4.2	4	4.3	4	4.3	4	4
How much the home's energy use contributes to greenhouse gas emissions	3.5	3.5	3	3.5	3.3	3.2	4	4
Age of home	3.1	2.9	3	3	2.9	3.2	3	3
Alternative energy on home (solar panels, Tesla power wall, etc.)	3.5	3.5	3	3.4	3.2	3.2	3	3
Travel-related Characteristics								
Safe and convenient to walk or bike for errands and shopping trips	2.6	3.9	3	3.6	4	3.2	5	4
Safe and convenient to walk or bike to work	2.4	3.5	3	3.3	3.7	2.7	5	4
Safe and convenient to walk or bike to school	2.4	3.1	3	3	3.5	3.1	4	3
Walking distance to bus route for errands and shopping trips	2.1	3	3	2.9	3.2	2.2	4	3
Walking distance to bus route for getting to work or school	2	2.8	3	2.7	3.2	2.7	4	3
Distance to park-and-ride lot with bus service to work or school	2.3	2.8	2	2.3	2.5	2	3	3
Time it would take to drive to work or school	3.1	3.2	4	3.5	3.7	3.4	4	4
Amount of driving required to complete errands	3.2	4.1	4	3.9	3.9	3.6	4	4
Cost of local bus service	2.1	2.4	2	2.6	2.9	2.2	4	3
Parking cost at work	2.4	2.7	3	2.8	2.9	2.4	3	3
The cost of gasoline or diesel fuel used for driving	3.2	3.4	4	3.5	3.5	3.6	3	4
Financial cost of driving to work or school	2.8	3.1	3	3.2	3.3	3	4	3
Traffic congestion	3.9	3.9	4	3.8	3.7	3.5	4	4
Off-street parking availability (in a driveway or reserved parking space)	3.7	4.3	4	4.3	4.3	4.3	4	4
At-home electric vehicle charging	2.8	2.9	3	2.7	2.6	2.1	3	2
Nearby public electric vehicle charging	2.2	2.7	2	2.6	2.4	1.9	3	2
How the amount you drive contributes to climate change or greenhouse gas emissions	2.9	3.4	3	3.3	3.1	2.9	4	4

[*]*C* corresponds to location consonant; *D* corresponds to location dissonant.

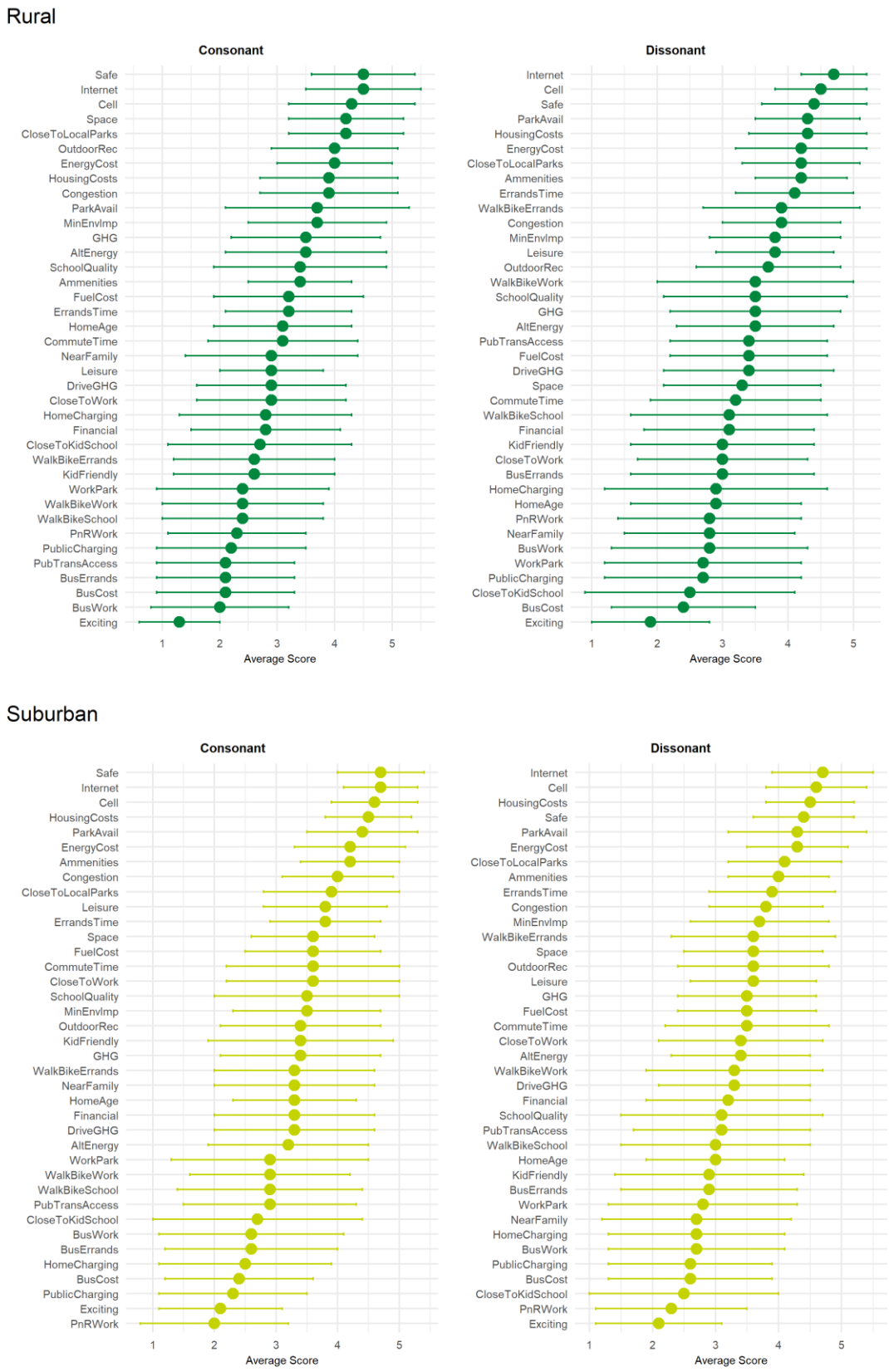

Figure 4 Preference score by community type (average with the standard deviation)

Figure 4 (Continued)

4.2.2. Satisfaction Scores

Table 7 presents the average satisfaction scores for dissonant and consonant respondents within each community type. Figure 5 presents the same information as Table 7 but ranks the satisfaction with each attribute for each community type and dissonance group from most to least satisfied and indicates the amount of variability in satisfaction. As anticipated, the overall findings indicate that dissonant respondents expressed lower levels of satisfaction with many aspects of their homes and neighborhoods, including transportation related attributes.

In rural areas, both the consonant and dissonant households were most dissatisfied with various aspects of transportation in their neighborhoods, including the availability of buses for errands, walking and biking options for commuting and errands, as well as access to transit. However, dissonant households displayed a higher level of dissatisfaction, as evidenced by their lower scores compared to consonant respondents. Both consonant and dissonant households in rural areas reported high levels of satisfaction with the availability of parking at home, proximity to parks and outdoor recreational activities, internet access, and overall safety.

In the suburban areas, both the consonant and dissonant households were most dissatisfied with fuel costs, availability of alternative energy options in their homes (such as solar panels), and the environmental impact of their driving in terms of greenhouse gas emissions. Dissonant suburban households also reported higher levels of dissatisfaction with the availability of walking and biking options for commuting to school, work, and errands, as well as the accessibility of electric vehicle (EV) chargers. Both consonant and dissonant households in suburban areas expressed satisfaction with certain factors, including parking availability at home, internet access, proximity to parks, and overall safety.

In town and village centers, consonant and dissonant households were most dissatisfied with the availability of alternative energy options at home, fuel costs, EV charger accessibility, housing costs, and energy expenses. Dissonant households also reported dissatisfaction with access to transit and the availability of walking and biking options for commuting to work.

In contrast to other community types, urban dissonant and consonant households were satisfied with the transportation characteristics of their neighborhoods, including walking and biking options for various trip purposes and access to public transit. However, consonant urban households were more dissatisfied with the availability of alternative energy options and electric vehicle (EV) chargers, as well as housing costs. Dissonant urban households were more dissatisfied with open space, housing costs, congestion, and safety.

