Appendix

**Table A. Measures**

|  |  |  |  |
| --- | --- | --- | --- |
| **Construct and time point if applicable** | **Scale Name** | **Item(s)** | **Notes** |
| Depression (T2) | CES-D | * I was bothered by things that usually don’t bother me.
* I did not feel like eating; my appetite was poor.
* I felt that I could not shake off the blues even with help from my family or friends.
* I felt I was just as good as other people.
* I had trouble keeping my mind on what I was doing.
* I felt depressed.
* I felt that everything I did was an effort.
* I felt hopeful about the future.
* I thought my life had been a failure.
* I felt fearful.
* My sleep was restless.
* I was happy.
* I talked less than usual.
* I felt lonely.
* People were unfriendly.
* I enjoyed life.
* I had crying spells.
* I felt sad.
* I felt that people dislike me.
* I could not get “going.”
 | Response options range from 0 (rarely or none of the time) to 3 (most or all of the time), which refer to frequency of the symptoms in the past week. Score totals for individuals with more than four missing responses were not calculated. After reverse coding, items are summed to create a total score that ranged from 0 (best possible) to 60 (worst). |
| Neighborhood poverty | -- | Block group household poverty compiled from 2010 census data.  | Analyzed as a continuous variable. |
| Neighborhood social cohesion | Sampson et al.’s 5 item measure of Social Cohesion and Trust | * People around here are willing to help their neighbors.
* This is a close-knit or unified neighborhood.
* People in my neighborhood can’t be trusted.
* People in my neighborhood don’t get along with each other.
* People in my neighborhood do not share the same values.
 | All items were assessed on a 5-point likert response scale (1=strongly agree to 5=strongly disagree). After reverse coding any necessary items, responses were summed and ranged from 5-25, with higher scores indicating more social cohesion. Responses of “don’t know” were combined with responses that indicated “neutral”, in line with Sampson et al.’s original analysis of this variable. |
| Neighborhood access to physical activity and walking resources | Walking and Exercise Environment scale | * My neighborhood offers many opportunities to be physically active.
* Local sports clubs and other providers in my neighborhood offer many opportunities to get exercise.
* It is pleasant to walk in my neighborhood.
* There are enough trees in my neighborhood to provide shade.
* My neighborhood has heavy traffic
* There are busy roads to cross when out for walks in my neighborhood.
* In my neighborhood, it is easy to walk to places.
* There are stores within walking distance of my home.
* On my neighborhood, the streets and sidewalks are in good condition.
* I often see other people walking in my neighborhood.
* I often see other people exercise (for example, jog, bicycle, play sports) in my neighborhood.
 | All items were assessed on a 5-point likert response scale (1=strongly agree to 5=strongly disagree) and after reverse coding, were summed, where higher scores indicate more access. Responses of “don’t know” were combined with responses that indicated “neutral”. |
| Neighborhood perceived safety | -- | * I feel safe walking in my neighborhood during the evening.
* My neighborhood is safe from crime.
* Violence is a problem in my neighborhood.
 | All items were assessed on a 5-point likert response scale (1=strongly agree to 5=strongly disagree) and after reverse coding any necessary items, summed, where higher scores indicate more safety. Responses of “don’t know” were combined with responses that indicated “neutral”. |
| Race / ethnicity | -- | White or Black / African American |  |
| Gender | -- | Male / Female |  |
| Age  | -- | Age |  |
| BMI  | -- | * Measured weight (to the nearest pound)
* Measured height (to the nearest .5 inch)
 | Calculated BMI |
| Education | -- | What is the highest grade or year of school that you have completed, including trade or vocational school or college? * 00 through 12=Grade school
* 13=GED
* 14=vocational, one year
* 15=vocational, two years
* 16=vocational, three years
* 17=college, one year
* 18=college, two years
* 19=college, three years
* 20=college, four years
* 21=graduate or professional school with advanced degrees
 | Education was used as a dichotomous variable (0=completed less than 12 years of formal schooling, 1=completed 12 years or more). |
| Health insurance | -- | Do you now have health insurance through…?* None
* Work or union
* Medicare A
* Medicare B
* Medicare D
* Medicaid or public aid
* Grange Farm Bureau
* Medical Society, or Group Retirement Plan
* Direct purchase from insurance company by yourself
* Veterans Administration
* CHAMPUS-coverage for military personnel and dependents
* Any other plan?
 | Insurance status was dichotomized as any (coded as 1) or none (coded as 0).  |
| Number of comorbidities (T2) | -- | Please tell me which of the following conditions or illnesses a DOCTOR, NURSE, or HEALTH PROFESSIONAL has told you that you have NOW.* Heart disease (heart attack, angina, congestive heart failure or other heart condition)
