Appendix A. Sensitivity test of multilevel models.

To explore the neighborhood scale influence on active travel, while controlling for the influence of individual level factors, we adopted the multilevel modeling techiques. A multilevel modeling approach recognizes hiearchical clusters and identify and differentiates between-cluster heterogeneity (Habib and Miller, 2008). In addition, a mixed-effects logistic regression model allows for many levels of nested clusters of both fixed and random effects (Stata, 2015). The model also performs optimization using the original metric of variance components (Stata, 2015). A two-level and a three-level model were applied. The models are represented as following:

$$Y_{ij} = \beta_{0j} + \beta_l X_{ij} + \varepsilon_{ij} \tag{1}$$

$$\beta_{ij} = \beta_0 + \beta_2 Z_j + \mu_{0j} \tag{2}$$

where Yij is active transport, β_{0j} and β_{l} are parameters, εij is the error term, and X_{ij} is the independent variables; $\beta 0$, $\beta 1$, and $\beta 2$ are the fixed components that represent fixed intercept and parameters for independent variables, and μ_{0j} is the random effects.

In the multilevel models, we assumed that people from each neighborhood were nested in one of the four neighborhood types. The dependent variable was active travel. In the two-level model, we ignored the neighborhood types and fit a a two-level model. In the three-level model, we incorporated invididual neighborhoods nested within each neighborhood types as an additional level. Both the two-level and three-level models showed similar results as the logistic regression models. Travel time, age, carownership, and desity were significant for both work trips and non-worktrips. Gender, education, and household size were only significant for work trips and employment and income were only significant for non-work trips. A likelihood-ratio

test comparing to the logistic regression model was provided and was not significant for nonwork trips (Prob >= chibar2 = 0.469) but significant for work trips at the 1% level (Prob >= chibar2 = 0.001). Compared to Model 3, gender became significant, females had a higher chance to choose active travel than male; FAR became significant at the 5% level, higher FAR indicated less chance of choosing active travel; Dissimilarity, intersection, riverfront location, and consruction were not significant anymore.

Table A-1. Results of three-level model for both work and non-work trips.

