

PSYCHOSOCIAL FACTORS AND ENVIRONMENTAL DESIGN

Patterns of technology access and preferences for remote assessments across groups at Alzheimer's Disease Research Centers

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Carol K Chan, Case Western Reserve University School of Medicine, Cleveland, OH, USA.

Email: carklchan@gmail.com**Abstract**

Background: Using remote assessments for Alzheimer's Disease and Related Disorders (ADRD) studies can have advantages, such as providing research opportunities to individuals who might otherwise be excluded due to geographical distances, transportation difficulties, and physical frailty. As studies adopt remote assessment modalities, however, people at highest risk of ADRD may be less likely to use the internet, own electronic devices, and be comfortable with technology utilization.

Method: These analyses included data obtained through the National Alzheimer's Coordinating Center Uniform Data Set from 3,803 participants across 17 Alzheimer's Disease Research Centers in the United States who completed the Technology Access Survey between July 2nd, 2020 and April 26th, 2023. Participants were categorized as either White or Other Race or Ethnicity. Mixed effects logistic regression models using generalized estimating equations with random effect for study site were used to examine the association of education, race and ethnicity, and education x Other Race or Ethnicity interaction with (1) device use and (2) device preferences for remote assessments. The analyses were adjusted for age, sex, cognitive status, and study site. Significance was set at $p < 0.05$.

Result: Descriptive statistics are shown in Table 1. Participants with more years of education had greater access to the internet across all devices (Table 2). Other Race or Ethnicity participants had lower odds of access to tablet, laptop and desktop computer compared to White participants. There was a significant interaction between Other Race or Ethnicity and education for use of tablet, laptop and desktop computer, where the effect of higher education was greater in Other Race or Ethnicity than

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White participants. A similar pattern of results was observed for interest in using a smartphone, tablet, laptop or desktop computer to complete parts of their study visit from home (Table 3).

Conclusion: These findings suggest that education has a role in racioethnic differences in technological access and preferences. Future ADRD studies utilizing remote assessments should consider these patterns to inform study design and potential selection of populations studied.

Table 1. Participant characteristics.

Variable	Non-Hispanic White		Under-represented Minority		Overall P-value
	N	Statistic	N	Statistic	
Age (yrs) at visit, mean ± sd	3,022	73.3 ± 10.1	781	73.3 ± 9.3	0.8803
Female, n (%)	3,022	1,606 (53.1%)	781	557 (71.3%)	<.0001
Years of Education, mean ± sd	3,012	16.6 ± 2.5	781	15.4 ± 3.2	<.0001
Years of Education, n (%)	3,022		781		<.0001
<12 years		14 (0.5%)		39 (5.0%)	
12+ years		3,008 (99.5%)		742 (95.0%)	
Cognitive status at UDS visit, n (%)	3,022		781		<.0001
Normal cognition		1,750 (57.9%)		513 (65.7%)	
Impaired - Not MCI		159 (5.3%)		33 (4.2%)	
MCI		448 (14.8%)		149 (19.1%)	
Dementia		665 (22.0%)		86 (11.0%)	
Global CDR, n (%)	3,022		781		<.0001
0.0		1,653 (54.7%)		464 (59.4%)	
0.5		885 (29.3%)		255 (32.7%)	
>=1		484 (16.0%)		62 (7.9%)	
Indicator of first-degree family member with cognitive impairment, n (%)	2,846	1,781 (62.6%)	709	387 (54.6%)	<.0001
Principal referral source, n (%)	2,998		775		<.0001
Non-professional contact		1,115 (37.2%)		318 (41.0%)	
Professional contact		1,338 (44.6%)		260 (33.5%)	
Other referral		545 (18.2%)		197 (25.4%)	
Preference to conduct a study visit, n (%)	2,944		759		0.1080
In person		1,280 (43.5%)		320 (42.2%)	
Telephone call		523 (17.8%)		162 (21.3%)	
Video call		530 (18.0%)		120 (15.8%)	
No preference		611 (20.8%)		157 (20.7%)	
Current access to internet via:					
Smartphone, n (%)	3,022	2,076 (68.7%)	778	517 (66.5%)	0.2306
Tablet/iPad, n (%)	3,022	1,289 (42.7%)	778	309 (39.7%)	0.1389
Laptop, n (%)	3,022	1,838 (60.8%)	778	429 (55.1%)	0.0040
Desktop computer, n (%)	3,022	1,280 (42.4%)	778	299 (38.4%)	0.0476
Uses email to receive and send documents, n (%)	2,978	2,620 (88.0%)	761	615 (80.8%)	<.0001
Interested in using:					
Smartphone, n (%)	3,022	1,675 (55.4%)	778	440 (56.6%)	0.5721
Table/iPad, n (%)	3,022	1,177 (38.9%)	778	303 (38.9%)	0.9993
Laptop, n (%)	3,022	1,694 (56.1%)	778	401 (51.5%)	0.0240
Desktop computer, n (%)	3,022	1,130 (37.4%)	778	285 (36.6%)	0.6957
Wearable devices, n (%)	3,022	612 (20.3%)	777	149 (19.2%)	0.5042
Smart home devices, n (%)	3,022	258 (8.5%)	777	68 (8.8%)	0.8492

UDS = Uniform Data Set; MCI = mild cognitive impairment; CDR = Clinical Dementia Rating scale; yrs = years; sd = standard deviation

Table 2. Mixed effects logistic regression models using generalized estimating equations with random effect for study site on current device used to access the internet in under-represented minority vs non-Hispanic White participants. Adjusted for age, sex, education, CDR, race-education interaction, and study site.

