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Cognition, Depressive Symptoms and Vascular Factors among Southwest Tribal Elders

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Objectives: Few data exist on cognitive and depressive symptoms and vascular factors in American Indian (AI) elders. Since vascular risk factors increase risk for cognitive impairments, depression and dementia, and since AI elders are at high vascular risk, it is timely to assess the interplay of these factors in comprehensive studies of aging in this population. To begin, pilot studies must be conducted to show these types of data can be collected successfully.

Design: A cross-sectional pilot study, the Southwest Heart Mind Study (SHMS).

Setting: Tribal community in the Southwest United States.

Participants: AI elders, aged ≥55 years.

Main Outcome Measures: Cross-cultural demographic, social network and risk factor surveys; tests of cognition, depression and anxiety; physical measurements; blood biochemistries; and APOE genotyping.

Results: SHMS elders were comparable to other rural elder populations on cognitive and depressive symptom scores. The average CogScore was 28.8 (out of 32), the average Geriatric Depression Scale (GDS) was 6.7 (of 30), and the average Hamilton Anxiety Scale was 1.2 (of 4). 32% possessed at least one APOEe4 allele. High vascular risk was evident: 76% were overweight or obese; 54% self-reported history of hypertension; 24% heart trouble; 32% type 2 diabetes; 35% depression; and 24% a family history of serious memory loss. More than 70% reported prescription medication use. 54% cared for someone besides self.

Conclusions: A better understanding of the burden of vascular risk in relation to cognition and depression among Southwest Tribes is needed. *Ethn Dis*. 2016;26(2):235-244; doi:10.18865/ed.26.2.235

Keywords: Cognition; Vascular; Depression; American Indian

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Introduction

American Indian (AI) communities in the United States (US) are aging; the AI and Native Alaskan (NA) older population (non-Hispanic and Hispanic) was 212,605 in 2007 and is projected to reach almost 918,000 by 2050.[1] In 2007, AI/NA older persons made up .6% of the older population. By 2050, the percentage of the older population that is AI and Native Alaskan is projected to account for 1% of the older US population. For those aged > 85 years in 2050, the AI/NA population is projected to reach 180,000, a 9-fold increase from 20,000 in 2010. The Southwest US is home to most AI communities. In 2007, 51% of AI and NA elderly lived in just six states: California (13.8%), Oklahoma (11.2%), Arizona (9.4%), New Mexico (6.5%), Texas (5.7%), and North Carolina (4.3%).

Alzheimer's disease is expected to reach epidemic proportions between 2010 and 2050, when the number of people with the disease is projected to more than double.[2] Among AI/NAs, we expect to identify 23,850 persons aged >65 years with dementia in 2010, increasing to 100,980 by 2050.[3] However, a PubMed search readily shows that rigorous studies of aging and cognitive disorders in AI populations are rare.

Accompanying aging is a profound increase in vascular and metabolic diseases – many due to obesity. The literature suggests that risk factors for heart disease, diabetes and stroke are modifiable and also risk factors for dementia.[4-6] In addition, adherence to medications for these conditions may be protective, and given this scenario, de-

mentia rates may go down or rise less rapidly in upcoming years.[7] Leading causes of death are related to obesity and include diabetes, heart disease and cerebrovascular disease and stroke.[8] These are known risk factors for AD and cognitive disorders. Vascular and metabolic risk is high among NAI elders,[9] thus potentially affecting cognitive performance and prevalence of subsequent cognitive impairment and dementia, statistics for which are virtually unknown. Therefore, data collected in our study may provide direction for targeted interventions within AI communities, as well as enhance our understanding of the influence of controlling vascular risk factors.