| Work trips (n=1,182) Travel time 0.949 -0.053 0.006 -8.85 0.000 **** Number of mode options 1.188 0.173 0.144 1.43 0.154 Female 1.500 0.405 0.222 2.73 0.006 *** Age 1.040 0.040 0.009 4.81 0.000 *** Education 0.927 -0.076 0.021 -3.35 0.001 ** Employment 2.234 0.804 1.648 1.09 0.276 Household size 1.356 0.304 0.086 4.82 0.000 **** Car ownership 0.266 -1.323 0.043 -8.13 0.000 **** Income 1.005 0.005 0.007 0.66 0.508 FAR 0.863 -0.147 0.063 -2.00 0.045 ** Dissimilarity 18.592 2.923 34.534 1.57 0.116 Intersection 1.009 0.0 | | Odds Ratio | Coef. | Std. Err. | Z | P> z | |
|---|------------------------|------------|--------|-----------|-------|-------|-----|
| Number of mode options 1.188 0.173 0.144 1.43 0.154 Female 1.500 0.405 0.222 2.73 0.006 *** Age 1.040 0.040 0.009 4.81 0.000 *** Education 0.927 -0.076 0.021 -3.35 0.001 *** Employment 2.234 0.804 1.648 1.09 0.276 Household size 1.356 0.304 0.086 4.82 0.000 **** Car ownership 0.266 -1.323 0.043 -8.13 0.000 **** Income 1.005 0.005 0.007 0.66 0.508 * FAR 0.863 -0.147 0.063 -2.00 0.045 * Dissimilarity 18.592 2.923 34.534 1.57 0.116 Intersection 1.009 0.009 0.024 0.36 0.715 Bike lane 1.329 0.285 0.403 0. | Work trips (n=1,182) | | | | | | |
| Female 1.500 0.405 0.222 2.73 0.006 *** Age 1.040 0.040 0.009 4.81 0.000 *** Education 0.927 -0.076 0.021 -3.35 0.001 *** Employment 2.234 0.804 1.648 1.09 0.276 Household size 1.356 0.304 0.086 4.82 0.000 *** Car ownership 0.266 -1.323 0.043 -8.13 0.000 *** Income 1.005 0.005 0.007 0.66 0.508 * FAR 0.863 -0.147 0.063 -2.00 0.045 * Dissimilarity 18.592 2.923 34.534 1.57 0.116 Intersection 1.009 0.009 0.024 0.36 0.715 Bike lane 1.329 0.285 0.403 0.94 0.348 Accessor 0.806 0.83 0.409 0.004 0.00 0.00 0.00 | Travel time | 0.949 | -0.053 | 0.006 | -8.85 | 0.000 | *** |
| Age 1.040 0.040 0.009 4.81 0.000 *** Education 0.927 -0.076 0.021 -3.35 0.001 *** Employment 2.234 0.804 1.648 1.09 0.276 Household size 1.356 0.304 0.086 4.82 0.000 *** Car ownership 0.266 -1.323 0.043 -8.13 0.000 *** Income 1.005 0.005 0.007 0.66 0.508 *** FAR 0.863 -0.147 0.063 -2.00 0.045 ** Dissimilarity 18.592 2.923 34.534 1.57 0.116 Intersection 1.009 0.009 0.024 0.36 0.715 Bike lane 1.329 0.285 0.403 0.94 0.348 Riverfront 0.930 -0.072 0.274 -0.25 0.806 0.806 0.409 0.000 0.00 0.00 0.00 0.00 0.00 0.00 | Number of mode options | 1.188 | 0.173 | 0.144 | 1.43 | 0.154 | |
| Education 0.927 -0.076 0.021 -3.35 0.001 ** Employment 2.234 0.804 1.648 1.09 0.276 Household size 1.356 0.304 0.086 4.82 0.000 *** Car ownership 0.266 -1.323 0.043 -8.13 0.000 *** Income 1.005 0.005 0.007 0.66 0.508 *** FAR 0.863 -0.147 0.063 -2.00 0.045 * Dissimilarity 18.592 2.923 34.534 1.57 0.116 ** Intersection 1.009 0.009 0.024 0.36 0.715 ** Bike lane 1.329 0.285 0.403 0.94 0.348 ** Riverfront 0.930 -0.072 0.274 -0.25 0.806 ** Construction 0.779 -0.250 0.236 -0.83 0.409 ** Neighborhood type 0. | Female | 1.500 | 0.405 | 0.222 | 2.73 | 0.006 | ** |