Independent Variable	Smartphone			Tablet			Laptop			Desktop		
	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value
Age (yrs) at visit	0.93	0.92-0.94	<.0001	0.98	0.97-0.99	<.0001	0.95	0.94-0.96	<.0001	1.00	0.99-1.01	0.9880
Female	0.82	0.71-0.94	0.0045	1.07	0.95-1.20	0.2907	0.87	0.75-1.00	0.0484	0.81	0.74-0.88	<.0001
Years of Education	1.06	1.02-1.10	0.0041	1.03	1.00-1.06	0.0331	1.11	1.07-1.15	<.0001	1.04	1.01-1.07	0.0210
Global CDR - overall			0.0001			0.0519			0.0054			0.1124
0.0	1.45	0.93-2.27	0.1035	1.31	1.01-1.71	0.0439	1.79	1.25-2.55	0.0014	1.32	1.01-1.71	0.0399
0.5	0.98	0.67-1.43	0.9134	1.06	0.86-1.32	0.5679	1.33	1.06-1.68	0.0155	1.18	0.91-1.54	0.2051
≥1	1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00	
Under-represented Minority	1.27	0.40-4.02	0.6872	0.33	0.18-0.61	0.0005	0.14	0.04-0.53	0.0035	0.37	0.15-0.91	0.0302
Non-Hispanic White	1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00	
Education x Under-represented Minority	0.98	0.91-1.05	0.5411	1.06	1.03-1.10	0.0003	1.12	1.04-1.22	0.0053	1.06	1.01-1.11	0.0301
Education x Non-Hispanic White	1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00	

UDS = Uniform Data Set; CDR = Clinical Dementia Rating scale; yrs = years

Table 3. Mixed effects logistic regression models using generalized estimating equations with random effect for study site on interest in using devices to complete parts of their study visits in under-represented minority vs non-Hispanic White participants. Adjusted for age, sex, education, CDR, and race-education interaction.

Independent Variable	Smartphone			Tablet			Laptop			Desktop			Wearable Device			Smart Home Device		
	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value
Age (yrs) at visit	0.96	0.94-0.97	<.0001	0.97	0.96-0.98	<.0001	0.95	0.94-0.96	<.0001	0.99	0.98-1.00	0.1303	0.96	0.95-0.97	<.0001	0.96	0.95-0.97	<.0001
Female	0.87	0.80-0.95	0.0023	1.07	0.96-1.20	0.2186	0.87	0.73-1.02	0.0888	0.82	0.75-0.91	0.0002	1.06	0.89-1.26	0.5376	0.92	0.70-1.21	0.5545
Years of Education	1.05	1.02-1.08	0.0007	1.04	1.01-1.08	0.0132	1.12	1.08-1.17	<.0001	1.04	1.01-1.06	0.0015	1.06	1.04-1.10	<.0001	1.08	1.04-1.12	<.0001
Global CDR - overall			0.0286			0.0652			<.0001			0.0766			0.0406			0.8699
0.0	1.21	0.85-1.71	0.2862	1.27	1.04-1.56	0.0197	1.85	1.40-2.46	<.0001	1.35	1.03-1.77	0.0276	1.50	1.09-2.06	0.0134	1.08	0.72-1.60	0.7132
0.5	0.92	0.71-1.19	0.5150	1.15	0.97-1.37	0.1103	1.30	1.08-1.57	0.0049	1.23	0.99-1.53	0.0577	1.30	0.95-1.80	0.1049	1.12	0.73-1.71	0.6012
≥1	1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00	
Under-represented Minority	1.49	0.36-6.26	0.5825	0.33	0.20-0.55	<.0001	0.18	0.06-0.56	0.0030	0.39	0.17-0.92	0.0307	0.39	0.15-1.02	0.0539	0.45	0.12-1.63	0.2245
Non-Hispanic White	1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00	
Education x Under-represented Minority	0.97	0.89-1.07	0.5741	1.07	1.03-1.10	0.0001	1.11	1.03-1.18	0.0036	1.06	1.01-1.11	0.0198	1.05	0.99-1.11	0.0860	1.05	0.97-1.13	0.2600
Education x Non-Hispanic White	1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00		1.00	1.00-1.00	

UDS = Uniform Data Set; CDR = Clinical Dementia Rating scale; yrs = years.