Neighborhood Accessibility and Cognitive Function Among Portland Area Seniors

A Thesis

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CERTIFICATE OF APPROVAL

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Abstract

Context: The risk of developing dementia increases with age. With the general public living longer, more strategies for promoting healthy aging and cognitive function will be critical. Many findings have shown that increased physical activity and the social environment play important roles in dementia prevention. However, the actual elements of a neighborhood environment--both physical activity and social environment--that promote healthy brain aging are uncertain. We hypothesized that individuals with greater neighborhood accessibility will have better cognitive function through more physical activity, walking, and social stimulation.

Objective: To determine how neighborhood accessibility is associated with cognitive function and dementia among Portland area older adults using perceived and objective measures in 2004.

Study Population: 133 older adults, 59 to 95 years old, selected from the three prospective cohorts within the Layton Aging & Alzheimer's Research Center at OHSU, the Oregon Brain Aging Study (OBAS), the Dementia Prevention Study (DPS), and the African American Dementia and Aging Project (AADAPt).

Methods: Neighborhood accessibility was determined subjectively through a questionnaire and objectively through the Regional Land Information System of the Portland government. These scores were compared using linear and logistic regression models to three cognitive tests (Animal Fluency, Logical Memory, and Clinical Dementia Rating) to determine the association between neighborhood accessibility and cognitive function while controlling for other risk factors.

Conclusion: No significant associations between neighborhood accessibility and increased cognitive function were found. Overall, individuals with higher neighborhood accessibility scored no better or worse on cognitive tests than individuals with low neighborhood accessibility.

Research Question and Specific Aims

Is neighborhood accessibility associated with intact cognitive function among Portland area seniors?

Specific Aim 1: Determine if cognitive function (determined by Animal Fluency scores and Logical Memory scores) is associated with neighborhood accessibility. We hypothesize that increased neighborhood accessibility will be associated with higher levels of cognitive function.

Specific Aim 2: Determine if dementia (determined by Clinical Dementia Rating scores) is associated with neighborhood accessibility. We hypothesize that decreased neighborhood accessibility will be associated with dementia.

Background and Significance

Impact of Dementia

According to the Centers for Disease Control and Prevention, Alzheimer's disease is the most common form of dementia. Alzheimer's is a brain disease that diminishes a person's capacity for thought, memory, and language. This in turn can seriously affect a person's ability to carry out activities of daily living such as eating, dressing, working, and engaging in hobbies (1). An individual's entire life is affected by cognitive decline. As many as 5 million Americans suffer from Alzheimer's disease, which usually begins after age 60, and the risk increases with age. About five percent of men and women aged 65 to 74 have Alzheimer's disease and nearly half of those aged 85 and older may have the disease (1). However, Alzheimer's disease is not a normal part of aging (1). Although Alzheimer's disease is the most common type of dementia, many other disorders can affect the brain in similar ways causing debilitating cognitive decline.

An example of the obstacles facing individuals and families with dementia is captured in this section from the National Institute of Neurological Disorders and Stroke. This excerpt describes one of the earliest documented Alzheimer's disease cases:

"A woman in her early 50s was admitted to a hospital because of increasingly odd behavior. Her family reported that she had been showing memory problems and strong feelings of jealousy. She also had become disoriented at home and was hiding objects. During a doctor's examination, the woman was unable to remember her husband's name, the year, or how long she had been at the hospital. She could read but did not seem to understand what she read, and she stressed the words in an unusual way. She sometimes became agitated and seemed to have hallucinations and irrational fears".

This woman, known as Auguste D., was the first person reported to have the disease now known as Alzheimer's. After Auguste D. died in 1906, doctors examined her brain and found that it appeared shrunken and contained several unusual features; including strange clumps of protein and tangled fibers inside the nerve cells (2). This example is a reality for individuals who experience late-stage dementia. Cognitive impairment can be a life-altering diagnosis responsible for frustration and loneliness for the individual, family, and friends. Diminishing cognitive function robs these individuals of their ability to live on their own terms, communicate, remember, and explain feelings and emotions. With these types of physical and social health consequences, it is important to determine what can be done to promote cognitive function and reduce dementia in our aging population.

Previous Research

The projected life expectancy for individuals in North America in 2050 is 83 years old compared to 76 years old in 2000, making it of public health interest to identify protective factors which promote healthy brain aging (3). The risk factors and causes of

Alzheimer's disease and dementia are not fully understood making it important to study cognitive function as individuals age. An older adult's cognitive function is likely to be influenced by genetic, environmental, and lifestyle factors (4). Research suggests that smoking, alcohol use, family history, atherosclerosis, cholesterol, and age are factors which may lead to cognitive decline (5) (6) (7). Research also indicates that certain lifestyle factors, such as a nutritious diet, exercise, social engagement, and mentally stimulating pursuits might promote cognitive capacity among older adults (4). However, additional research is needed to clarify the association between health, lifestyle, and environmental factors and cognitive function. Many of these characteristics can be found close to an individual's home or neighborhood. Therefore, in this study we examined how the physical and social characteristics of a neighborhood are associated with cognitive function among Portland, Oregon area seniors.

Cognitive function can be assessed through a variety of tests. We used two neuropsychological tests (Animal Fluency and Logical Memory) to determine cognitive function and its relationship with neighborhood accessibility. We also used dementia (determined by the Clinical Dementia Rating scale) as an outcome to analyze the relationship with neighborhood accessibility.

Previous research shows that physical activity is positively associated with cognitive function in elderly adults (8) (9) (10) (11). Also, a recent Cochrane review found that 8 out of 11 studies showed improvement in cognitive capacity with aerobic exercise interventions (12). Another study found that less active women had 2 times the incidence rate of cognitive impairment compared to less active men and almost 5 times the rate compared to active women after a 5-year follow-up (13). Although these studies show an

association between physical activity and healthy cognitive function, they do not provide information on how a neighborhood with increased physical activity opportunities may promote healthy brain aging.

Decreased social networks have also demonstrated significant associations with dementia (14). A longitudinal study of 964 people over the age 65 reported that higher social engagement at baseline was associated with lower risk of cognitive decline over a 4-year follow-up (15). Another longitudinal study in Sweden suggested that stimulating activity, either mentally or socially oriented, may protect against cognitive decline, indicating that both social interaction and intellectual stimulation may preserve mental functioning in the elderly (16).

We looked at characteristics of a neighborhood environment through neighborhood accessibility. Neighborhood accessibility is an important concept that reflects the possibilities for activities, such as working or shopping available to residents of a neighborhood, and is determined by attributes of both the activity patterns and the transportation system in the area (17). Accessibility involves both social networks and physical activity opportunities. Literature regarding neighborhood accessibility has primarily focused on urban planning and physical activity. In previous studies, accessibility has been measured through cumulative opportunity measures, gravity-based measures, or random utility (17). We looked at cumulative opportunities which measure the number of opportunities within a given distance as an indication of an individual's choice. We focused on different neighborhood attributes which would increase walking behavior, physical activity, and social stimulation, such as: friendliness of neighbors, scenery, parks, trails, sidewalks, shopping, public transportation, and traffic. One study

found that local shopping and services, traffic and pedestrian infrastructure, neighborhood attractiveness, and public transportation influence activity among older adults (18). By looking at neighborhood accessibility, we hope to gain knowledge about how physical and social activity patterns in one's neighborhood may affect cognitive function. We believe individuals who live in highly accessible neighborhoods; with increased opportunities for physical activity and social behavior have better cognitive outcomes than individuals who do not. Generally, neighborhood characteristics, identified by measures such as presence of sidewalks, enjoyable scenery, and seeing others exercising, are positively correlated with walking and total physical activity (19). However, very few studies to our knowledge have researched how the built environment may affect cognitive function among older adults (20).

Need for Research

For this study, both objective and perceived neighborhood accessibility scores were analyzed. Perceived neighborhood accessibility was determined by a questionnaire in which individuals rated their neighborhood characteristics. Individuals process and store information differently and it is not always congruent with the objective surroundings. For any given built environment or neighborhood, individuals view, experience, and use it differently (21). Individuals who believe they live in a highly accessible neighborhood may engage in more physical and social stimulating activity. This in turn may lead to better cognitive function as one ages. Another study showed that when perceptions of the environment improved without actual change of the environment, individuals were significantly more likely to increase their walking behavior (22). Also, in a recent Dutch study, minutes of cycling increased in the intervention group by improving environmental

perceptions (23). Therefore, it is important to understand how individuals' perceptions of their surroundings relate to their activity patterns and cognitive function.

The objective data were from the Regional Land Information System (RLIS) database of the Portland City Government. Attributes such as distance to establishments, bus line frequency, and percent sidewalk coverage were summed into an overall score at quarter and half mile distances. This information provides a method to objectively determine what opportunities are readily available to the individual, whether he or she perceived this or not. Including objective measures is especially important when studying older adults who may already have some cognitive impairment or other co-morbidities.

The inclusion of objective measures of the physical environment provides an innovative way to evaluate self-reported measures that may be biased. Generally, research regarding neighborhood environment and health of individuals relies on surveys and perceptions only. However, a few studies report using both perceived and objective environmental characteristics (24) (25) (26) (27) (28) (29). These studies did not research whether neighborhood accessibility is associated with cognitive function among older adults. Therefore, using RLIS data *and* perceptions we evaluated how neighborhood accessibility is associated with cognitive functioning among older adults living in the Portland area. By learning more about these individuals we can target modifiable neighborhood characteristics to increase physical and social activity or facilitate change in perceptions of neighborhoods to promote cognitive function.

Parent Studies

This study is in conjunction with OHSU's Layton Aging and Alzheimer Research Center (LAARC). In 2004, this center had a research core which consisted of the Oregon Brain

Aging Study (OBAS), Dementia Prevention Study (DPS), and the African American Dementia and Aging Project (AADAPt).

Since 1989, the LAARC has performed longitudinal studies of the natural history of Alzheimer's disease in patients and healthy controls through standardized neurological, neuropsychological, and brain-imaging assessments at the Aging and Alzheimer's disease Clinic and the Memory Assessment Clinic. They are particularly focused on research aimed at preventing cognitive decline and detecting it at its earliest stages, even prior to developing symptoms. The LAARC vision is to add life to years, not simply years to life (30).

The Oregon Brain Aging Study (OBAS) recruits participants who are healthy, non-demented adults 55 years old and older. Subjects are recruited through presentations at retirement facilities, senior fairs, flyers, and word of mouth in the community. Those expressing interest are screened over the phone and must sign a medical release for LAARC to obtain current medical records. Those meeting the health criteria are scheduled for initial visits and informed consent is obtained. Determination of eligibility is based on data collected at these screening visits, which includes normal cognition, normal blood chemistry results, and normal MRI of the brain. The initial visits need to be completed within a two week time period. During these visits, subjects receive a variety of tests and data collection (31). OBAS inclusion/exclusion criteria can be found in Appendix A.

The Dementia Prevention Study (DPS) was a 42-month pilot study to determine the effect of ginkgo biloba extract on cognitive impairment in the oldest old (individuals 85 years old and older). A total of 134 individuals were enrolled in this study. These

individuals were cognitively intact with average physical health. These individuals were recruited through mailings of eligible individuals in the Portland area and through studies already taking place at LAARC. Neuropsychological tests were completed every six months within the participant's home (30) (31). DPS inclusion/exclusion criteria can be found in Appendix B.

The African American Dementia and Aging Project (AADAPt) is a cohort study of African American adults 65 years old and older living in the Portland area and undergo regular follow-up assessments. These individuals were cognitively intact, ambulatory, with adequate vision, hearing, and language abilities. The study's goal is to determine the incidence and specific risk factors for age-related problems related to memory loss (30). AADAPt inclusion/exclusion criteria can be found in Appendix C.

Preliminary Studies

In 2004, neighborhood accessibility questionnaires (Appendix D) were mailed to a total of 245 consenting adults originally within the three LAARC cohorts and their corresponding collateral (a designated person within the participant's life who knew the participant well). The surveys consisted of 9 questions where neighborhood characteristics were ranked on a Likert-scale. Each participant was also asked where he or she resided as a child, as well as addresses for age 30, 40, 50, and 60. These participants were selected from the OBAS, AADAPt, and DPS cohorts because they had complete data on objective neighborhood accessibility and a collateral informant. The participants' and collaterals' neighborhood accessibility scores were divided at the median into high/low groups and kappa statistics were analyzed to determine the correlation. The results showed good congruence (Table 1).

Objective scores for each participant were determined using the participant's address and linking it to the Regional Land Information System database. Both objective and perceived scores were divided into high/low groups to determine the correlation. The results (Table 2) showed low to moderate correlation between perceived neighborhood accessibility and objective neighborhood accessibility using kappa statistics. Due to this low agreement, we became interested in the differences between perceived and objective neighborhood accessibility and how they may affect cognitive function.

Methods

Study Sample

This was a secondary cross-sectional analysis using data collected at the Layton Aging and Alzheimer's Research Center on individuals in OBAS, DPS, and AADAPt cohorts. The neighborhood accessibility questionnaire was sent to 245 consenting adults within these cohorts in 2004. The participants were given a stamped envelope to return the questionnaire and a follow-up reminder postcard a few weeks later. A total of 141 participants returned their neighborhood accessibility questionnaire (58%). This response rate is similar to other mail surveys published in academic journals (32). Eight participants answered five or fewer questions and were excluded from this analysis. Therefore, the final study sample included a total of 133 older adults who live in the Portland metro area who adequately responded to a questionnaire determining perceived neighborhood accessibility in 2004. These individuals also had objective data regarding their neighborhood accessibility and pedestrian safety. The data collected from the LAARC were from biannual visits and responses to the Personal and Family History Form in 2004.

Variables

Primary Outcome Variables

We used two neuropsychological tests to determine cognitive function: Animal Fluency and Logical Memory II Story A. We also used the Clinical Dementia Rating scale to determine dementia. We compared these test scores to the perceived and objective neighborhood accessibility scores in 2004.

Animal Fluency Test

The LAARC uses the Animal Fluency test to assess small changes in cognitive function. The Animal fluency test is a brief assessment of verbal production, semantic memory, and language. It has helped in identifying patients with probable Alzheimer's disease. The individuals are asked to name as many animals as possible in sixty seconds. If the patient answers with less than 15 animals, he or she may have cognitive impairment (33). One study found that the Animal Fluency test can assist in early detection of dementia in the memory clinic setting (34). Another study found that semantic (animal) fluency had sufficient power to discriminate between healthy aging and very mild dementia (35). The Animal Fluency scores used for this analysis were the average of the two scores from 2004. If individuals had only one score for 2004, that score was used in the analysis. These scores were left as a continuous variable due to their normal distribution and ranged from 7 to 32.

Logical Memory Story II A

We also used the Wechsler Memory Scale-Revised Logical Memory II Story A test (Appendix E) to determine cognitive function (36). Approximately twenty minutes after listening to a short story, a participant is asked to recall details and themes to examine

story retention (37). The score ranges from 0 (lowest, no recollection) to 25 (perfect recollection). In one study, the internal consistency reliability was found to be high (r = 0.74) and the interscorer reliability was also high (r = 0.99) (38). Another study found that Logical Memory had power to discriminate between healthy aging and very mild dementia (35). The scores used for this analysis were the average of the two scores from 2004. However, if only one score was available, that one score was used in the analysis. These scores were normally distributed and kept as a continuous variable and ranged from 0 to 23.