| Employment 2.234 0.804 1.648 1.09 0.276 Household size 1.356 0.304 0.086 4.82 0.000 **** Car ownership 0.266 -1.323 0.043 -8.13 0.000 **** Income 1.005 0.005 0.007 0.66 0.508 FAR 0.863 -0.147 0.063 -2.00 0.045 * Dissimilarity 18.592 2.923 34.534 1.57 0.116 Intersection 1.009 0.009 0.024 0.36 0.715 Bike lane 1.329 0.285 0.403 0.94 0.348 Riverfront 0.930 -0.072 0.274 -0.25 0.806 Construction 0.779 -0.250 0.236 -0.83 0.409 constant 0.785 -0.243 0.854 -0.22 0.824 Neighborhood type 0.000 0.00 0.00 0.00 0.00 Neighborhood | Age | 1.040 | 0.040 | 0.009 | 4.81 | 0.000 | *** |
| Household size 1.356 0.304 0.086 4.82 0.000 *** Car ownership 0.266 -1.323 0.043 -8.13 0.000 *** Income 1.005 0.005 0.007 0.66 0.508 *** FAR 0.863 -0.147 0.063 -2.00 0.045 * Dissimilarity 18.592 2.923 34.534 1.57 0.116 ** Intersection 1.009 0.009 0.024 0.36 0.715 ** Bike lane 1.329 0.285 0.403 0.94 0.348 * Riverfront 0.930 -0.072 0.274 -0.25 0.806 * Construction 0.779 -0.250 0.236 -0.83 0.409 * constant 0.785 -0.243 0.854 -0.22 0.824 * Neighborhood type 0.090 0.000 0.00 *** *** Number of mode options <td< td=""><td>Education</td><td>0.927</td><td>-0.076</td><td>0.021</td><td>-3.35</td><td>0.001</td><td>**</td></td<> | Education | 0.927 | -0.076 | 0.021 | -3.35 | 0.001 | ** |
| Car ownership 0.266 -1.323 0.043 -8.13 0.000 **** Income 1.005 0.005 0.007 0.66 0.508 FAR 0.863 -0.147 0.063 -2.00 0.045 * Dissimilarity 18.592 2.923 34.534 1.57 0.116 Intersection 1.009 0.009 0.024 0.36 0.715 Bike lane 1.329 0.285 0.403 0.94 0.348 Riverfront 0.930 -0.072 0.274 -0.25 0.806 Construction 0.779 -0.250 0.236 -0.83 0.409 constant 0.785 -0.243 0.854 -0.22 0.824 Neighborhood type 0.000 0.00 0.00 0.00 0.00 Neighborhood (n=1,215) 0.948 -0.053 0.007 -7.02 0.000 *** Number of mode options 0.921 -0.082 0.136 -0.56 0.577 | Employment | 2.234 | 0.804 | 1.648 | 1.09 | 0.276 | |
| Income 1.005 0.005 0.007 0.66 0.508 FAR 0.863 -0.147 0.063 -2.00 0.045 * Dissimilarity 18.592 2.923 34.534 1.57 0.116 Intersection 1.009 0.009 0.024 0.36 0.715 Bike lane 1.329 0.285 0.403 0.94 0.348 Riverfront 0.930 -0.072 0.274 -0.25 0.806 Construction 0.779 -0.250 0.236 -0.83 0.409 constant 0.785 -0.243 0.854 -0.22 0.824 Neighborhood type 0.000 0.00 0.00 0.00 0.00 Neighborhood type 0.093 0.142 0.00 0.00 0.00 Neighborhood type 0.094 -0.053 0.007 -7.02 0.000 *** Number of mode options 0.921 -0.082 0.136 -0.56 0.577 Female | Household size | 1.356 | 0.304 | 0.086 | 4.82 | 0.000 | *** |