Increases in dementia, depression and obesity in AI communities may have resulted from abrupt changes in Native communities in the last 100-150 years. Changes occurred in relation to westward expansion, and European infiltration of the western and southwestern United States. The establishment of Indian reservations in 1851 resulted in displacement of many Native communities and the loss of traditional hunting, gathering, and agriculture. In addition, federal subsidies, including food stamps and commodity foodstuffs, changed the important food and physical activity culture in the Southwest. While traditional ways have not disappeared entirely, they have been attenuated, and the introduction of these foodstuffs and changes in lifestyle have increased risk and occurrence of a variety of chronic diseases, such as obesity, type 2 diabetes mellitus, cardiovascular disease, and perhaps dementia. As these communities age, increasing occurrences of cognitive impairments and dementia may be expected.

Rigorous studies of aging and cognitive disorders in AI/NA populations are rare. Therefore data collected in this, and subsequent studies, may provide direction for targeted interventions within AI/NA communities. As usual for multifactorial diseases, common risk factors and sequelae abound. Many factors associated with obesity are risk factors for dementia; and consequences of overweight and obesity increase risk for dementia.[6]

We conducted a pilot survey to ascertain the feasibility of assessing cognitive and depressive symptoms, and cardiovascular, lifestyle, and demographic factors among 37 Southwest Tribal elders

We conducted a pilot survey to ascertain the feasibility of assessing cognitive and depressive symptoms, and cardiovascular, lifestyle, and demographic factors among 37 Southwest Tribal elders. Culturally fair instruments were used from the 10/66 Project – a project of dementia in the developing world. The Southwest Tribe within our study is from the Albuquerque Area (AA) of the Indian Health Service. At the time of this survey, 19% (16,293/86,000) of individuals were aged >50 years in the AA. These pilot data form the basis for future investigation.

Methods

Participants

Elders were recruited from one native Southwest community during 2010. This community was established around the 14th century. To protect tribal confidentiality, the name of the tribe participating in this study is not specified.[10] Most elders live on the reservation, which is approximately 150 acres. In addition, the community is within one day's drive to Albuquerque, New Mexico, which facilitates community member's access to a wide range of health and health care services, as well as shopping and social venues. This community is representative of a reservation community in the Southwest that is located close to a major metropolitan area (2011 population, ~552,804).

Elders are defined as aged ≥55 years by the tribal community. Recruitment of elders occurred in two ways: 1) via community forums, events and announcements; and 2) through the tribal registry, and grouped by 10-year age groups. Reference to the tribal registry allowed a more representative approach to participant recruitment by age and sex. The goal was to recruit 40 elders equally across each of four age decades: 55-64, 65-74, 75-84 and aged ≥85 years, and with similar proportions of women and men in each age group.

All participants or relatives of participants gave their informed consent

and the study was approved by the Southwest Tribal Institutional Review Board (IRB), the local Tribal Council, and the national Indian Health Service IRB. Participants were given the option of participating in one or all three portions of the project, which included: 1) survey and physical measurements; 2) blood collection; and 3) genetic analyses.

Surveys

All surveys were conducted at participants' homes at one or two visits by trained community workers. After signing the informed consent form, a variety of assessments were completed. Surveys and data collected were as included in the 10/66 protocol, a protocol for assessing cognition in developing countries as described below and elsewhere.[11-20]

Household Questionnaire

Measures included: age; home ownership; household composition; possession of appliances; presence of electricity, main water, and plumbed bathroom; and presence of a telephone, television, computer, and internet.

Cognitive Test

Cognition was assessed using the Community Survey in Dementia (CSID), a survey of high multicultural representativeness.[11-13] Tests included assessment of global cognition, recent and remote memory, executive function, depressive symptoms, anxiety symptoms, and neurological function. Development of the CSID involved special emphasis on making the items harmonious with the local language and culture. The CSID includes: the Mini-Mental State Examination (MMSE); a modified Consortium to Establish a Registry for Alzheimer Disease (CERAD) battery; and a brief neuropsychological inventory including tests of language, comprehension, memory, registration, attention and calculation, recall, orientation to time and place, praxis. The CSID also includes the 15-item Geriatric Depression Scale (GDS), the 4-item Hopkins Anxiety Scale (HAS), activities of daily living (ADL), quality of life, life events, and well-being, there is also a structured neurological assessment with quantifiable measures of laterising signs, Parkinsonism, ataxia, apraxia, and primitive 'release' reflexes.

