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Evaluating Demand-Responsive Scheduling in Public Transportation Service Offerings to Retirement Communities

Steven Silver, PhD

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16. Abstract
This project addresses alternatives to fixed schedule local transportation service offerings to members of retirement communities. The project design measures the effects of the contrast between fixed schedule (Fixed) service and demand-responsive services (DRT) in retirement communities in Santa Clara County that are closely matched in demographic profiles and geographic location. The research team investigates the effects of scheduling alternatives in a diary format with a within-person variable of four recent trips. The measure of public transportation usage under the Fixed schedule and DRT service offerings is supplemented by a measure of subjective well-being (STS) for each trip—in other words, the project tracks not only how much/when participants use these public transportation models but also how they feel about its use. Results indicate that the community with DRT service had significantly higher public transportation usage and STS ratings than the committee with fixed schedules. Evaluations of the service provider Valley Transportation Authority (VTA) from DRT community members trended higher but were not significantly different across each item measures in the scale. These results show the potential benefits of flexible transportation options in enhancing mobility and satisfaction among older adults and can provide informative insights for policymakers to make improvements in mobility for this group and everyone.

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1. Introduction

An enduring challenge to the design and scheduling of public transportation service offerings that support mobility is to provide adequate transportation to communities that currently report being underserved in the face of continuing annual deficits in the net cost of the offerings. As used here, "underserved" means that members of a definable community judge current service offerings to not meet fundamentals in their transportation needs (Dillahunt and Veinot 2018). Among these communities are retirement communities for independent living. The importance of mobility to these communities has long been recognized (Coughlin 2001) but remains under investigated (Li 2024a, 2024b; Schofield et al. 2023). Following current definitions, the age bracket of retirement communities in the study has a mean age of greater than 55 years and residents who have adequate physical health and financial resources to support independent living. Retirement communities are of particular interest to those who manage public transportation since the welfare of residents is likely to be among the most sensitive to limitations in their mobility. For example, access to transportation for medical and dental visits and food shopping is particularly essential to the well-being of this demographic. As is increasingly recognized, ordinary definitions of well-being can be extended and operationalized in the construct of subjective well-being (SWB) (Deiner 1984; Deiner et al. 1999; Deiner et al. 2018; Kahneman and Krueger 2006). As such, self-judgments of psychological and social well-being can be fundamental adjuncts to measures of physical well-being (Deiner et al. 2018).

The transportation needs of members of retirement communities commonly differ from those who are in the workforce on several counts. First, the timing of essential trips is likely to be more heterogeneous than the timing of those in the workforce (Giménez-Nadal et al. 2022). That is, the local travel of residents of retirement communities is less likely to be bunched in peak morning and late afternoon commuting times. Second, the number and proportion of the total trips that those in retirement communities are obliged to make for essential services is likely to be greater than this proportion in the working population. For example, medical visits are more frequent than in the general population and are more likely to be distributed over the opening times of providers (Somenahalli and Shipton 2013). Third, there are reasons to anticipate that those in retirement communities are more likely to rely on public transit for their transportation needs since private vehicle ownership has been reported to be substantially lower than in the working population (Li 2024a, 2024b). There are a range of alternative designs to deliver public transportation services to residents of retirement communities that relate to scheduling. While the most common design is fixed schedule offerings, there are now alternatives to fixed schedule service that we will next consider.

1.1 Demand Responsive Service Offerings in Public Transportation

Most transportation offerings to retirement and other communities in counties of California remain on fixed schedules. One of the alternatives to fixed schedule offerings is in the forms of on-demand or demand-responsive transit (DRT) (Enoch et al. 2004; Montenegro et al. 2020; cf. Franco et al. 2020), in which individuals can schedule a pick-up and drop-off time. This can and often does require a lead time for booking and a co-payment. While the potential of demand-responsive public transportation to better serve public needs has long been recognized (Enoch et al. 2004), there has not been a direct comparison of the usage of public transportation under DRT with usage under fixed schedule offerings that focus on travelers with the demographics of retirement communities. Moreover, although fixed schedules in public transportation are commonly considered to be financially efficient, comparisons of fixed scheduling to alternatives in service offerings have not commonly included a formal measure of gains to the well-being of users that alternatives to fixed offerings could engender. As observed by others (Deiner et al. 1999; Deiner et al. 2018; Kahneman and Krueger 2006, Stanley et al 2021) in multiple contexts, welfare gains in comparisons of service offerings could be further facilitated by a metric that assesses subjective well-being.

1.2 Self-Reported Subjective Well-Being as a Welfare Measure in Public Transportation

While the welfare of users of transportation remains of interest independent of usage and cost estimates (Allen and Arkolakis 2022; Hörcher and Tirachini 2021), welfare in public transportation has historically been theorized in utility frameworks (McFadden 1974, 2007) that do not consider a welfare measure. However, the work led by Deiner (Deiner et al. 1999; Deiner et al. 2018; Kahneman and Krueger 2006) strongly supports conceptualizing welfare in what has been designated as subjective well-being.[1] Stanley et al. (2021) are among the investigators that have directly indicated the relevance of SWB to policy designs in public transportation.