Table 7 Average satisfaction scores by community type

	Rural		Suburban		Town Center		Urban	
	*C**	*D**	*C*	*D*	*C*	*D*	*C*	*D*
Neighborhood Characteristics								
Living in a fast-paced, exciting area	1	0.5	1.1	0.8	1	0.5	1.4	1.1
Close to natural areas and open space (local parks)	1.5	1.7	1.3	1.2	1.2	0.9	1.3	0.7
Access to expansive outdoor recreation areas (hiking trails, skiing, mountain biking, etc.)	1.5	1.6	1.2	1	0.8	0.8	0.9	0.6
Living near family	0.7	0.3	0.8	0.2	0.3	0.2	0.1	0.1
Public school quality	1.1	1.1	0.7	0.8	1	0.7	0.5	0.3
Close to where you work and/or go to school	0.2	0.1	0.2	0.3	0.4	0.3	0.3	0.4
Close to where children in your household go to school	0.5	0.1	0.5	0.5	0.8	0.5	0.3	0.3
Close to essential amenities (grocery store, pharmacies, etc.)	0.9	0.2	1.5	1.2	1.3	1.3	1.3	1.4
Close to leisure and cultural activities (restaurants, playgrounds, cinema, etc.)	0.6	0	1.2	0.8	1.1	1	1.6	1.3
Being in a kid friendly neighborhood	0.7	0.1	0.9	0.9	0.9	0.5	0.5	0.1
Housing costs (rent/mortgage, utilities, taxes, etc.)	-0.1	-0.3	0	0	-0.2	-0.2	-0.2	-0.4
Access to convenient (frequent) and reliable transit	-0.3	-1.2	-0.1	-0.1	0.2	-0.2	1	0.7
Physical separation from my neighbors	1.3	1	0.7	0.4	0.3	0.1	0.3	-0.5
Reliable high-speed internet access	1.2	1	1.5	1.3	1.4	0.9	1.5	1.5
Reliable cell phone service	0.8	0.1	1.1	1	1.1	0.7	1.6	1.4
Good public safety and low crime	1.5	1.5	1.3	1.1	1.2	1	0.3	-0.1
Housing Characteristics								
Financial costs related to all energy use (heating, cooling, electricity, etc.)	0	0.2	0	-0.1	-0.1	-0.4	0.1	-0.1
How much the home's energy use contributes to greenhouse gas emissions	0.1	0.2	0	-0.1	-0.2	-0.2	-0.1	-0.3
Age of home	0.9	0.7	0.7	0.3	0.4	0.3	0.5	0.2
Alternative energy on home (solar panels, Tesla power wall, etc.)	0.1	-0.1	-0.3	-0.4	-0.7	-0.8	-0.6	-0.8
Travel-related Characteristics								
Safe and convenient to walk or bike for errands and shopping trips	-0.4	-1.1	0.4	-0.2	0.5	0	0.9	0.6
Safe and convenient to walk or bike to work	-0.4	-0.9	0	-0.5	0	-0.3	0.6	0
Safe and convenient to walk or bike to school	-0.1	-0.8	0.2	-0.2	0.4	-0.1	0.5	0.3
Walking distance to bus route for errands and shopping trips	-0.6	-1.3	0	-0.2	0.3	-0.1	1	0.7
Walking distance to bus route for getting to work	-0.3	-1.1	0.1	-0.3	0.3	0	0.8	0.6
Walking distance to bus route for getting to school	-0.1	-0.3	0.2	0	0.5	0.3	0.7	0.6
Distance to park-and-ride lot with bus service to work or school	-0.2	-0.4	-0.1	-0.2	-0.1	-0.3	0	-0.1
Time it would take to drive to work or school	0.1	0.1	0.6	0.5	0.7	0.4	0.6	0.8
Amount of driving required to complete errands	0.3	-0.8	0.9	0.4	0.6	0.4	0.8	0.8
Cost of local bus service	0	0.2	0.2	0.6	0.7	0.1	1.2	0.8
Parking cost at work	0.4	0.5	0.4	0.4	0.4	0.3	0.4	0.5
The cost of gasoline or diesel fuel used for driving	-0.5	-0.8	-0.4	-0.5	-0.4	-0.7	-0.1	-0.4
Traffic congestion	0.6	0.5	0.3	0.2	0.1	0	0.2	-0.2
Off-street parking availability (in a driveway or reserved parking space)	1.9	1.7	1.5	1.5	1.6	1	1.3	1.1
At-home electric vehicle charging	-0.2	-0.3	0	-0.3	-0.3	-0.7	-0.5	-0.5
How the amount you drive contributes to climate change or greenhouse gas emissions	-0.2	-0.7	-0.1	-0.1	-0.1	0	0.1	0

*C corresponds to location consonant; *D* corresponds to location dissonant.

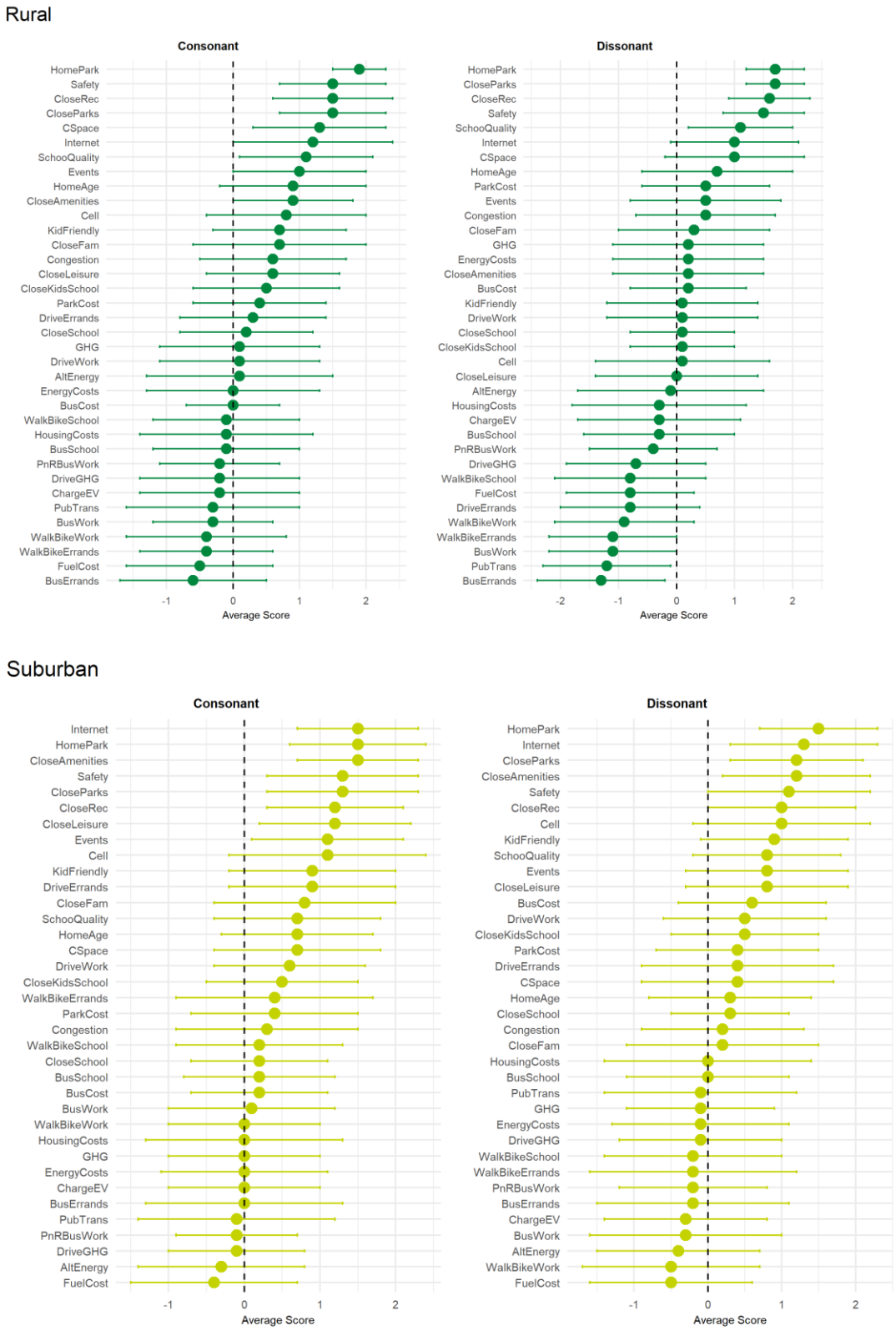

Figure 5 Satisfaction score by community type (average with the standard deviation)

