SUPPLEMENTAL MATERIAL

Table S1. Missing Values for post-stroke outcomes and covariates which were imputed using available data from each study population

| Variable | 2009-2020 Study Population N=1,392 N (%) | 2009-2019 Study Population N=1,299 N (%) | 2010-2020 Study Population N=1,293 N (%) | 2011-2020 Study Population N=1,188 N (%) |
|---|---|---|---|---|
| ADL/IADL[*] | 23 (1.7%) | - | - | - |
| 3MSE[*] | - | 38 (2.9%) | - | - |
| SS-QoL[*] | - | - | 53 (4.1%) | - |
| PHQ-8[*] | - | - | - | 14 (1.2%) |
| IQCODE[*] | 246 (17.7%) | 222 (17.1%) | 241 (18.6%) | 224 (18.9%) |
| Insurance Status | 20 (1.4%) | 20 (1.5%) | 16 (1.2%) | 10 (0.8%) |
| Modified Rankin Scale | 15 (1.1%) | 15 (1.2%) | 15 (1.2%) | 15 (1.3%) |
| Pre-stroke Depression | 12 (0.9%) | 11 (0.8%) | 10 (0.8%) | 7 (0.6%) |
| NIHSS[*] Score | 8 (0.6%) | 8 (0.6%) | 8 (0.6%) | 8 (0.7%) |
| Social Support Scale | 5 (0.4%) | 5 (0.4%) | 4 (0.3%) | 1 (0.1%) |
| Smoking Status | 2 (0.1%) | 2 (0.2%) | 2 (0.2%) | 2 (0.2%) |

* Abbreviations: Activities of Daily Living/ Instrumental Activities of Daily Living; 3MSE – Modified Mini-Mental State Examination; PHQ-8 – Patient Health Questionnaire Eight; SS-QOL - Stroke Specific Quality of Life Scale; IQCODE - Informant Questionnaire on Cognitive Decline in the. Elderly; NIHSS – NIH Stroke Scale

Table S2. Hedges' *g* for Outcomes comparing recreational center first quartile with fourth quartile.

| Outcome | Recreation Center Quartile 1 | | Recreation Center Quartile 4 | | Hedges' *g* |
|---|---|---|---|---|---|
| | N | Mean (SD*) | N | Mean (SD*) | |
| Disability | 346 | 2.055 (0.818) | 344 | 1.886 (0.779) | 0.212 |
| Cognition | 351 | 75.539 (12.702) | 317 | 78.523 (10.095) | 0.259 |
| Quality of Life | 323 | 3.751 (0.917) | 317 | 3.470 (0.979) | 0.296 |
| Depression | 297 | 7.391 (6.583) | 283 | 6.399 (6.325) | 0.154 |

* Standard Deviation

Table S3. Association between IQR increases in neighborhood recreation center density among stroke survivors and 90-day post stroke outcomes of functional status, cognition, depressive symptoms, and health-related quality of life among those with complete data

| Model[†] | ADL/IADL* (N=1,317) IQR* Proportional Difference | | 3MSE* (N=1,207) IQR* Proportional Difference | | PHQ-8* (N=1,133) IQR* Proportional Difference | | SS-QOL* (N=1,194) IQR* Proportional Difference | |
|---|---|---|---|---|---|---|---|---|
| | (95% CI*) | p-value | (95% CI*) | p-value | (95% CI*) | p-value | (95% CI*) | p-value |
| 1 | 0.98 (0.96, 1.01) | 0.229 | 1.01 (1.00, 1.01) | 0.179 | 0.95 (0.90, 0.99) | 0.024 | 1.01 (1.00, 1.03) | 0.107 |
| 2 | 0.99 (0.97, 1.02) | 0.687 | 1.00 (1.00, 1.01) | 0.492 | 0.97 (0.92, 1.02) | 0.194 | 1.01 (0.99, 1.03) | 0.199 |
| 3 | 1.00 (0.97, 1.02) | 0.835 | 1.00 (1.00, 1.01) | 0.567 | 0.97 (0.92, 1.03) | 0.311 | 1.01 (0.99, 1.02) | 0.209 |
| 4 | 1.00 (0.97, 1.03) | 0.990 | 1.00 (1.00, 1.01) | 0.459 | 0.97 (0.92, 1.02) | 0.222 | 1.01 (0.99, 1.02) | 0.314 |
| 5 | 1.00 (0.97, 1.02) | 0.892 | 1.00 (1.00, 1.01) | 0.344 | 0.97 (0.92, 1.02) | 0.209 | 1.01 (0.99, 1.02) | 0.274 |
| 6 | 1.00 (0.97, 1.03) | 0.947 | 1.00 (1.00, 1.01) | 0.292 | 0.97 (0.92, 1.02) | 0.229 | 1.01 (0.99, 1.02) | 0.314 |
| 7 | 1.00 (0.97, 1.03) | 0.939 | 1.00 (1.00, 1.01) | 0.265 | 0.97 (0.92, 1.02) | 0.211 | 1.01 (0.99, 1.02) | 0.276 |
| 8 | | 0.037‡ | | 0.879‡ | | 0.562‡ | | 0.131‡ |
| NIHSS score ≤5 | 1.01 (0.98, 1.04) | 0.583 | 1.00 (1.00, 1.01) | 0.254 | 0.97 (0.93, 1.02) | 0.272 | 1 (0.99, 1.02) | 0.649 |
| NIHSS score >5 | 0.95 (0.90, 1.00) | 0.041 | 1.00 (0.98, 1.03) | 0.662 | 0.94 (0.84, 1.05) | 0.305 | 1.04 (0.99, 1.08) | 0.091 |