Clinical Dementia Rating

The Clinical Dementia Rating (CDR) (Appendix F) is a 5 point numeric scale used to determine the severity of dementia and was developed at the Memory and Aging Project at Washington University School of Medicine in 1979 (39). A CDR is determined using a structured interview process to assess cognitive and functional performance in memory, orientation, judgment and problem solving, community affairs, home and hobbies, and personal care. The final score is a composite ranging from 0(no dementia), 0.5(very mild), 1(mild), 2(moderate), to 3(severe). The CDR scale was found to be reliable with 83% agreement among 82 interviewers after receiving a proper training protocol (40). Another study also found it to be reliable among multiple clinicians after a video-tape training session (41). Since participants have biannual visits to the LAARC, some individuals had more than one CDR score for 2004. Therefore, we used the worst score of 2004 or the only score. The study sample was then divided into two groups based on the presence or absence of possible dementia (CDR= 0 and CDR> 0). A total of 17 of

133 individuals had CDR > 0. However, of these individuals, all had a CDR= 0.5 except for one participant who had a CDR= 1.

Primary Predictor Variables

Our primary predictor variables were perceived neighborhood accessibility, objective neighborhood accessibility, and objective pedestrian safety.

Perceived Neighborhood Accessibility

A questionnaire (appendix D) was used to determine perceived neighborhood accessibility. The neighborhood accessibility questionnaire included nine questions assessing different neighborhood characteristics such as friendliness of people, scenery, park distance, walking path accessibility, sidewalk coverage, overall walking convenience, and distance to shops. This questionnaire was found reliable to assess perceived environmental attributes using intraclass correlation and all categories were found to have greater than r= 0.73 (42). The responses were summed to provide a total neighborhood accessibility score. The question regarding problematic traffic had a backward ranked Likert-scale. Calculations were done in Microsoft Excel and re-checked for 20 random scores for accuracy. For participants who answered at least eight out of the nine questions, responses were averaged to develop an overall perceived neighborhood accessibility score (N=133) by dividing the total neighborhood accessibility score by the number of questions answered. After the perceived neighborhood accessibility scores were determined, the participants were placed into tertiles of low, moderate, and high based upon their average perceived neighborhood accessibility score.

Objective Neighborhood Accessibility and Pedestrian Safety

Objective scores for each participant were determined using the participant's address and linking it to the Regional Land Information System (RLIS) database. RLIS uses data from Assessment and Taxation records from the counties in the Portland metro area. The neighborhood accessibility measures included frequency of intersections, bus lines, bus stops, establishments, and selected establishments (Table 3). Establishments consisted of any type of business and selected establishments were businesses which an individual would use and visit. The pedestrian safety scores comprised of percent of low volume streets and average sidewalk coverage (Table 4). These objective measures were then placed into low, moderate, and high groups.

Covariates

Because the actual cause of Alzheimer's disease and dementia is not fully understood, it is important to analyze health, environmental, and lifestyle factors (4). Therefore, we gathered information in the LAARC database on known risk factors.

Socio-demographics

Baseline demographics such as sex, race, and marital status were from self-reported answers upon entry into a LAARC cohort. Race was coded as white (0) and non-white (1). Sex was male (0) and female (1). The age used for this analysis was the age at evaluation in 2004.

Education level

When determining cognitive function and memory, it is important to adjust for education level. Education level was used as a proxy for general intellectual ability when the person was young. However, due to our multi-ethnic study sample; we used two different variables to assess pre-morbid intellectual ability. Because some African-American participants grew up in a segregated society, the schools they attended may

have been poorly funded with few resources. Therefore, we used both education level (less than high school diploma or greater than high school) and the Wide Range Achievement Test- Revised (WRAT-R) (Appendix G) to determine baseline reading skill. The WRAT-R score used for this analysis was the first score in the database for the participant, as scores generally do not increase with age. The WRAT-R evaluates an individual's reading, spelling, and arithmetic skills (43). In one study, the WRAT-R test-retest reliability was 0.79 (arithmetic) to 0.97(spelling) (43). However, the score used in the analysis was only the reading score. WRAT-R Reading Level 2 determines reading vocabulary. The raw scores were transformed into standardized scores in the LAARC database. A total of 128 WRAT-R scores were available and ranged 15-88. WRAT-R was a continuous variable.

Functional Status

Functional Status was based upon the Older Americans Resource Scale Instrumental Activities of Daily Living (Appendix H). Instrumental activities of daily living are behaviors that allow individuals to live independently, such as managing money, personal hygiene, taking own medicine, making phone calls, and performing housework (44). Individuals were divided into two groups based upon functional status. Participants with scores < 12 were independent and those with scores ≥ 12 were functionally dependent (45). Functional status was available on 129 of our final sample of 133 participants.

Socio-economic Status

The participant's socioeconomic status was determined by the Hollingshead instrument (46). This instrument is based upon education, occupation, sex, and marital status of the individual and spouse. The Hollingshead instrument relies on the census and defines

each occupation as being in one of nine categories, the ninth being at the highest SES level. One study found high interrater agreement (r= 0.91) (47). This same study compared other four factor SES instruments and found the intermeasure agreement high (r= 0.81) (47). SES was available for 131 participants and ranged from 19 to 66. SES was left as a continuous variable.

Depression

Depression was based upon a diagnosis at the LAARC using the Center for Epidemiologic Studies Short Depression Scale (CES-D 10) (Appendix I). Depression has been shown to be a risk factor for cognitive impairment (48). The CES-D 10 is a shortened version of the CES-D. Individuals were asked ten questions about feelings within the last week and scored 0 (false) to 1 (true). The overall score is the sum of the 10 answers. A score of 4 or greater is considered depressed (49). Among individuals with chronic disease, the CES-D 10 was found to have high internal consistency reliability (r= 0.84) (49). The CES-D 10 was also found to have similar reliability to the original longer version among older adults (sensitivity of 97%, specificity of 84%, and positive predictive value of 85%) (50). Of our final sample of 133 participants, a CES-D 10 score was only available for 116. Twelve participants had a CES-D10 score ≥ 4.

MCIRS

The Modified Cumulative Illness Rating Scale (MCIRS) (Appendix J) is an instrument used to measure the burden of multiple morbidities. It measures the chronic medical illness burden while taking into account the severity of chronic diseases. The illnesses included are: cardiac, hypertension, respiratory, EENT (ear, eyes, nose and throat), upper GI, lower GI, hepatic, and renal diseases. Health status has been shown to be a risk

factor for cognitive impairment (48). MCIRS has been found to have interrater reliability among nurses and the intraclass correlation coefficients were 0.81 and 0.78 (51). The MCIRS has also been found to be a valid indicator of health status among older institution residents (52). This variable was left as continuous and ranged from 14- 29.

MIS

The Modified Ischemic Scale (MIS) (Appendix K) is an instrument used to determine vascular risk factors. Accumulating evidence has suggested that vascular risk factors contribute to Alzheimer disease (53). The score is determined by asking questions regarding abrupt onset of symptoms, stepwise deterioration, somatic complaints, labile emotions, hypertension, stroke, and focal neurological symptoms and can range from 0 – 12. This variable was left continuous and scores ranged from 0 to 7.

Walking

As previously stated, walking has been shown to be significantly associated with promoting cognitive function. Walking was determined from a baseline personal and family history questionnaire (appendix L). Participants were asked how many city blocks they walked daily. This was divided into ≤ 2 blocks a day and > 2 blocks a day (13). This variable was not included as a possible confounder. We believe walking would be an intermediate variable within the causal pathway between neighborhood accessibility and cognitive function.

Exercise

As previously stated, physical activity is positively associated with cognitive function. Exercise was also determined from the baseline questionnaire (appendix L). Participants were asked how many hours a week they participate in light and heavy physical activity.

This was then dichotomized into < 4 hours a week and ≥ 4 hours a week (13). Exercise was included as a possible confounder. Although the questionnaire gave examples of exercise such as walking, hiking and biking, it also included golf, dancing, and gardening. Therefore, we do not believe exercise would be in the causal pathway between neighborhood accessibility and cognitive function.

Statistical Analysis

All statistical analyses were conducted using STATA Version 10.0 and PASS 2002 (Power and Sample Size).

Descriptive Analysis:

Descriptive analyses were performed for all individuals who received the questionnaire, replied adequately, and those excluded from this study at each step. Among the eligible population, descriptive analyses were performed for each outcome and primary predictor variable. For continuous variables, frequency, mean, standard deviation, and number of missing values were calculated. For categorical variables, counts and percentages were calculated. The differences in continuous variables were determined using two sample t-tests, while the differences in proportions of categorical variables were analyzed with χ^2 statistics. To determine significant differences in the proportion of missing data, Pearson χ^2 statistics were used again. Also, if cell counts were less than five, Fisher's exact statistics were used. Additionally, prior to adjusting for potential confounders, the data were examined for trends among our three predictor variables and each outcome variable by looking at the mean score or proportions within each predictor variable tertile. To assess differences in mean score of Animal Fluency and Logical Memory among tertile,

one-way ANOVA tests were used. To assess differences in proportions among tertiles, χ^2 statistics were used.

Linear Regression:

Two linear regression models were created. One model was used to determine the association between our main neighborhood predictor variables and Animal Fluency test scores and the other model was used to look at the association of our predictor variables and Logical Memory test scores. The steps followed were the same for each linear regression model.

Univariate Analysis:

First, each primary predictor variable and covariate was put into a simple linear regression model with the outcome variable for univariate analysis. After determining the significance, variables with $p \leq 0.25$ were kept for the multivariable model.

Multivariate Linear Regression Analysis:

Perceived neighborhood accessibility, objective neighborhood accessibility, and pedestrian safety were the main predictor variables so they were forced into the model regardless of their statistical significance. Other variables with a significance level of $p \leq 0.25$ were also initially included. Independent variables were then eliminated one by one beginning with the least significant until all variables had a significance of $p < 0.05$. Once a preliminary model was constructed, each variable that had been removed was re-entered into the model to assure that it was not significant or it did not significantly change the relationship between our primary predictor variables and the outcome. If the beta coefficients of our primary predictor variables changed more than 10%, the covariate was considered a confounder and left in the model. We also entered an interaction between perceived neighborhood accessibility scores and gender. We believed it was

possible that an association between neuropsychological score and perceived neighborhood accessibility was different for males and females. Therefore, if the interaction was significant, it was kept in the model.

The final model was then assessed for fit by plotting the residuals. Each point was assessed based upon leverage and studentized residuals. The cutoff point for leverage for our data was greater than 0.348 and for studentized residuals was greater than 2.5, both at $\alpha = 0.1$ level. If outliers were present, the participant was evaluated and taken out of the analysis to determine a change in significance of the variables. If the results remained similar, the participant was kept in the analysis. PP plots and QQ plots were used to look at overall fit.

Crude β coefficients were determined separately for each predictor variable using simple linear regression. Then adjusted β coefficients were determined for each predictor variable with all covariates. Finally, multi-variable adjusted β coefficients were determined by putting all three predictor variables into the model with the covariates, which was our final model.

Logistic Regression

One logistic regression model was created to determine how CDR scores and neighborhood accessibility were associated.

Univariate Analysis:

First, logistic regression models were built between each primary predictor variable, covariate, and CDR score as a dichotomous outcome variable. The significance was determined by Wald F statistics and their associated p-values. Variables were included in building a multivariate regression model by their significance at the 0.25 level.

Multivariate Logistic Regression Analysis:

Perceived neighborhood accessibility, objective neighborhood accessibility, and objective pedestrian safety were the main predictor variables so they were forced into the model regardless of their statistical significance. Other variables with a significance level of $p \leq 0.25$ were also initially included. Independent variables were then eliminated one by one beginning with the least significant until all variables that were left had a significance of $p < 0.05$.

Once a preliminary model was constructed, each variable that had been removed was re-entered one at a time into the model to assure that it was not significant and did not significantly change the relationship between primary predictor variables and the outcome. Covariates which changed the odds ratio of our primary predictor variables more than 10% were considered confounders and kept in the model. We also entered an interaction between perceived neighborhood accessibility scores and gender. We believed it was possible that an association between neuropsychological score and perceived neighborhood accessibility was different for males and females. Therefore, if the interaction was significant, it was kept in the model. The final model was then assessed for fit by the Hosmer and Lemeshow goodness-of-fit test statistic (54).

Crude odds ratios were determined for each predictor variable separately using univariate logistic regression. Then adjusted odds ratios were determined for each predictor variable with all covariates. Finally, multi-variable odds ratios were determined by putting all three predictor variables into the model with the covariates, which was our final model.

Power

After examining post-hoc power calculations, the linear regression analyses had greater than 80% power using an F-test to detect a slope of 0.30 at the 0.05 significance level.

The logistic regression analysis also had greater than 80% power to detect an odds ratio of 3.0 at the 0.05 level. Linear and logistic regression power calculations were done using PASS (Power Analysis and Sample Size).

Results

A total of 245 questionnaires were sent to participants within the OBAS, DPS, and AADAPt cohorts. Of the recipients, 141 individuals returned the questionnaire. The differences between those who returned the questionnaire and those who did not were minimal. Those who did not respond were significantly older (p= .014), more functionally dependent (p= .003), and did not engage in as much heavy exercise (p= .010). However, we had significantly less data available for SES, MCIRS, and MIS on participants who did not return the questionnaire. These results can be found in Table 5. Of the 141 questionnaire responders, 133 individuals filled out the perceived neighborhood questionnaire adequately by answering at least 8 out of 9 questions. The individuals who did not respond adequately were similar to the 133 included participants for all variables except MCIRS. The eight individuals who did not answer the questionnaire adequately had higher co-morbidity burden (Table 6).

Of our final sample of 133 participants, the majority were female (70.7%), white (67.7%), independent (90.2%), not depressed (78.2%), and educated beyond high school (60.2%). These results can also be found in Table 6.

Perceived Neighborhood Accessibility

Table 7 shows the relationship between perceived neighborhood accessibility tertiles and other covariates. A significant difference between groups was found for marital status (p= 0.042). Marginally significant differences and trends were seen for MCIRS and

walking. As perceived neighborhood accessibility increased, the percentage of "heavy" walkers decreased and mean MCIRS (co-morbidity burden) increased. Overall, the other covariates were very similar across the perceived neighborhood accessibility tertiles.

Objective Neighborhood Accessibility

Table 8 shows the relationship between objective neighborhood accessibility tertiles and other covariates. Statistically significant differences were found across tertiles for SES ($p= 0.029$), MIS ($p= 0.000$), WRAT ($p= 0.001$), and race ($p= 0.011$). Trends were noted for three significant covariates. Ischemic risk factors (MIS) increased, pre-morbid intelligence (WRAT-R) decreased, and the percentage of non-white individuals increased as objective neighborhood accessibility increased. Overall, the other covariates were very similar across the objective neighborhood accessibility tertiles.

Objective Pedestrian Safety

Table 9 shows the relationship between objective pedestrian safety tertiles and other covariates. Statistically significant differences were found across tertiles and mean MIS ($p= 0.000$), WRAT ($p= 0.006$), and percentage of race ($p= 0.000$). As objective pedestrian safety increased, the percentage of non-white participants increased and WRAT decreased. The difference in proportions of gender by tertile was also marginally significant ($p= 0.063$). However, among all tertiles the majority was female. Although not statistically significant, the proportion of "heavy" exercisers increased as pedestrian safety increased. Other than these findings, proportions and means of covariates were very similar across the objective pedestrian safety tertiles.

Animal Fluency

A total of 115 individuals in this final sample had Animal Fluency test scores in 2004. Individuals with this score were generally female (70.4%), white (67%), married (60%), and had more than a high school education (62.6%), which did not differ from our baseline population (Table 10). Individuals who had missing Animal Fluency test scores (N=18), were more likely to be in the OBAS cohort because it is the largest (61.1%). Approximately 20% of the OBAS cohort did not have these scores compared to 15% of AADAPt and 3% of DPS. These 18 individuals also had missing data or significantly less data available for MCIRS, MIS, WRAT-R, marital status, functional status, walking, and depression. These results can also be found in Table 7.

The mean Animal Fluency test scores by predictor variable tertile were examined before regression analysis (Table 11). Within each predictor variable, mean Animal Fluency scores decreased as neighborhood accessibility or safety scores increased.