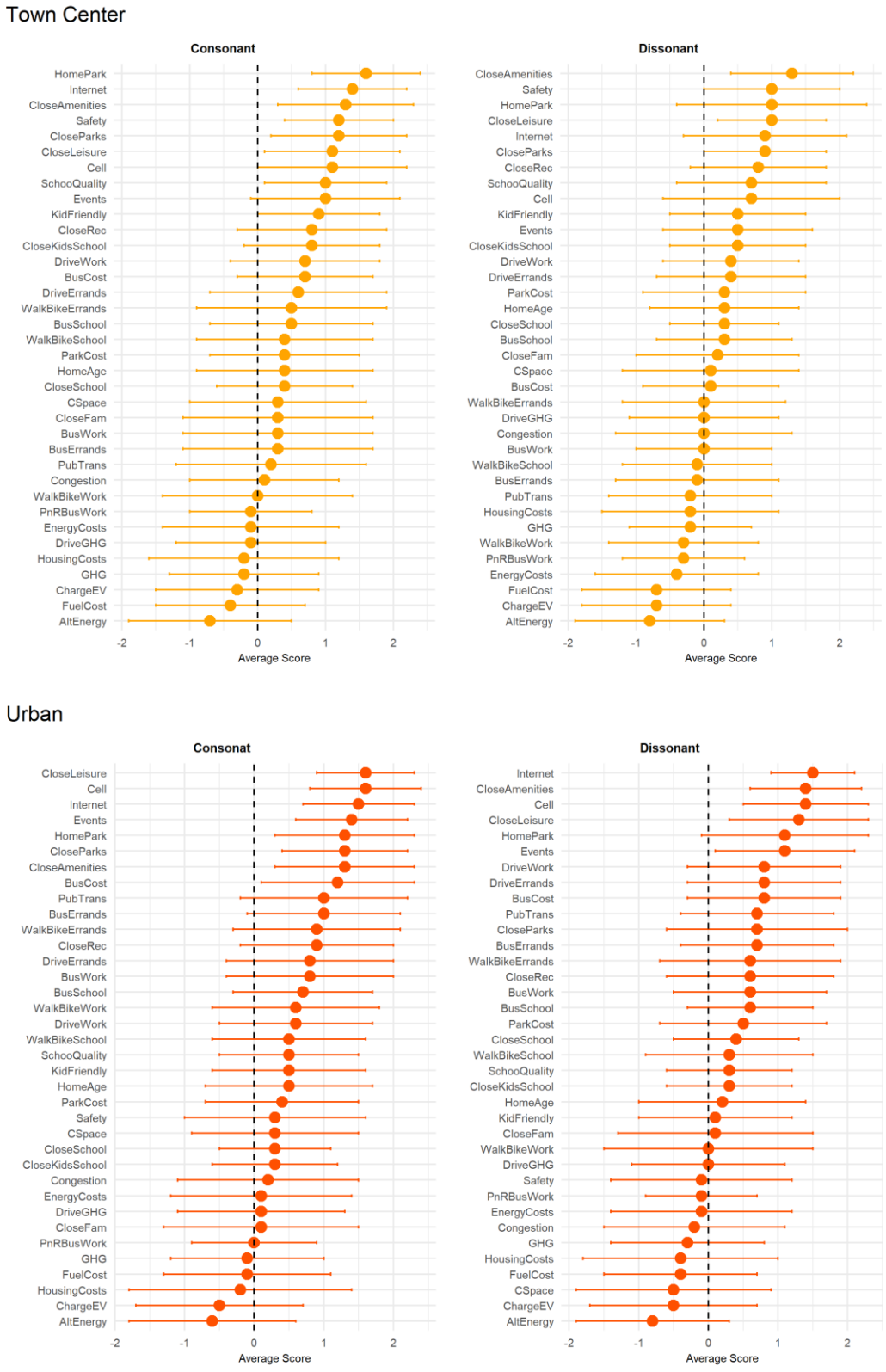

Figure 5 (Continued)

4.3. Housing Dissonance Scores

Finally, we evaluate housing dissonance scores that quantify the mismatch between housing preferences and current housing attributes. Table 8 presents the average housing dissonance scores for both dissonant and consonant individuals within each community type. Figure 6 presents the same information as Table 8, but ranks the dissonance score with each attribute for each community type and dissonance group from most to least dissonant and indicates the amount of variability in housing dissonance score. Overall, location dissonant respondents exhibit lower (more dissonant) overall housing dissonance scores. In other words, dissonant respondents generally express higher levels of dissatisfaction with each aspect of their home and neighborhood than consonant respondents. When comparing housing dissonance scores across community types, rural households that are location dissonant stand out as the most housing dissonant group. While there is a higher percentage of location dissonant respondents in suburban areas (as shown in Figure 2), their overall housing dissonance is less than those in rural areas. The cost of housing, energy use and at-home electric vehicle charging availability were sources of dissonance in all community types and location dissonant groups.

Taking a closer look at rural areas, we observe distinct patterns in the levels of dissonance among rural location consonant and dissonant households. Both location consonant and dissonant rural households were most dissonant with respect to transportation related attributes of their communities, including walking, bicycling, and transit access, the amount they had to drive and fuel costs. However, rural location dissonant households had much lower dissonance scores for these transportation related factors than consonant households. Location dissonant rural households also had negative dissonance scores on attributes related to proximity to schools, work and activities other than those associated with outdoor recreation and nature, while location consonant households had positive scores.

Housing dissonance scores for both location consonant and dissonant household in suburban areas were generally similar, with location dissonant households showing slightly lower housing dissonance scores on most attributes. Like rural households, transportation-related factors were a large source of dissonance, though to a lesser degree than in rural areas. In suburban areas, proximity to work, school and other amenities received positive dissonance scores unlike what we found in rural areas.

The least amount of location dissonance was found in town and village centers, and unsurprisingly we find the least amount of housing dissonance here as well. Housing costs, energy use and the ability to charge an EV at home were the main sources of dissonance. Location dissonant and consonant households were very similar.

While more than 50% of urban households were location dissonant and few other location dissonant households expressed a desire for urban areas, urban households on average had the least housing dissonance. That is people in urban areas were generally the most satisfied out the four community types we considered with respect to the attributes of their homes and neighborhoods that we evaluated. Urban households, unlike most other households, had positive transportation related dissonance scores. Housing costs were a larger source of dissonance in urban areas than in other areas, but surprisingly by only a relatively small margin. Public safety received substantially

Table 8 Average housing dissonance score by community type

	Rural		Suburban		Town Center		Urban	
	C*	***D****	***C***	***D***	***C***	***D***	***C***	***D***
Neighborhood Characteristics								
Living in a fast-paced, exciting area	1.3	0.7	2.3	1.7	2.3	0.7	4.4	2.5
Close to natural areas and open space (local parks)	6.6	7.4	5.3	5	4.7	3.6	5.7	2.9
Access to expansive outdoor recreation areas (hiking trails, skiing, mountain biking, etc.)	6.1	6.2	4.4	3.7	3	2.8	3.4	2.1
Living near family	2.9	1.8	3.1	1.2	1.4	1	0.8	0.8
Public school quality	4.2	4	3	2.8	3.8	2.8	2	1
Close to where you work and/or go to school	1.1	0.1	1	1.1	1.8	1.2	1.4	1.7
Close to where children in your household go to school	1.7	0.5	2	1.4	2.8	2.2	1.5	1.2
Close to essential amenities (grocery store, pharmacies, etc.)	3	0.8	6.4	4.7	5.3	4.9	6.1	5.9
Close to leisure and cultural activities (restaurants, playgrounds, cinema, etc.)	1.8	-0.2	4.9	2.8	4.2	3.5	7	4.5
Being in a kid friendly neighborhood	2.1	0.7	3.7	3.2	3.1	1.8	2.1	0.7
Housing costs (rent/mortgage, utilities, taxes, etc.)	-0.6	-1.5	-0.3	-0.9	-0.7	-1.2	-1.4	-2
Access to convenient (frequent) and reliable transit	-0.8	-4.1	-0.2	-0.2	0.6	-0.4	4.4	2.5
Physical separation from my neighbors	5.5	2.9	2.4	1.3	0.6	-0.1	0.7	-1.8
Reliable high-speed internet access	5.4	4.6	7.2	6.3	6	4.5	7	6.8
Reliable cell phone service	3.6	0.7	5.1	4.7	5.3	3.4	7.2	6.3
Good public safety and low crime	6.8	6.8	6	4.9	5.4	4.3	1.1	-0.6
Housing Characteristics								
Financial costs related to all energy use (heating, cooling, electricity, etc.)	-0.5	0.6	-0.1	-0.5	-0.4	-1.6	0.1	-0.6
How much the home's energy use contributes to greenhouse gas emissions	0	0.7	-0.1	-0.6	-0.8	-0.8	-0.5	-1.3
Age of home	2.9	2	2.1	0.7	1	0.9	1.2	0.6
Alternative energy on home (solar panels, Tesla power wall, etc.)	0.3	0	-0.8	-1.6	-2.3	-3.1	-2.2	-2.8
Travel-related Characteristics								
Safe and convenient to walk or bike for errands and shopping trips	-1.6	-4.7	1.4	-0.4	2	0.3	4.2	2.7
Safe and convenient to walk or bike to work	-1	-3.8	0	-1.6	-0.3	-0.3	3	0.4
Safe and convenient to walk or bike to school	-0.4	-2.9	0.6	-0.6	1.6	0	2.2	1.5
Walking distance to bus route for errands and shopping trips	-1.7	-4.5	-0.1	-0.7	0.9	0	4.4	2.5
Walking distance to bus route for getting to work	-0.9	-3.3	0.2	-0.7	0.8	0.2	3.7	2.1
Walking distance to bus route for getting to school	-0.5	-0.8	0.7	0.1	1.5	1	2.9	2
Distance to park-and-ride lot with bus service to work or school	-0.5	-1	-0.3	-0.5	-0.3	-0.9	0	0
Time it would take to drive to work or school	0.1	0.5	2.6	1.7	2.9	1.5	2.6	3.2
Amount of driving required to complete errands	0.4	-3.2	3.4	1.6	2.3	1.5	3.4	3.4
Cost of local bus service	0.2	0.6	0.6	1.9	2	0.2	4.8	2.4
Parking cost at work	1	1.1	1.4	1.2	1.1	0.1	1.2	1.2
The cost of gasoline or diesel fuel used for driving	-2.1	-3.1	-1.4	-2.3	-2.1	-3	-0.7	-1.6
Traffic congestion	2.4	1.9	0.7	0.5	0	-0.3	0.8	-1
Off-street parking availability (in a driveway or reserved parking space)	7	7.5	6.7	6.6	6.7	4.8	5.2	4.6
At-home electric vehicle charging	-0.2	0	0.4	-0.8	-0.8	-1.8	-1.4	-0.9
How the amount you drive contributes to climate change or greenhouse gas emissions	-0.9	-2.4	-0.5	-0.6	-0.5	-0.2	0.5	0.1