* High blood pressure (hypertension)
* Lung disease (asthma, TB, chronic bronchitis, emphysema, chronic allergy or other chronic lung problem)
* Vascular disease (stroke or circulation problems)
* Ulcer (stomach ulcer or GERD)
* Liver disease
* Cancer
* Anxiety/depression
* Anemia
* Diabetes
* Kidney disease (kidney stone or renal failure)
 | A comorbidity index of 11 diseases (heart disease, high blood pressure, lung disease, cardiovascular disease, ulcer, liver disease, cancer, anxiety/depression, anemia, diabetes, and kidney disease) was created and defined as the sum of positive responses for individual diseases. |
| Physical activity | Behavioral Risk Factor Surveillance System | Moderate activities are defined as any activity performed for at least 10 minutes at a time, such as brisk walking, bicycling, vacuuming, gardening, or anything else that causes some increase in breathing or heart rate. Vigorous activities are defined as any activity performed for at least 10 minutes at a time, such as running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate.* Thinking about the MODERATE activities that you do IN A USUAL WEEK, do you do MODERATE activities for at least 10 minutes at a time, such as brisk walking, bicycling, vacuuming, gardening or anything else that causes small increases in breathing or heart rate?
* How many DAYS PER WEEK do you do these MODERATE activities for at least 10 minutes at a time?
* On days when you do MODERATE activities for at least 10 minutes at a time, how much TOTAL TIME PER DAY do you spend doing these activities? (measured in hours)
* On days when you do MODERATE activities for at least 10 minutes at a time, how much TOTAL TIME PER DAY do you spend doing these activities? (measured in minutes)
* Now thinking about VIGOROUS physical activities you do IN A USUAL WEEK, do you do VIGOROUS activities for at least 10 minutes at a time, such as running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate?
* How many DAYS PER WEEK do you do these VIGOROUS activities for at least 10 minutes at a time?
* On days when you do VIGOROUS activities for at least 10 minutes at a time, how much TOTAL TIME PER DAY do you spend doing these activities? (measured in hours)
* On days when you do VIGOROUS activities for at least 10 minutes at a time, how much TOTAL TIME PER DAY do you spend doing these activities? (measured in minutes)
 | Based on responses to questions, individuals were classified as* Inactive (participants that report doing no moderate or vigorous physical activity).
* Insufficiently active (participants that report doing insufficient moderate or vigorous physical activity to meet recommendations, i.e. participants that reported less than 5 days of moderate activity with 30 or more minutes per day and less than 3 days of vigorous activity with 20 or more minutes per day)
* Active (participants that report that report doing enough moderate or vigorous physical activity to meeting the recommendations, i.e., participants that reported 5 or more days of moderate activity with 30 or more minutes per day and/or 3 or more days of vigorous activity with 20 or more minutes per day)
 |
| Knee OA | KL scale | -- | Radiographic knee OA was assessed using clinical exams. Posterior-anterior radiographs of the knee were obtained and interpreted by a musculoskeletal radiologist using the Kellgren-Lawrence (KL) scale from 0 to 4. Presence of radiographic OA was defined as KL grade at 2 or higher.  |
| Loneliness | Strong Ties scale | * How often are you bothered by not having a close companion?
* How often are you bothered by not seeing people you feel close to?
* How often are you bothered by not having enough close friends?
* How often are you bothered by not having someone who shows you love and affection?
 | All items were assessed on a 5-point likert response scale (1=strongly agree to 5=strongly disagree), reverse coded, and summed, where higher scores indicate more loneliness. |
| Perceived individual control | Perceived Control Scale | * I have control over the decisions that affect my life.
* I am satisfied with the amount of control I have over decisions that affect my life.
 | Both items were assessed on a 5-point likert response scale (1=strongly agree to 5=strongly disagree), reverse coded, and summed, where higher scores indicate more control. |
| Chronic conditions (for sensitivity analysis) | Disease Inventory Index and radiography / KL scores | * Knee or hip OA
* Heart disease (heart attack, angina, congestive heart failure or other heart condition)
* Hypertension
* Lung disease (including asthma, tuberculosis, chronic bronchitis, emphysema, chronic allergy or another chronic lung problem)
* Vascular disease (including: stroke or circulation problems)
* Liver disease
* Cancer
* Diabetes
* Kidney disease/renal failure
 | All conditions were measured using the Disease Inventory Index, except for knee and hip OA for which we used radiography and KL scores.  |