Animal Fluency Model

The final Animal Fluency model included the primary predictor variables, age, WRAT-R, race, SES, and exercise. Only age, WRAT-R, and race were significantly associated with Animal Fluency scores in the final model. However, in the univariate analysis, age, SES, MIS, WRAT-R, race, education, and walking were all significantly associated with Animal Fluency scores at the p= 0.05 level (Table 12). In the final model both SES and exercise significantly changed the beta coefficients of the primary predictor variables and were kept due to possible confounding. This model had good fit with no significant outliers, as evidenced by the PP and QQ plots (Table 13).

Perceived Neighborhood Accessibility

Although no statistically significant association was found between perceived neighborhood accessibility and Animal Fluency scores, exercise and SES significantly changed the relationship and were thus retained in the model as confounders (Table 14). The Animal Fluency scores in 2004 did not significantly differ between perceived neighborhood accessibility group and no trend was noted as perceived neighborhood accessibility increased. Animal Fluency scores, on average, were 1.09 points higher for individuals within the moderate group (95% CI: -1.09 – 3.20) and 1.18 points lower for individuals within the high group (95% CI: -3.30 - 0.94) compared to the low group after adjusting for other covariates. This shows very small changes in Animal Fluency scores which would not be clinically significant.

Objective Neighborhood Accessibility

No statistically significant association was found between objective neighborhood accessibility and Animal Fluency scores. Exercise and SES were found to be significant confounders (Table 14). The Animal Fluency scores in 2004 did not significantly differ between objective neighborhood accessibility group and no trend was noted as objective neighborhood accessibility increased. On average, Animal Fluency scores were 0.92 points higher for individuals within the moderate group (95% CI: -1.31 – 3.15) and 0.51 points lower for individuals within the high group (95% CI: -2.78 – 1.77) compared to the low group after adjusting for other covariates. This shows very small changes in Animal Fluency scores which would not be clinically significant.

Objective Pedestrian Safety

No statistically significant association was found between objective pedestrian safety and Animal Fluency scores. However, exercise and SES, significantly changed the

relationship between objective pedestrian safety and Animal Fluency scores (Table 14). The Animal Fluency scores in 2004 did not significantly differ between objective pedestrian safety groups and no trend was noted as objective pedestrian safety increased. On average, Animal Fluency scores were 1.10 points lower for individuals within the moderate group (95% CI: -3.31 – 1.10) and 0.13 points lower for individuals within the high group (95% CI: -2.46 – 2.20) compared to the low group after adjusting for other covariates. This shows very small changes in Animal Fluency scores which would not be clinically significant.

Logical Memory Story II A

A total of 115 individuals in this final sample had Logical Memory test scores for 2004. These were the same individuals who also had Animal Fluency test score. Therefore, individuals with this score were generally female (70.4%), white (67%), married (60%), and have more than a high school education (62.6%), which did not differ from our baseline population (Table 10). .

The mean test scores by predictor variable tertiles were examined before regression analysis (Table 15). For perceived and objective neighborhood accessibility, the mean Logical Memory scores decreased as participants' perceived and objective neighborhood accessibility scores improved. However, individuals with low objective pedestrian safety scores had the highest mean animal fluency score.

Logical Memory Model

The final Logical Memory model included the primary predictor variables, age, WRAT-R, race, functional status, SES, and exercise. Only age, WRAT-R, and race were significantly associated with Logical Memory scores in the final model. However, in the

univariate analysis SES, WRAT-R, race, and walking were significantly associated with Logical Memory scores at the p=.05 level (Table 16). In the final model, functional status, exercise and SES were included because of significant changes of beta coefficients in the three primary predictor variables. This model had good fit with no statistically significant outliers, as evidenced by the PP and QQ plots (Table 17).

Perceived Neighborhood Accessibility

No statistically significant association was found between perceived neighborhood accessibility and Logical Memory scores. However, adding functional status, exercise, and SES, significantly changed the relationship (Table 18). The Logical Memory scores in 2004 did not significantly differ between perceived neighborhood accessibility group and no trend was noted as perceived neighborhood accessibility increased. On average, Logical Memory scores were 1.14 points higher for individuals within the moderate group (95% CI: -0.92 – 3.20) and 0.74 points lower for individuals within the high group (95% CI: -2.81 – 1.32) compared to the low group after adjusting for other covariates. This shows very small changes in Logical Memory scores which would not be clinically significant.

Objective Neighborhood Accessibility

No statistically significant association was found between objective neighborhood accessibility and Logical Memory scores. However, functional status, exercise, and SES were significant confounders (Table 18). The Logical Memory scores in 2004 did not significantly differ between objective neighborhood accessibility group and no trend was noted as objective neighborhood accessibility increased. On average, Logical Memory scores were 1.30 points higher for individuals within the moderate group (95% CI: -0.83

– 3.51) and 1.08 points higher for individuals within the high group (95% CI: -1.12 – 3.28) compared to the low group after adjusting for other covariates. This shows very small changes in Logical Memory scores which would not be clinically significant.

Objective Pedestrian Safety

No statistically significant association was found between objective pedestrian safety and Logical Memory scores. Functional status, exercise, and SES were significant confounders (Table 18). The Logical Memory scores in 2004 did not significantly differ between objective pedestrian safety groups and no trend was noted as objective pedestrian safety increased. On average, Logical Memory scores were 0.24 points lower for individuals within the moderate group (95% CI: -2.37 – 1.89) and 0.42 points higher for individuals within the high group (95% CI: -1.82 – 2.67) compared to the low group after adjusting for other covariates. This shows very small changes in Logical Memory scores which would not be clinically significant.

Clinical Dementia Rating

A total of 119 participants from our baseline population had available CDR scores in 2004. The majority of participants without a CDR score were from OBAS cohort because it is the largest (57.1%). Approximately the same percentage of individuals in OBAS and AADAPt did not have scores (14%) while all participants in DPS had CDR scores. Overall, individuals were similar to our baseline population. The majority of this sample were white (68.1%), female (69.7%), with greater than high school education (64.3%), married (59.7%), without depression (87.4%), and independent (93.3%). The 14 individuals without a CDR score also had significantly less data available for MCIRS,

MIS, WRAT-R, marital status, functional status, and depression. These results can be found in Table 19.

The proportions of predictor variable tertiles were examined before regression analysis by CDR outcome (Table 20). For perceived and objective neighborhood accessibility, the proportion of individuals with CDR > 0 increased as accessibility scores increased. However, individuals with low objective pedestrian safety scores had the highest proportion of individuals with CDR > 0. The differences in proportions were not statistically significant.

Clinical Dementia Rating Model

The final Clinical Dementia Rating model included the primary predictor variables, age, WRAT-R, depression, education, MIS, functional status, and MCIRS. However, only age and WRAT-R, were significantly associated with CDR> 0 in the final model. In the univariate analysis age, MCIRS, WRAT-R, functional status, and walking were significantly associated with Clinical Dementia Rating scores at the p= 0.05 level (Table 21). In the final model, depression, education, MIS, functional status, and MCIRS were left due to significant changes in odds ratios of the three primary predictor variables. We analyzed the model with and without the participant with CDR=1. No significant changes were found and the participant was left in the analysis. This model had good fit according to the Hosmer and Lemeshow test statistic (chi2=54.59, p=.999).

Perceived Neighborhood Accessibility

A statistically significant association was found between perceived neighborhood accessibility and CDR> 0. Adding covariates such as depression, education, MIS, MCIRS, and functional status significantly changed the relationship between perceived

neighborhood accessibility and CDR> 0 (Table 22). As perceived neighborhood accessibility scores increased, individuals were more likely to have CDR> 0. On average, the moderate group had 4.13 times the odds of the low group (95% CI: 0.53 – 31.97) and the high group had 9.8 times the odds of the low group (95% CI: 1.24 – 77.67) of having CDR> 0 after adjusting for other covariates (Table 22). This shows a significant change in odds ratios and is not consistent with our hypothesis. However, due to a small number of individuals with CDR> 0, the confidence intervals were very large, showing large variability of the estimate.

Objective Neighborhood Accessibility

No statistically significant association was found between objective neighborhood accessibility and CDR> 0. Covariates such as depression, education, MIS, MCIRS, and functional status significantly changed the relationship between objective neighborhood accessibility and CDR> 0 (Table 22). No trend was noted as objective neighborhood accessibility scores increased. On average, the moderate group had 1.96 times the odds of having CDR> 0 compared to the low group after adjusting for other covariates (95% CI: 0.21 – 18.04). However, the high group had 0.32 times the odds of having CDR> 0 compared to the low group after adjusting for other covariates (95% CI: 0.03 – 3.06). Due to a small number of individuals with CDR> 0, the confidence intervals were very large, showing variability of the estimate.

Objective Pedestrian Safety

A statistically significant association was found between objective pedestrian safety and CDR> 0. Depression, education, MIS, MCIRS, and functional status were significant confounders (Table 22). As objective pedestrian safety scores increased, individuals had

lower odds of having CDR> 0. On average, the moderate group had 0.04 times the odds of the low group (95% CI: 0.003 - 0.71) and the high group had 0.21 times the odds of the low group (95% CI: 0.02 – 2.13) of having CDR>0 after adjusting for other covariates (Table 22). However, due to a small number of individuals with CDR>0, the confidence intervals were very large, showing large variability of the estimate.

Discussion

Overall, the primary predictor variables showed no statistically significant association with Logical Memory and Animal Fluency test scores. For both tests, individuals with moderate perceived accessibility and moderate objective accessibility scored on average the highest. However, the results for objective pedestrian safety do not follow the same pattern. Individuals within the low objective safety group scored the highest, on average, for the Animal Fluency test. However, individuals within the high objective safety group had the highest scores, on average, on the Logical Memory test. The overall trend of these findings does not match our original hypothesis. Both Animal Fluency and Logical Memory test scores were shown to be significantly associated with age, WRAT-R, and race. Individuals who were younger, white, and had better pre-morbid intelligence scored better.

Having a CDR>0 was significantly associated with perceived neighborhood accessibility and objective pedestrian safety at the 0.05 level. Individuals who were in the high perceived neighborhood accessibility group had significantly higher odds of having CDR> 0 (OR= 9.80, 95% CI: 1.24 – 77.67) compared to the low group. Individuals within the moderate pedestrian safety group had significantly lower odds of having CDR> 0 (OR= .0448, 95% CI: 0.003 - 0.706) compared to the low group. Overall,

individuals who were older, were depressed, had less than high school education, had lower pre-morbid intelligence (WRAT-R), had higher co-morbidity burden (MCIRS), had greater neurological symptoms (MIS), were functionally dependent, had high perceived neighborhood accessibility, and did not have moderate objective pedestrian safety had a greater odds of having a CDR> 0.

Previous literature has stated that exercise and walking are positively associated with cognitive function (8) (9) (10) (11) (12) (13). In all univariate analyses, individuals who were "heavy walkers" had significantly better cognitive function. However, after adding other covariates into the model, walking was no longer significant. No statistically significant associations were found between overall physical activity and cognitive function in our sample. We believed individuals who lived in highly accessible neighborhoods would have better cognitive function due to increased walking and social stimulation. An individual's exercise status (whether he or she engaged in < 4 hours or ≥ 4 hours weekly) was found to be a significant confounder and was included in both Animal Fluency and Logical Memory models. However, in both models individuals who engaged in ≥ 4 hours of weekly exercise had lower cognitive scores, on average, than those who exercised less. This is not congruent with previous research or our hypothesis of how physical activity could relate to neighborhood accessibility and cognitive function in this population. Nevertheless, exercise was not found to be statistically associated with either Logical Memory or Animal Fluency scores.

Our findings showed age and pre-morbid intelligence (WRAT-R) were significantly associated with all three cognitive tests. Race was also found to have a significant association with both Animal Fluency and Logical Memory scores, while education was

significantly associated with having CDR> 0. Individuals who were white and of higher education had better cognitive functioning. Other covariates used in our models included SES, depression, MIS, MCIRS, and functional status. These variables were not statistically associated with the outcomes. However, these covariates significantly changed the relationship between our primary predictor variables and the outcomes by more than ten percent, which may indicate confounding.

For example, SES may be indicative of where and what type of neighborhood an individual chooses to live. Giles-Corti and Donovan found that individuals living in low SES areas had better access to many recreational facilities, but were less likely to use them compared with those living in high SES areas. These same individuals of low SES believed they had accessible sidewalks, shops, but perceived their neighborhood was busier with traffic, less attractive, and had less walking opportunities (25). This could explain how individuals' perceptions affect how they utilize their neighborhood. The other covariates may also affect the choice and the extent of how individuals participate in walking, physical activity, and social stimulation in a neighborhood setting.

Strengths and Limitations

As with any cross-sectional study, we were unable to determine temporality when assessing the association of neighborhood accessibility and cognitive function. We were only able to describe how neighborhood accessibility is related to cognitive function using three cognitive tests.

Our research study included 133 participants within three separate cohorts. This was a relatively small sample size. However we had adequate power to detect a slope of 0.30 for linear analyses and an odds ratio of 3 for the logistic analysis. The average age of

participants was 80 years old and they had a similar prevalence of dementia (12.8%) compared to national averages of individuals 65 and older (1). However, according to the Clinical Dementia Rating, all 12.8% had very mild dementia except for one who had mild dementia. Therefore, the individuals with CDR> 0 may have been cognitively similar to those without, causing a lack of variability.

As with all research studies, individuals who are willing and able to travel tend to participate in research studies. These participants also were chosen based upon strict inclusion/exclusion criteria for each cohort. Although we did not determine how long each participant had been within each cohort, upon entry individuals were cognitively intact with few co-morbidities and functional limitations. This limits generalizability to elderly persons who tend to be educated and healthier. Most participants in this study also had a collateral informant for self-reporting reliability purposes and to decrease loss to follow-up. This shows that most subjects already have at least a small social network in which they live and function. However, most individuals live in a social setting with friends and family caring for one another. According to the U.S. Census Bureau, up to 63% of individuals 65 and older live with at least one other person (55). Thus, this characteristic of the study sample does not particularly limit generalizability of the findings.

We limited recall bias by comparing perceived neighborhood accessibility of the participant to that of his/her collateral. Using kappa statistics, the results showed good correlation. We also used objective neighborhood accessibility measures to limit recall bias. Therefore, we were able to determine if perceptions and/or objective measures were significantly associated with cognitive function scores.

Residual confounding also may have occurred due to unaccounted variables. One such variable is crime rate in each neighborhood. If an individual lived in an area with increased crime, he or she might not take advantage of the positive attributes of the neighborhood even if they were otherwise highly accessible. A "crime variable" might have correlated with SES. However, we did not have the data available. We also did not gather information on how long each participant had lived at their residence in 2004. Part of the neighborhood questionnaire asked where the participants lived at different ages. However, this information only went to age 60 and therefore was not used in this analysis. It would be helpful to understand how time lived in their current neighborhood relates to neighborhood accessibility and neurocognitive test scores**.** The LAARC also asks one question at each visit regarding the number of friends participants have at that time. This "friends" variable was available for less than half of the study sample and therefore was not used in this analysis. However, information about number of friends and social stimulation is an important aspect of how a neighborhood may affect cognitive function and should be examined further in future studies.

The cognitive scores, variables, and other tests (WRAT-R, IADL, SES, CESD-10, MCIRS, and MIS) used for this analysis were all performed and recorded by LAARC staff. Although they are all trained professionals, some bias and misclassification may occur as many of the results are based upon subjective measurements. Different staff members may have evaluated the same subject differently. However, as previously stated the LAARC uses standardized tests found to be reliable tools when assessing cognitive status.