From the demand side, there have been limited formal assessments of how alternatives to fixed schedule offerings affect transportation mode usage and SWB. From the cost side, part of the reason why public transportation in and close to major metropolitan locations is commonly run at a financial loss may be that ridership outside the hours of work travel is low (Berrebi et al. 2021; Litman 2015). It may be that alternatives to fixed schedule offerings can notably increase the overall use of public transportation services by increasing usage outside of work commute times. This is likely to be partly through the substitution of public conveyances for private auto usage with commensurate gains in the reduction of costs of externalities that include air quality and infrastructure wear-out.

As noted, available studies of DRT have not generally included a measure of welfare gains of DRT as in a SWB measure. Additionally, detected effects of DRT or its equivalents are likely to depend on the demographics of the populations being served. For example, it may be that older age groups are particularly responsive to DRT in their transportation modes. Moreover, older age groups may

[1] Deiner (1984) and co-investigators have provided a tripartite model of SWB in which components of positive and negative affect and generalized life satisfaction are self-reported in rating scales.

further evidence increased sensitivity in their judgments of well-being to variation in service offerings. We propose to examine the effects of DRT offerings in comparison to fixed schedule offerings on transportation modes and an SWB measure in residents of retirement communities in the county of Santa Clara, California.

1.3 Research Objective

Santa Clara is among the Bay Area counties of California that are now experimenting with on-demand service or its approximations in restricted areas of the counties to better meet the needs of constituents. We will directly compare a retirement community in Santa Clara County that is served by DRT to a community with geographical proximity and similar demographic profiles that continues to be on fixed schedule offerings. The comparisons will include the effects of the scheduling alternatives on (1) overall public transportation usage, (2) a measure of self-reports of SWB that is adapted to travel behavior, and (3) general satisfaction with the service provider Valley Transit Authority (VTA) with demographic control variables.

2. Method

2.1 Design

As noted, in Bay Area counties, transportation service offerings are most generally on fixed schedules. Santa Clara County is among the counties that have offered DRT in restricted geographic areas of the county on a trial basis. In cooperation with schedulers of the Valley Transit Authority, we identified two residential communities in Santa Clara County that are within five miles apart but differ in their transportation service offerings: one of these is in an area of the county that has DRT, and the other is in an area that remains on fixed schedule offerings. Although the two retirement communities in the county we studied in the design differed in the service offerings, they were generally similar in socio-demographics measures.

Estimates of modal income and education categories by Activity Directors of the communities were comparable. Modal annual income was reported to be in the $30,000–$40,000 interval. Modal education was reported to be "some college" with more than 20% of residents having an undergraduate degree. The residents of the communities were disproportionately female. Age designations were predominantly greater than 65 years in both communities. Although there are some differences in age distribution across communities, we control for demographics in analyses. As will be reported, the measurement instruments and participation rate were piloted in a retirement community that is not in the study design but was similar in socio-demographics to refine study procedures.

2.2 Measure of Subjective Well-Being

We follow investigators that have now operationalized welfare loss in terms of decrements to subjective well-being (SWB) (Diener et al. 1999; Kahneman 1999; Lucas and Diener 2008). For evidence in support of the construct validation for SWB as a welfare measure, see Fischer (2009) and Kapteyn et al. (2015). In addition to usage behavior, we propose to investigate participants' self-judgments of their welfare in travel-related behavior over short time intervals as operationalized in ratings on a scale measure of SWB adapted to travel behavior. The *Satisfaction with Daily Travel* (STS) (Ettema et al. 2011) has demonstrated a relationship to components of the generalized SWB (Bergstad et al. 2011; Singleton 2019). The application of the STS measure to public transportation has been reviewed by Singleton and Clifton (2021).

2.3 Data Collection Instrument

Diary methods in which participants record or recall their recent trips have now been applied in public transportation research (Axhausen et al. 2002; Raux et al. 2016). Recent studies have provided strong support for the accuracy that diary methods can attain.[2] For each day of a 21-day study period, we collected participant reports of trips outside the communities by private auto and public transportation. A corresponding completion of the STS (Ettema et al. 2011) measure of short-term, travel-related SWB for each trip was included in the diary. A final page of the diary reported participant demographics and a five-item scale that evaluated VTA as a service provider. Full definitions of the STS and VTA ratings are in Appendix A, Tables A.1 and A.2.

2.4 Hypothesis

Our initial hypotheses were that (1) the number of public transportation trips and proportion of total trips that were in public transportation will be significantly greater under DRT than under fixed scheduling; (2) SWB, as measured in STS-measured welfare for each trip, will be significantly higher in the community with a DRT offering; and (3) satisfaction with VTA services will be significantly higher in the community with DRT.