Table B.Model fit from the confirmatory factor analyses for adults from the T2 wave of the Johnston County Osteoarthritis Project, Johnston County, North Carolina, 2006-2011, n=1697

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Items | Modifications  | Chi-Square (p-value) a,b | CFI a,c | TLI a,c | RMSEA a,d | Cronbach’s Alpha |
| Depressive symptoms | All 20 items | -- | 810.71(p<.0001) | 0.96 | 0.95 | 0.05 (0.05, 0.05) | 0.88 |
| Perceived neighborhood social cohesion | All 5 items | -- | 386.66 (p<.0001) | 0.95 | 0.89 | 0.21 (0.20, 0.23) | 0.86 |
| All 5 items  | Correlated two items, which were reverse coded. | 27.61 (p<.0001) | 0.99 | 0.99 | 0.06 (0.04, 0.08) | 0.86 |
| Perceived neighborhood resources for physical activity and walking | All 11 items | -- | 6995.897 (p<.0001) | 0.66 | 0.57 | 0.31 (0.30, 0.31) | 0.73 |
| 4 items (8, 10, 11, 16) | Only included 4/11 items since the initial model had poor fit. f | 7.71 (p=0.02) | 0.99 | 0.99 | 0.04 (0.01, 0.07) | 0.65 |
| Perceived neighborhood safety e | 3 items | -- | -- | -- | -- | -- | 0.70 |
| Loneliness | All 4 items | -- | 51.70 (p<.0001) | 0.99 | 0.96 | 0.12 (0.10, 0.15) | 0.75 |
| Perceived individual control e | 2 items | -- | -- | -- | -- | -- | 0.72 |
| Perceived neighborhood environment e | Higher order factor comprised of neighborhood social cohesion, access to physical activity and walking resources, and safety | -- | -- | -- | -- | -- | 0.72 |
| **Notes**: a All CFAs controlled for clustering using type=complexb Chi-square test (p-value should be >0.05; however, model fit can still be adequate if this p-value value is <0.05 since chi-square is dependent on sample size172)c The Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) (CFI, TLI should be >0.95173,174)d The root mean square error of approximation (RSMEA, should be <0.06175,176)e The model fit of factors with 3 or less items cannot be determined since the model would be just identified or not identified.f Items were selected based on empirical evidence (correlations >0.40) and previous research suggesting their importance for measuring resources for physical activity and walking in rural neighborhoods. |