*Abbreviations: Activities of Daily Living/ Instrumental Activities of Daily Living; 3MSE – Modified Mini-Mental State Examination; PHQ-8 – Patient Health Questionnaire Eight; SS-QOL - Stroke Specific Quality of Life Scale; IQR – Interquartile Range; CI – Confidence Interval; NIHSS – NIH Stroke Scale

†Models 1) unadjusted, 2) basic demographics of age, sex, and race/ethnicity, 3) model 2 + individual socioeconomic status (education and insurance status), 4) model 3 + individual-level pre-stroke characteristics relating to functioning, cognition, depression, and health, 5) model 4 + marital status and social support, 6) model 5 + neighborhood socioeconomic status 7) model 6 + stroke type and stroke severity, and 8) model 7 + interaction term of neighborhood resources and stroke severity

‡ P-value for interaction between recreational center density and stroke severity

Table S4. P-values for interactions with the association between Interquartile range increases in neighborhood recreation center density among stroke survivors and 90-day post stroke outcomes.

| Interaction Terms* | ADL/IADL [†] (N=1,392) | 3MSE [†] (N=1,299) | PHQ-8 [†] (N=1,188) | SS-QOL [†] (N=1,293) |
|---|---|---|---|---|
| Recreation Center Density x Race/Ethnicity x Severity | 0.5638 | 0.7127 | 0.4783 | 0.2864 |
| Recreation Center Density x Race/Ethnicity | 0.9981 | 0.0774 | 0.7511 | 0.8072 |
| Recreation Center Density x Sex x Severity | 0.7912 | 0.7292 | 0.4228 | 0.9920 |
| Recreation Center Density x Sex | 0.0347 | 0.2962 | 0.9137 | 0.7977 |

*All models adjusted for basic demographics of age, sex, and race/ethnicity, individual SES (education and insurance status), individual-level pre-stroke characteristics relating to functioning, cognition, depression, and health, marital status and social support, neighborhood affluence score, stroke severity, interaction between recreation center density and stroke severity, and additional indicated interaction terms. In case of three way interaction terms, an interaction term between recreation center density and race/ethnicity or sex was also included.

[†]Abbreviations: IQR – Interquartile Range; CI – Confidence Interval; Activities of Daily Living/ Instrumental Activities of Daily Living; 3MSE – Modified Mini-Mental State Examination; PHQ-8 – Patient Health Questionnaire Eight; SS-QOL - Stroke Specific Quality of Life Scale

Table S5. Association between Interquartile range increases in neighborhood recreation center density among stroke survivors and 90-day post stroke outcomes of cognition by stroke severity and race/ethnicity (N=1,299).

| Strata* | IQR† Proportional Difference (95% CI†) | p-value |
|---|---|---|
| Non-Hispanic White | | |
|     Mild Stroke | 1.00 (0.99, 1.00) | 0.4418 |
|     Moderate-Severe Stroke | 1.00 (0.98, 1.02) | 0.8757 |
| Mexican American | | |
|     Mild Stroke | 1.01 (1.00, 1.01) | 0.0968 |
|     Moderate-Severe Stroke | 1.01 (0.99, 1.03) | 0.3525 |