2.5 Participants

Pre-Study Calibration. Prior to data collection in the study communities, we studied the participation rate and the ability to meaningfully compile trips in a travel diary in a retirement community of Santa Clara County that was not in the designated comparison. The benefits initially offered to participants in the pre-study community were (1) an opportunity to document the extent to which transportation service offerings meet their transportation needs and possibly contribute to the design of service offerings and (2) a raffle reward of one $40 gift card for every ten respondents. We provided a QR code and an email address for participants. We initially anticipated a participant rate in each of the retirement communities under study that was close to the rate that previous diary studies in public transportation have reported (Axhausen et al. 2002; Raux et al. 2016). The pre-study results of the initial procedures in the demographics of a retirement community indicated that the incentives did not attain anything close to the participation rate reported for other demographics.

We then adopted the study design to an anticipated lower participation rate in the study communities by (1) re-designing the survey to include a within-person variable of four most recent trips, (2) increasing the payment for participation to $20 upon completion of the diary, and (3) having a trained research assistant (RA) present at designated times to answer questions and facilitate participation. The RA exemplified procedures to be followed and answered questions that were put forth. Additionally, upon request, assistance with procedures in data collection was provided by the RA. These procedures yield more than 20 participants in each study community and more than 90 total trips within a community.

[2] For example, Müller, Peters, Matz et al. (2020) report a comprehensive validation study in which real-time camera recordings of daily activities were demonstrated to be consistent with regularities in diary reporting. Also see Gershung et al. (2020).

2.6 Procedures

Participants were solicited through the cooperation of Activity Directors in each of the retirement communities. Data was collected at times that followed pre-designated community meetings. The Activity Director introduced the study and the RA at the conclusion of the meeting and data was collected from a sample of community members that elected to participate. In the community with a DRT offering n = 23, total trips = 92. In the comparison community with fixed schedule offering n = 24, total trips = 96. Participants in each of the study communities followed similar procedures in recording their four most recent trips by public transport or private auto, the purpose of each trip, and STS ratings as a SWB measure for each reported trip. Self-reported demographics and ratings of the service provided were completed on the final page of the diary.

3. Results

3.1 Analysis

As indicated, each participant reported four trips and their level of STS for each trip. Tables 2a–2e report descriptives for each of the study variables and demographics of the communities. Table 3 reports results for the *public vs. private trip* usage dichotomy in a General Linear Multimode Model (GLMM) analysis that accommodated between subject variables of Fixed vs. DRT service to the community, gender, age, and purpose of visit, and the within-subject variable of time across the multiple trips and a principal component of STS ratings. In the main effects of DRT and Fixed Schedules, the DRT community variable had a significantly higher ($\chi^2 = 4.410$, $p < 0.05$) number of trips by public transport ($M_{DRT} = 54.167$; $M_{Fixed} = 34.524$). An STS factor score was higher for private auto trips ($\chi^2 = 4.189$, $p < 0.05$). The within-subject variable measure of the *time* measure of variation across the four recorded trips was not statistically significant. Differences in the between-subject demographic variables and the within-subject variable of a medical trip purpose vs. all other purposes were not significant.

Table 4 reports the results of a Mixed Level Analysis of Variance (LMM) analysis applied to the principal component (PC) of the *STS* scale items for *SWB* that were measured for each trip.[3] In the results for the PC of STS, the Fix-DRT dichotomy and age categories were statistically significant. The DRT community had a significantly higher PC of STS than the Fixed community. The age category of 55–65 had significantly lower STS factor scores than other age categories. Since satisfaction with VTA services was measured once with the demographic variables, these ratings were analyzed in an n-way ANOVA (GLM). Parameter estimates for the principal component of VTA ratings were not statistically significant. However, ratings for several of the individual items of the scale in Appendix B were statistically significant.[4]

[3] We initially analyzed the structure of multi-item STS and VTA ratings in principal component analyses (PCA). A first principal component accounted for greater than 0.65 of the total measure variance for both the SLS and VTA ratings. Only this component had eigenvalues greater than 1 in both PCA analyses. We report the results for the PCA components of both scales in the results section. We further report item results for both scales in Appendix C, Tables C.1 and C.2.

[4] As commonly recognized in applications of LMMs, the Saithwaite method followed in many algorithms tends to result in large magnitude and sometimes fractional df's. We restate the df's to be consistent with a F-based df.

Table 1. Descriptives

Table 1-a. Mode of Transportation Count and Percentage

Mode Of Transportation	Public Count	Private Count	Public Percentage	Private Percentage
Fixed	29	55	34.524	65.476
DRT	52	44	54.1667	45.833

Table 1-b. Gender Count and Percentage

Gender	Male Count	Female Count	Male Percentage	Female Percentage
Fixed	4	19	19.048	80.952
DRT	5	19	20.833	78.125

Table 1-c. Age Classification Percentage and Count

Age Classification	55–65 Count	66–75 Count	>75 Count	55–65 Percentage	66–75 Percentage	>75 Percentage
Fixed	1	12	9	4.545	54.545	40.9
DRT	7	8	8	30.435	34.782	34.8