Table C. Results of the structural equation model, for somatic and non-somatic depressive symptoms, for adults from the T2 wave of the Johnston County Osteoarthritis Project, Johnston County, North Carolina, 2006-2011, n=1558

|  |  |
| --- | --- |
| Exogenous variables | Endogenous variables |
| Perceived neighborhood environment | Physical activity  | Loneliness | Perceived individual control | Depressive symptoms (somatic) | Depressive symptoms (non-somatic) |
| Poverty | B= -0.16\*\*\* | B = -0.06\* | -- | -- | B= -0.07 | B= 0.003 |
| Perceived neighborhood environment | -- | B= 0.09\*\* | B= -0.41\*\*\* | B= 0.61\*\*\* | B= -0.02 | B= 0.01 |
| Physical activity | -- | -- | -- | -- | B= -0.12\*\*\* | B= -0.13\*\*\* |
| Loneliness | -- | -- | -- | -- | B= 0.37\*\*\* | B=0.49\*\*\* |
| Perceived individual control |  |  |  | -- | B= -0.08 | B= -0.14\* |
| **Notes**All relationships controlled for race, gender, BMI, education, health insurance status, number of comorbidities, age, and knee OA status. All relationships also controlled for clustering using type=complex. The correlation between somatic and non-somatic symptoms was 0.83. Beta coefficients are standardized.\* p<.05, \*\* p<.01, \*\*\* p<.001**Model Fit:**Chi-Square value (p-value): 1659.92, p<.001); RMSEA: 0.02 (95% CI: 0.02, 0.02); CFI: 0.96; TLI: 0.96**Indirect Effects** * Perceived neighborhood environment 🡪 Physical activity 🡪 Depressive symptoms (somatic): B= -0.01, p=0.003
* Perceived neighborhood environment 🡪 Physical activity 🡪 Depressive symptoms (non-somatic): B= -0.01, p=0.006
* Perceived neighborhood environment 🡪 Loneliness 🡪 Depressive symptoms (somatic): B= -0.15, p<0.001
* Perceived neighborhood environment 🡪 Loneliness 🡪 Depressive symptoms (non-somatic): B= -0.20, p<0.001
* Perceived neighborhood environment 🡪 Perceived individual control 🡪 Depressive symptoms (somatic) B= -0.05, p=0.06
* Perceived neighborhood environment 🡪 Perceived individual control 🡪 Depressive symptoms (non-somatic) B= -0.08, p=0.02
* Poverty 🡪 Physical activity 🡪 Depressive symptoms (somatic): B= 0.007, p=0.07
* Poverty 🡪 Physical activity 🡪 Depressive symptoms (non-somatic): B= 0.008, p=0.06
* Poverty 🡪 Perceived neighborhood environment 🡪 Depressive symptoms (somatic): B= 0.003, p=0.65
* Poverty 🡪 Perceived neighborhood environment 🡪 Depressive symptoms (non-somatic): B= -0.001, p=0.92
* Poverty 🡪 Perceived neighborhood environment 🡪 Physical activity 🡪 Depressive symptoms (somatic): B= 0.002, p=0.01
* Poverty 🡪 Perceived neighborhood environment 🡪 Physical activity 🡪 Depressive symptoms (non-somatic): B= 0.002, p=0.01
* Poverty 🡪 Perceived neighborhood environment 🡪 Loneliness 🡪 Depressive symptoms (somatic): B= 0.02, p<0.001
* Poverty 🡪 Perceived neighborhood environment 🡪 Loneliness 🡪 Depressive symptoms (non-somatic): B= 0.03, p<0.001
* Poverty 🡪 Perceived neighborhood environment 🡪 Perceived individual control 🡪 Depressive symptoms (somatic): B= 0.008, p=0.07
* Poverty 🡪 Perceived neighborhood environment 🡪 Perceived individual control 🡪 Depressive symptoms (non-somatic): B=0.01, p=0.04
* Poverty 🡪 Perceived neighborhood environment 🡪 Physical activity: B=-0.02, p=0.009
 |