*Models 1) unadjusted, 2) model 1 + basic demographics of age, sex, and race/ethnicity, 3) model 2 + individual SES (education and insurance status), 4) model 3 + individual-level pre-stroke characteristics relating to functioning, cognition, depression, and health, 5) model 4 + marital status and social support, 6) model 5 + nSES 7) model 6 + stroke type and stroke severity, and 8) model 7 + interaction term of neighborhood resources and stroke severity

†Abbreviations: IQR – Interquartile Range; CI – Confidence Interval

Table S6. Association between Interquartile range increases in neighborhood recreation center density among stroke survivors and 90-day post stroke outcomes of Activities of Daily Living (ADL)/Instrumental ADL by stroke severity and sex (N=1,392)

| Strata* | IQR[†] Proportional Difference (95% CI[†]) | p-value |
|---|---|---|
| Female | | |
|     Mild Stroke | 0.98 (0.96, 1.00) | 0.1206 |
|     Moderate-Severe Stroke | 0.93 (0.89, 0.99) | 0.0118 |
| Male | | |
|     Mild Stroke | 1.02 (0.99, 1.06) | 0.1681 |
|     Moderate-Severe Stroke | 0.97 (0.92, 1.03) | 0.3190 |

*Models 1) unadjusted, 2) model 1 + basic demographics of age, sex, and race/ethnicity, 3) model 2 + individual SES (education and insurance status), 4) model 3 + individual-level pre-stroke characteristics relating to functioning, cognition, depression, and health, 5) model 4 + marital status and social support, 6) model 5 + nSES 7) model 6 + stroke type and stroke severity, and 8) model 7 + interaction term of neighborhood resources and stroke severity

[†]Abbreviations: IQR – Interquartile Range; CI – Confidence Interval

Table S7. Association between IQR increases in neighborhood recreation center density among stroke survivors and disability and quality of life after accounting for missing data and differential loss to follow-up in BASIC study.

| Model * | Mild Stroke | | | Moderate-Severe Stroke | | |
| | IQR[†] Proportional Difference (95% CI[†]) | p-value | | IQR[†] Proportional Difference (95% CI[†]) | p-value | |
| --- | --- | --- | --- | --- | --- | --- |
| ADL/IADL | (N=1081)[‡] | | | (N=311)[§] | | |
| 1 | 0.993 (0.966, 1.021) | 0.618 | | 0.948 (0.904, 0.995) | 0.032 | |
| 2 | 1.002 (0.974, 1.032) | 0.879 | | 0.952 (0.912, 0.993) | 0.023 | |
| 3 | 1.005 (0.977, 1.033) | 0.735 | | 0.951 (0.912, 0.992) | 0.019 | |
| 4 | 1.009 (0.981, 1.037) | 0.546 | | 0.948 (0.910, 0.988) | 0.012 | |
| 5 | 1.008 (0.981, 1.035) | 0.580 | | 0.950 (0.911, 0.990) | 0.016 | |
| 6 | 1.009 (0.982, 1.038) | 0.513 | | 0.950 (0.911, 0.990) | 0.014 | |
| 7 | 1.009 (0.982, 1.038) | 0.509 | | 0.954 (0.914, 0.996) | 0.033 | |
| SS-QOL | (N=1024)[∥] | | | (N=269)[#] | | |
| 1 | 1.009 (0.992, 1.025) | 0.298 | | 1.040 (0.993, 1.089) | 0.096 | |
| 2 | 1.004 (0.989, 1.019) | 0.574 | | 1.041 (0.997, 1.086) | 0.070 | |
| 3 | 1.004 (0.989, 1.018) | 0.609 | | 1.041 (0.995, 1.088) | 0.080 | |
| 4 | 1.003 (0.989, 1.017) | 0.669 | | 1.044 (1.002, 1.088) | 0.040 | |
| 5 | 1.003 (0.989, 1.016) | 0.674 | | 1.046 (1.003, 1.090) | 0.034 | |
| 6 | 1.002 (0.989, 1.016) | 0.743 | | 1.038 (1.001, 1.076) | 0.043 | |
| 7 | 1.002 (0.989, 1.016) | 0.722 | | 1.036 (0.998, 1.076) | 0.067 | |

* Models 1) unadjusted, 2) basic demographics of age, sex, and race/ethnicity, 3) model 2 + individual SES (education and insurance status), 4) model 3 + individual-level pre-stroke characteristics relating to functioning, cognition, depression, and health, 5) model 4 + marital status and social support, 6) model 5 + neighborhood SES, and 7) model 6 + stroke type and stroke severity