The cognitive assessment was conducted in face-to-face interviews using components of the CSID, the CERAD Word List Learning and Recall,[14] and the Animal Fluency Test.[15] Together, the CSID, CERAD Word List Learning and Recall, and Animal Fluency tests, were combined to form a COGSCORE, with a score range of 0-32.

Global cognitive function

The CSID was developed as a screening tool for dementia in populations with various cultural backgrounds and literacy levels. The CSID has demonstrated good test–retest reliability, interrater reliability, and validity in detecting dementia when used for dementia screening in various populations, with initial development and validation among Cree AI.[14,16] The CSID assesses orientation, comprehension, memory, naming, and language expression.

Memory

The CERAD Word List Learning and Word List Recall are measures from the CERAD neuropsychological assessment battery designed to assess cognitive skills in elderly people.[17] It consists of a 10-item, three-trial word list in which free recall is taken after each learning trial and after a brief delay (≤ 5 minutes). The Word List includes six words from the original CERAD battery English language list: butter, arm, letter, queen, ticket, and grass. The remaining words, pole, shore, cabin and engine, were replaced with corner, stone, book, and stick, as they were deemed more cross-culturally relevant.[18,19] The score is the total number of words recalled across the three learning trials (range 0–30) and after a delay (range 0–10).

Verbal fluency

The Animal Fluency Test requires a participant to name as many animals as possible in 60 seconds.[14] One point is given for every valid animal. This kind of naming task is associated with executive, linguistic, and semantic components.[20] To compute the COGSCORE, the verbal fluency score is divided by 23.

Prior to conducting the survey in the community, we discussed the survey with elders from two tribal communities. The purpose of these discussions was to review the entire survey, item by item. As a result, standardized translations were created, and certain aspects of the survey were made relevant to the culture and community. For example, the list of social activities was modified to include going to the casino, taking Senior day trips, and making jewelry. Components of the CSID that were altered included querying for: 1) two major local landmarks, instead of two major streets

Table 1. Characteristics of Southwest Heart Mind Pilot Study participants

Characteristics	N (%), or range
Sex, n, % female	26 (70.3%)
Age, median years, range 58-99	74.7 (11.6)
Age group, years	
55-64; 6 women, 3 men	9 (24.3%)
65-74; 6 women, 5 men	11 (29.7%)
75-84; 7 women, 3 men	10 (27.0%)
85 years and older; 7 women	7 (18.9%)
Length of time living in community, median years; range: 9-99	62.7 (23.6)
Born on the reservation	21 (56.8%)
Lived on reservation between aged 20-55 years	21 (56.8%)
Lived on reservation aged ≥55 years	36 (97.3%)
Education	
None	0
Some, but not completing primary, 0-6	1 (2.7%)
Completed primary/elementary, grade 6	10 (27.0%)
Completed secondary, high school/GED/grade 12	18 (48.6%)
Completed tertiary (college)/further education	8 (21.6%)
Able to read newspaper	35 (94.6%)
Able to write a letter	36 (97.3%)
Head of household, yes	32 (86.5%)
Social Network	
Marital status	
Never married	4 (10.8%)
Married/cohabitating	12 (32.4%)
Widowed	11 (29.7%)
Divorced/separated	10 (27.0%)
Religious group	
Agnostic/atheist	1 (2.7%)
Roman Catholic	31 (83.8%)
Protestant/Anglican/other Christian	4 (10.8%)
Other	1 (2.7%)
Regularly or occasionally attend religious meetings	28 (75.6%)
Regularly or occasionally attend community or social groups	22 (59.4%)
Nearest relative lives within one mile/same home	31 (83.8%)
Have children	32 (86.5%)
Nearest child within one mile/same home	24 (75%)
Daily contact with children/other relatives	28 (87.5)
Have friends in community	37 (100%)
At least weekly chat or activity with friends	31 (83.8%)
Average number of friends to talk to or meet at least monthly	5.6 (6.9)
Satisfied with help and support from close friends	36 (97.3%)
At least weekly chat or activity with neighbors	28 (87.5%)
Involvement	
Care for someone else besides self	19 (54.1%)
Daily television watching, hours; range 0-8 hrs	3.1 (2.0)
Daily radio listening, hours; range 0-24 hrs	2.8 (4.2)
Socioeconomic Status	
Retired	23 (62.2%)
Receive income, benefits, pensions, allowances	35 (94.6%)
Receive government pension/Social Security	29 (82.9%)