**C* corresponds to location consonant; *D* corresponds to location dissonant.

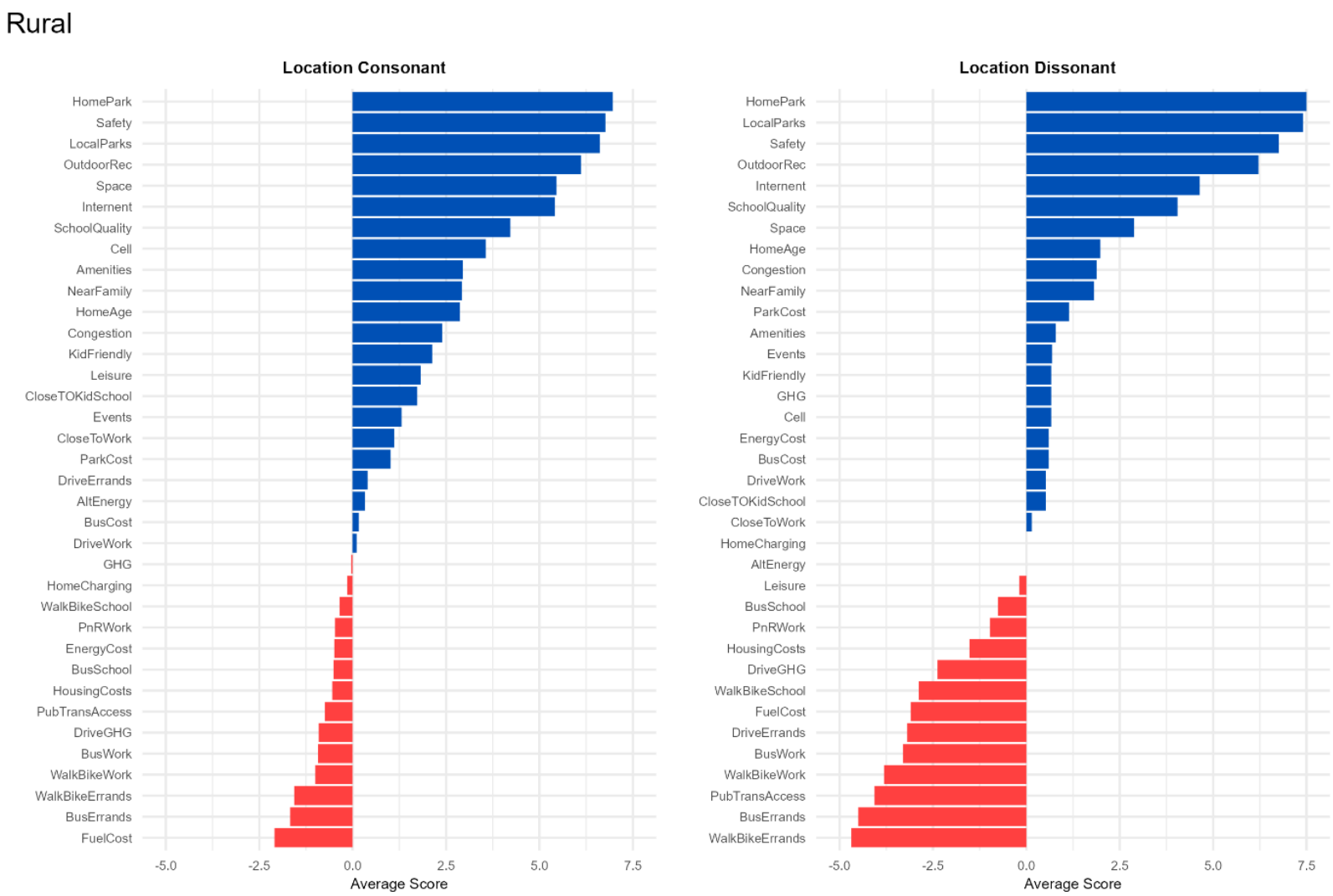

Figure 6 Average housing dissonance score by community type and location dissonance [a].

[a] Negative scores (red) indicate dissatisfaction while positive scores (blue) indicate satisfaction. Larger scores (negative or positive) indicate greater levels of dissatisfaction or satisfaction combined with greater levels of importance.

Suburban

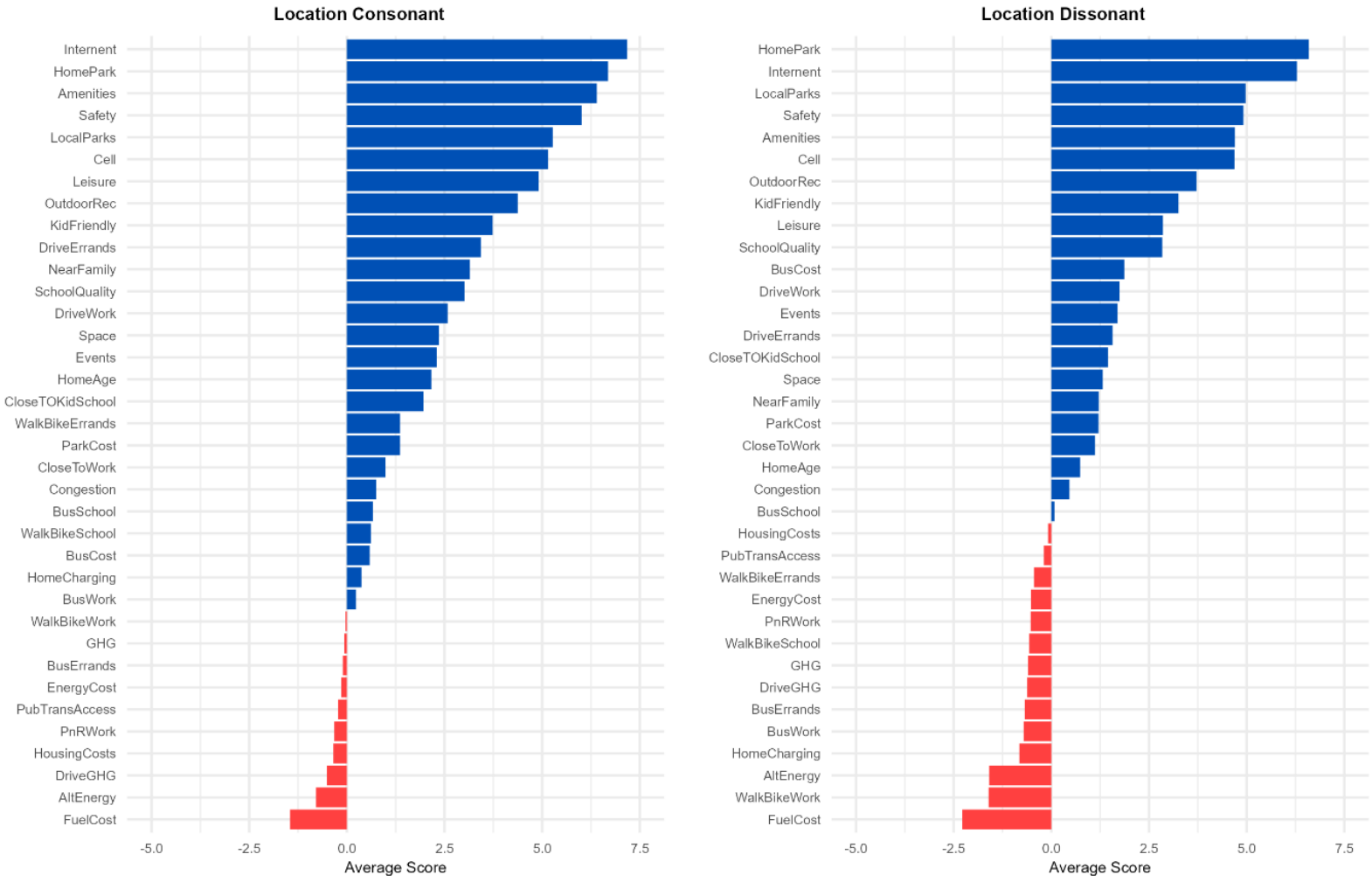

Figure 6 (Continued)