[†] Abbreviations: IQR – Interquartile Range; CI – Confidence Interval

[‡] Across 10 imputations, number of persons with mild stroke ranged from 1080-1083. N provided by pooling frequencies and standard error. N=1081.1 (Standard Error=15.58, 95% CI=1050.57, 1111.64)

[§] Across 10 imputations, number of persons with moderate-severe stroke ranged from 309-312. N provided by pooling frequencies and standard error. N=310.9 (Standard Error=15.58, 95% CI=280.36, 341.44)

[∥] Across 10 imputations, number of persons with mild stroke ranged from 1022-1025. N provided by pooling frequencies and standard error. N=1023.8 (Standard Error=14.64 95% CI=995.11, 1052.49)

[#] Across 10 imputations, number of persons with moderate-severe stroke ranged from 268-271. N provided by pooling frequencies and standard error. N=269.2 (Standard Error=14.64, 95% CI=240.51, 297.89)
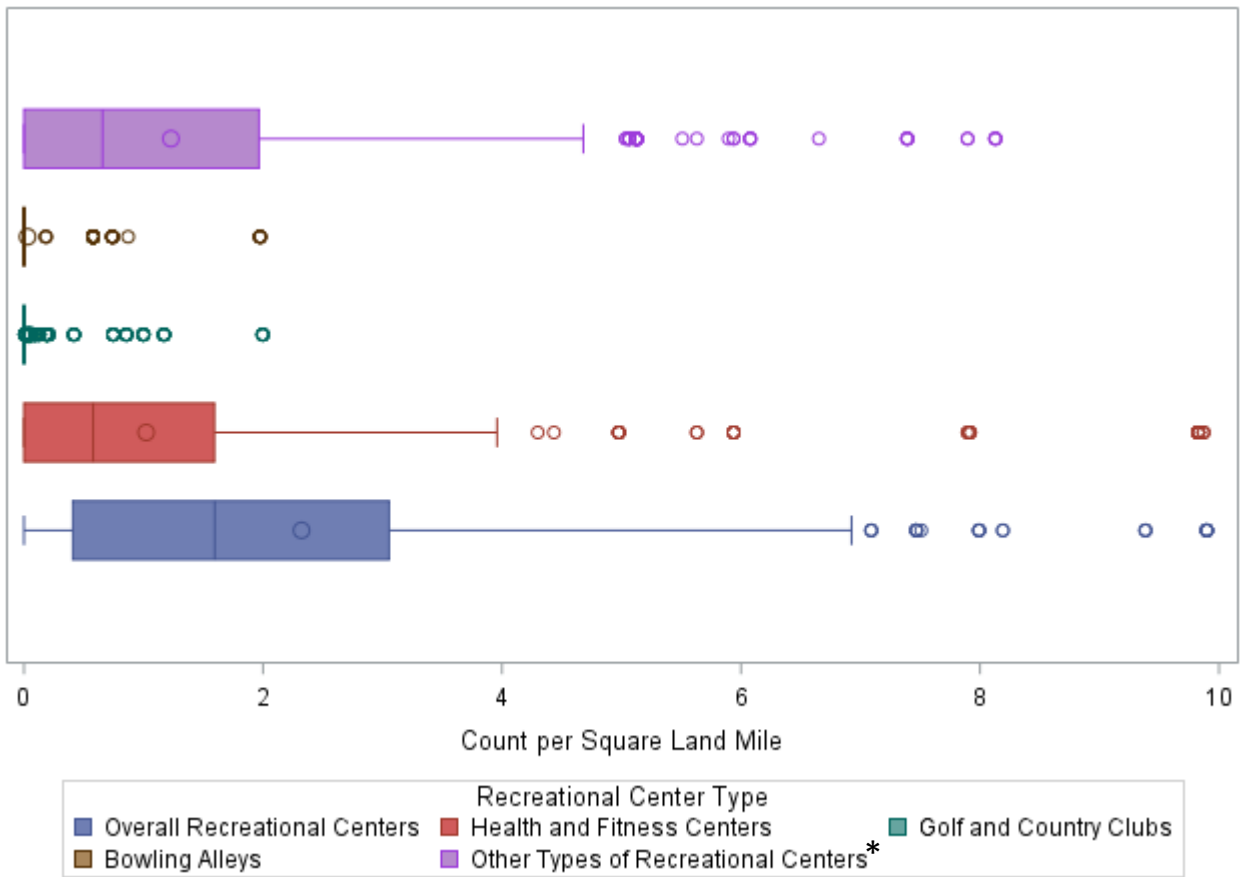
**Figure S1. Composition of recreational centers among eligible stroke survivors (N=1,392)**
*Count obtained by subtracting numbers for health club and exercise facilities, golf courses and country clubs, and bowling alleys from overall recreational and fitness centers.