Table 1. Characteristics of Southwest Heart Mind Pilot Study participants (cont)

Characteristics	N (%), or range
Self-Reported Medical History	
Hypertension	20 (54.1%)
Heart Trouble	9 (24.3%)
Stroke	1 (2.7%)
TIA	3 (8.1%)
Head injury	2 (5.4%)
Type 2 diabetes	12 (32.4%)
HIV/AIDS	0
Tuberculosis	2 (5.4%)
Cancer	5 (13.5%)
Depression	13 (35.1%)
Age of onset, years	20-91
Family history of serious memory loss, leading to problems looking after themselves	9 (24.3%)
Impairments	Those having no impairments or those that do not interfere (n)
Arthritis	21
Eyesight problems	23
Hearing difficulty, deafness	23
Persistent cough	36
Breathless, difficulty breathing, asthma	35
High blood pressure	36
Heart trouble or angina	34
Stomach or intestine problems	36
Faints or blackouts	36
Paralysis, weakness or loss of one leg or arm	33
Skin disorders such as pressure sores, leg ulcers or severe burns	36
Medication Use	
Prescription medication use	70.3% (26/37)
Among those reporting use, number of prescription medications; range 1-15	5.2 (3.7)
Over the counter medication use	10/37
Among those reporting use, number of OTC medications; range 1-3	2.0 (0.5)
Alcohol Use	16.2% (6/37)
Tobacco Use	8.1% (3/37)
Pain	
No pain due to health condition in past month	14 (37.8%)
Monthly to weekly	23 (62.2%)
Overall health rating	
Good or very good	35 (94.6%)
Disability score; range 0-30	5.57 (7.74)

near your home; 2) location of the Post Office, instead of the City Market; 3) the name of the governor of the tribe, instead of the governor of the State of New Mexico; 4) what people do in a church or kiva, instead of what people do in a church; and 5) remembering the name of a color throughout the interview, vs remembering the interviewer's last name (interviewers were community members and their identity was known in this small community).

We also removed the question regarding whether it rained yesterday, since New Mexico is high desert and an arid climate and we provided other examples to accompany questions. For example, in response to the question, 'Where do you go to get medicine?', appropriate responses included WalMart, Indian Health Service, and Community Health Representatives (CHR). These responses were not part of the original CSID.

A short, 4-item version of the Hamilton Anxiety Scale (HAS) was used.[21] This HAS covered frequency during the last week of being nervous, avoiding situations due to fright, being tense, and having fear, with a