| FAR 0.863 -0.147 0.063 -2.00 0.045 * Dissimilarity 18.592 2.923 34.534 1.57 0.116 Intersection 1.009 0.009 0.024 0.36 0.715 Bike lane 1.329 0.285 0.403 0.94 0.348 Riverfront 0.930 -0.072 0.274 -0.25 0.806 Construction 0.779 -0.250 0.236 -0.83 0.409 constant 0.785 -0.243 0.854 -0.22 0.824 Neighborhood type 0.000 0.00 0.00 0.00 0.00 Neighborhood (n=1,215) 0.948 -0.053 0.007 -7.02 0.000 *** Number of mode options 0.921 -0.082 0.136 -0.56 0.577 Female 1.374 0.318 0.262 1.67 0.095 Age 1.062 0.061 0.008 7.63 0.000 *** Ed | Car ownership | 0.266 | -1.323 | 0.043 | -8.13 | 0.000 | *** |
| Dissimilarity 18.592 2.923 34.534 1.57 0.116 Intersection 1.009 0.009 0.024 0.36 0.715 Bike lane 1.329 0.285 0.403 0.94 0.348 Riverfront 0.930 -0.072 0.274 -0.25 0.806 Construction 0.779 -0.250 0.236 -0.83 0.409 constant 0.785 -0.243 0.854 -0.22 0.824 Neighborhood type 0.000 0.00 0.00 0.00 Neighborhood 0.393 0.142 0.00 0.00 Non-Work (n=1,215) 0.948 -0.053 0.007 -7.02 0.000 *** Number of mode options 0.921 -0.082 0.136 -0.56 0.577 Female 1.374 0.318 0.262 1.67 0.095 Age 1.062 0.061 0.008 7.63 0.000 *** Education 0.961 -0.040 | Income | 1.005 | 0.005 | 0.007 | 0.66 | 0.508 | |
| Intersection 1.009 0.009 0.024 0.36 0.715 Bike lane 1.329 0.285 0.403 0.94 0.348 Riverfront 0.930 -0.072 0.274 -0.25 0.806 Construction 0.779 -0.250 0.236 -0.83 0.409 constant 0.785 -0.243 0.854 -0.22 0.824 Neighborhood type 0.000 0.000 0.00 0.00 0.00 Neighborhood 0.393 0.142 0.00 0.00 0.00 Non-Work (n=1,215) 0.948 -0.053 0.007 -7.02 0.000 *** Number of mode options 0.921 -0.082 0.136 -0.56 0.577 Female 1.374 0.318 0.262 1.67 0.095 Age 1.062 0.061 0.008 7.63 0.000 *** Education 0.961 -0.040 0.027 -1.42 0.155 Employment | FAR | 0.863 | -0.147 | 0.063 | -2.00 | 0.045 | * |
| Bike lane 1.329 0.285 0.403 0.94 0.348 Riverfront 0.930 -0.072 0.274 -0.25 0.806 Construction 0.779 -0.250 0.236 -0.83 0.409 constant 0.785 -0.243 0.854 -0.22 0.824 Neighborhood type 0.000 0.000 0.00 Neighborhood 0.393 0.142 Non-Work (n=1,215) Travel time 0.948 -0.053 0.007 -7.02 0.000 *** Number of mode options 0.921 -0.082 0.136 -0.56 0.577 Female 1.374 0.318 0.262 1.67 0.095 Age 1.062 0.061 0.008 7.63 0.000 *** Education 0.961 -0.040 0.027 -1.42 0.155 Employment 0.205 -1.583 0.042 -7.71 0.000 *** Household size 0.897 -0.109 0.074 -1.31 0.190 Car ownership 0. | Dissimilarity | 18.592 | 2.923 | 34.534 | 1.57 | 0.116 | |
| Riverfront 0.930 -0.072 0.274 -0.25 0.806 Construction 0.779 -0.250 0.236 -0.83 0.409 constant 0.785 -0.243 0.854 -0.22 0.824 Neighborhood type 0.000 0.000 0.00 Neighborhood Non-Work (n=1,215) 0.948 -0.053 0.007 -7.02 0.000 *** Number of mode options O.921 -0.082 0.136 -0.56 0.577 0.577 Female 1.374 0.318 0.262 1.67 0.095 Age 1.062 0.061 0.008 7.63 0.000 *** Education O.961 -0.040 0.027 -1.42 0.155 Employment 0.205 -1.583 0.042 -7.71 0.000 *** Household size O.897 -0.109 0.074 -1.31 0.190 *** Car ownership O.500 -0.694 0.099 -3.49 0.000 *** | Intersection | 1.009 | 0.009 | 0.024 | 0.36 | 0.715 | |