This study was also limited to participants who returned their neighborhood accessibility questionnaires mailed in 2004. Out of 245, only 141 participants returned the neighborhood accessibility questionnaire, and of those, 133 completed the questionnaire adequately. We determined very little response bias with what data was available. However, we had missing data which limited our ability to rule out selection bias. The items of the questionnaire also related to what older adults had said influenced their physical activity within their neighborhood (18). We relied on specific variables in the RLIS database for objective measures. Additional information regarding parks, trails, neighbors, and scenery might have been helpful in this analysis. These factors might relate more to possible physical and social activity opportunities.

Public Health Implications and Future Studies

Evidence shows that regular physical activity and social activity can extend the number of independent years without dementia. Therefore, it is important to understand environmental barriers that may exist which make it difficult for older adults to walk and interact safely and comfortably in their neighborhood. Although we suspected that older individuals with high neighborhood accessibility scores would have better cognitive function relative to those who have low neighborhood accessibility scores, our results showed no significant association. Although significant associations were found within various accessibility groups, they did not follow any trend or support our hypothesis. We hope more studies regarding this topic can be done with larger sample sizes and longitudinally.

Future studies with this questionnaire using information about previous residences may be helpful in determining accessibility attributes throughout a lifetime and how this may

affect cognitive functioning. Previous studies researching a variety of topics have found early and middle-age factors play ann important role in cognitive functioning as one ages (56) (57). Therefore, neighborhood accessibility in older adulthood may not be a good indicator of cognitive functioning and it would be of greater value to research this topic earlier in the lifespan. Future studies examining the influence of friends or social networks should be evaluated further. It also may be helpful to design a case control study to determine how neighborhood accessibility, physical activity, and social stimulation throughout the lifespan vary between individuals who have and have not developed cognitive impairment.

At this time, research suggests individuals who are socially and physically active tend to have better cognitive function. Therefore it is of public health concern to develop neighborhoods and cities which promote healthy social and physical activities. This may not only change one's habits but change perceptions within a community to increase older adults' knowledge about neighborhood attributes and benefits of staying active.

Human Subject Protections

This study used data already collected as part of the NIH funded OHSU Layton Aging and Alzheimer Research Center (LAARC). We used information about the participants at time of questionnaire receipt in 2004. This study used questionnaire data that have already been collected using the LAARC protocol and from a mail survey about neighborhood characteristics and past addresses. Information from the neighborhood survey was already linked using Geographic Information Systems to determine objective measures for each individual about accessibility. This study used existing data with an anonymous linkage so risk to the study participants was quite minimal. A unique number

had been assigned to all participants as part of the approved LAARC study protocol and this was used for the GIS linkage and statistical analyses to distinguish individual records. The information from the neighborhood surveys regarding previous residences was not used for this study.

Informed consent procedures were conducted as part of the LAARC study protocol. This was done by personnel who conducted interviews with each possible candidate using standardized operating procedures. The written informed consent form indicates investigators affiliated with LAARC studies have access to coded data and that the information collected during the study may be used indefinitely. Additional consent was not needed, according to OHSU IRB, to create the neighborhood accessibility characteristics by linking addresses to administrative data because the Portland Metro government meets the definition of a business associate under HIPAA regulations.

The datasets were stored on password enabled computers in locked areas. Also, all investigators who used this data were required to file a signed Data Use Agreement with the LAARC Data Core.

Tables

Table 1- Matched participant and collateral neighborhood accessibility questionnaire results (N=94 pairs)

Neighborhood Characteristic	Kappa Statistic*
Friendliness of Neighbors	.3787
Enjoyable Scenery	.2519
Distance to park	.3337
Accessible walking paths	.4665*
Sidewalk coverage	.4695*
Walking Convenience	.3431
Distance to shops	.5399*
Distance to public transportation	.3191
Problematic Traffic	.4405*

*good reproducibility in agreement (kappa >.40)

Table 2- Participants' perceived neighborhood accessibility and objective neighborhood accessibility comparison

Comparison (objective, subjective)	Kappa Statistic*
Park distance, Park distance	.0580
Average sidewalk %, Sidewalk coverage	.2239*
Bus stop frequency , Distance to public transportation	.0422
Establishment frequency, Distance to shops	.2696*
High volume street %, Overall walking opportunities	.1161
High/Med volume street %, Problematic traffic	.0981
Overall accessibility , Sidewalk coverage	.1250
Overall accessibility , Problematic traffic	.0380
Overall accessibility , Walking convenience	.2220*
Overall accessibility , Overall walking opportunities	.1505
Pedestrian safety , Sidewalk coverage	.1547
Pedestrian safety , Walking convenience	.2818*

*fair reproducibility in agreement (kappa >.20 - <.40)

Table 3- Measures used to determine the objective neighborhood accessibility scores from the Regional Land Information System

Intersection frequency at half and quarter-mile (measure connectivity)
Log of Bus line frequency at half and quarter-mile (measure of transit access)
Log of Bus stop frequency at half and quarter mile (measure of transit access)
Total establishment[1] frequency at half and quarter-mile (neighborhood destinations)
Total of selected establishment[2] at half and quarter-mile (neighborhood destinations)

[1] Any business

[2] Businesses in which an individual would use and visit

Table 4- Objective Measures used to determine the objective pedestrian safety scores from the Regional Land Information System

Low volume streets percent at half and quarter-mile (measure of traffic volume)
Average percent sidewalk coverage at half and quarter-mile (measure of sidewalk coverage)

Table 5- Baseline characteristics of individuals who did and did not return the neighborhood accessibility questionnaire in 2004

	Returned	Non-returned	P-value
Total No.	141	104	
Age	141 (100%)	104 (100%)	
mean (SD)	80.18 (8.7)	82.92 (8.3)	**.014***
SES	139 (98.6%)	98 (94.2%)	**.058**
mean (SD)	44.65 (11.5)	43.99 (13.0)	.681*
MCIRS[1]	122 (86.5%)	75 (72.1%)	**.005**
mean (SD)	19.47 (2.9)	20.23 (3.6)	.105*
MIS[2]	121 (86.5%)	72 (69.2%)	**.001**
mean (SD)	1.04 (1.5)	1. 43 (2.1)	.132*
WRAT-R[3]	136 (96.5%)	96 (92.3%)	.146
mean (SD)	72.11 (12.3)	73.90 (11.7)	.264*
Cohort	141 (100%)	104 (100%)	
OBAS	41.1%	31.7%	
DPS	27.0%	34.6%	
AADAPt	31.9%	33.7%	.267
Sex	141 (100%)	104 (100%)	
Male	29.8%	31.7%	
Female	70.2%	68.3%	.744
Race	141 (100%)	104 (100%)	
White	66.7%	63.5%	
Non-white	33.3%	36.5%	.602
Marital Status	140 (99.3%)	104 (100%)	.393
Married	58.2%	63.5%	
Not-married	41.1%	36.5%	.439
Education	141 (100%)	104 (100%)	
< high school	39.0%	44.2%	.412
≥ high school	61%	55.8%	
Functional Status [c]	137 (97.2%)	103 (99.0%)	.324
Independent	90.8%	79.8%	
Dependent	6.4%	19.2%	**.003**
Weekly Exercise[d]	133 (94.3%)	94 (90.4%)	.248
Light	39.7%	53.8%	
Heavy	54.6%	36.5%	**.010**
Daily Walking [e]	125 (88.7%)	94 (90.4%)	.669
Light	36.9%	46.2%	
Heavy	51.8%	44.2%	.164
Depression	124 (87.9%)	81 (77.9%)	**.036**
None	78.7%	66.5%	
Depressed	9.2%	14.4%	.101

*T-tests
[1]Modified Cumulative Illness Rating
[2]Modified Ischemic Scale score
[3]Wide Range Achievement Test-Revised score
Bold implies statistical significance at p= .05 level

Table 6- Baseline characteristics of individuals who replied to the neighborhood accessibility questionnaire adequately and inadequately in 2004

	Adequately replied	Inadequately replied	P-value
Total No.	133	8	
Age	133 (100%)	8 (100%)	
mean (SD)	80.20 (8.6)	79.89 (9.9)	.922*
SES	131 (98.5%)	8 (100%)	.727
mean (SD)	44.90 (11.5)	40.63 (11.3)	.309*
MCIRS[1]	114 (85.7%)	8 (100%)	.251
mean (SD)	19.32 (2.9)	21.5 (3.1)	**.043***
MIS[2]	113 (85.0)	8 (100%)	.238
mean (SD)	.99 (1.4)	1.75 (2.3)	.160*
WRAT-R[3]	128 (96.2%)	8 (100%)	.575
mean (SD)	72.42 (12.2)	67.0 (14.2)	.229*
Cohort	133 (100%)	8 (100%)	
OBAS	42.1%	37.5%	
DPS	27.1%	12.5%	
AADAPt	30.8%	50.0%	.536
Sex	133 (100%)	8 (100%)	
Male	29.3%	37.5%	
Female	70.7%	62.5%	.695
Race	133	8	
White	67.7%	50.0%	
Non-white	32.3%	50.0%	.441
Marital Status	132 (99.2%)	8 (100%)	.780
Married	57.8%	62.5%	
Not-married	41.4%	37.5%	1
Education	133	8	
< high school	39.8%	25.0%	
≥ high school	60.2%	75.0%	.483
Functional Status [c]	129 (97.0%)	8 (100%)	.613
Independent	90.2%	100%	
Dependent	0%	0%	1
Weekly Exercise[d]	125 (94.0%)	8 (100%)	.476
Light	38.4%	62.5%	
Heavy	55.6%	37.5%	.280
Daily Walking [e]	118 (88.7%)	7 (87.5%)	.917
Light	36.8%	47.5%	
Heavy	51.9%	50.0%	1
Depression	116 (87.2%)	8 (100%)	.280
None	78.2%	87.5%	
Depressed	9.0%	12.5%	1

*T-tests
[1]Modified Cumulative Illness Rating
[2]Modified Ischemic Scale score
[3]Wide Range Achievement Test-Revised score
Bold implies statistical significance at p= .05 level

Table 7- Means and proportions of covariates by perceived neighborhood accessibility tertile

Covariate	Low	Moderate	High	P-value
Total Number	55	41	37	
Age	55 (100%)	41 (100%)	37(100%)	
Mean (SD)	80.67 (1.18)	80.09 (1.32)	79.61 (1.47)	0.934*
SES	54 (98.1%)	40 (97.6%)	37 (100%)	
Mean (SD)	44.37 (1.50)	47.33 (1.61)	43.05 (2.17)	0.255*
MCIRS[1]	46 (83.6%)	35 (85.4%)	34 (91.9%)	
Mean (SD)	19.54 (0.50)	19.51 (0.41)	18.82 (0.43)	0.052*
MIS[2]	46 (83.6%)	35 (85.4%)	33 (89.2%)	
Mean (SD)	1.02 (0.25)	1 (0.20)	.909 (0.24)	0.111*
WRAT-R[3]	52 (94.5%)	40 (97.6%)	36 (97.3%)	
Mean (SD)	73.21 (1.54)	73.5 (2.05)	70.08 (2.12)	0.540*
Sex	55 (100%)	41 (100%)	37 (100%)	
Male	23.6%	39.0%	32.4%	0.263
Female	76.4%	61.0%	67.6%	
Race	55 (100%)	41 (100%)	37 (100%)	
White	70.9%	68.3%	59.5%	0.506
Non-white	29.1%	31.7%	40.5%	
Marital Status	54 (98.2%)	41 (100%)	37 (100%)	
Married	69.1%	46.3%	51.4%	**0.042**
Non-married	29.1%	53.7%	48.6%	
Education	55 (100%)	41 (100%)	37 (100%)	
≤ High school	36.4%	34.1%	43.2%	0.688
> High school	63.6%	65.9%	56.8%	
Functional Status	53 (96.4%)	40 (97.6%)	37 (100%)	
Independent	89.1%	95.1%	89.2%	0.347
Dependent	7.3%	2.5%	10.8%	
Exercise	55 (100%)	38 (92.7%)	34 (91.9%)	
Light	45.5%	34.1%	40.5%	0.694
Heavy	54.5%	58.5%	51.4%	
Walking	49 (89.1%)	38 (92.7%)	31 (83.8%)	
Light	27.3%	39.0%	45.9%	0.097
Heavy	61.8%	53.7%	37.8%	
Depression	46 (83.6%)	35 (85.4%)	35 (94.6%)	
None	74.5%	75.6%	86.5%	0.915
Depressed	9.1%	9.8%	8.1%	

*Oneway ANOVA
[1]Modified Cumulative Illness Rating
[2]Modified Ischemic Scale score
[3]Wide Range Achievement Test-Revised score
Bold implies statistical significance at p= .05 level

Table 8- Means and proportions of covariates by objective neighborhood accessibility tertile

Covariate	Low	Moderate	High	P-value
Total Number	44	44	45	
Age Mean (SD)	44 (100%) 80.85 (1.29)	44 (100%) 79.87 (1.30)	45 (100%) 79.87 (1.33)	0.957*
SES Mean (SD)	42 (95.5%) 48.10 (1.32)	44 (100%) 43.23 (1.86)	45(100%) 43.56 (1.87)	**0.029***
MCIRS[1] Mean (SD)	39 (88.6%) 19.21 (0.51)	39 (88.6%) 19.05 (0.39)	37 (82.2%) 19.73 (0.48)	0.262*
MIS[2] Mean (SD)	38 (86.4%) .658 (0.16)	39 (88.6%) .846 (0.19)	37 (82.2%) 1.46 (.316)	**0.000***
WRAT-R[3] Mean (SD)	43 (97.8%) 74.37 (1.39)	42 (95.5%) 72.33 (1.66)	43 (95.6%) 70.56 (2.38)	**0.001***
Sex Male Female	44 (100%) 31.8% 68.2%	44 (100%) 40.9% 59.1%	45 (100%) 20.0% 80.0%	0.101
Race White Non-white	44 (100%) 84.1% 15.9%	44 (100%) 61.4% 38.6%	45 (100%) 55.6% 44.4%	**0.011**
Marital Status Married Non-married	44 (100%) 54.5% 45.5%	43 (97.8%) 59.1% 38.6%	45 (100%) 57.8% 42.2%	0.855
Education ≤ High school > High school	44 (100%) 33.3% 66.7%	44 (100%) 42.2% 57.8%	45 (100%) 35.6% 64.4%	0.639
Functional Status Independent Dependent	42 (95.5%) 86.4% 9.1%	43 (97.8%) 95.5% 2.3%	45 (100%) 91.1% 8.9%	0.357
Exercise Light Heavy	39 (88.6%) 38.6% 50.0%	44 (100%) 31.8% 68.2%	44 (97.8%) 51.1% 46.7%	0.150
Walking Light Heavy	39 (88.6%) 31.8% 56.8%	38 (86.4%) 29.55 56.8%	41 (91.1%) 46.7% 44.4%	0.233
Depression None Depressed	40 (90.9%) 86.4% 4.5%	40 (90.9%) 81.8% 9.1%	36 (80.0%) 66.7% 13.3%	0.275

*Oneway ANOVA
[1]Modified Cumulative Illness Rating
[2]Modified Ischemic Scale score
[3]Wide Range Achievement Test-Revised score
Bold implies statistical significance at p= .05 level

Table 9- Means and proportions of covariates by objective pedestrian safety tertile