Table 2. Clinical measures, The Southwest Heart Mind Pilot Study

Measure	Women, n=26	Men, n=11
Anthropometrics		
BMI	29.3 (6.1)	29.0 (4.4)
	Range 18.6-44.0	Range 22.0-36.8
BMI (kg/m2)	Total	
18.5 ≤ BMI < 25	9 (24.3%)	
25 ≤ BMI < 30	12 (32.4%)	
30 ≤ BMI < 35 Class I obesity	10 (27%)	
35≤ BMI < 40, Class II obesity	4 (10.8%)	
≥ 40 Class III obesity	2 (5.4%)	
WHR	.93 (.06)	.98 (.05)
	Range.83-1.07	Range .90-1.07
Waist circumference, in	42.5 (13.9)	45.7 (17.3)
	Range 33-107	Range 36-97
Blood pressure		
Systolic blood pressure, mmHg	142.8 (23.1)	150.0 (32.3)
	Range 96-192	Range 126-219
Diastolic blood pressure, mmHg)	74.3 (12.0)	80.5 (13.7)
	Range 51-103	Range 64-105
Pulse	74.8 (10.2)	73.1 (11.9)
	Range 54-93	Range 57-96

range of possible scores of 0-12. A score of <5 indicated no anxiety symptoms, 5-6 mild or moderate symptoms, and >6 as severe symptoms.

The Geriatric Depression Scale (GDS) was used to measure the occurrence of depressive symptoms (score range 0-18).[22] We used the Happy Face Scale (score 1-5) to provide an indication of happiness and well-being.

Key informant neuropsychiatric interview

The key informant interview consisted of questions regarding participants': 1) medical history and medications; 2) family history of dementia; 3) current psychiatric status; 4) changes in psychiatric status over the last 1-2 years; 5) ADL; and 5) history of dementia-associated conditions.

Demographics

Information was collected on: age; sex; tribal affiliation; mother language; medical history; medication use; use of medical services; socioeconomic status; educational level; social network and activities; smoking; alcohol intake; and family history of AD and other diseases. All medical conditions were self-reported.

Clinical Measures

Clinical measures of height, weight, hip and waist circumference, lower leg length, diastolic and systolic blood pressures, and pulse rate. Body weight was recorded to the nearest .1 kg, and body height was measured to the nearest .5 centimeters. Body mass index (BMI) was calculated as kilograms per meter squared (kg/m^2). Waist and hip circumferences were measured to the nearest .5 inches. Circumference measures were taken at least twice. If they disagreed by more than .5 inches, they were repeated until agreement within .5 inches. Blood pressure was measured using a mercury manometer on the right arm while the patient was seated after 5 minutes of rest. Systolic blood pressure (SBP) was registered to the nearest 2 mm Hg.

On a separate visit, fasting blood samples were drawn at the local Indian Health Service (IHS) clinic and serum, plasma, and whole blood samples were collected. Whole blood was stored at -20C. Serum and plasma were used immediately for determination of serum lipids (total cholesterol, triglycerides, HDL, LDL), glucose, HbA1c, Hb, Hct, T4, TSH, Na, K, Cl, CO2, BUN, Crn, Ca, Anion Gap, and eGFR, at the local Indian Health Service Clinic. These data were also included in the participants' medical record for evaluation by their physician.

Whole blood was used for DNA extraction and determination of the APOE genotype – e2, e3, and e4 alleles. An aliquot of whole blood was sent to a laboratory at Mayo Clinic Jacksonville, Florida, where APOE genotyping was conducted. Genotyping for the APOE SNPs rs429358 and rs7412 were performed using TaqMan® SNP Genotyping Assays (assay IDs C_3084793_20 and C_904973_10, respectively) in an ABI PRISM® 7900HT Sequence Detection System with 384-Well Block Module from Applied Biosystems, California, USA. The genotype data was analyzed using the SDS software version 2.2.3 (Applied Biosystems, California, USA).

Statistics

Data are reported as means and standard deviations (SDs) or numbers and percentages. Ranges are sometimes included. Sex was considered for the anthropometric measures.