| Construction 0.779 -0.250 0.236 -0.83 0.409 constant 0.785 -0.243 0.854 -0.22 0.824 Neighborhood type 0.000 0.00 Neighborhood (n=1,215) Travel time 0.948 -0.053 0.007 -7.02 0.000 *** Number of mode options 0.921 -0.082 0.136 -0.56 0.577 Female 1.374 0.318 0.262 1.67 0.095 Age 1.062 0.061 0.008 7.63 0.000 *** Education 0.961 -0.040 0.027 -1.42 0.155 Employment 0.205 -1.583 0.042 -7.71 0.000 *** Household size 0.897 -0.109 0.074 -1.31 0.190 Car ownership 0.500 -0.694 0.099 -3.49 0.000 *** | Bike lane | 1.329 | 0.285 | 0.403 | 0.94 | 0.348 | |
| constant 0.785 -0.243 0.854 -0.22 0.824 Neighborhood type 0.000 0.00 Neighborhood 0.393 0.142 Non-Work (n=1,215) Travel time 0.948 -0.053 0.007 -7.02 0.000 *** Number of mode options 0.921 -0.082 0.136 -0.56 0.577 Female 1.374 0.318 0.262 1.67 0.095 Age 1.062 0.061 0.008 7.63 0.000 *** Education 0.961 -0.040 0.027 -1.42 0.155 Employment 0.205 -1.583 0.042 -7.71 0.000 *** Household size 0.897 -0.109 0.074 -1.31 0.190 Car ownership 0.500 -0.694 0.099 -3.49 0.000 *** | Riverfront | 0.930 | -0.072 | 0.274 | -0.25 | 0.806 | |
| Neighborhood type 0.000 0.000 Neighborhood 0.393 0.142 Non-Work (n=1,215) 0.948 -0.053 0.007 -7.02 0.000 *** Number of mode options 0.921 -0.082 0.136 -0.56 0.577 Female 1.374 0.318 0.262 1.67 0.095 Age 1.062 0.061 0.008 7.63 0.000 *** Education 0.961 -0.040 0.027 -1.42 0.155 Employment 0.205 -1.583 0.042 -7.71 0.000 *** Household size 0.897 -0.109 0.074 -1.31 0.190 Car ownership 0.500 -0.694 0.099 -3.49 0.000 *** | Construction | 0.779 | -0.250 | 0.236 | -0.83 | 0.409 | |
| Neighborhood 0.393 0.142 Non-Work (n=1,215) Travel time 0.948 -0.053 0.007 -7.02 0.000 *** Number of mode options 0.921 -0.082 0.136 -0.56 0.577 Female 1.374 0.318 0.262 1.67 0.095 Age 1.062 0.061 0.008 7.63 0.000 *** Education 0.961 -0.040 0.027 -1.42 0.155 Employment 0.205 -1.583 0.042 -7.71 0.000 *** Household size 0.897 -0.109 0.074 -1.31 0.190 Car ownership 0.500 -0.694 0.099 -3.49 0.000 **** | constant | 0.785 | -0.243 | 0.854 | -0.22 | 0.824 | |
| Non-Work (n=1,215) Travel time 0.948 -0.053 0.007 -7.02 0.000 *** Number of mode options 0.921 -0.082 0.136 -0.56 0.577 Female 1.374 0.318 0.262 1.67 0.095 Age 1.062 0.061 0.008 7.63 0.000 *** Education 0.961 -0.040 0.027 -1.42 0.155 Employment 0.205 -1.583 0.042 -7.71 0.000 *** Household size 0.897 -0.109 0.074 -1.31 0.190 Car ownership 0.500 -0.694 0.099 -3.49 0.000 *** | Neighborhood type | | 0.000 | 0.00 | | | |
| Travel time 0.948 -0.053 0.007 -7.02 0.000 *** Number of mode options 0.921 -0.082 0.136 -0.56 0.577 Female 1.374 0.318 0.262 1.67 0.095 Age 1.062 0.061 0.008 7.63 0.000 *** Education 0.961 -0.040 0.027 -1.42 0.155 Employment 0.205 -1.583 0.042 -7.71 0.000 **** Household size 0.897 -0.109 0.074 -1.31 0.190 Car ownership 0.500 -0.694 0.099 -3.49 0.000 **** | Neighborhood | | 0.393 | 0.142 | | | |