Table 1-d. STS Ratings Mean and Standard Deviation

STS Ratings	1 relaxed	2 confident	3 standards	4 how well	5 overall
Fixed	6.88 (1.797)	7.049 (2.01)	7.37 (1.847)	7.443 (1.895)	7.444 (1.757)
DRT	7.833 (1.756)	7.708 (1.76)	7.832 (1.569)	7.906 (1.460)	8.031 (1.441)

Table 1-e. VTA ratings Mean and Standard Deviation

VTA Ratings	1 cares	2 serve	3 timely	4 convenient	5 responsive	6 overall
Fixed	6.928 (2.065)	6.75 (1.664)	6.4 (2.562)	6.667 (2.534)	7.3 (2.850)	6.63 (2.179)
DRT	8.125 (1.137)	8.071 (1.088)	7.929(1.897)	7.539 (1.642)	8.231(1.082)	7.667 (1.729)

Table 1-f. Car Ownership Count and Percentage

Car Ownership	Count Yes	Count No	Percent Yes	Percent No
Fixed	14	8	63.636	36.363
DRT	14	9	60.870	39.130

Table 2. General Linear Multimode Model (GLMM): Public vs. Private Travel Mode

Source	B	Std. Error	95% Wald Confidence Interval					Exp(B)
			Lower	Upper	Wald Chi-Square	df	Sig.	
Intercept	1.411	0.1872	1.044	1.778	56.811	1	< 0.001	4.100
Between								
Fixed – DRT	-0.173	0.0823	-0.334	-0.011	4.408	1	0.036	0.841
Purpose of Visit (Medical vs. other)	-0.008	0.0836	-0.172	0.155	0.010	1	0.920	0.992
Gender – Female	0.052	0.1240	-0.191	0.295	0.174	1	0.676	1.053
Age – 55 to 65	0.183	0.1530	-0.117	0.483	1.431		0.232	1.201
Age – 66 to 75	0.094	0.0803	-0.064	0.251	1.364	1	0.243	1.098
Within								
STS Factor	-0.84	0.0410	-0.164	-0.004	4.189	1	0.041	0.920
Time	0.002	0.0327	-0.062	0.066	0.005	1	0.942	1.002

Model Fit: Likelihood Ratio $\chi^2(8) = 25.352$ | ($p < 0.005$).

Table 3. Linear Mixed Model (LMM): Principal Component of STS

Parameter	Estimate	Std. Error	df	t	Sig	Lower Bound	Upper Bound
Intercept	0.337	0.911	1	0.370	0.713	-1.497	2.172
Between							
Fixed/DRT	-0.619	0.131	1	-4.716	< 0.001	-0.787	-0.359
Age – 55 to 65	-1.136	0.228	1	-4.972	< 0.001	-1.587	-0.684
Age – 66 to 75	-0.027	0.131	1	-0.207	0.837	-0.287	0.233
Gender Female	0.103	0.902	1	-0.114	0.910	-1.920	1.715
Within							
Mode of Transport	0.221	0.123	1	1.794	0.075	-0.022	0.464
Purpose of Visit	0.090	0.133	1	0.675	0.501	-0.173	0.353

Null Model -2 Log Likelihood – 446.160
Full Model -2 Log Likelihood – 417.433
Model Fit: Likelihood Ratio $\chi^2 = 28.727$ | ($p < 0.005$)

Table 4. General Linear Model (GLM): Principal Component of VTA Ratings

Source	B	Std. Error	df	Sig.	t	95% Wald Confidence Interval		Partial Eta Squared
						Lower	Upper	
(Intercept)	1.144	0.773	1	0.215	1.480	-0.639	2.927	0.177
Between								
Gender Female	-0.316	0.813	1	0.019	-0.389	-2.191	1.559	0.708
Age – 55 to 65	-0.545	0.871	1	0.047	-0.626	-2.555	1.464	0.549
Age – 66 to 75	-0.313	0.424	1	0.064	-0.739	-1.290	0.664	0.481
Fixed vs. DRT	-0.662	0.391	1	0.264	-1.692	-1.564	0.240	0.129

R Squared = 0.641 (Adjusted R Squared = 0.417)
Model fits of the GLMM and LMM applications were statistically significant ($p < 0.005$). The adjusted R^2 of the GLM model of VTA ratings exceeded 0.40.

4. Summary & Conclusions

The use of transportation alternatives in local travel by residents of retirement communities remains of particular importance to the design of service offerings for reasons that include the increasing size of this demographic and the sensitivity of well-being to the residents. The results we report are the first study we can locate that directly examines the service attribute of dial-up scheduling (DRT) in direct comparison to a fixed schedule (Fixed) service across retirement communities with close geographical locations and generally similar demographics. The age and gender profiles of the communities indicate that residents who participated in the study were predominantly female and in the age categories of 65 and older. Activity Directors judged that these are reasonable approximations of resident profiles in the respective communities.

The diary method that we implement studies a within-subject measure of the four most recent trips taken by samples of residents in the study communities. Our main analyses examine the predictors of the criterion variable of the mode of transportation *(public vs. private auto*) in a GLMM model that represented Fixed vs. DRT as between-subject variables and the ratings of STS for each of four trips as a within subject variable. We analyzed a principal component of STS ratings in an LMM model that accommodated the between and within factors. The analyses of the overall ratings of VTA service were in a GLM model.