Results

The pilot and feasibility SHMS was a success. We conducted an acceptable, culturally relevant, comprehensive interview that included measures of cognition, emotion and functioning. Participant characteristics are summarized in Table 1. All 37 participants chose to complete the survey and anthropometric measurement portions of the interview. Blood samples for biochemistries and APOE genotyping were available for 34 participants. The participant's residence was the location of the interview for 87% (n=33) of participants, and 5% (n=2) were interviewed at the Senior Center. Twenty-nine of the 33 resided in one postal code. Two elders (aged late 80s and 90) needed approximately 95% of the survey translated, and 10 needed approximately 50% of the survey translated into their native language.

Of these elders, 62% were retired, and 54% cared for someone besides self. The average length of time residing in the community was 62.7 (23.6) years, 56.8% were born on the reservation, and at aged > 55 years, 97.3% were living on the reservation. All elders reported having friends in the community. 70% of the elders had at least a high school education.

In terms of appliances and household features, all participants reported having a refrigerator and/or freezer, main water, and a plumbed toilet and bathroom. Only one participant reported not having a television or telephone. A home computer was reported by 15 (40.5%) elders and 11 (29.7%) had Internet access.

Clinical measures reported in Table 2 indicated an average BMI among women and men that was clearly overweight, and bordering obese. Only 25% of the total sample had a BMI within the normal range. In addition, individuals with Class II and Class III obesity were identified. Measures of central adiposity, including waist circumference and WHR, clearly indi-

Table 3. Biochemistries among fasting participants, The Southwest Heart Mind Pilot Study

Biochemistries, n=34[a]	
Sodium, mM	138.1 (3.1)
Normal, 136-148	29 (85.3%)
Potassium, mM	4.3 (.5)
Normal, 3.5-5.1	32 (94.1%)
Chloride, mM	104.5 (4.2)
Normal, 98-108	27 (79.4%)
CO2, mM	24.7 (2.2)
Normal, 21-32	33 (97.1%)
Glucose, mg/dL	106.4 (25.5)
Normal, 60-100	17 (50%)
Impaired, 100-126	17 (50%)
Blood urinary nitrogen (BUN), mg/dL	18.9 (9.7)
Normal, 3-21	26 (76.5%)
Creatinine, mg/dL	1.2 (1.3)
Normal, .60-1.00	24 (70.6%)
Calcium, mg/dL	8.9 (.4)
Normal, 8.5-10.1	32 (94.1%)
Triglycerides, mg/dL	176.9 (84.4)
Desirable, <150	17 (50%)
Not desirable, ≥150	17 (50%)
Cholesterol, mg/dL	188.0 (39.3)
Desirable, 100 - 199.99	22 (64.7%)
Borderline High, 200 - 239.99	9 (26.5%)
High, >240	3 (8.8%)
HDL, mg/dL	46.5 (12.6)
Low, <40	11 (32.4%)
High, ≥60	3 (8.8%)
LDL, mg/dL	106.1 (38.1)
Normal, 40-189	32 (94.1%)
High, 190-263	2 (5.9%)
HbA1c, %	6.4 (.9)
Normal, 4.4-5.8%	
Hemoglobin, g/dL	14.3 (.6)
Normal, 12.0-16.0	
Hematocrit, %	41.6 (3.3)
Normal, 36-48	34 (100%)
T4, mcg/dL	8.3 (1.5)
Normal, 4.8-13.9	34 (100%)
TSH, mcIU/mL	3.2 (2.7)
Normal, .358-3.740	24 (70.6%)
APOE genotype[b]	
33	23 (67.6%)
34	10 (29.4%)
44	1 (2.9%)

a. 55% were fasted, 17.5% were of unknown fasting state, and 12.5% were not fasted.
b. Three participants did not consent to APOE genotyping. No e2 alleles were detected.