Covariate	Low	Moderate	High	P-value
Total Number	44	44	45	
Age	44 (100%)	44 (100%)	45 (100%)	
Mean (SD)	81.04 (1.65)	81.70 (1.29)	78.24 (1.48)	0.532
SES	42 (95.5%)	44 (100%)	45(100%)	
Mean (SD)	47.46 (1.62)	45.0 (1.92)	41.46 (1.98)	0.532
MCIRS[1]	38 (86.4%)	39 (88.6%)	38 (84.4%)	
Mean (SD)	19.63 (0.38)	19.67 (0.54)	19.03 (0.44)	0.092
MIS[2]	37 (84.1%)	39 (88.6%)	38 (84.4%)	
Mean (SD)	.457 (0.11)	1.54 (0.30)	.973 (0.21)	**0.000**
WRAT-R[3]	41 (93.2%)	43(97.7%)	44 (97.8%)	
Mean (SD)	75.63 (1.51)	72.05 (1.91)	70.24 (2.51)	**0.006**
Sex	44 (100%)	44 (100%)	45 (100%)	
Male	18.25	40.9%	33.3%	
Female	81.8%	59.1%	66.7%	0.063
Race	44 (100%)	44 (100%)	45 (100%)	
White	84.1%	75.0%	42.2%	
Non-white	15.9%	25.0%	57.8%	**0.000**
Marital Status	43 (97.8%)	44 (100%)	45 (100%)	
Married	61.4%	56.8%	53.3%	
Non-married	36.4%	43.2%	46.7%	0.663
Education	44 (100%)	44 (100%)	45 (100%)	
≤ High school	40.9%	31.8%	40.0%	
> High school	59.1%	68.2%	60.0%	0.624
Functional	43 (97.8%)	42 (95.5%)	45 (100%)	
Status	90.9%	90.9%	91.1%	
Independent	6.8%	4.5%	8.9%	0.909
Dependent				
Exercise	40 (90.9%)	42 (95.5%)	45 (100%)	
Light	47.7%	40.9%	33.3%	
Heavy	43.2%	54.5%	66.7%	0.203
Walking	39 (88.6%)	37 (84.1%)	42 (93.3%)	
Light	36.4%	31.8%	40.0%	
Heavy	52.3%	52.3%	53.3%	0.901
Depression	38 (86.4%)	40 (90.9%)	38 (84.4%)	
None	81.8%	77.3%	75.6%	
Depressed	4.5%	13.6%	8.9%	0.415

*Oneway ANOVA
[1]Modified Cumulative Illness Rating
[2]Modified Ischemic Scale score
[3]Wide Range Achievement Test-Revised score
Bold implies statistical significance at p= .05 level

Table 10- Baseline characteristics of individuals with and without available Animal Fluency and Logical Memory scores in 2004

	Available Score	No score	P-value
Total No.	115	18	
Age	115 (100%)	18 (100%)	
mean (SD)	80.35 (9.0)	79.21 (6.3)	.606*
SES	113 (98.3%)	18 (100%)	.577
mean (SD)	44.65 (11.4)	46.50 (12.1)	.525*
MCIRS[1]	114 (99.1%)	1 (5.6%)	
mean (SD)	19.32 (2.9)	19	**.001**
MIS[2]	113 (98.3%)	1 (5.6%)	
mean (SD)	.991 (1.4)	0	**.001**
WRAT-R[3]	114 (99.1%)	14 (77.8%)	**.001**
mean (SD)	72.78 (12.4)	69.5 (10.3)	.379*
Cohort	115	18	
OBAS	39.1%	61.1%	
DPS	30.4%	5.6%	**.050**
AADAPt	30.4%	33.3%	
Sex	115 (100%)	18 (100%)	
Male	29.6%	38.9%	.426
Female	70.4%	61.1%	
Race	115 (100%)	18 (100%)	
White	67.0%	66.7%	.981
Non-white	33.0%	33.3%	
Marital Status	115 (100%)	17 (94.4%)	**.011**
Married	60.0%	38.8%	
Not-married	40.0%	55.6%	.143
Education	115 (100%)	18 (100%)	
< high school	37.4%	38.9%	
≥ high school	62.6%	61.1%	.903
Functional Status	114 (99.1%)	16 (88.9%)	**.007**
Independent	99.1%	88.9%	
Dependent	0%	0%	1
Weekly Exercise	110 (95.7%)	17 (94.4%)	.804
Light	42.6%	27.8%	
Heavy	53.0%	66.7%	.298
Daily Walking [e]	100 (75.2%)	18 (100%)	**.017**
Light	29.3%	50.0%	
Heavy	45.9%	50.0%	.382
Depression	115 (100%)	1 (10%)	**.000**
None	89.5%	100%	
Depressed	10.5%	0%	1
Perceived Accessibility	115 (100%)	18 (100%)	
Low	40.0%	50.0%	
Moderate	30.4%	33.3%	.559
High	29.6%	16.7%	
Objective Accessibility	115 (100%)	18 (100%)	
Low	33.9%	27.8%	
Moderate	34.8%	22.2%	.366
High	31.3%	50.0%	
Objective Pedestrian Safety	115 (100%)	18 (100%)	
Low	33.0%	33.3%	.949
Moderate	34.0%	27.8%	
High	33.0%	46.7%	

*T-tests

[1]Modified Cumulative Illness Rating

[2]Modified Ischemic Scale score

[3]Wide Range Achievement Test-Revised score

Bold implies statistical significance at p= .05 level

Table 11- Mean Animal Fluency score by tertile of primary predictor variables

	Animal Fluency Mean Score (95% Confidence Interval)
Perceived Neighborhood Accessibility (p= .554***)	
Low N=46	17.4 (16.03 - 18.84)
Moderate N=35	17.4 (15.54 - 19.32)
High N=34	15.5 (13.58 - 17.36)
Objective Neighborhood Accessibility (p= .122***)	
Low N=39	17.5 (15.47 - 19.45)
Moderate N=40	17.3 (15.84 - 18.71)
High N=36	15.7 (14.10 - 17.35)
Objective Pedestrian Safety (p= .206***)	
Low N=38	17.9 (15.96 - 19.88)
Moderate N=39	15.8 (14.37 - 17.27)
High N=38	16.8 (15.18 - 18.51)

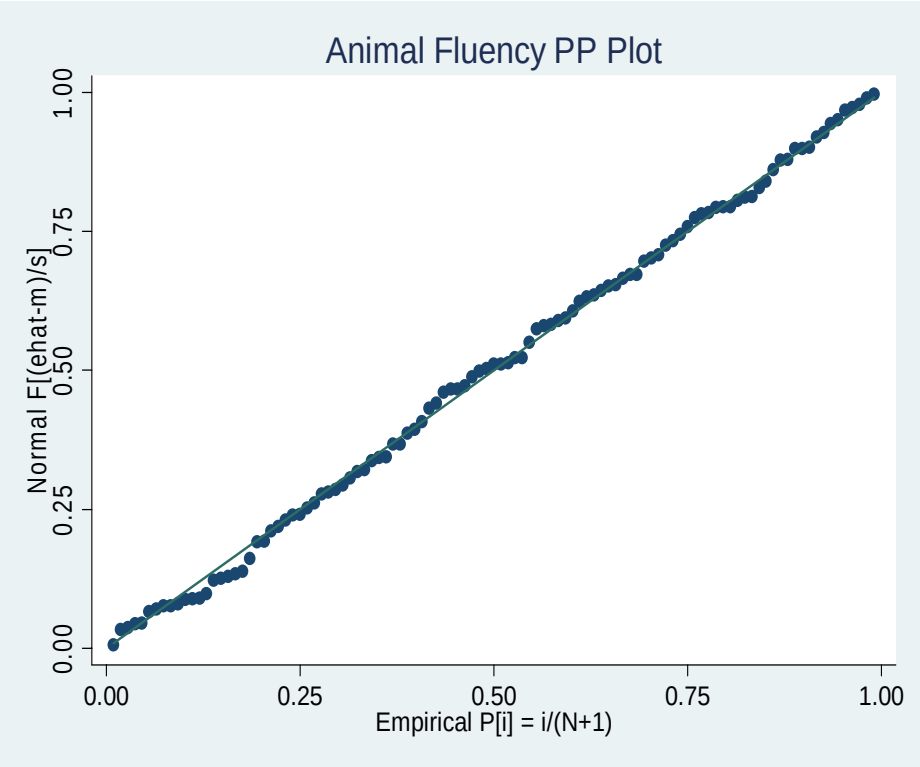
***One way ANOVA

Table 12- Univariate analysis for all covariates by Animal Fluency scores

Predictor Variable	β Coefficient (95% Confidence Interval)
Age	**-.168 (-.275- -.062)**
SES	**.155 (.073 - .237)**
MCIRS[1]	-.138 (-.487 - .210)
MIS[2]	**-.795 (-1.48 - -.110)**
WRAT-R[3]	**.116 (.038 - .193)**
Gender	
Male	Referent
Female	-.335 (-2.50- 1.83)
Race	
White	Referent
Non-white	**-2.92 (-4.95 - -.892)**
Marital Status	
Married	Referent
Not-married	1.95 (-.037 - 3.94)
Education	
< High school	Referent
> High school	**2.25 (.251 - 4.25)**
Functional Status	
Independent	Referent
Dependent	-3.85 (-7.92 - .234)
Exercise	
Light	Referent
Heavy	.707 (-1.30 - 2.71)
Walking	
Light	Referent
Heavy	**3.18 (1.01 - 5.35)**
Depression	
None	Referent
Depressed	1.37 (-1.85 – 4.60)
Perceived Accessibility	
Low	Referent
Moderate	-.0062 (-2.36 – 2.19)
High	-1.964 (-4.34 - .417)
Objective Accessibility	
Low	Referent
Moderate	-.1865 (-2.56 – 2.19)
High	-1.739 (-4.18 - .698)
Objective Pedestrian Safety	
Low	Referent
Moderate	-2.101 (-4.18 - .698)
High	-1.080 (-3.49 – 1.33)

[1]Modified Cumulative Illness Rating
[2]Modified Ischemic Scale score
[3]Wide Range Achievement Test-Revised score
Bold implies statistical significance at p= .05 level

Table 13- Normal probability plots of the Animal Fluency model



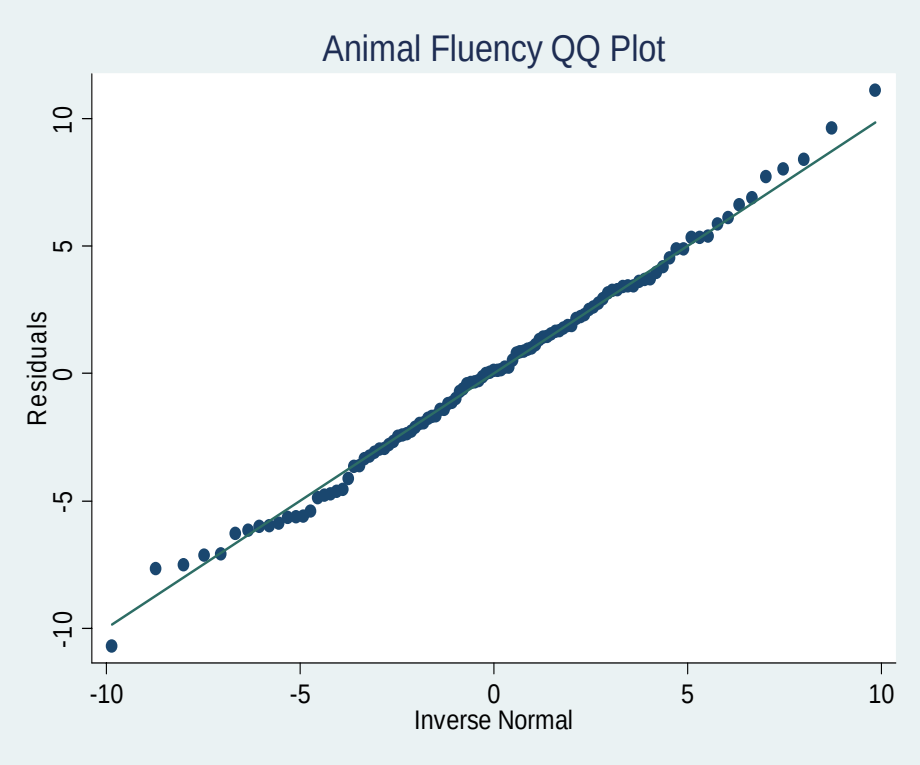


Table 14- Crude, adjusted, and multivariable adjusted odds ratios of primary predictor variables in the Animal Fluency model

	Crude β Coefficients (95% Confidence Interval)	Adjusted[1] β Coefficients (95% Confidence Interval)	Multivariable Adjusted[2] β Coefficients (95% Confidence Interval)
Perceived Accessibility			
Moderate v. Low	-.0062 (-2.36 – 2.19)	1.055 (-1.01 – 3.12)	1.092 (-1.02 – 3.20)
High v. low	-1.964 (-4.34 - .417)	-1.299 (-3.39 - .792)	-1.182 (-3.30 - .939)
Objective Accessibility			
Moderate v. Low	-.1865 (-2.56 – 2.19)	.5595 (-.61 – 2.73)	.9188 (-1.31 – 3.15)
High v. low	-1.739 (-4.18 - .698)	-.7838 (-3.02 – 1.45)	-.5068 (-2.78 – 1.77)
Objective Pedestrian Safety			
Moderate v. Low	-2.101 (-4.18 - .698)	-1.225 (-3.40 - .949)	-1.104 (-3.31 – 1.10)
High v. low	-1.080 (-3.49 – 1.33)	-.1123 (-2.40 – 2.17)	-.1329 (-2.46 – 2.20)

1 Adjusted for age, WRAT-R[3], race, exercise, and SES

2 Adjusted for other primary predictor variables, age, WRAT-R[3], race, exercise, and SES

3 Wide Range Achievement Test-Revised score

Table 15- Mean Logical Memory score by tertile of primary predictor variables

	Logical Memory II Mean Score (95% Confidence Interval)
Perceived Neighborhood Accessibility (p= .072**)	
Low N=46	13 (11.65 - 14.35)
Moderate N=35	13 (11.58 - 14.420
High N=34	10.9 (8.86 - 13.02)
Objective Neighborhood Accessibility (p= .650**)	
Low N=39	12.5 (11.02 - 14.01)
Moderate N=40	12.5 (10.91 - 14.09)
High N=36	12.1 (.916) (10.33 - 13.95)
Objective Pedestrian Safety (p= .852**)	
Low N=38	13 (11.28 - 14.67)
Moderate N=39	12 (10.38 - 13.62)
High N=38	12.2 (10.66 - 13.76)