TownCenter

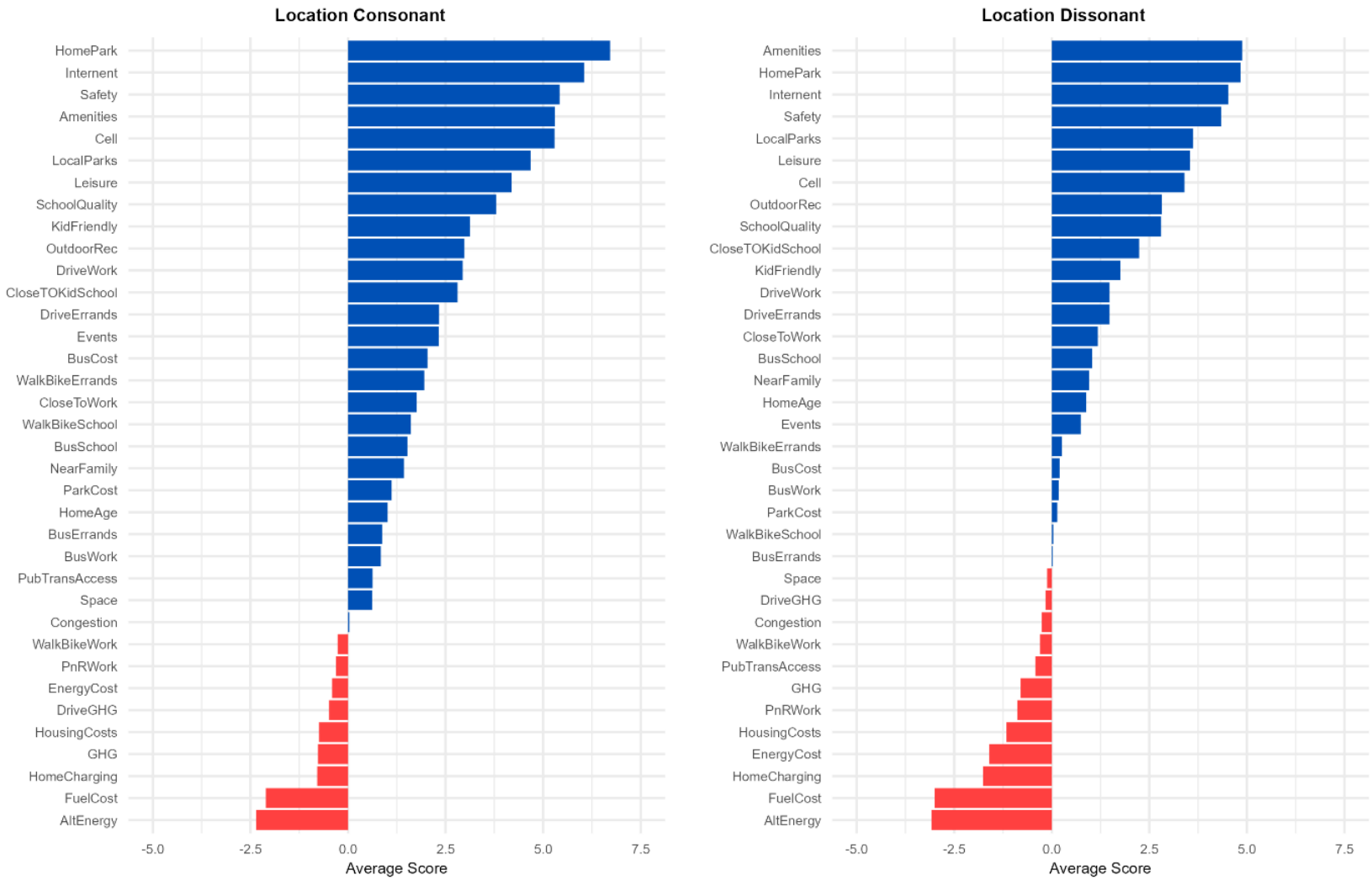

Figure 6 (Continued)

Urban

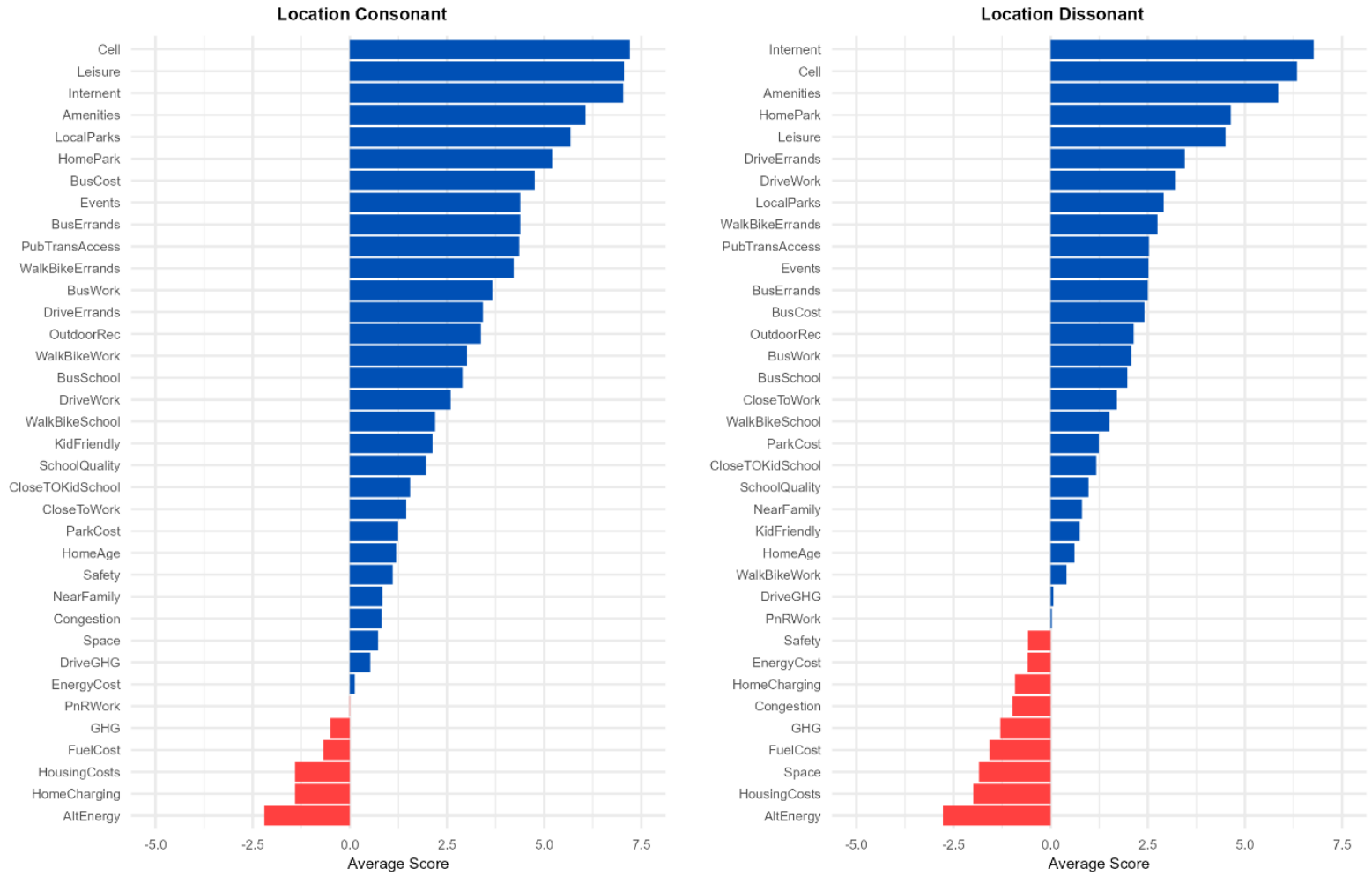

Figure 6 (Continued)

lower dissonance scores in urban areas than all other areas. Location dissonant urban households also had notably lower scores for safety, traffic congestion, safe to walk and bike to work, physical separation from neighbors and proximity to natural areas and open space than location consonant urban households did.

4.4. Urban to Rural/Rural to Urban

We also focus our analysis on two groups of location dissonant households where we expect the largest impacts on travel behavior if they were to actually move: households currently living in urban areas with a preference for rural areas and households living in rural areas with a preference for urban areas. Table 9 provides a summary of the socioeconomic characteristics of these two household groups. The small number of households in these two groups should be considered when interpreting the values in Table 9. A larger sample of data could reveal different conclusions, particularly regarding the rural to urban group (n = 7).

Rural dissonant households with a preference for urban areas in our sample tend to be older and have higher income compared to urban dissonant households with a preference for rural areas. Similar to the previous findings, a great proportion of rural dissonant households live in single family homes (85.7%) unlike urban dissonant households (33.3%). Moreover, rural dissonant households have a somewhat higher score on driving attitudes compared to urban dissonant households, indicating their preference towards not driving. While the employment rate is similar for both of the groups, a greater proportion of urban dissonant households work remotely (61.5%) compared to rural dissonant households (25%).

Regarding the intention to move, a substantial contrast is observed between urban households desiring to relocate to rural areas and rural households seeking to move to urban areas. Among urban households intending to live in rural areas, a majority (61.9%) deem staying in their current location as not at all important unlike rural dissonant households (28.6%). While 42.9% of urban dissonant households express a strong desire to move within the next year only 14.3% of rural dissonant households them express their intention not to move within the next year, indicating a preference for stability and longer-term residence.