Table 4. Cognitive and depressive symptoms, The Southwest Heart Mind Pilot Study

Cognitive Scores	Mean (SD) or range
COGSCORE	28.8 (2.9)
	Range 0-32
CERAD Word List Learning	14.7 (5.2)
	Range 1-24
CERAD Word List Recall	4.9 (2.5)
	Range 0-10
Animal Fluency Test	18.19 (6.36)
	Range 3-35
	Mean (SD), range or n (%)
Geriatric Depression Scale (GDS)	6.7 (1.8)
	Range 5-18
None	0 (0%)
Mild	28 (75.7%)
Moderate	8 (21.6%)
Severe	1 (2.7%)
4-item Hamilton Anxiety Scale (HAS)	1.22 (1.9)
	Range 0-9; mode=0
None	34 (94.4%)
Mild-Moderate	1 (2.8%)
Severe	1 (2.8%)
Mastery	
I can do just about anything I really set my mind to. (strongly or somewhat agree)	100%
Happy Faces Scale	3.9 (.9)
	Mode 4; Range 1-5

cated high cardiovascular risk among women and men. In contrast, average levels of systolic and diastolic blood pressures and pulse, were considered healthy. The prevalence of hypertension on the basis of clinical measures in the SHMS was 10.8% (4/37, 2 women, 2 men) of the sample.

Biochemistries (Table 3) among fasting participants indicated relatively good control of hematological cardiovascular risk factors on average. Of the 34 participants with a blood sample, 55% were fasting, 17.5% were of unknown fasting state, and 12.5% were not fasting.

APOE genotype is also reported in Table 3. Of note, is that in this small sample of elders, there were no e2 alleles identified. The proportion of the e4 allele was in line with studies of northern European populations.

COGSCORE

The average scores, SDs and ranges for COGSCORE, CERAD Word List Learning and Word List Recall and the Animal Fluency Test are reported in Table 4. Also included are data for the GDS, HAS and the Happy Faces Scale.

The average score on the GDS indicated that the majority of elders (76%) reported a mild level of depressive symptoms over the last week. Lower scores were due to more than 50% of participants responding 'no' to the questions: Are you basically satisfied with your life? (n=33, 89.2%); Are you in a good mood most of the time? (n=34, 91.9%); Do you feel happy most of the time? (n=37, 100%); Do you think it is wonderful to be alive now? (n=36, 97.3%); Do you prefer to stay home, rather than going out and doing new things? (n=20, 54.1%); Do you feel full of energy? (n=27, 73%).

Responses to items on the abbreviated Hamilton Anxiety Scale (HAS) indicated very little anxiety symptoms over the last week. Regarding mastery, elders either strongly (n=26, 70.3%) or somewhat (n=11, 29.7%) agreed with the statement, 'I can do just about anything I really set my mind to.' The Happy Faces Scale reflected the GDS score.

Results from the neurological examination revealed few noticeable neurological impairments among these participants. Most participants were able to hold their palms up successfully for 30 seconds (right side, n=28, 75.7%; left side, n=29, 78.4%). Some were unable to do this (right side, n=3, 8.1%; left side, n=2, 5.4%). The fingers to nose exercise was successfully completed by 35 (97.2%) on the right side, and 36 (100%) on the left side. The most common number of attempts it took to stand from a chair was 2 (n=31, 83.8%). No amputations were observed. Three participants had paralysis or major weakness of the legs, 2 in one leg, and 1 in both legs. The semi-tandem stand was held successfully for 10 seconds by 35/37 participants (94.6%); the side-by-side stand for 10 seconds by 97.3% (36/37) participants. Difficulties due to arthritis were reported by 3 participants.

The most frequently reported medical conditions were hypertension, followed by depression and heart trouble. The most frequently reported impairments were arthritis, eyesight problems, and hearing dif-

ficulty or deafness. Approximately 70% of elders were taking prescription medications, and 58% of those were taking 5 or more medications daily. Medications were reported for type 2 diabetes mellitus, lipid lowering, hypertension, nutritional supplementation, and thyroid conditions.