Table D. Results of the structural equation model for adults with at least one chronic disease, from the T2 wave of the Johnston County Osteoarthritis Project, Johnston County, North Carolina, 2006-2011, n=1482

|  |  |
| --- | --- |
| Exogenous variables | Endogenous variables |
| Perceived neighborhood environment | Physical activity  | Loneliness | Perceived individual control | Depressive symptoms |
| Poverty | B= -0.17\*\*\* | B = -0.05 | -- | -- | B= -0.03 |
| Perceived neighborhood environment | -- | B= 0.11\*\* | B= -0.40\*\*\* | B= 0.60\*\*\* | B= -0.01 |
| Physical activity | -- | -- | -- | -- | B= -0.16\*\*\* |
| Loneliness | -- | -- | -- | -- | B= 0.49\*\*\* |
| Perceived individual control |  |  |  | -- | B= -0.14\*\* |
| **Notes**All relationships controlled for race, gender, BMI, education, health insurance status, and age. All relationships also controlled for clustering using type=complex. Beta coefficients are standardized.\* p<.05, \*\* p<.01, \*\*\* p<.001**Model Fit:**Chi-Square value (p-value): 1672.79, p<.001); RMSEA: 0.02 (95% CI: 0.02, 0.02); CFI: 0.96; TLI: 0.96**Indirect Effects*** Perceived neighborhood environment 🡪 Physical activity 🡪 Depressive symptoms: B = -0.02, p=0.003
* Perceived neighborhood environment 🡪 Loneliness 🡪 Depressive symptoms: B = -0.19, p<0.001
* Perceived neighborhood environment 🡪 Perceived individual control 🡪 Depressive symptoms: B = -0.08, p=0.003
* Poverty 🡪 Physical activity 🡪 Depressive symptoms: B= 0.008, p=0.17
* Poverty 🡪 Perceived neighborhood environment 🡪 Depressive symptoms: B= 0.001, p=0.87
* Poverty 🡪 Perceived neighborhood environment 🡪 Physical activity 🡪 Depressive symptoms: B=0.003, p=0.006
* Poverty 🡪 Perceived neighborhood environment 🡪 Loneliness 🡪 Depressive symptoms: B= 0.03, p<0.001
* Poverty 🡪 Perceived neighborhood environment 🡪 Perceived individual control 🡪 Depressive symptoms: B= 0.01, p=0.02
* Poverty 🡪 Perceived neighborhood environment 🡪 Physical activity: B= -0.02, p=0.004
 |

Table E. Results of the structural equation model, for individuals with OA (knee or hip) and another chronic condition, for adults from the T2 wave of the Johnston County Osteoarthritis Project, Johnston County, North Carolina, 2006-2011, n=864

|  |  |
| --- | --- |
| Exogenous variables | Endogenous variables |
| Perceived neighborhood environment | Physical activity  | Loneliness | Perceived individual control | Depressive symptoms |
| Poverty | B= -0.20\*\*\* | B = -0.09\* | -- | -- | B= -0.02 |
| Perceived neighborhood environment | -- | B= 0.05 | B= -0.44\*\*\* | B= 0.56\*\*\* | B= -0.05 |
| Physical activity | -- | -- | -- | -- | B= -0.21\*\*\* |
| Loneliness | -- | -- | -- | -- | B= 0.52\*\*\* |
| Perceived individual control |  |  |  | -- | B= -0.07 |
| **Notes**All relationships controlled for race, gender, BMI, education, health insurance status, and age. All relationships also controlled for clustering using type=complex. Beta coefficients are standardized.\* p<.05, \*\* p<.01, \*\*\* p<.001**Model Fit:**Chi-Square value (p-value): 1468.69, p<.001); RMSEA: 0.03 (95% CI: 0.02, 0.03); CFI: 0.95; TLI: 0.95**Indirect Effects*** Perceived neighborhood environment 🡪 Physical activity 🡪 Depressive symptoms: B = -0.01, p=0.20
* Perceived neighborhood environment 🡪 Loneliness 🡪 Depressive symptoms: B = -0.22, p<0.001
* Perceived neighborhood environment 🡪 Perceived individual control 🡪 Depressive symptoms: B = -0.04, p=0.14
* Poverty 🡪 Physical activity 🡪 Depressive symptoms: B= 0.02, p=0.02
* Poverty 🡪 Perceived neighborhood environment 🡪 Depressive symptoms: B= 0.01, p=0.32
* Poverty 🡪 Perceived neighborhood environment 🡪 Physical activity 🡪 Depressive symptoms: B=0.002, p=0.19
* Poverty 🡪 Perceived neighborhood environment 🡪 Loneliness 🡪 Depressive symptoms: B= 0.05, p<0.001
* Poverty 🡪 Perceived neighborhood environment 🡪 Perceived individual control 🡪 Depressive symptoms: B= 0.008, p=0.18
* Poverty 🡪 Perceived neighborhood environment 🡪 Physical activity: B= -0.01, p=0.19
 |