In the GLMM analysis of the mode of travel, the community with a DRT offering reported significantly ($p < 0.05$) more public transportation trips than private auto trips and higher STS ratings ($p < 0.05$). For the reported STS component ratings of trips taken, LMM results indicated a significant main effect ($p < 0.05$) of higher satisfaction by the DRT community and in older age groups than the 55–65 age category compared to other age categories. In a GLM analysis of the principal component of VTA ratings, none of the predictors were statistically significant. However, as reported in Appendix B, the DRT community ratings of individual items of "cares about our welfare," "doing what it can," and "timely service" were significantly higher ($p < 0.05$) than the ratings of the fixed schedule community.

Taken together, the results support the hypothesized effects of differences in service offering on mode of travel and corresponding differences in rated STS. They partially support community differences in VTA ratings. Several qualitative observations on the study and its results may be in order since there are comparatively few studies of retirement communities that implement closed-end ratings. First, since the demographics of those in retirement communities are generally likely to increasingly be predominantly female and in older age groups, generalizing beyond these categories of residents is limited. Second, although we were able to obtain closed-end ratings of study variables, in-depth interviews may be a complementary methodology that can add to the documentation of the needs of demographics in the communities. Structured interviews can now be decomposed into additional numerical content variables (Neuendorf 2018).

In addition to the analysis of the content variables that we report, this study also informs on the methodological challenges in studying such communities. As indicated in the pre-study calibration, incentives are likely to be particularly important in obtaining participant numbers. The presence of a facilitator can also add to reducing any perceived methodological challenges of participation in these communities. In directions for subsequent study, funding of a replication of the results in additional counties that offer alternatives to fixed schedule offerings or an equivalent differentiation would further support inference. As noted, this would best be supported by supplementing the diary data with methods in structured interviews. In summary, the study we report does indicate the relevance and importance that directly addressing the design of public transportation offerings to retirement communities can have to objectives in public transport usage and the well-being of residents in the demographics we address.

Appendix A

Table A.1. STS Scale Items

How relaxed did you feel during your trip?
How confident were you about being on time for your trip?
How well did your travel arrangements work for you?
What was the standard (comfort, cleanliness, safety) of the travel?
How would you rate your travel experience?

Table A.2. VTA Rating Items

The Valley Transit Authority cares about our welfare.
The Valley Transit Authority is doing what it can to serve our transportation needs.
The Valley Transit Authority offers timely service to my transportation needs.
The Valley Transit Authority offers convenient service for my transportation needs.
The Valley Transit Authority is open and responsive to my comments.
My overall satisfaction with transport service offerings by the Valley Transit Authority.

Table B.1. Estimates of Fixed Effects of Linear Mixed Model
for "How relaxed did you feel during your trip"

Parameter	Estimate	Std. Error	df	t	Sig
Intercept	8.880	0.643	426.498	13.807	< 0.001
Between					
Gender - Female	-0.730	0.660	1087.607	-1.105	0.269
Age 55 to 65	-1.693	0.478	160.814	-3.540	< 0.001
Age 66 to 75	-0.054	0.274	160.377	-0.197	0.844
Within					
Fixed/DRT	-1.350	0.272	161.910	-4.955	< 0.001
Mode of Transport	0.069	0.343	523.792	0.201	0.841

Null Model -2 Log Likelihood – 703.867
Full Model -2 Log Likelihood – 678.574
Model Fit: Likelihood Ratio χ^2= 25.293 | ($p < 0.005$)

Table B.2. Estimates of Fixed Effects of Linear Mixed Model
for “How confident were you about being on time for your trip”

Parameter	Estimate	Std. Error	df	t	Sig
Intercept	8.570	0.527	167.947	16.269	< 0.001
Between					
Gender - Female	-0.580	0.428	168.091	-1.355	0.177
Age 55 to 65	-1.982	0.500	167.061	-3.967	< 0.001
Age 66 to 75	-0.044	0.287	168.110	-0.154	0.878
Within					
Fixed/DRT	-1.163	0.284	168.030	-4.088	< 0.001
Mode of Transport	0.435	0.267	166.419	1.630	0.105

Null Model -2 Log Likelihood – 716.866
Full Model -2 Log Likelihood – 690.728
Model Fit: Likelihood Ratio χ^2= 26.138 | ($p < 0.005$)

Table B.3. Estimates of Fixed Effects of Linear Mixed Model
for “How well did your travel arrangements work for you

Parameter	Estimate	Std. Error	df	t	Sig
Intercept	9.272	0.445	158.594	20.828	< 0.001
Between					
Gender – Female	-1.267	0.359	156.479	-3.530	< 0.001
Age 55 to 65	-2.426	0.423	159.401	-5.739	< 0.001
Age 66 to 75	0.120	0.242	158.521	0.496	0.621
Within					
Fixed/DRT	-1.148	0.240	159.112	-4.788	< 0.001
Mode of Transport	0.492	0.227	163.378	2.164	0.032