Table 9 Summary statistics of variables for rural to urban movers and vice versa

Variables	Rural To Urban (n=7)	Urban To Rural (n=21)
Demographics		
Age		
18-34	14.3%	28.6%
35-54	28.6%	28.6%
55-64	0	33.3%
>65	57.1%	9.5%
Ethnicity		
Hispanic	0	9.5%
Non-Hispanic	100%	90.5%
Race		
White	100%	81.0%
Other	0	19.0%
Income		
Less than $34,999	0	47.6%
$35,000 to $74,999	42.9%	28.5%
$75,000 to 149,999	42.9%	19.0%
Over $150,000	14.3%	4.8%
Children		
Yes	28.6%	14.3%
No	71.4%	85.7%
Number Adults (mean)	2.1	1.8
Housing Characteristics		
Type of Residence		
Single family home (no shared walls)	85.7%	33.3%
Multi-family home/Apartment (shared walls)	0	66.7%
Other	14.3%	0
Housing Status		
Rent	14.3%	61.9%
Own	85.7%	38.1%
Other	0	0
Vehicle and Transportation		
Number of Vehicles		
Zero	0	4.8%
One	14.3%	66.7%
Two or more	85.7%	28.6%
Work Mode		
Walk	0	4.8%
Bike	0	0
Bus	0	4.8%
Car	57.1%	66.7%
Not Applicable	42.9%	23.8%
Walking Distance to Bus		
Yes	0	100.0%
Unsure	14.3%	0
No	85.7%	0
Driving Attitude(mean)[a]		
I do not like driving when it's dark outside.	3.4	3.1
I do not like driving on the highway.	2.4	1.8
I do not like driving in the snow or other inclement weather.	3.0	3.0

[a] *Respondents should have provided a rating on a Likert-scale ranging from 1 (Not true at all) to 5 (Very true)*

Table 9 (Continued)

Variables	Rural To Urban (n=7)	Urban To Rural (n=21)
Employment		
Employment Status		
Employed	57.2%	61.9%
Unemployed	42.9%	38.1%
Remote Work [a]		
Yes	25%	61.5%
No	75%	38.5%
Would/Could Remote Work [b]		
Yes	66%	40%
No	33%	60%
Intention to Move		
Stay Current Residence		
Not at all important	28.6%	61.9%
Slightly important	0	9.5%
Moderately important	14.3%	23.8%
Very important	28.6%	4.8%
Extremely important	28.6%	0
Move within a year		
Yes	14.3%	42.9%
Maybe	28.6%	28.6%
No	57.1%	28.6%

[a] *Percent of Employed (full time and part time) respondents who do or do not remote work.*

[b] *Percent of Employed (full time and part time) respondents that do not remote work and whether they would/could remote work.*

Finally, we compared the housing dissonance scores for these two groups (Figure 7). Urban dissonant respondents with a preference for rural areas show more discontent with living space, housing costs, safety, congestion, and fuel costs. On the other hand, rural dissonant respondents with a preference for urban areas were more discontented with transportation-related factors including transit accessibility, the availability of buses for errands, and the options for walking and biking to work and errands.

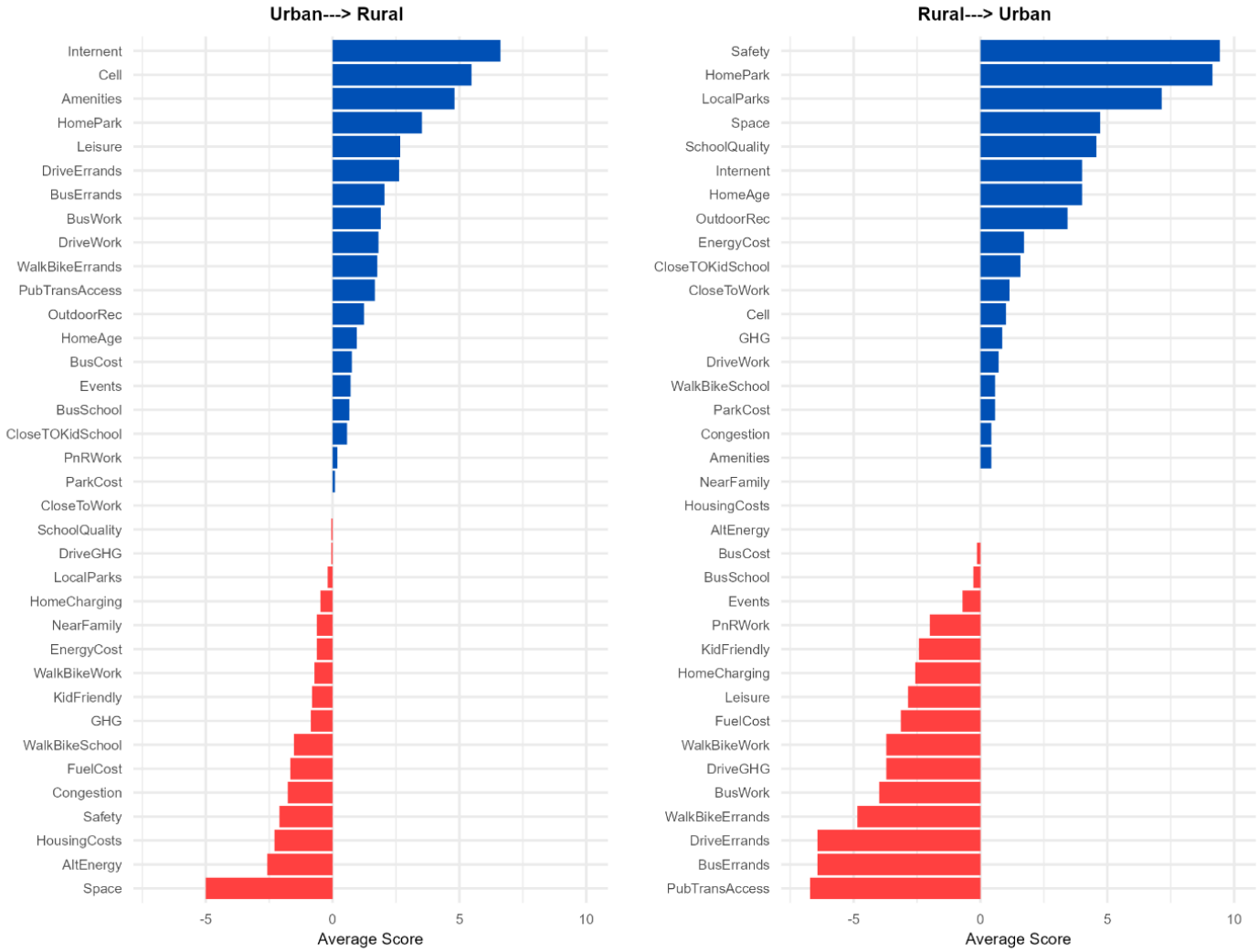

Figure 7 Average housing dissonance score for respondents who would like to move from urban to rural and vice versa [a].

[a] *Negative scores (red) indicate dissatisfaction while positive scores (blue) indicate satisfaction. Larger scores (negative or positive) indicate greater levels of dissatisfaction or satisfaction combined with greater levels of importance.*

5. Conclusions

The main objectives of this research study were to better understand housing location preferences in Chittenden County, Vermont and how well current housing arrangements meet the needs and preferences of current residents. We evaluated housing preferences and how well they are satisfied by measuring the amount of dissonance in residents' current housing location and various attributes of their housing and community. In this final section of the report, we discuss how AVs, EVs and greater availability of work from home opportunities could further affect housing location dissonance and the likelihood of households moving to different types of communities and how this could impact travel.

We found that more than half (54%) of the respondents we surveyed are location dissonant. They prefer to live in a different type of neighborhood than they currently do. Town and village centers were overwhelming the preferred housing location choice of most respondents while urban areas were least preferred. Suburban areas had the largest share of location dissonant respondents followed by urban and rural areas, while town and village center had the least location dissonance. The strong preference for town and village centers is encouraging from a transportation sustainability perspective as they are generally associated with greater opportunities for active travel and less vehicle travel than suburban and dispersed rural areas due to shorter travel distances to various amenities and needs. Compact town centers and villages may also offer greater opportunities for more efficient and effective transit service.

When we evaluated how particular attributes of homes and communities affected overall housing dissonance levels, we found that transportation and accessibility related factors were often a source of discontent. In this context, accessibility is the ease (typically measured in distance, travel time or cost) with which individuals can get to the places, goods and services they need or desire (*16*). The level of discontent with transportation and accessibility related factors was greatest in rural and suburban areas while there was much less discontent with these factors in town centers and urban areas. These findings suggest that location dissonant households in rural and suburban areas in Chittenden County are looking towards town and village centers to increase their access to amenities and services and reduce their automobile dependance. Many rural and suburban dissonant respondents indicated a desire for better walking, cycling and transit opportunities to get to work, school and accomplish errands. These results suggest that there may be a significant unmet demand for more compact and mixed-use development outside of the more urbanized Burlington area and an oversupply of suburban development. Addressing this housing market supply mismatch could help reduce vehicle travel demand and increase the use of alternative and more sustainable modes of travel.

For location dissonant households in town and village centers and urban areas, transportation and accessibility were generally not a source of discontent. Instead, public safety, safety concerns with walking and bicycling, space (separation from neighbors), and housing prices were the main sources of dissonance. Location dissonant households in town and village centers and urban areas also had somewhat lower preferences for urban amenities and less satisfaction with their access to natural amenities which could also further explain their level of discontent. Some of these factors are incompatible with urban living, such as greater separation from neighbors and others are

challenging to address such as higher housing prices and higher crime rates or the perception of their being more crime. Addressing these challenges could help urban areas like Burlington compete with town and village centers as a more preferred alternative to living in rural and suburban areas. It is also important to note that respondents in urban areas on average had the least overall housing dissonance. While urban households are dissatisfied with some aspects of living in an urban area and some preferred living in a more rural setting, they have lower levels of discontent about most factors we evaluated than households in other areas. Urban households were on average the most content with their housing. These findings suggest that urban areas will likely remain attractive places to live for those who currently live in them.