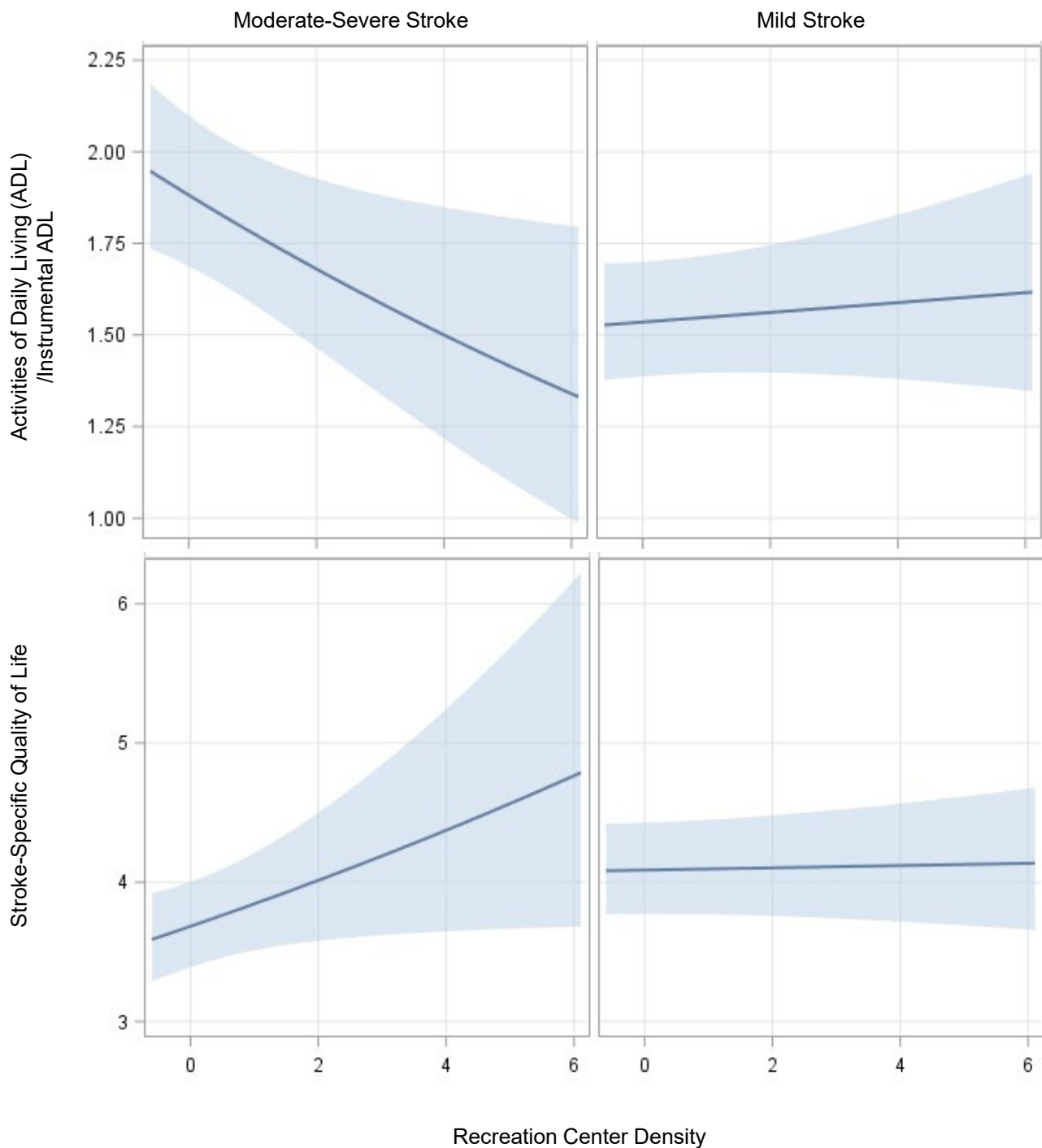
**Figure S2. Graph of recreational center density and post-stroke outcomes.**
* Recreational center density is centered at median and rescaled by interquartile range
** The graph portrays a mixed generalized linear model with gamma family and log link
function based on the first imputed set (results from other imputed sets were similar and are
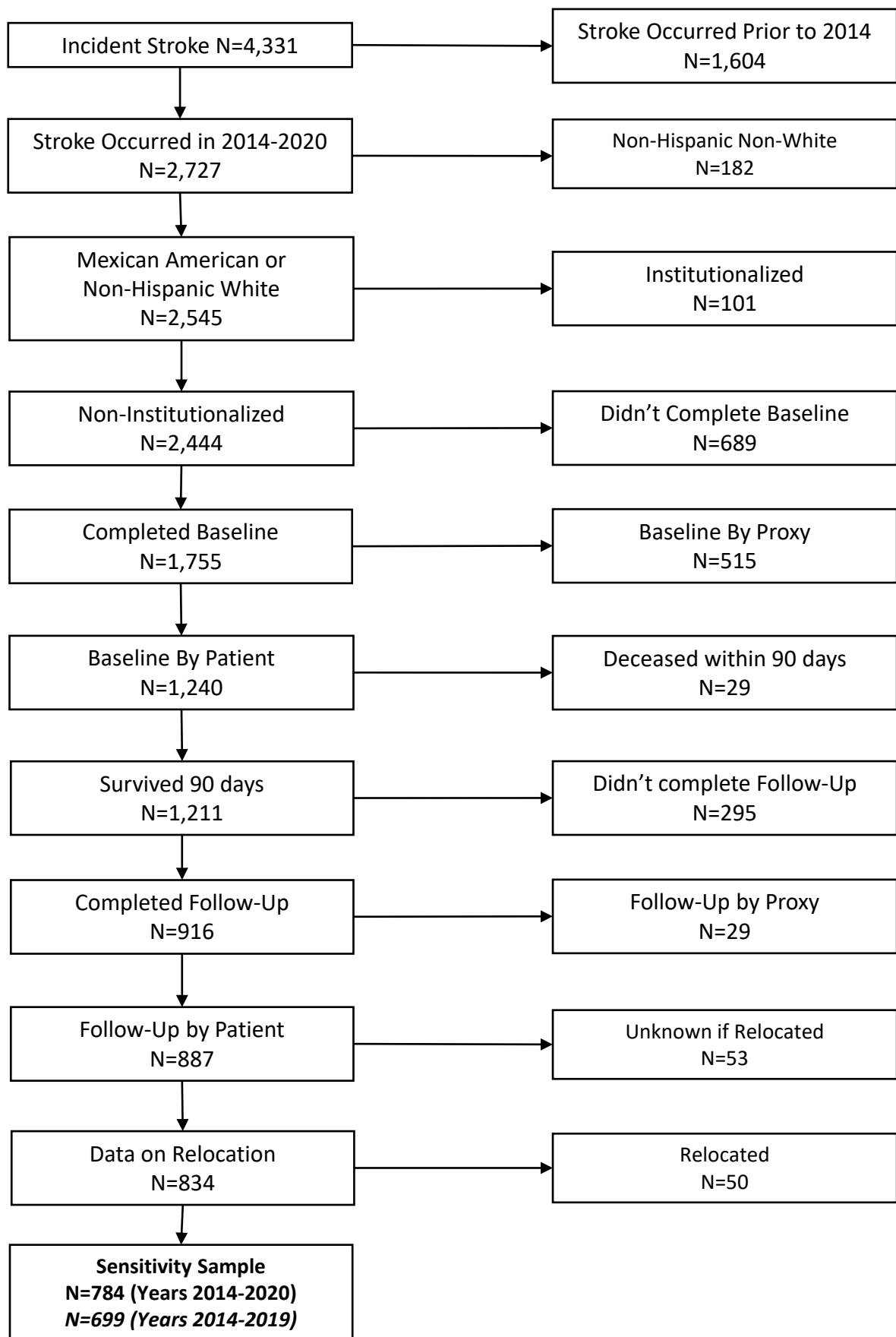not shown). All covariates are held constant at median value or most common category.