Null Model -2 Log Likelihood – 676.233
Full Model -2 Log Likelihood – 652.238
Model Fit: Likelihood Ratio χ^2= 23.995 | ($p < 0.005$)

Table B.4. Estimates of Fixed Effects of Linear Mixed Model
for "What was the standard comfort, cleanliness, and safety of the travel"

Parameter	Estimate	Std. Error	df	t	Sig
Intercept	9.017	0.458	166.856	19.710	< 0.001
Between					
Gender – Female	-0.975	0.371	167.253	-2.629	0.009
Age 55 to 65	-2.001	0.433	166.542	-4.620	< 0.001
Age 66 to 75	-0.087	0.249	167.345	-0.349	0.728
Within					
Fixed/DRT	-1.032	0.247	167.502	-4.174	< 0.001
Mode of Transport	0.602	0.232	166.242	2.599	0.010

Null Model -2 Log Likelihood – 663.697
Full Model -2 Log Likelihood – 633.296
Model Fit: Likelihood Ratio χ^2= 30.401 | ($p < 0.005$)

Table B.5. Estimates of Fixed Effects of Linear Mixed Model
for "How would you rate your travel experience"

Parameter	Estimate	Std. Error	df	t	Sig
Intercept	8.988	0.426	143.373	21.080	< 0.001
Between					
Gender – Female	-0.683	0.346	142.472	-1.974	0.050
Age 55 to 65	-1.443	0.406	144.739	-3.554	< 0.001
Age 66 to 75	-0.101	0.232	143.796	-0.435	0.665
Within					
Fixed/DRT	-0.921	0.231	145.897	-3.988	< 0.001
Mode of Transport	0.147	0.219	151.353	0.673	0.502

Null Model -2 Log Likelihood – 647.433
Full Model -2 Log Likelihood – 630.515
Model Fit: Likelihood Ratio χ^2= 16.918 | ($p < 0.005$)

Table B.6. GLM Parameter Estimates
for “VTA cares about our welfare”

Source	B	Std. Error	df	t	Sig.	95% Wald Confidence Interval		Partial Eta Squared
						Lower	Upper	
(Intercept)	9.929	1.006	1	9.870	< 0.001	7.842	12.015	0.816
Gender – Female	-1.148	0.867	1	-1.325	0.199	-2.946	0.649	0.074
Age – 55 to 65	-0.970	1.016	1	-0.955	0.350	-3.076	1.136	0.040
Age – 66 to 75	-0.283	0.589	1	-0.481	0.635	-1.504	0.938	0.010
Fixed/DRT	-1.382	0.551	1	-2.506	0.020	-2.525	-0.238	0.222

R Squared = 0.504 (Adjusted R Squared = 0.391)

Table B.7. GLM Parameter Estimates
for “VTA is doing what it can to serve transport our needs” (VTA Rating)

Source	B	Std. Error	df	t	Sig.	95% Wald Confidence Interval		Partial Eta Squared
						Lower	Upper	
(Intercept)	8.420	1.176	1	7.160	< 0.001	5.987	10.852	0.690
Gender – Female	-0.282	0.998	1	-0.282	0.780	-2.346	1.782	0.003
Age – 55 to 65	-0.559	1.345	1	-0.415	0.682	-3.341	2.224	0.007
Age – 66 to 75	0.035	0.644	1	0.055	0.957	-1.297	1.368	0
Fixed/DRT	-1.443	0.640	1	-2.257	0.034	-2.766	-0.120	0.181

R Squared = 0.223 (Adjusted R Squared = 0.047)

Table B.8. GLM Parameter Estimates
for "VTA offers timely service for my transportation needs" (VTA Rating)

Source	B	Std. Error	df	t	Sig.	95% Wald Confidence Interval		Partial Eta Squared
						Lower	Upper	
(Intercept)	9.395	1.498	1	6.273	< 0.001	6.289	12.501	0.641
Gender – Female	-0.177	1.276	1	-0.139	0.891	-2.823	2.468	0.001
Age – 55 to 65	-3.586	1.503	1	-2.385	0.026	-6.704	-0.468	0.205
Age – 66 to 75	-1.041	0.832	1	-1.251	0.224	-2.767	0.685	0.066
Fixed/DRT	-2.059	0.820	1	-2.510	0.020	-3.759	-0.358	0.223

R Squared = 0.363 (Adjusted R Squared = 0.211)

Table B.9. GLM Parameter Estimates
for "VTA offers convenient service for my transportation needs" (VTA Rating)

Source	B	Std. Error	df	t	Sig.	95% Wald Confidence Interval		Partial Eta Squared
						Lower	Upper	
(Intercept)	8.219	1.574	1	5.222	< 0.001	4.946	11.492	0.565
Between								
Gender – Female	0.732	1.307	1	0.560	0.582	-1.987	3.451	0.015
Age – 55 to 65	-2.368	1.569	1	1.569	0.146	-5.630	0.895	0.098
Age – 66 to 75	-1.579	0.880	1	0.880	0.087	-3.409	0.251	0.133
Fixed/DRT	-1.138	0.867	1	0.867	0.203	-2.941	0.665	0.076