| Number of mode options 0.921 -0.082 0.136 -0.56 0.577 Female 1.374 0.318 0.262 1.67 0.095 Age 1.062 0.061 0.008 7.63 0.000 *** Education 0.961 -0.040 0.027 -1.42 0.155 Employment 0.205 -1.583 0.042 -7.71 0.000 *** Household size 0.897 -0.109 0.074 -1.31 0.190 Car ownership 0.500 -0.694 0.099 -3.49 0.000 *** | Non-Work (n=1,215) | | | | | | |
| Female 1.374 0.318 0.262 1.67 0.095 Age 1.062 0.061 0.008 7.63 0.000 *** Education 0.961 -0.040 0.027 -1.42 0.155 Employment 0.205 -1.583 0.042 -7.71 0.000 *** Household size 0.897 -0.109 0.074 -1.31 0.190 Car ownership 0.500 -0.694 0.099 -3.49 0.000 *** | Travel time | 0.948 | -0.053 | 0.007 | -7.02 | 0.000 | *** |
| Age 1.062 0.061 0.008 7.63 0.000 *** Education 0.961 -0.040 0.027 -1.42 0.155 Employment 0.205 -1.583 0.042 -7.71 0.000 *** Household size 0.897 -0.109 0.074 -1.31 0.190 Car ownership 0.500 -0.694 0.099 -3.49 0.000 *** | Number of mode options | 0.921 | -0.082 | 0.136 | -0.56 | 0.577 | |
| Education 0.961 -0.040 0.027 -1.42 0.155 Employment 0.205 -1.583 0.042 -7.71 0.000 *** Household size 0.897 -0.109 0.074 -1.31 0.190 Car ownership 0.500 -0.694 0.099 -3.49 0.000 *** | Female | 1.374 | 0.318 | 0.262 | 1.67 | 0.095 | |
| Employment 0.205 -1.583 0.042 -7.71 0.000 *** Household size 0.897 -0.109 0.074 -1.31 0.190 Car ownership 0.500 -0.694 0.099 -3.49 0.000 *** | Age | 1.062 | 0.061 | 0.008 | 7.63 | 0.000 | *** |
| Household size 0.897 -0.109 0.074 -1.31 0.190 Car ownership 0.500 -0.694 0.099 -3.49 0.000 *** | Education | 0.961 | -0.040 | 0.027 | -1.42 | 0.155 | |
| Car ownership 0.500 -0.694 0.099 -3.49 0.000 *** | Employment | 0.205 | -1.583 | 0.042 | -7.71 | 0.000 | *** |
| Car ownership 0.500 -0.694 0.099 -3.49 0.000 *** | Household size | 0.897 | -0.109 | 0.074 | -1.31 | 0.190 | |
| Income 1.024 0.024 0.006 3.87 0.000 *** | Car ownership | 0.500 | -0.694 | 0.099 | -3.49 | 0.000 | *** |
| | Income | 1.024 | 0.024 | 0.006 | 3.87 | 0.000 | *** |
| FAR 0.827 -0.190 0.048 -3.26 0.001 ** | FAR | | | | | | ** |
| Dissimilarity 1.363 0.310 1.879 0.22 0.822 | Dissimilarity | | 0.310 | | 0.22 | | |

| | Odds Ratio | Coef. | Std. Err. | Z | P> z | |
|-------------------|------------|--------|-----------|-------|-------|--|
| Intersection | 1.033 | 0.032 | 0.018 | 1.86 | 0.063 | |
| Bike lane | 1.101 | 0.096 | 0.264 | 0.40 | 0.687 | |
| Riverfront | 1.136 | 0.128 | 0.278 | 0.52 | 0.603 | |
| Construction | 0.700 | -0.357 | 0.166 | -1.50 | 0.133 | |
| constant | 4.259 | 1.449 | 3.537 | 1.74 | 0.081 | |
| Neighborhood type | | 0.000 | 0.000 | | | |
| Neighborhood | | 0.007 | 0.090 | | | |