**Figure S3.** Eligibility flow chart for sensitivity analysis excluding persons who reported moving following stroke.
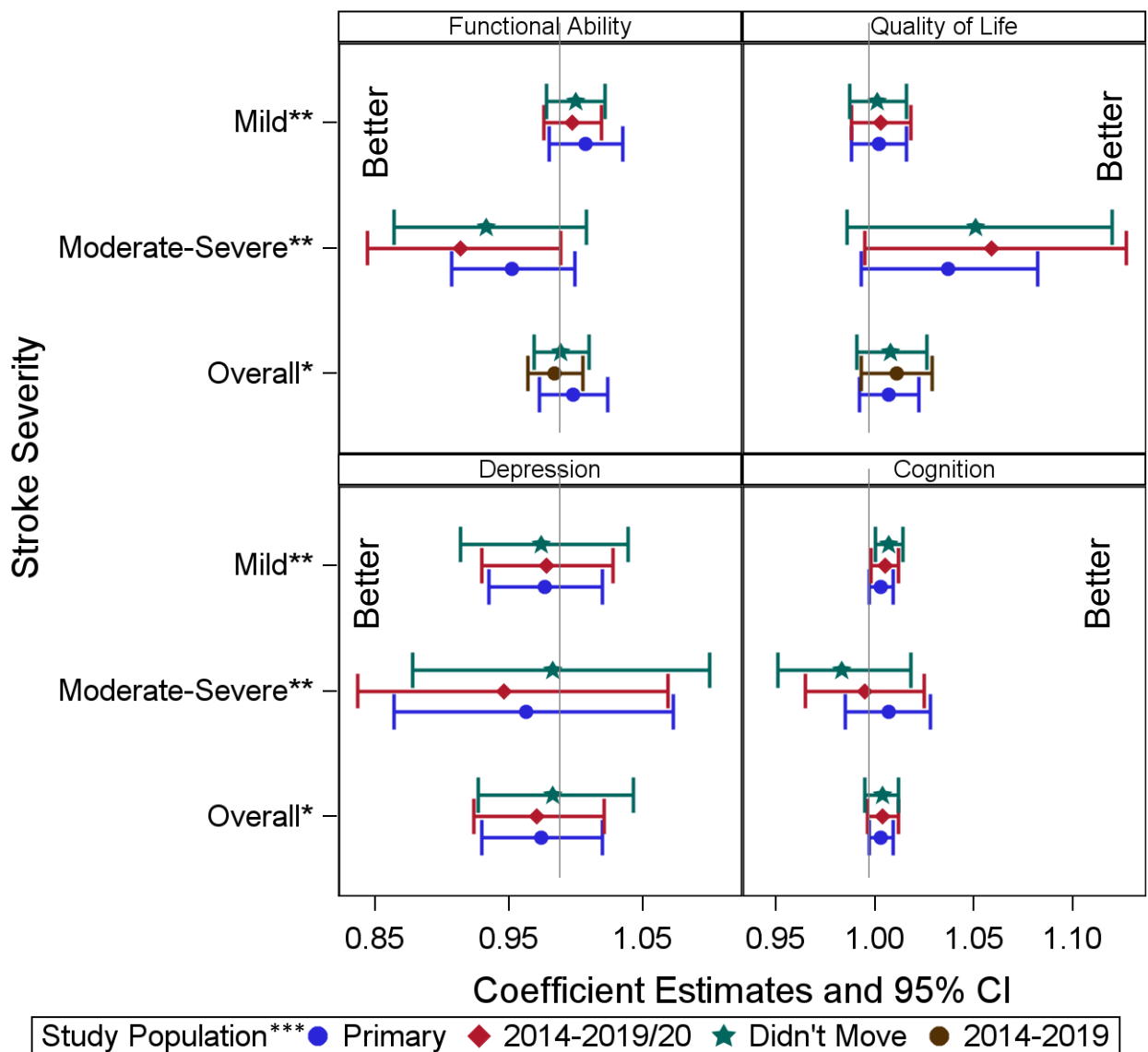
**Figure S4.** Interquartile proportional differences in recreation centers density and 90-day post-stroke outcomes by stroke severity and study population