R Squared = 0.368 (Adjusted R Squared = 0.210)

Table B.10. GLM Parameter Estimates
for "VTA is open and responsive to my comments" (VTA Rating)

Source	B	Std. Error	df	t	Sig.	95% Wald Confidence Interval		Partial Eta Squared
						Lower	Upper	
(Intercept)	9.728	1.855	1	5.245	< 0.001	5.797	13.660	0.632
Between								
Gender – Female	-0.589	1.676	1	-0.351	0.730	-4.142	2.964	0.008
Age – 55 to 65	-1.752	1.697	1	-1.032	0.317	-5.350	1.846	0.062
Age – 66 to 75	-1.103	0.988	1	-1.116	0.281	-3.197	0.991	0.072
Fixed/DRT	-1.341	0.936	1	-1.432	0.171	-3.326	0.644	0.114

R Squared = 0.489 (Adjusted R Squared = 0.319)

Table B.11. GLM Parameter Estimates
for "My overall satisfaction with transport service offerings by the VTA" (VTA Rating)

Source	B	Std. Error	df	t	Sig.	95% Wald Confidence Interval		Partial Eta Squared
						Lower	Upper	
(Intercept)	8.588	1.554	1	5.525	< 0.001	5.309	11.868	0.642
Between								
Gender – Female	-0.139	1.299	1	-0.107	0.916	-2.881	2.602	0.001
Age – 55 to 65	-2.473	1.535	1	-1.611	0.126	-5.712	0.765	0.132
Age – 66 to 75	-0.560	0.949	1	-0.590	0.563	-2.561	1.442	0.020
Fixed/DRT	-1.321	0.905	1	-1.460	0.163	-3.229	0.588	0.111

R Squared = 0.436 (Adjusted R Squared = 0.260)

Bibliography

Allen, J., & Farber, S. (2020). Planning transport for social inclusion: An accessibility-activity participation approach. *Transportation Research Part D: Transport and Environment*, *78*, 102212.

Allen, T., & Arkolakis, C. (2022). The welfare effects of transportation infrastructure improvements. *Review of Economic Studies*, *89*(6), 2911–2957.

Alsnih, R., & Hensher, D. A. (2003). The mobility and accessibility expectations of seniors in an aging population. *Transportation Research Part A: Policy and Practice*, *37*(10), 903–916.

Axhausen, K. W., Zimmermann, A., Schönfelder, S., Rindsfüser, G., & Haupt, T. (2002). Observing the rhythms of daily life: A six-week travel diary. *Transportation*, *29*(2), 95–124.

Bergstad, C. J., Gamble, A., Gärling, T., Hagman, O., Polk, M., Ettema, D. & Olsson, L. E. (2011). Subjective well-being related to satisfaction with daily travel. *Transportation*, *38*, 1–15.

Berrebi, S. J., Joshi, S., & Watkins, K. E. (2021). On bus ridership and frequency. *Transportation Research Part A: Policy and Practice*, *148*, 140–154.

Chudyk, A. M., Winters, M., Moniruzzaman, M. D., Ashe, M. C., Gould, J. S., & McKay, H. (2015). Destinations matter: The association between where older adults live and their travel behavior. *Journal of Transport & Health*, *2*(1), 50–57.

Coughlin, J. F. (2001). Beyond health and retirement: Placing transportation on the aging policy agenda. MIT Center for Transportation Studies/AgeLab.

Das, K. V., Jones-Harrell, C., Fan, Y., Ramaswami, A., Orlove, B., & Botchwey, N. (2020). Understanding subjective well-being: Perspectives from psychology and public health. *Public Health Reviews*, *41*(1), 1–32.

Delle Site, P., de Palma, A., & Kilani, K. (2022). Consumers' welfare and compensating variation: survey and mode choice application. https://cnam.hal.science/hal-03719025

Diener, E. (1984). Subjective well-being. *Psychological Bulletin*. *95*(3): 542–575.

Diener, E., Suh, E. M., Lucas, R. E., & Smith, H. L. (1999). Subjective well-being: Three decades of progress. *Psychological Bulletin*, *125*(2), 276.

Diener, E., Oishi, S., & Tay, L. (2018). Advances in subjective well-being research. *Nature: Human Behaviour*, *2*(4), 253–260.

Dillahunt, T. R., & Veinot, T. C. (2018). Getting there: Barriers and facilitators to transportation access in underserved communities. *ACM Transactions on Computer-Human Interaction (TOCHI)*, *25*(5), 1–39.

Enoch, M. P., Potter, S., Parkhurst, G., & Smith, M. (2004). Intermode: Innovations in demand responsive transport. Final Report Department for Transport and Greater Manchester Passenger Transport Executive.

Ettema, D., Gärling, T., Eriksson, L., Friman, M., Olsson, L. E., & Fujii, S. (2011). Satisfaction with travel and subjective well-being: Development and test of a measurement tool. *Transportation Research Part F: Traffic Psychology and Behaviour*, *14*(3), 167–175.