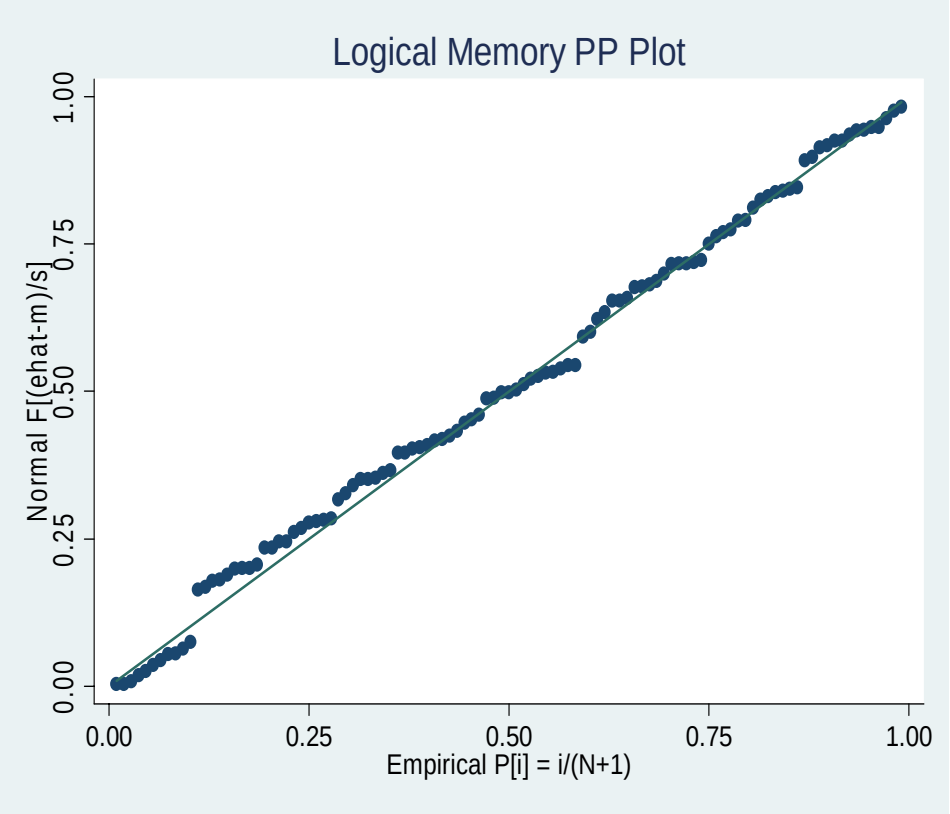
**One way ANOVA

Table 16- Univariate analysis for all covariates by Logical Memory scores

Covariate	β Coefficient (95%Confidence Interval)
Age	-.070 (-.174 - .034)
SES	**.129 (.050 - .209)**
MCIRS[1]	-.046 (-.377 - .285)
MIS[2]	-.256 (-.918 - .407)
WRAT-R[3]	**.137 (.064 - .209)**
Gender	
Male	Referent
Female	-.071 (-2.12 – 1.98)
Race	
White	Referent
Non-white	**-3.96 (-5.81 - -2.11)**
Marital Status	
Married	Referent
Not-married	.652 (-1.26 – 2.56)
Education	
< High school	Referent
> High school	1.33 (-.590 – 3.25)
Functional Status	
Independent	Referent
Dependent	-3.34 (-7.22 - .540)
Exercise	
Light	Referent
Heavy	.476 (-1.41 - 2.36)
Walking	
Light	**Referent**
Heavy	**2.62 (.667 - 4.57)**
Depression	
None	Referent
Depressed	2.35 (-.679 – 5.39)
Perceived Accessibility	
Low	Referent
Moderate	1.98 e^{-15} (-2.22 - 2.22)
High	-2.059 (-4.30 - .184)
Objective Accessibility	
Low	Referent
Moderate	-.0128 (-2.28 - 2.26)
High	-.3739 (-2.71 – 1.96)
Objective Pedestrian Safety	
Low	Referent
Moderate	-.9737 (-3.27 – 1.32)
High	-.7632 (-3.07 – 1.54)

[1]Modified Cumulative Illness Rating
[2]Modified Ischemic Scale score
[3]Wide Range Achievement Test-Revised score
Bold implies statistical significance at p= .05 level

Table 17- Normal probability plots of the Logical Memory model



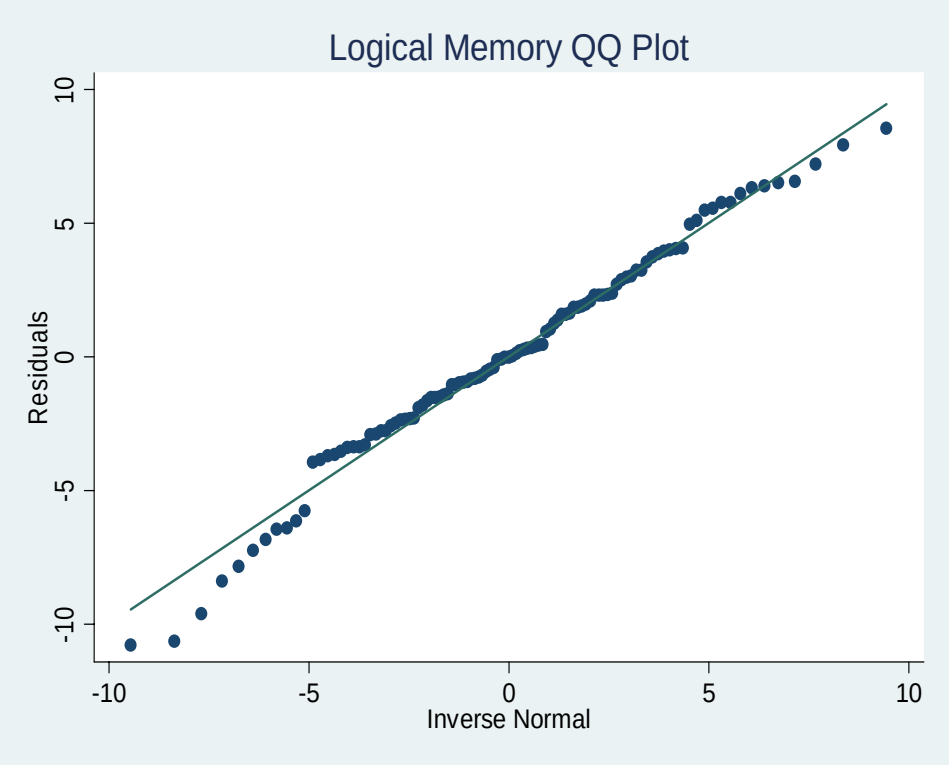


Table 18- Crude, adjusted, and multivariable adjusted odds ratios of primary predictor variables in the Logical Memory model

	Crude β Coefficients (95% Confidence Interval)	Adjusted[1] β Coefficients (95% Confidence Interval)	Multivariable Adjusted[2] β Coefficients (95% Confidence Interval)
Perceived Accessibility			
Moderate v. Low	$1.98\ e^{-15}$ (-2.22 - 2.22)	.9394 (-1.06 – 2.94)	1.141 (-.915 – 3.20)
High v. low	-2.059 (-4.30 - .184)	-.8010 (-2.83 – 1.22)	-.7436 (-2.81 – 1.32)
Objective Accessibility			
Moderate v. Low	-.0128 (-2.28 - 2.26)	1.137 (-.950 – 3.22)	1.339 (-.834 – 3.51)
High v. low	-.3739 (-2.71 – 1.96)	.9126 (-1.22 – 3.05)	1.075 (-1.12 – 3.28)
Objective Pedestrian Safety			
Moderate v. Low	-.9737 (-3.27 – 1.32)	-.1981 (-2.28 – 1.88)	-.2389 (-2.37 – 1.89)
High v. low	-.7632 (-3.07 – 1.54)	.6788 (-1.51 – 2.86)	.4242 (-1.82 – 2.67)

1 Adjusted for age, WRAT-R[3], race, functional status, exercise, and SES

2 Adjusted for other primary predictor variables, age, WRAT-R[3], race, functional status, exercise, and SES

3 Wide Range Achievement Test-Revised score

Table 19- Baseline characteristics of individuals with and without an available CDR score in 2004

	Available Score	No score	P-value
Total No.	119	14	
Age	119 (100%)	14 (100%)	
mean (SD)	80.42 (8.8)	78.30 (6.7)	.388*
SES	117 (98.3%)	14 (100%)	.623
mean (SD)	44.70 (11.4)	46.57 (12.6)	.590*
MCIRS[1]	115 (96.6%)	0	**.001**
mean (SD)	19.32 (2.9)		
MIS[2]	114 (95.8%)	0	**.001**
mean (SD)	.98 (1.4)		
WRAT-R[3]	118 (99.2%)	10 (71.4%)	**.001**
mean (SD)	72.48 (12.3)	71.70 (11.2)	.847*
Cohort	119 (100%)	14 (100%)	
OBAS	40.3%	57.1%	
DPS	30.3%	0%	**.030**
AADAPt	29.4%	42.9%	
Sex	119 (100%)	14 (100%)	
Male	30.3%	35.7%	.761
Female	69.7%	64.2%	
Race	119 (100%)	14 (100%)	
White	68.1%	57.1%	.411
Non-white	31.9%	42.9%	
Marital Status	119 (100%)	13 (92.9%)	**.004**
Married	59.7%	35.7%	
Not-married	40.3%	57.1%	.154
Education	119 (100%)	14 (100%)	
< high school	35.7%	37.8%	.878
≥ high school	64.3%	62.2%	
Functional Status [c]	118 (99.2%)	12 (85.7%)	**.001**
Independent	93.3%	71.4%	
Dependent	5.9%	14.3%	.195
Weekly Exercise[d]	114 (95.7%)	13 (92.9%)	.636
Light	42.0%	28.6%	
Heavy	53.8%	64.3%	.555
Daily Walking [e]	104 (87.4%)	14 (100%)	.156
Light	34.5%	50%	
Heavy	52.9%	50%	.449
Depression	116 (97.5%)	0	**.001**
No	87.4%		
Yes	10.1%		
Perceived Accessibility	119(100%)	14(100%)	
Low	40.3%	50.0%	
Moderate	30.3%	35.7%	.556
High	29.4%	14.3%	
Objective Accessibility	119(100%)	14 (100%)	
Low	35.3%	14.3%	
Moderate	33.6%	28.6%	.137
High	31.1%	57.1%	
Objective Pedestrian Safety	119 (100%)	14 (100%)	
Low	32.8%	35.7%	
Moderate	34.4%	21.4%	.683
High	32.8%	42.9%	

*T-tests

[1]Modified Cumulative Illness Rating

[2]Modified Ischemic Scale score

[3]Wide Range Achievement Test-Revised

Bold implies statistical significance at p= .05 level

Table 20- Proportions of CDR>0 by tertile of primary predictor variables

	Intact (CDR= 0) Proportion (95% Confidence Interval)	Impaired (CDR ≥ .5) Proportion (95% Confidence Interval)
Perceived Neighborhood Accessibility (p= .459*)		
Low N=48	.4223 (.324 - .519)	.2941 (.069 - .520)
Moderate N=36	.3039 (.213 - .395)	.2941 (.069 - .520)
High N=35	.2745 (.187 - .362)	.4118 (.168 - .655)
Objective Neighborhood Accessibility (p= .897*)		
Low N=42	.3529 (.259 - .447)	.3529 (.116 -.590)
Moderate N=40	.3431 (.250 - .437)	.2941 (.069 - .520)
High N=37	.3039 (.213 - .395)	.3529 (.116 - .590)
Objective Pedestrian Safety (p= .802*)		
Low N=39	.3137 (.222 - .405)	.4118 (.168 - .655)
Moderate N=41	.3529 (.259 - .447)	.2941 (.069 - .520)
High N=39	.3333 (.240 - .426)	.29411 (.069 - .520)

* Chi-square

Table 21- Univariate analysis for all covariates by CDR>0

Covariate	Odds Ratio (95% Confidence Interval)
Age	**1.119 (1.02 - 1.22)**
SES	.9890 (.946 - 1.03)
MCIRS[1]	**1.230 (1.03 - 1.47)**
MIS[2]	1.135 (.825 - 1.56)
WRAT-R[3]	**.9445 (.908 - .982)**
Gender	
Male	Referent
Female	.5675 (.197 - 1.63)
Race	
White	Referent
Non-white	.6153 (.186 - 2.03)
Marital Status	
Married	Referent
Not-married	.7792 (.267 - 2.27)
Functional Status	
Independent	Referent
Dependent	**10.1 (2.02 – 50.03)**
Education	
< High school	Referent
> High school	1.135 (.389 - 3.31)
Exercise	
Light	Referent
Heavy	1.667 (.531 - 5.23)
Walking	
Light	Referent
Heavy	**.2797 (.078 - .999)**
Depression	
None	Referent
Depressed	1.289 (.255 – 6.49)
Perceived Accessibility	
Low	Referent
Moderate	1.387 (.370 – 5.21)
High	2.15 (.621 – 7.45)
Objective Accessibility	
Low	Referent
Moderate	.8571 (.240 – 3.07)
High	1.161 (.340 – 3.97)
Objective Pedestrian Safety	
Low	Referent
Moderate	.6349 (.183 – 2.20)
High	.6723 (.194 – 2.33)

[1]Modified Cumulative Illness Rating
[2]Modified Ischemic Scale score
[3]Wide Range Achievement Test-Revised
Bold implies statistical significance at p= .05 level

Table 22- Crude, Adjusted, and Multivariable adjusted odds ratios of primary predictor variables in the CDR model

	Crude Odds Ratio	Adjusted[1] Odds Ratio[1]	Multivariable Adjusted[2] Odds Ratio[2]
Perceived Accessibility			
Moderate v. Low	1.387 (.370 – 5.21)	3.324 (.577 – 19.15)	4.133 (.534 – 31.97)
High v. low	2.15 (.621 – 7.45)	5.292 (.951 – 29.45)	**9.803 (1.24 – 77.67)**
Objective Accessibility			
Moderate v. Low	.8571 (.240 – 3.07)	.8328 (.145 – 4.78)	1.958 (.212 – 18.04)
High v. low	1.161 (.340 – 3.97)	.3377 (.049 – 2.33)	.3191 (.033 – 3.06)
Objective Pedestrian Safety			
Moderate v. Low	.6349 (.183 – 2.20)	.1682 (.022 – 1.26)	**.0448 (.003 - .706)**
High v. low	.6723 (.194 – 2.33)	.4447 (.070 – 2.83)	.2063 (.020 – 2.13)

1 Adjusted for age, WRAT-R[3], depression, education, MIS[4], MCIRS[5], and functional status

2 Adjusted for other primary predictor variables, age, WRAT-R[3], depression, education, MIS[4], MCIRS[5], and functional status

3 Wide Range Achievement Test-Revised score

4 Modified Ischemic Scale score

5 Modified Cumulative Illness Rating

Bold implies statistical significance at p= .05 level

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Appendix

A.

Oregon Brain Aging Study

Inclusion Criteria

1. Principal language, English
2. Functionally independent
3. Has not sought evaluation for cognitive impairment
4. Willing and able to return for follow-up
5. Does not refuse to undergo post mortem examination
6. Score of < 12 on Instrumental Activities of Daily Living Scale (OARS)
7. Score of ≥ 24 on Mini-Mental State Exam
8. Score of <10 on Cornell Depression Scale
9. Score of < 11 on Geriatric Depression Scale
10. Score of 0 on Clinical Dementia Rating Scale
11. Gives informed consent
12. No exclusion criteria listed in Table 6 (below)

Major exclusion criteria.

1. Medical Conditions
    a. diabetes mellitus
    b. hypertension (supine BP > 160/95)
    c. angina pectoris or myocardial infarction
    d. cardiac arrhythmia
    e. coronary bypass/carotid endarterectomy
    f. Stroke* or TIA
    g. Parkinson disease*
    h. chronic pulmonary disease
    i. chronic renal disease
    j. chronic immunosuppression
    k. vitamin deficiencies
    l. seizure disorder
    m. active cancer (< 5 years without recurrence)
    n. hypothyroidism
2. Psychiatric Disorders
    a. chronic schizophrenia*
    b. major affective disorders*
    c. chronic anxiety or phobias*
3. Vision and Hearing
    a. vision uncorrectable to 20/100 O.U.(near card)*
    b. hearing loss (interferes with speech perception)*
4. Other Conditions
    a. alcohol abuse / drug abuse*
    b. significant head injury (>30 min unconscious)
    c. unexplained prolonged loss of consciousness
    d. use of medicines impairing cognitive function
    e. internal metal such as pacemakers, will be excluded from MR imaging

B.

Dementia Prevention Study

Inclusion Criteria:

1. Age > 84 years
2. No complaint of memory impairment compared to others their age.
3. Has not sought assessment for memory or cognitive dysfunction.
4. Normal Memory function defined by an education-adjusted score on the Logical Memory Subscale of the Wechsler Memory Scale - Revised:
    a. > 8 for 16 or more years of education.
    b. > 4 for 8-15 years of education.
    c. > 2 for 0-7 years of education.
5. Mini-Mental State Examination score > 23,
6. Functionally independent.
7. Clinical Dementia Rating (CDR) = zero.
8. Subjects will not be depressed: CESD-10 < 4.
9. Sufficient vision and hearing to complete all testing.
10. Sufficient English language skills to complete all testing.
11. General health status that will not interfere with ability to complete longitudinal study. Conditions that will likely to lead to this problem are listed below in the Study Exclusions list.
12. Informant available with frequent (at least one hour per day three days a week) contact with subject to verify functional status.