Discussion

These pilot data provide a first-ever look at cognitive and depressive symptoms and related cardiovascular risk factors within a Southwest Tribal community. While a few studies have been conducted among AI communities, there is only one study, to our knowledge, that has conducted a cognitive assessment among AI elders.[23] Of these elder participants, we recruited approximately 10% at aged ≥80 years, when dementia prevalence and incidence are highest. Average life expectancy in the Albuquerque Area estimated by Indian Health Service and based on calendar years 1990-1992, was estimated to be 70.5 years for men and 79.0 years for women, the last decade of which is predicted to be unhealthy.

The average cognitive test scores resulting from this pilot study are similar to those reported by the 10/66 study in Central and South American rural communities.[13] The 10/66 uses the CSID as its primary cognitive assessment tool, and reports results from the same cognitive tests as administered here. The similarity of test scores point to the utility of these cognitive tests in rural Southwest AI communities and their ability to assess cognitive function. In the published literature, a Northern Plains community sample of 140 women and men, aged >60 years completed the MMSE and scores of 26 and 27.7 (out of a maximum score of 30 point) were observed among those with <12 years vs >12 years education, respectively.[23] The COGSCORE reported here is somewhat analogous to the MMSE, with a maximum score of 32. Average COGSCORE was 28.8 in SHMS. Prevalence of diabetes, stroke and other morbidities were much lower in the SHMS sample than those reported in the Northern Plains community sample, again reflecting the healthy volunteer participating in this pilot and feasibility study. In addition, more SHMS participants reported receiving benefits, such as Social Security (50.4% in the Northern Plains community vs 83% of SHMS participants).

The average cognitive test scores resulting from this pilot study are similar to those reported by the 10/66 study in Central and South American rural communities.[13]

The lack of APOE 2 genotype in this sample is not unprecedented. Lack of an APOE 2 allele among indigenous societies in the southwest US was reported approximately 20 years ago.[24] As this pilot sample is small, further genotyping is required to determine more accurate APOE allele prevalence in these communities.

While cardiovascular risk factors were prevalent, based on average clinical measures, control of hypertension and blood lipids was good, despite the high prevalence of overweight and obesity. However, this was a not a representative sample of elderly volunteers. It will be interesting, with a larger sample size, to understand how this type of cardiovascular risk profile (ie, population-level control of hypertension and lipids against the background of overweight and obesity) influences cognition and dementia onset. The prevalence of hypertension in the SHMS was lower than reported by the Strong Heart Study. However, self-reported history of hypertension in the SHMS was 54%, compared with a 10.8% prevalence based on clinical measures.

Participating elders reported being reasonably happy and lacking depressive symptoms. Most were or had been married, had children, were literate, and reported having strong social networks. Most attended the Senior Center. While more than half of participants were retired, most received some form of income, benefits or pensions. It may be that those who participated in this pilot were emotionally and physically healthier than remaining elders on this participating reservation, and in the Southwest region. Further studies in the Southwest will lend support or not to this observation.

This pilot study demonstrates the feasibility of conducting a community-based study in an AI population, which was our main objective. In addition, the SHMS included blood sampling as well as a comprehensive interview including harmonized information on cognition, emotion and

functioning. As such, it also provides very useful information on cognitive scores ranges for an elderly AI group that is relatively well-functioning.

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Conflict of Interest

No conflicts of interest to report.

Author Contributions

Research concept and design: Gachupin, Gustafson, Jojola, Sanchez, Torres, Abeita F, Abeita U, Lujan, Lente B, Lente M, Teller; Acquisition of data: Gachupin, Gustafson, Romero, Ortega, Jojola, Sanchez, Torres, Abeita F, Abeita U, Lujan, Lente B, Lente M, Teller; Data analysis and interpretation: Gachupin, Gustafson; Manuscript draft: Gachupin, Gustafson, Romero, Ortega; Statistical expertise: Gustafson; Acquisition of funding: Gachupin; Administrative: Gachupin, Gustafson, Romero, Ortega; Supervision: Gachupin

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