Fischer, J. A. (2009). Subjective well-being as a welfare measure: Concepts and methodology. mpra.ub.uni-muenchen.de

Franco, P., Johnston, R., & McCormick, E. (2020). Demand responsive transport: Generation of activity patterns from mobile phone network data to support the operation of new mobility services. *Transportation Research Part A: Policy and Practice*, *131*, 244–266.

Geerling, D. M., & Diener, E. (2020). Effect size strengths in subjective well-being research. *Applied Research in Quality of Life*, *15*, 167–185.

Gershuny, J., Harms, T., Doherty, A., Thomas, E., Milton, K., Kelly, P., & Foster, C. (2020). Testing self-report time-use diaries against objective instruments in real time. *Sociological Methodology*, 50(1), 318–349.

Giménez-Nadal, J. I., Molina, J. A., & Velilla, J. (2022). Trends in commuting time of European workers: A cross-country analysis. *Transport Policy*, *116*, 327–342.

Hörcher, D., & Tirachini, A. (2021). A review of public transport economics. *Economics of Transportation*, *25*, 100196.

Kahneman, D., & Krueger, A. B. (2006). Developments in the measurement of subjective well-being. *Journal of Economic Perspectives*, 20(1), 3–24.

Kapteyn, A., Lee, J., Tassot, C., Vonkova, H., & Zamarro, G. (2015). Dimensions of subjective well-being. *Social Indicators Research*, *123*, 625–660.

Kellia J Hansmann, D.A. Deemer, & S. Robert (2024). Measuring age-friendliness of transportation and mobility characteristics in communities: A scoping review. *The Gerontologist*, *64*(5). https://doi.org/10.1093/geront/gnad106

Li, S. (2024a). Vehicle ownership over the life course among older Americans: A longitudinal analysis. *Transportation*, *51*(1), 247–270.

Li, S. (2024b). Transportation planning for older Americans: Challenges, federal policies, and next steps. *Journal of Aging & Social Policy*, *36*(5), 929–947.

Litman, T. (2015). *Evaluating public transit benefits and costs*. Victoria Transport Policy Institute.

Lucas, R. E., & Diener, E. (2008). Subjective well-being. In J. Haviland-Jones et al. (Eds.), *Handbook of Emotions* (pp. 471–484). Guilford Publications.

McFadden, D. (1974). The measurement of urban travel demand. *Journal of Public Economics*, *3*(4), 303–328.

McFadden, Ć, D. (2007). The behavioral science of transportation. *Transport Policy*, *14*, 269–274.

Montenegro, B. D. G., Sörensen, K., & Vansteenwegen, P. (2020). *A demand-responsive feeder service with mandatory and optional, clustered bus-stops*. University of Antwerp, Faculty of Business and Economics.

Müller, S. R., Peters, H., Matz, S. C., Wang, W., & Harari, G. M. (2020). Investigating the relationships between mobility behaviours and indicators of subjective well–being using smartphone–based experience sampling and GPS tracking. *European Journal of Personality*, *34*(5), 714–732.

Mulliner, E., Riley, M., & Maliene, V. (2020). Older people's preferences for housing and environment characteristics. *Sustainability*, *12*(14), 5723.

Neuendorf, K. A. (2018). Content analysis and thematic analysis. In P. Brough (Ed.), *Advanced research methods for applied psychology* (pp. 211–223). London, Routledge.

Raux, C., Ma, T. Y., & Cornelis, E. (2016). Variability in daily activity-travel patterns: The case of a one-week travel diary. *European Transport Research Review*, *8*(4), 1–14.

Schofield, K., Kean, B., Oprescu, F., Downer, T., & Hardy, M. (2023). A systematic review and meta-synthesis of the complex and interconnected factors that influence planning for driving retirement. *Journal of Safety Research*, *85*, 42–51.

Silver, S. D. (2018). Multivariate methodology for discriminating market segments in urban commuting. *Public Transport*, *10*(1), 63–89.

Singleton, P. A. (2019). Validating the satisfaction with travel scale as a measure of hedonic subjective well-being for commuting in a US city. *Transportation Research Part F: Traffic Psychology and Behaviour, 60*, 399–414.

Singleton, P. A., & Clifton, K. J. (2021). Towards measures of affective and eudaimonic subjective well-being in the travel domain. *Transportation*, *48*(1), 303–336.

Somenahalli, S., & Shipton, M. (2013). Examining the distribution of the elderly and accessibility to essential services. *Procedia-Social and Behavioral Sciences*, *104*, 942–951.

Stanley, J. K., Hensher, D. A., Stanley, J. R., & Vella-Brodrick, D. (2021). Valuing changes in well-being and its relevance for transport policy. *Transport Policy*, *110*, 16–27.

Sun, B., Lin, J., & Yin, C. (2021). How does commute duration affect subjective well-being? A case study of Chinese cities. *Transportation*, *48*, 885–908.

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