*Adjusted for demographics (age, sex, race/ethnicity), individual socioeconomic status (education, health insurance), pre-stroke health (comorbidities, function, cognition, depression, smoking), interpersonal factors (marital status, social support), neighborhood socioeconomic status (neighborhood disadvantage, neighborhood affluence), stroke type and severity.

**Additionally adjusted for interaction between religious organization density and stroke severity.

*** Primary study population reflects available data for each outcome from 2009-2020. 2014-2019/20 study population reflects available data for each outcome from 2014-2020. Didn't move study population reflects available data for persons who indicated they did not move since discharge at the 90-day interview for available data for each outcome from 2014-2020. (Disability was available for 2009-2020, Cognition was available for 2009-2019, Quality of Life was available for 2010-2020, and Depression was available for 2011-2020)
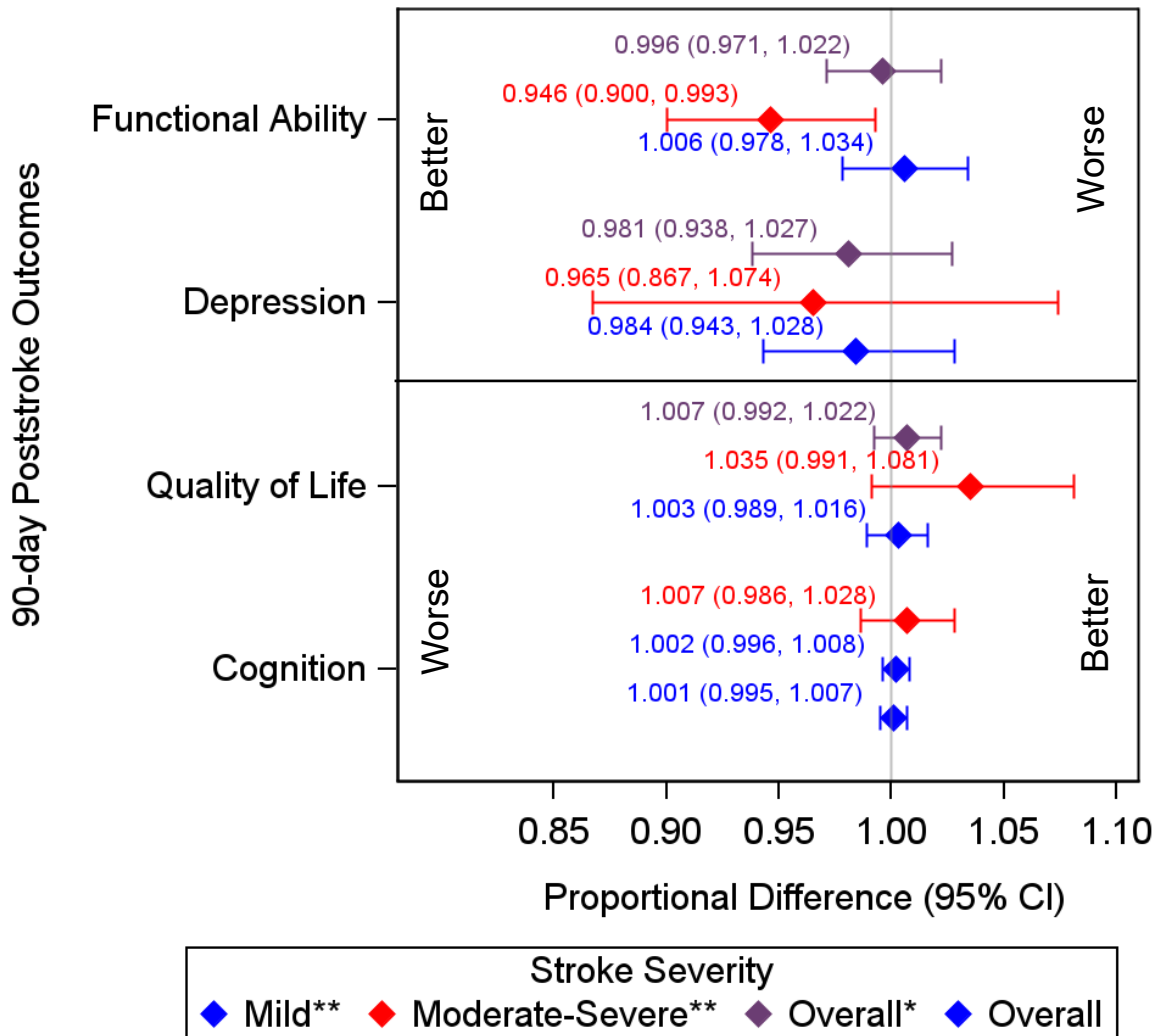
**Figure S5.** Interquartile proportional differences in recreation centers density and 90-day post-stroke outcomes by stroke severity among those residing in non-rural census tracts

*Adjusted for demographics (age, sex, race/ethnicity), individual socioeconomic status (education, health insurance), pre-stroke health (comorbidities, function, cognition, depression, smoking), interpersonal factors (marital status, social support), neighborhood socioeconomic status (neighborhood disadvantage, neighborhood affluence), stroke type and severity.
**Additionally adjusted for interaction between religious organization density and stroke severity.