Exclusion Criteria:

1. Diseases associated with dementia such as AD, ischemic vascular dementia, normal pressure hydrocephalus, or Parkinson's disease.
2. Significant disease of the central nervous system such as brain tumor, seizure disorder, subdural hematoma, cranial arteritis.
3. Current (within the last 2 years) alcohol or substance abuse according to DSM IV criteria.
4. Major depression, schizophrenia or other major psychiatric disorder defined by DSM IV criteria.
5. Abnormal laboratory values indicating B12 deficiency, thyroid disease or urinary tract infection (documented chronic bacterial colonization is acceptable).
6. Unstable or significantly symptomatic cardiovascular disease such as coronary artery disease with frequent angina, or congestive heart failure with shortness of breath at rest.
7. Insulin dependent diabetes mellitus.
8. Active systemic cancer within 5 years of study entry. Gleason Grade < 3 prostate cancer, and non-metastatic skin cancers are acceptable.
9. Illness that requires > 1 visit per month to a clinician.
10. Progressive vision loss (Age-related macular degeneration already beginning to significantly degrade vision).
11. No need for oxygen supplementation for adequate function
12. Medications:
    a. Frequent use of high doses of analgesics.

b. Sedative medications except for those used occasionally for sleep (use limited to no more than twice per week).
c. Subjects may be on doses of CNS-active medications that have been stable for at least 2 months including cimetidine, beta-blockers and selective serotonin reuptake inhibitors.
d. Subjects taking neuroleptics, antiparkinsonian agents, systemic corticosteroids, and narcotic analgesics will be excluded. In the case where these were used for a self-limited time they must have been discontinued for a period of 5 half-lives prior to baseline.
e. Subjects will not be excluded if they are taking other over-the-counter supplements, but the dose must not be changed during the course of the trial unless medically indicated. The presence and dose of these agents will be recorded.
f. Cholinesterase inhibitors.
g. Use of investigational drugs within 5 half-lives prior to baseline.

C.
African American Dementia and Aging Project

Inclusion Criteria

1. Self-reported African-American residing in Portland metropolitan area
2. Age >65 years, of either gender
3. Ambulatory
4. Adequate vision, hearing and language abilities to understand consent, and complete assessments
5. Clinical Rating Scale score of ≤ 0.5 (indicating minimal cognitive impairment)
6. Ability to comply with and complete the assessments
7. Available collateral historian
8. Gives informed consent

Exclusion Criteria

1. Dementia as defined by Clinical Dementia Rating score > 0.5
2. Unstable and/or untreated medical or psychiatric illness
    a. Potential or enrolled subjects, who are found to have such illness, including harmful alcohol or drug use or disorders, will be referred to their primary care physician (PCP)
    b. Individuals referred to their PCP for such reasons may remain enrolled in the present study, if this is deemed safe for the participant, at the discretion of the investigators.
    c. For those not initially enrolled, reassessment is possible, once the condition has stabilized and/or is being appropriately treated.
    d. Individuals requiring, but refusing referral will be dropped from the study.
    e. Individuals without a PCP or medical insurance will be offered assistance in obtaining such.
3. Any subject who, in the opinion of the investigator, is unlikely to comply with or be able to complete the study protocol
4. Does not meet one or more inclusion criteria

D. Neighborhood Questionnaire

ID Number/ Extension

Neighborhood and Address Questionnaire

Neighborhood Characteristics

The following questions will ask you to rate characteristics of your home neighborhood that might influence whether or not you walk. Answer all questions thinking about the area within a quarter-mile from your home or a 20-minute walk. Please circle the single best answer for each question below.

Appearance and People:

1. How would you rate general friendliness of the people?

   1=not at all friendly

   2=somewhat friendly

   3=friendly

   4=very friendly

2. How enjoyable is the scenery?

   1=not at all enjoyable

   2=somewhat enjoyable

   3=enjoyable

   4=very enjoyable

Walking opportunities in the neighborhood:

1. How would you rate the walking distance to a park?

   1=not at all close

   2=somewhat close

   3=close

   4=very close

2. How accessible is a trail or path for walking?

   1=not at all accessible

   2=somewhat accessible

   3=accessible

   4=very accessible

3. How would you rate the presence of sidewalks?

   1=no sidewalks

   2=some sidewalks (less than 30% coverage)

   3=good sidewalk coverage (30-60% coverage)

   4=excellent sidewalk coverage (60-100% coverage)

4. Overall, how convenient is it to walk in your neighborhood?

   1=not at all convenient

   2=somewhat convenient

   3=convenient

   4=very convenient

Access to services:

1. How would you rate the walking distance to shops?

   1=not at all close

   2=somewhat close

   3=close

   4=very close

2. How would you rate the walking distance to a bus stop, MAX (light rail), or streetcar?

   1=not at all close

   2=somewhat close

   3=close

   4=very close

Traffic:

1. How much of a problem is traffic when walking in the neighborhood?

   1=not at all a problem

   2=somewhat of a problem

   3=problem

   4=very big problem

Childhood and early adulthood residences

1. Where did you mostly live when you were a child? If possible, write the city/town, county, and state of residence below.

City/town_____

County_____

State, Zip code_____

2. Please, provide your address 9street number and name, city, county, state and zip code) at these points in adulthood (if not able to provide the exact address, please provide the street name and the closest cross-street)

a. Age 30:

Street address or intersection_____

City/town_____

County_____

State, Zip code_____

b. Age 40:

Street address or intersection_____

City/town_____

County_____

State, Zip code_____

c. Age 50:

Street address or intersection_____

City/town_____

County_____

State, Zip code_____

d. Age 60:

Street address or intersection_____

City/town_____

County_____

State, Zip code_____

You are finished! Thank you for your participation.

E. Logical Memory

Jan 16 09 04:27p Diane Howieson 503-636-8190 p.3

Worksheet for LOGICAL MEMORY IIA–DELAYED

Administer this test approximately 20 minutes after *Logical Memory IA – Immediate.* (**Note:** If 20 minutes have not elapsed, do not add other tests to fill the interval. Administer *Logical Memory IIA – Delayed* and enter the actual time elapsed.)

Read the instructions:

[SAY]: **"I read you a little story a few minutes ago. Now I want you to tell me the story again. It was about a woman who was robbed. Tell me everything that you can remember about that story."**

Record the subject's response on the *Worksheet for Logical Memory IIA–Delayed* (master form provided in the tabbed section entitled "UDS Npsych Test Forms"). Make sure that your written record is legible before proceeding. If the subject asks a question about the story or for repetition of some or all of it, say **" Please tell me as much as you can remember about the story."**

Scoring is deferred until after the examination. The examiner may prefer to tape record the subject's response and then transcribe the results after the session; this is acceptable if appropriate consent has been obtained.

Story A – Delayed	**Score**
Anna / Thompson / of South / Boston /, employed / as a cook /	___ (0–6)
in a school / cafeteria /, reported / at the City Hall /Station /	___ (0–5)
that she had been held up / on State Street / the night before /	___ (0–3)
and robbed / of fifty-six dollars /. She had four /	___ (0–3)
small children /, the rent was due /, and they had not eaten /	___ (0–3)
for two days /. The police /, touched by the woman's story /,	___ (0–3)
took up a collection / for her /.	___ (0–2)

Total number of story units recalled: ___ ___

Time elapsed since Logical Memory IA – Immediate: ___ ___ (minutes)

March 2006

Scoring:
Scoring is deferred until after the examination and is done from the written record, which must be written in a legible, decipherable manner. The story consists of 25 units. On the *Worksheet for Logical Memory IA–Immediate*, underline each unit that is successfully recalled. Then total the units recalled and enter that number (00-25) in the space provided. This is the number to be entered on NACC UDS Form C1, item 3c. Scoring criteria for each unit are given below.

STORY A SCORING CRITERIA

Text	General Rule	Examples of 1-point Responses	Examples of 0-Point Responses
Anna	Anna" or variant of the name	Ann; Annie; Annette	Angela; Allison
Thompson	"Thompson" is required	-----	Thompkins; Thomas
of South	"South" (in any context)	from South; who lived in South; who came from South	----
Boston	"Boston" (in any context)	who worked in Boston; on a trip to Boston	-----
employed	An indication that she held a job	worked; had a job as; who was; who earned a living as	who wanted to be; employed a cook
as a cook	"Cook" or some form of the word is required	who cooked	as a waitress; in the kitchen
in a school	"School" is required	at a high school; by a school	in a hospital; at a company
cafeteria	"Cafeteria" is required	---	lunchroom; dining hall; diner; restaurant; kitchen
reported	Indication that a formal statement was made to someone in authority (in any context)	filed a complaint; said to police; made a statement; notified the police; called the police; told the police	said; told how
at the City Hall	"City Hall" (in any context)	went to City Hall; called City Hall	------
Station	"Station" in any context, or a word, or a word phrase denoting a police station	police station; train station; station house; police headquarters; precinct house; police department	office; building
that she had been held up	An indication that she had been held up (i.e., gun point or knife)	that someone held her up; that she was in a stick-up	that she was beaten; she was attacked; that she was robbed; she got mugged
on State Street	"State Street" (in any context)	she lived on State Street; on her way to State Street	on some street; State Avenue
the night before	Indication that the hold-up occurred the previous night	last night; the previous night	at night; one night; yesterday; the day before
and robbed	Indication that a robbery took place	was robbed, her money was stolen; they took her money; someone took her purse	lost her money; somebody took her things

STORY A SCORING CRITERIA (continued)			
Text	General Rule	Examples of 1-point Responses	Examples of 0-Point Responses
of fifty-six dollars.	Indication that an amount of money greater than $49 but less than $60 was taken from her	fifty-some dollars; fifty-five dollars; about fifty dollars	sixty-five dollars; a lot of money; the police collected fifty-six dollars for her
She had four	"Four" is required together with an indication that the children were hers	she was the mother of four	she had two; she had some; there were some
small children,	"Children" or a synonym is required	little children; kids; small kids; young children	babies; girls; sons; small boys
the rent was due,	A phrase indicating that the rent was due	she had not paid the rent; she owed for the rent; the landlord had to be paid; she needed money for the rent	she owed money; she needed money; there was no money
and they had not eaten	Indication that her children, or the family, were without food	they had gone without food; they were hungry; there was no food; her kids had nothing to eat; she couldn't feed her family	there wasn't much food they had only a little food; she had not eaten; didn't have money to buy food
for two days.	"Two days" is required, or a phrase meaning about two days	for a couple of days; for one or two days; for two or three days	for days; for several days; for a day; for three days
The police,	A word or phrase signifying one or more members of the police department (in any context)	the cops; the policeman; the detectives; the police officer; they (where police is clearly meant)	they (unspecified); some people; her neighbors; somebody
touched by the woman's story	An indication that her story evoked sympathy	were touched; felt sorry for the woman; wanted to help her; were sympathetic; were impressed by her story (implying emotional reaction)	listened to her story; helped her; believed her
took up a collection	A phrase indicating that money was collected	chipped in; collected money; donated; collected some food	gave her some money; found some money
for her.	An indication that the money collected was for her or her children	and gave it to her for her children; for her family; for them; to help her out	as a gift; to make things better; for food

F. Clinical Dementia Rating Scale

ADCO **CLINICAL DEMENTIA RATING SCALE (CDR)**

Office Use Only

Clinic Site | Patient ID# | Patient Designation | Evaluation #

Patient Name _____ **Medical Record #** _____

Evaluation Date M D Y **Evaluating Clinician** _____

Name of Person Completing Form _____ **Date Completed** _____

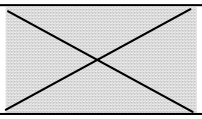
Instructions for assigning the CDR are as follows:

Use all information and make the best judgement. Score each category (M, O, JPS, CA, HH, PC) as independently as possible. **Circle only one item** in each category row, rating each according to subject's cognitive function. **When in doubt** on category score, score to higher level. **For determining the global CDR** , memory is considered the primary category; all others are secondary.

If at least three secondary categories are given the same numerical score as memory, then CDR = M. **If three or more** secondary categories are given a score greater or less than the memory score, CDR = score of majority of secondary categories, unless three secondary categories are scored on one side of M and two secondary categories are scored on the other side of M. In this last circumstance, CDR = M. **If** there is a tie in the secondary categories on one side of M, choose the CDR closest to M (e.g., 2 secondary categories = 1, 2 secondary categories = 2, M and another secondary category = 3; global CDR = 2).

If only one or two secondary categories are given the same score as M, the CDR = M as long as no more than 2 secondary categories are on either side of M.

When M = 0.5 , CDR = 1 if at least three of certain others (O, JPS, CA, HH) are scored 1 or greater (PC not influential here). **If M = 0.5**, CDR cannot be 0; CDR can only be 0.5 or 1. **If M = 0** , CDR = 0 unless there is slight impairment in two or more secondary categories, in which case CDR = 0.5.