AVs can influence travel behavior by reducing the burden of driving or its implicit cost. Essentially, time spent in an AV where you do not need to drive may not seem as long or burdensome. Other tasks besides driving can be accomplished. AVs could therefore reduce the amount of discontent that households have with travel distances, congestion, proximity to work, retail, school and other places and a desire for better transit service. Rural and suburban households had the greatest amount of discontent with transportation and accessibility related factors. AVs could therefore reduce the level of existing housing location dissonance in rural and suburban areas and reduce the potential demand for housing in town and village centers and urban areas. AVs could therefore reinforce existing development and travel behavior patterns. While we find that households in urban areas are relatively content with transportation and accessibility related factors, AVs could still have an impact by providing an opportunity for households that are discontent with other aspects of urban living such as space and safety to move to a less urban environment while still enjoying some level of greater accessibility that does not require driving themselves. However, given that we find urban respondents to be on average the least dissonant (most satisfied) with their housing choices, AVs are unlikely to compel a significant number of current urban residents to move to more rural areas. Another potential impact of AVs is in the search for less expensive housing. Housing costs were seen as a source of discontent everywhere and it's possible that AVs could allow households to seek more affordable housing options even further from existing amenities and travel destinations. However, it is important to also note that there is an apparent strong preference for being near amenities and having an opportunity to walk, bike and use transit to reach them, or at least drive less. While driving in an AV may make car travel less burdensome, it is unlikely to completely substitute for the desire to be within closer proximity to many things.

EVs may reduce the cost of driving and would reduce the amount of GHG emissions from a vehicle trip. The cost of fuel was a large source of discontent for households outside of urban areas. Therefore, EVs may reduce this source of dissonance and reduce the potential desire for rural and suburban households to move to more urbanized areas to save on fuel costs. Furthermore, we found that location dissonant rural households had the highest level of discontent about how their driving contributed to GHG emissions. EVs could reduce or eliminate this large source of discontent for these households and reduce the potential that they move to more urbanized and transportation efficient communities. The concern with GHG emissions from driving in other community types were generally lower and of similar magnitude between consonant and dissonant households.

The impact of greater opportunities to work from home on housing location choice is less clear. Many respondents already work from home and about half of those who do not work from home would like the opportunity to do so. While remote work can reduce discontent with the time it takes to travel to work and proximity to work, these factors were surprisingly not a major source of discontent in any of the community types we evaluated. While rural and suburban households had lower dissonance scores for time to travel to work and proximity to work, they were still on average positive. Other accessibility and transportation factors such as the ability to walk, bike, use transit and be near various amenities were much larger sources of dissonance and have negative scores. This suggests the work from home may not have a significant impact on housing location dissonance and where people ultimately choose to live. That said, it is possible that remote work combined with an increase in e-retail and other service delivery could reduce discontent with access to other amenities and services which could have a larger impact on dissonance.

Where people choose to live is a complex decision-making process as are the connections between land-use and travel behavior. This study uses the concept of dissonance as a unique lens to evaluate the potential impacts of disruptive transportation technologies such as AVs, EVs and remote work on where people may choose to live and by extension how that could affect travel. The results are based on a sample of 721 people living in Chittenden County and focused on a range of attributes principally related to satisfaction with their housing location. There may be other factors that are more important in housing location decisions. Furthermore, while land-use is known to affect travel behavior, including overall travel demand and mode choice, the interactions are complex and there is large degree of uncertainty about their magnitude (*17–19*). More compact and mixed-use development is associated with less vehicle travel demand and greater use of alternatives to single occupancy passenger vehicles, but the size of this affect, particularly in less studied smaller urban areas and rural communities like those in Vermont is highly uncertain. What is clear, however, is that living in more compact and mixed-use communities presents greater opportunities for reducing travel demand and making greater use of alternatives. We find it encouraging that many people we surveyed would prefer to live in a more compact village or town center and want to drive less. The challenge seems to be providing more housing in compact and mixed use areas, particularly outside of the core urban area.

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7. Appendix A

CCRPC Housing Dissonance Survey

Start of Block: Section 1: Consent to Participate

Q1.1
The University of Vermont Transportation Research Center (UVM TRC), in partnership with the Chittenden County Regional Planning Commission (CCRPC), is conducting a study on the level of satisfaction of housing location for individuals living in Chittenden County, VT. We will use this information to better understand current location choices and determine how disruptive transportation factors may affect future housing location choices.

Thank you for your help with this effort. For more information on the study, including risks regarding personal information as a participant, click: Research Information Sheet. At the end of the survey, you will have the opportunity to enter a drawing for one of ten $50 cash cards.

If you consent to participating, click "Next" to begin. If you do not consent, you may close the survey.

End of Block: Section 1: Consent to Participate

Start of Block: Section 2: Neighborhood, Housing and Travel Preferences

Q2.1 The following questions relate to your preferred housing choices. Think about them in the context of "If you were in the market for a new residence, what would your preferred options be?"

Q2.2 *If you were in the market for a new residence…*

What type of neighborhood would you **prefer to live in**?

○ Urban center (a densely developed area with a mix of residential and commercial buildings)

○ Suburban (less densely developed residential area)

○ Town/Village center (a developed area with a mix of residential and commercial buildings within a rural or suburban community)

○ Rural (sparsely developed and populated area)

Q2.3 What type of home (residence) would you be most interested in?

- ○ Single family home (no shared walls)
- ○ Multi-family home / apartment (shared walls)
- ○ University or college residential housing (dormitory or on-campus apartment for students)
- ○ Mobile home
- ○ Accessory dwelling unit (smaller, independent dwelling located on the same lot as an existing single-family home)
- ○ Other (please describe) _____

Q2.4 Select the option that best describes your housing status **preference**.

- ○ I would like to own my residence
- ○ I would like to rent my residence
- ○ Other _____

Q2.5

If you were in the market for a new residence…

On a scale of 1 (Not Important) to 5 (Extremely Important), how important would the following **neighborhood characteristics** be to your **preferred** housing choice:

	1	2	3	4	5
Living in a fast-paced, exciting area	○	○	○	○	○
Close to natural areas and open space (local parks)	○	○	○	○	○
Access to expansive outdoor recreation areas (hiking trails, skiing, mountain biking, snowmobile trails, etc.)	○	○	○	○	○
Living near family	○	○	○	○	○
Public school quality	○	○	○	○	○
Close to where you work and/or go to school	○	○	○	○	○
Close to where children in your household go to school	○	○	○	○	○
Close to essential amenities (grocery store, pharmacies, doctor’s office, etc.)	○	○	○	○	○

Close to leisure and cultural activities (restaurants, playgrounds, cinema, etc.)	○	○	○	○	○
Being in a kid friendly neighborhood	○	○	○	○	○
Housing costs (rent/mortgage, utilities, taxes, etc.)	○	○	○	○	○
Access to convenient (frequent) and reliable public transit	○	○	○	○	○
Physical separation from my neighbors	○	○	○	○	○
Reliable high-speed internet access	○	○	○	○	○
Reliable cell phone service	○	○	○	○	○
Living in an area where I can minimize my environmental impact	○	○	○	○	○
Good public safety and low crime	○	○	○	○	○

Q2.6
If you were in the market for a new residence…

On a scale of 1 (Not Important) to 5 (Extremely Important), how important would the following factors be for your **preferred** housing choice:

	1	2	3	4	5
Financial costs related to all energy use (heating, cooling, electricity, etc.)	○	○	○	○	○
How much the home's energy use contributes to greenhouse gas emissions	○	○	○	○	○
Age of home	○	○	○	○	○
Alternative energy on home (solar panels, Tesla power wall, etc.)	○	○	○	○	○

Q2.7 *If you were in the market for a new residence…*

On a scale of 1 (Not Important) to 5 (Extremely Important), how important would the following **travel related considerations** be to your **preferred** housing choice:

	1	2	3	4	5
Safe and convenient to walk or bike for errands and shopping trips	○	○	○	○	○
Safe and convenient to walk or bike to work	○	○	○	○	○
Safe and convenient to walk or bike to school	○	○	○	○	○
Walking distance to bus route for errands and shopping trips	○	○	○	○	○
Walking distance to bus route for getting to work or school	○	○	○	○	○
Distance to park-and-ride lot with bus service to work or school	○	○	○	○	○
Time it would take to drive to work or school	○	○	○	○	○
Amount of driving required to complete errands and shopping trips	○	○	○	○	○

Cost of local bus service	○	○	○	○	○
Parking cost at work	○	○	○	○	○
The cost of gasoline or diesel fuel used for driving	○	○	○	○	○
Financial cost of driving to work or school	○	○	○	○	○
Traffic congestion	○	○	○	○	○
Off-street parking availability (in a driveway or reserved parking space)	○	○	○	○	○
At-home electric vehicle charging	○	○	○	○	○
Nearby public electric vehicle charging	○	○	○	○	○
How the amount you drive contributes to climate change or greenhouse gas emissions	○	○	○	○	○

End of Block: Section 2: Neighborhood, Housing and Travel Preferences

Start of Block: Section 3: Current Neighborhood, Housing and Travel Information

Q3.1 This section will ask you a few brief questions related to your current housing location and vehicle information.