Table F.Baseline characteristics for participants included and not included in T2 analyses for Study 2, from the Johnston County Osteoarthritis Project, Johnston County, North Carolina, 2006-2011

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Baseline characteristics for participants not included in T2 analysesN (%) or N (mean) | Baseline characteristics for participants included in T2 analysesN (%) or N (mean) | P-value | Baseline characteristics for participants not included in T2 waveN (%) or N (mean) | Baseline characteristics forparticipants included in T2 waveN (%) or N (mean) | P-value |
| **Characteristic** |  |  |  |  |  |  |
| Age, years, mean | 106 (60.5) | 1558 (58.0) | p=0.006 | 2673 (62.7) | 1664 (58.2) | p<.0001 |
| Gender |  |  |  |  |  |  |
| Male | 28 (26.4) | 516 (33.1) | p=0.15 | 1044 (39.1) | 544 (32.7) | p<.0001 |
| Female | 78 (73.6) | 1042 (66.9) |  | 1629 (60.9) | 1120 (67.3) |  |
| Race |  |  |  |  |  |  |
| White | 68 (64.2) | 1082 (69.5) | p=0.25 | 1671 (62.5) | 1150 (69.1) | p<.0001 |
| Black or African American | 38 (35.9) | 476 (30.6) |  | 1002 (37.5) | 514 (30.9) |  |
| Education |  |  |  |  |  |  |
| ≥ High school | 69 (68.3) | 1225 (78.8) | p=0.01 | 1479 (55.6) | 1294 (78.1) | p<.0001 |
| < High school | 32 (31.7) | 330 (21.2) |  | 1183 (44.4) | 362 (21.9) |  |
| Health insurance |  |  |  |  |  |  |
| No | 4 (3.9) | 77 (5.1) | p=0.59 | 146 (5.9) | 81 (5.0) | p=0.22 |
| Yes | 99 (96.1) | 1441 (94.9) |  | 2332 (94.1) | 1540 (95.0) |  |
| BMI |  |  |  |  |  |  |
| <30 | 43 (41.4) | 913 (59.4) | p=0.003 | 1571 (61.7) | 956 (58.2) | p=0.03 |
| ≥30 | 61 (58.7) | 625 (40.6) |  | 976 (38.3) | 686 (41.8) |  |
| Number of comorbidities | 106 (1.1) | 1558 (1.0) | p=0.38 | 2670 (1.3) | 1664 (1.0) | p<.0001 |
| Occupation |  |  |  |  |  |  |
| High SES job | 40 (42.6) | 774 (53.1) | p=0.05 | 910 (38.2) | 814 (52.4) | p<.0001 |
| Low SES job | 54 (57.5) | 685 (47.0) |  | 1472 (61.8) | 739 (47.6) |  |
| CES-D scores (range 0-60), mean | 105 (7.2) | 1545 (6.3) | p=0.24 | 2620 (7.6) | 1650 (6.3) | p<.0001 |
| Neighborhood poverty | 100 (18.9) | 1506 (18.4) | p=0.63 | 2556 (20.4) | 1606 (18.5) | p<.0001 |