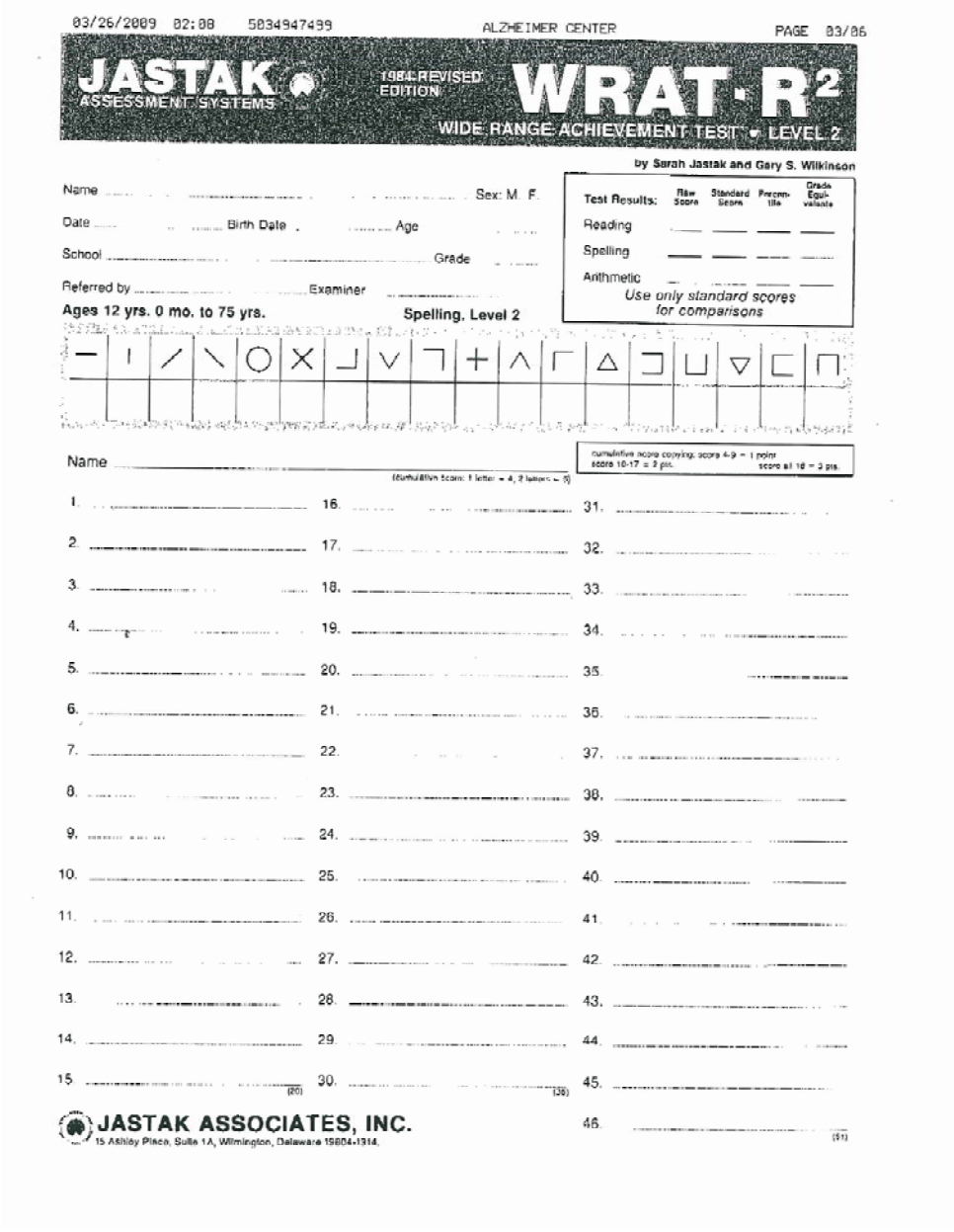
	Healthy CDR 0	**Questionable Dementia CDR 0.5**	**Mild Dementia CDR 1**	**Moderate Dementia CDR 2**	**Severe Dementia CDR 3**
MEMORY	No memory loss or slight inconsistent forgetfulness	Mild consistent forgetfulness; partial recollection of events; "benign" forgetfulness	Moderate memory loss, more marked for recent events; defect interferes with everyday activities	Severe memory loss; only highly learned material retained; new material rapidly lost	Severe memory loss; only fragments remain
ORIENTATION	Fully oriented	Fully oriented except for slight difficulty with time relationships	Some difficulty with time relationships; oriented for place and person at examination but may have geographic disorientation	Usually disoriented	Orientation to person only
JUDGEMENT AND PROBLEM SOLVING	Solves every day problems well; judgement good in relation to past performance	Only doubtful impairment in solving problems, similarities, differences	Moderate difficulty in handling complex problems; social judgement usually maintained	Severely impaired in handling problems, similarities, differences; social judgement usually impaired	Unable to make judgements or solve problems
COMMUNITY AFFAIRS	Independent function at usual level in job, shopping, business and financial affairs, volunteer and social groups	Only doubtful mild impairment in these activities	Unable to function independently at these activities though may still be engaged in some; may still appear normal to casual inspection	No pretense of independent function outside the home. Appears well enough to be taken to functions outside a family home	No pretense of independent function outside the home Appears too ill to be taken to functions outside a family home
HOME AND HOBBIES	Life at home, hobbies, intellectual interests well maintained	Life at home, hobbies, intellectual interests slightly impaired	Mild but definite impairment of function at home: more difficult chores abandoned; more complicated hobbies and interests abandoned	Only simple chores preserved; very restricted interests, poorly sustained	No significant function in home or outside of own room
PERSONAL CARE	Fully capable of self care		Needs occasional prompting	Requires assistance in dressing, hygiene, keeping of personal effects	Requires much help with personal care; often incontinent

CDR Score: _____

ADCOCDR - 004 **7/20/2001**

G.

WRAT-R



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JASTAK ASSESSMENT SYSTEMS

1984 REVISED EDITION

WRAT-R²

WIDE RANGE ACHIEVEMENT TEST • LEVEL 2

by Sarah Jastak and Gary S. Wilkinson

Name ..... Sex: M F

Date ..... Birth Date ..... Age .....

School ..... Grade .....

Referred by ..... Examiner .....

Ages 12 yrs. 0 mo. to 75 yrs.

Spelling, Level 2

Test Results:	Raw Score	Standard Score	Percentile	Grade Equivalents
Reading				
Spelling				
Arithmetic				

Use only standard scores for comparisons

Name .....

(Cumulative Score: 1 letter = 4, 2 letters = 5)

cumulative score copying: score 4-9 = 1 point; score 10-17 = 2 pts.; score of 18 = 3 pts.

1.	16.	31.
2.	17.	32.
3.	18.	33.
4.	19.	34.
5.	20.	35.
6.	21.	36.
7.	22.	37.
8.	23.	38.
9.	24.	39.
10.	25.	40.
11.	26.	41.
12.	27.	42.
13.	28.	43.
14.	29.	44.
15. (20)	30. (36)	45.
		46. (51)

JASTAK ASSOCIATES, INC.

15 Ashley Place, Suite 1A, Wilmington, Delaware 19804-1314.

WIDE RANGE ACHIEVEMENT TEST • REVISED LEVEL 2

Page 2

Arithmetic, Oral Part

41 17 6 5 3

1. Counts 1-5
2. Counts 6-15
3. Reads 3
4. Reads 5
5. Reads 6
6. Reads 17
7. Reads 41
8. Pennies 3-1
9. Apples 3 + 4
10. Marbles 9-3

Arithmetic, Written Part

$2 + 7 =$ _____

$8 - 4 =$ _____

$\begin{array}{r} 43 \\ +\ 6 \\ \hline \end{array}$

$\begin{array}{r} 73 \\ +\ 9 \\ \hline \end{array}$

$\begin{array}{r} 36 \\ -15 \\ \hline \end{array}$

$\begin{array}{r} 94 \\ -64 \\ \hline \end{array}$

$3 \times 4 =$ _____

$18 \div 6 =$ _____

$\begin{array}{r} 512 \\ \times\ 3 \\ \hline \end{array}$

$\begin{array}{r} \$4.95 \\ \times\ 3 \\ \hline \end{array}$

$\begin{array}{r} 726 \\ -349 \\ \hline \end{array}$

$4\frac{1}{3} + 3 =$ _____

$2\frac{1}{2} + 1\frac{1}{2} =$ _____

$\frac{1}{2}$ of 18 = _____

$\frac{1}{6}$ of 30 = _____

$\begin{array}{r} 229 \\ 5048 \\ 63 \\ +1381 \\ \hline \end{array}$

$5\overline{)215}$

$9\overline{)4527}$

$1\frac{1}{3}$ ft. = _____ in.

$2 -$ _____ $= \frac{1}{4}$

Add: $6\frac{1}{4}$, $1\frac{5}{8}$, $4\frac{1}{2}$

$\begin{array}{r} 809 \\ \times\ 47 \\ \hline \end{array}$

Write as percent:

.42 = _____%

Subtract:

$10\frac{1}{4}$

$7\frac{2}{3}$

Multiply:

$\begin{array}{r} 6.23 \\ \times\ 12.7 \\ \hline \end{array}$

Find average:

34, 16, 45, 39, 27

Ans. _____

Write as decimal:

$52\frac{1}{2}\%$ = _____

Write as percent:

$\frac{3}{8}$ = _____%

$2.9\overline{)308.85}$

Add: 3 ft. 6 in.
5 ft. 5 in.
8 ft. 11 in.

M + 2 = 5

M = _____

2x = 3

x = _____

$6 \times 3\frac{7}{8} =$ _____

15% of 175 = _____

Go to Next Page

WIDE RANGE ACHIEVEMENT TEST • REVISED LEVEL 2

Arithmetic, Written Part Continued

Write as common fraction in lowest terms: .075 = _____

The complement of an angle of 30° = _____

46

4^3 = _____

$.25 \div 1\frac{1}{5}$ = _____

If a = 7, b = 3;

$a^2 + 3b$ = _____

$\frac{1}{4}$ % of 60 = _____

66 sq. ft. = _____ sq. yd.

Solve:

$\frac{7 - (6 + 8)}{2}$ = _____

52

Add:

$-x - y - 23$

$x - y + 22$

Factor:

$r^2 + 25 - 10r$

Ans. _____

$\frac{r^2 - 5r - 6}{r + 1}$

Ans. _____

Change to familiar numerals:

M D C X C I = _____

Find interest on $1,200 at 6% for 70 days. Ans. _____

57

$3p - q = 10$

$2p - q = 7$

p = _____

q = _____

$\sqrt{2ax} = 6$

x = _____

$\frac{7}{17} = \frac{6}{x}$

x = _____

Find square root:

$\sqrt{67081}$

62

$\log_{10}\left(\frac{1}{100}\right)$

Ans. _____

$\log_5 5\sqrt{5}$

Ans. _____

Reduce:

$\frac{k^2 + k}{k^2} \cdot \frac{3k - 3}{k^2 - 1}$

Ans. _____

Find root:

$2x^2 - 36x = 162$

Ans. _____

68

WIDE RANGE ACHIEVEMENT TEST • REVISED LEVEL 2

Page 4

Reading, Level 2

Two letters in name (2) A B O S E R T H P I U Z Q (13) 15

milk city in tree animal himself between chin split 24

form grunt stretch theory contagious grieve toughen aboard 32

triumph contemporary escape eliminate tranquillity conspiracy 38

image ethics deny rancid humiliate bibliography unanimous 45

predatory alcove scald mosaic municipal decisive contemptuous 52

deteriorate stratagem benign desolate protuberance prevalence 59

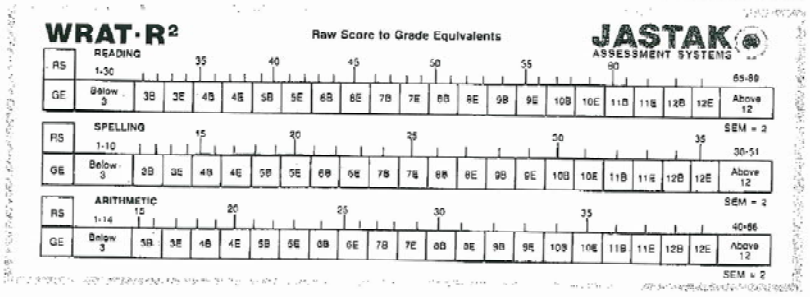
regime irascible peculiarity pugilist enigmatic predilection 64

covetousness soliloquize longevity abysmal ingratiating oligarchy 70

coercion vehemence sepulcher emaciated evanescence centrifugal 76

subtlety beatify succinct regicidal schism ebullience misogyny 83

beneficent desuetude egregious heinous internecine synecdoche 89



H. IADL

ADCO

MODIFIED ACTIVITIES OF DAILY LIVING/ INSTRUMENTAL ACTIVITIES OF DAILY LIVING (ADL/ IADL)

OARS Methodology Adaptation

Office Use Only

Clinic Site | Patient ID# | Patient Designation | Evaluation #

Patient Name _____ **Medical Record #** _____

Evaluation Date M D Y **Evaluating Clinician** _____

Name of Person Completing Form _____ **Date Completed** _____

INSTRUCTIONS: Assessor should make every effort to **thoroughly probe** each item with the informant to evaluate what subject is functionally **capable of doing** , not what (s)he actually does. *Sample probes in italics below.* ***If patient/ subject is able to perform activity but requires prompting or reminders from the caregiver, score 1 for Slight Assistance Needed.***

Activities of Daily Living - ADL

Assistance Needed

Unless otherwise specified, Score:
0 None
1 Slight
2 Full

1. Eating *(needs food cut up, reminder to eat?)*
2. Dressing and undressing *(needs clothing set out for him/her, help with buttons?)*
3. Combing hair and shaving *(needs to be reminded?)*
4. Walking

Score:
0 1 cane
1 Walker, crutches, 2 canes or the aid of another person
2 Can't walk at all, or wheelchair bound

5. Getting in and out of bed
6. Bathing or showering *(needs prompting or reminders; needs assistance with part of task i.e. washing hair?)*
7. Toileting *(needs reminders or help with cleaning self after toileting?)*
8. Incontinence

Score:
0 No incontinence
1 Incontinence managed independently
2 Incontinence requiring another person's assistance

9. Needs help with shopping, bathing, housework, and/ or getting around?
Code with the score most frequently assigned to these activities: shopping (IADL #3), bathing (ADL # 6), housework (IADL #5),and/ or getting around (IADL #2)
If there is a tie, round up.

Total ADL Score _____

Instrumental Activities of Daily Living - IADL

Assistance Needed

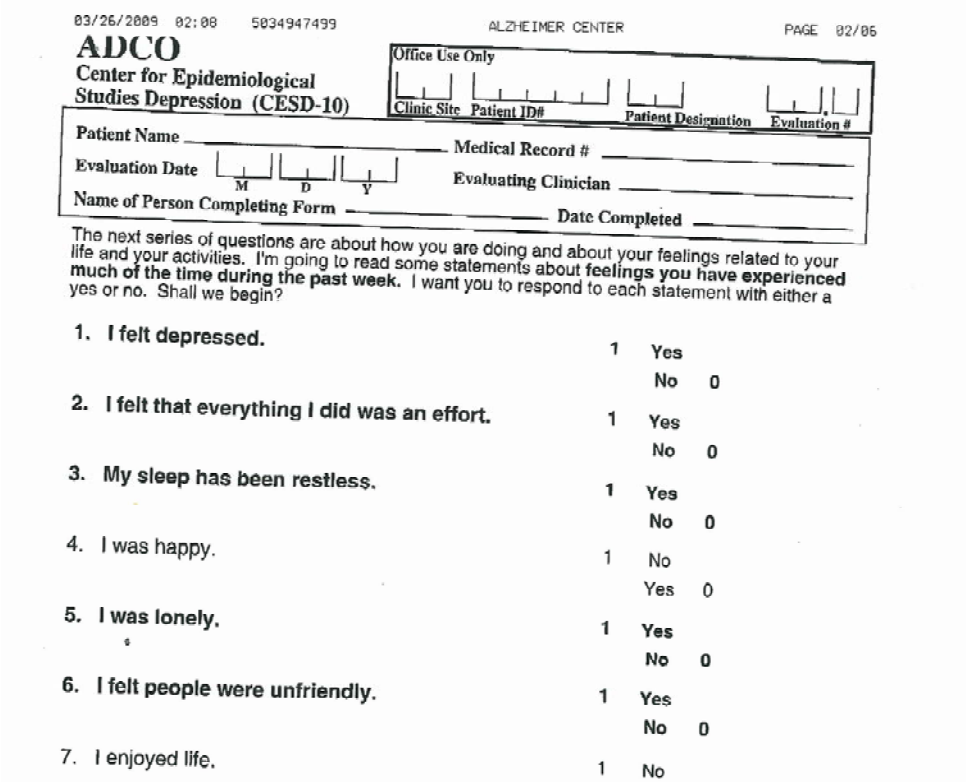
Score:
0 None
1 Slight
2 Full

1. Using telephone *(does subject look up phone numbers or answer phone?)*
2. Travelling by car, bus, or taxi
3. Shopping for food and clothing *(able to choose appropriate items)*
4. Preparing meals *(needs ingredients set out or other supervision?) able to make breakfast, sandwich?)*
5. Doing housework *(able to make bed, wash dishes)*
6. Taking own medicine *(are meds prepared by another person)*
7. Handling own money *(receives correct change, writes checks, balances checkbook, does taxes?)*

Total IADL Score _____

ADCOADL-006 7/16/2001

I. CESD-10



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ADCO
Center for Epidemiological Studies Depression (CESD-10)

Office Use Only
Clinic Site | Patient ID# | Patient Designation | Evaluation #

Patient Name _____ Medical Record # _____
Evaluation Date M D Y Evaluating Clinician _____
Name of Person Completing Form _____ Date Completed _____

The next series of questions are about how you are doing and about your feelings related to your life and your activities. I'm going to read some statements about **feelings you have experienced much of the time during the past week.** I want you to respond to each statement with either a yes or no. Shall we begin?

1. **I felt depressed.** 1 Yes / No 0
2. **I felt that everything I did was an effort.** 1 Yes / No 0
3. **My sleep has been restless.** 1 Yes / No 0
4. I was happy. 1 No / Yes 0
5. **I was lonely.** 1 Yes / No 0
6. **I felt people were unfriendly.** 1 Yes / No 0
7. I enjoyed life. 1 No