Q3.2 Select the type of neighborhood you **currently live in**.

○ Urban center (a densely developed area with a mix of residential and commercial buildings)

○ Suburban (less densely developed residential area)

○ Town/Village center (a developed area with a mix of residential and commercial buildings within a rural or suburban community)

○ Rural (sparsely developed and populated area)

Q3.3 Select the type of residence you **currently live in**.

- ○ Single family home (no shared walls)
- ○ Multi-family home / apartment (shared walls)
- ○ University or college residential housing (dormitory or on-campus apartment for students)
- ○ Mobile home
- ○ Accessory dwelling unit (smaller, independent dwelling located on the same lot as an existing single-family home)
- ○ Other (please describe) _____

Q3.4 Select the option that best describes your **current housing status**.

- ○ I own my residence
- ○ I rent my residence
- ○ I live with my parents/guardian
- ○ Other (please explain) _____

Q3.5 What is your zip code?
** Although OK to skip, please provide if comfortable. This is important for identifying land use in relative proximity to your home.*

_____

Q3.6 How many years have you lived in your **current residence**?

_____

Q3.7 How many household vehicles do you have access to?

_____

Q3.8 Do you own an electric vehicle?

- ○ No
- ○ Yes

Q3.9 How do you most often travel to the following places?

	Car	Bus	Bike	Walk	Not Applicable
Work	○	○	○	○	○
School	○	○	○	○	○
Errands or Shopping	○	○	○	○	○
Visiting outdoor space for recreation	○	○	○	○	○
Visiting indoor space for recreation (climbing, hockey, weightlifting, etc.)	○	○	○	○	○

Q3.10 Rate the following statements from 1 (Not True) to 5 (Very True)

	1	2	3	4	5
I do not like driving when it's dark outside.	○	○	○	○	○
I do not like driving on the highway.	○	○	○	○	○
I do not like driving in the snow or other inclement weather.	○	○	○	○	○

Q3.11 Would you say you are within walking distance of a bus stop?

- ○ Yes
- ○ Unsure
- ○ No

End of Block: Section 3: Current Neighborhood, Housing and Travel Information

Start of Block: Section 4: Employment status

Q4.1 The following questions will briefly ask you about your employment status and, where applicable, your commute.

Q4.2 What is your current employment status?

- ○ Employed Full Time
- ○ Employed part time
- ○ Unemployed looking for work
- ○ Unemployed not looking for work
- ○ Caregiver/ homemaker/ stay at home parent
- ○ Retired
- ○ Student

Display This Question:

If Q4.2 = Employed Full Time

Or Q4.2 = Employed part time

Q4.3 Do you currently work from home at least one day a week?

- ○ No
- ○ Yes

Display This Question:

If Q4.3 = Yes

Q4.4 During a typical week, how many days do you work from home?

_____

Display This Question:

If Q4.3 = No

Q4.5 Do you feel that you could (or would you like to) perform your job from home at least one day a week if your employer allowed you to?

- No
- Yes

Display This Question:

If Q3.9 != Work [Not Applicable]

Q4.6 On average, how long does it take you get to work by ${Q3.9/ChoiceGroup/SelectedAnswers/1}?

- < 5min
- 5 to 10min
- 10 to 20min
- 20 to 30min
- 30 to 60min
- > 60min
- I do not travel to work

End of Block: Section 4: Employment status

Start of Block: Section 5: Current Neighborhood and Travel Satisfaction

Q5.1 The following questions relate to your current housing characteristics. Think about them in the context of "How important are each of the characteristics to me?"

Q5.2 On a scale of -2 (extremely dissatisfied) to +2 (extremely satisfied) how would you rate your **level of satisfaction** with the following characteristics of your **current neighborhood**:

	-2	-1	0	1	2
Opportunities to engage in a wide range of activities and events	○	○	○	○	○
Proximity to natural areas and open space	○	○	○	○	○
Access to outdoor recreation areas (hiking trails, skiing, mountain biking, snowmobile trails, etc.)	○	○	○	○	○
Public school quality	○	○	○	○	○
Proximity to family	○	○	○	○	○
Proximity to where you go to school	○	○	○	○	○
Proximity to where children in your household go to school	○	○	○	○	○
Proximity to essential amenities (grocery store, pharmacies, doctor's office)	○	○	○	○	○

Proximity to leisure and cultural activities (restaurants, playgrounds, cinema)	○	○	○	○	○
Being in a kid friendly neighborhood	○	○	○	○	○
Housing costs (rent/mortgage, utilities, taxes, etc.)	○	○	○	○	○
Access to convenient (frequent) and reliable public transit	○	○	○	○	○
Space from my neighbors	○	○	○	○	○
High-speed internet access	○	○	○	○	○
Cell phone service	○	○	○	○	○
Good public safety and low crime	○	○	○	○	○

Q5.3 On a scale of -2 (Extremely dissatisfied) to +2 (Extremely satisfied) how would you rate your **level of satisfaction** with your **current residence:**

	-2	-1	0	1	2
Financial costs related to all energy use (heating, cooling, electricity, etc.)	○	○	○	○	○
How much the home's energy use contributes to greenhouse gas emissions	○	○	○	○	○
Age of home	○	○	○	○	○
Alternative energy sources (solar panels, Tesla power wall, etc.)	○	○	○	○	○

Q5.4 On a scale of -2 (Extremely dissatisfied) to +2 (Extremely satisfied) how would you rate your **level of satisfaction** with your **current travel options**:

	-2	-1	0	1	2
Ability (safe and convenient) to walk or bike to complete some errands and shopping trips	○	○	○	○	○
Ability (safe and convenient) to walk or bike to work	○	○	○	○	○
Ability (safe and convenient) to walk or bike to school	○	○	○	○	○
Walking distance to bus route for completing some errands and shopping trips	○	○	○	○	○
Walking distance to bus route for getting to work	○	○	○	○	○
Walking distance to bus route for getting to school	○	○	○	○	○

Distance to park-and-ride lot with bus service to work	○	○	○	○	○
Time it takes to drive to work or school	○	○	○	○	○
Amount of driving required to complete errands and shopping trips	○	○	○	○	○
Cost of local bus service	○	○	○	○	○
Parking cost at work or school	○	○	○	○	○
Amount of traffic congestion	○	○	○	○	○
Parking at my home	○	○	○	○	○
Ability to charge an electric vehicle at home	○	○	○	○	○
The cost of gasoline or diesel fuel used for driving	○	○	○	○	○

How the amount you drive contributes to climate change or greenhouse gas emissions	○	○	○	○	○

End of Block: Section 5: Current Neighborhood and Travel Satisfaction

Start of Block: Section 6: Intention to Move

Q6.1 How important is it for you to stay in your current residence?

- ○ Not at all important
- ○ Slightly important
- ○ Moderately important
- ○ Very important
- ○ Extremely important

Q6.2 Do you have any intention to move **within the next year**?

- ○ Yes
- ○ Maybe
- ○ No

End of Block: Section 6: Intention to Move

Start of Block: Section 7: Demographics

Q7.1 This final section will briefly ask you some basic questions about yourself. Click Next to begin.

Q7.2 In what year were you born?

**In the format YYYY*

_____

Q7.3 Please state your gender

- Male
- Female
- Non-binary or other gender identity

Q7.4 Are you of Hispanic, Latino, and/or Spanish Origin?

- No, not of Hispanic, Latino, or Spanish origin
- Yes, Mexican, Mexican American, Chicano
- Yes, Puerto Rican
- Yes, Cuban
- Yes, another Hispanic Latino, or Spanish Origin

Q7.5 What is your race? (Select all that apply)

- ☐ White
- ☐ Black or African American
- ☐ American Indian or Alaska Native
- ☐ Chinese
- ☐ Filipino
- ☐ Asian Indian
- ☐ Vietnamese
- ☐ Korean
- ☐ Japanese
- ☐ Other Asian
- ☐ Native Hawaiian
- ☐ Samoan
- ☐ Chamorro
- ☐ Other Pacific Islander

Q7.6 How many adults (18 and over) live in your household, including yourself?

_____

Q7.7 How many children (under 18) live in your household?

_____

Q7.8 What is the highest degree or level of schooling completed?

- Less than high school or GED
- High school diploma or GED
- Some college - no degree
- Associates degree
- Bachelor's degree
- Master's degree
- Professional degree beyond Bachelor's degree
- Doctorate degree

Q7.9 Please state your yearly **household** income.

- ○ Less than $20,000
- ○ $20,000 - $34,999
- ○ $35,000 - $49,999
- ○ $50,000 - $74,999
- ○ $75,000 - $99,999
- ○ $100,000 - $149,999
- ○ $150,000 - $199,999
- ○ $200,000 - $249,999
- ○ $250,000 - $299,999
- ○ Over $300,000

End of Block: Section 7: Demographics

8. Appendix B

Social media advertisement for the survey