

Socioeconomic Disparities in Telemedicine Use and High-Need Nonuse Among Older Adults With Multimorbidity: A Cross-Sectional Analysis of NHANES August 2021–August 2023

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Research Article

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Abstract

Background

Telemedicine, including video and telephone encounters, is now a common route for care delivery. Among older adults with multimorbidity, however, its use may reflect both clinical need and unequal access to the resources that make remote care feasible. Functional limitations, treatment burden, transportation barriers, caregiver availability, and the organization of routine care may all affect whether patients use it. We examined video-or-telephone telemedicine use among U.S. older adults with multimorbidity and described high-need nonuse, defined as no video-or-telephone telemedicine use among participants with high health care need.

Methods

We analyzed public-use NHANES August 2021–August 2023 data in a cross-sectional study. The primary analytic sample included participants aged 65 years or older who had complete chronic-condition components, at least two chronic conditions, and a valid response to the telemedicine-use item. Video-or-telephone telemedicine use was defined as a past-year appointment with a health professional by video conference or telephone. High health care need was defined as at least three chronic conditions plus at least one functional limitation. Survey-weighted logistic regression was used to estimate adjusted odds ratios (ORs) and 95% confidence intervals (CIs).

Results

Among older adults with multimorbidity, the weighted prevalence of past-year video-or-telephone telemedicine use was 39.7% (95% CI, 37.3–42.1). The primary analytic sample included 1,655 older adults with multimorbidity, of whom 387 met the high health care need definition. In that high-need group, 51.1% (95% CI, 45.6–56.6) did not report video-or-telephone telemedicine use. In adjusted regression, college education or above was associated with higher odds of video-or-telephone telemedicine use compared with less than high school education (OR, 1.96; 95% CI, 1.14–3.37). Higher family income-to-poverty ratio categories were also associated with higher odds of use. Each additional chronic condition (OR, 1.09; 95% CI, 1.00–1.19) and functional limitation (OR, 1.52; 95% CI, 1.12–2.06) was associated with higher odds of use. In the high-need subsample, lower income was associated with higher odds of high-need nonuse (OR, 1.92; 95% CI, 1.21–3.05).

Conclusions

Among older adults with multimorbidity, video-or-telephone telemedicine use was associated with socioeconomic resources as well as indicators of clinical need. Lower income was associated with high-need nonuse. Access to video-or-telephone telemedicine may therefore remain uneven among older adults with substantial care needs, although nonuse may also reflect patient preference, clinical circumstances, or the need for in-person care.

Clinical trial number: not applicable.

Background

Telemedicine expanded rapidly during the COVID-19 pandemic, when health systems needed to maintain access to care while reducing infection exposure and preserving clinical capacity [1,16]. Remote care can reduce travel burden and improve convenience, and it has remained part of routine care delivery beyond the early pandemic period [17,24]. Its use depends on devices, connectivity, accessible platforms, communication support, and care workflows that fit patients' needs.

Older adults are a central population for questions about telemedicine access. Many have frequent clinical contact, chronic disease management needs, or functional limitations that make in-person visits difficult. At the same time, sensory impairment, cognitive impairment, limited technology experience, disability, and lack of assistance may make telemedicine harder to use. Prior work estimated that many U.S. older adults were not ready for video visits during the COVID-19 pandemic, particularly those with socioeconomic disadvantage, disability-related barriers, and poorer health status [2]. Other studies of telemedicine access and equity have similarly shown that digital access, language, disability, and socioeconomic resources can determine who benefits from remote care [18,19,25,26].

Telemedicine access also reflects digital inequality. Among Medicare beneficiaries, access to high-speed internet-enabled devices and smartphone data has differed by income, education, race and ethnicity, Medicaid enrollment, age, and disability [3]. These differences raise the possibility that telemedicine may improve access for some patients while leaving existing barriers in place, or even making them more consequential, for others.

Older adults with multimorbidity are clinically relevant in this setting. Multimorbidity, commonly defined as two or more chronic conditions, is common in older populations and is linked to complex health care needs, treatment burden, and functional limitations [4,5,20,27]. Research on high-need patients often focuses on the combination of clinical complexity, functional vulnerability, and intensive care needs [6,28]. For older adults with multimorbidity, access to care depends not only on the number of chronic conditions but also on functional limitations, treatment burden, transportation, caregiver availability, and how routine care is organized [21,22,27]. Telemedicine may be useful for these patients because of their ongoing care needs, but they may also face barriers that limit remote-care use.

Using NHANES August 2021–August 2023 data, we examined video-or-telephone telemedicine use among U.S. adults aged 65 years or older with multimorbidity as an issue of health care access and equity. We also defined a high health care need subgroup using chronic-condition burden and functional limitation, then examined high-need nonuse. This construct was not meant to classify individual nonuse as inappropriate. It was used as a population-level marker of possible undercoverage of remote-care options among patients with substantial care needs.

Methods

Study Design and Data Source

We conducted a cross-sectional study using publicly available data from the NHANES August 2021–August 2023 cycle. NHANES is conducted by the National Center for Health Statistics and uses a complex, multistage probability design to produce estimates for the civilian, noninstitutionalized U.S. population [7,8]. The primary analysis used interview questionnaire data on demographic characteristics, health care access and utilization, medical conditions, functioning, and prescription medication use. Depressive symptoms were assessed only in PHQ-9 extension and sensitivity analyses using the DPQ/MEC component.

The analysis was limited to participants aged 65 years or older. The primary analytic sample also required complete chronic-condition components for the multimorbidity definition, at least two chronic conditions, and a valid response to the telemedicine-use item. Because the study used publicly available, deidentified NHANES data, no additional institutional review board approval was required.

Analytic Sample

Of 11,933 NHANES August 2021–August 2023 participants, 2,586 were aged 65 years or older. Among them, 2,503 had complete chronic-condition components. Requiring at least two chronic conditions left 1,656 participants. One participant was excluded because the telemedicine-use response was missing, refused, or "don't know," leaving a final Model A analytic sample of 1,655 older adults with multimorbidity. Within this sample, 387 participants met the high health care need definition; 199 were classified as high-need nonusers, and 188 reported video-or-telephone telemedicine use. Figure 1 summarizes the sample selection process.

Outcome Measures

Outcome Measures

The primary outcome for Model A was video-or-telephone telemedicine use in the past 12 months. Telemedicine use was based on HUQ055, which asks whether the participant had an appointment with a doctor, nurse, or other health professional by video conference or by phone in the past 12 months [9]. For brevity, video-or-telephone telemedicine use is referred to as telemedicine use hereafter. Responses of "yes" were coded as telemedicine use, and responses of "no" were coded as nonuse. Refused and "don't know" responses were treated as missing. This outcome captures video-or-telephone telemedicine and should not be read as video-only telemedicine.

The outcome for Model B was high-need nonuse, defined as no telemedicine use among participants with high health care need. High-need nonuse was operationalized as a potential need-use mismatch. It

was not directly reported by participants and should not be interpreted as a direct measure of unmet care, delayed care, or inappropriate nonuse.

Multimorbidity and High Health Care Need

The primary chronic-condition count included 10 self-reported chronic conditions: hypertension, diabetes, ischemic heart disease, congestive heart failure, stroke, chronic obstructive pulmonary disease or emphysema or chronic bronchitis, current asthma, arthritis, cancer or malignancy, and liver disease. Ischemic heart disease was coded as present if the participant reported coronary heart disease, angina, or heart attack. Current asthma required both a history of asthma and current asthma. Physician-diagnosed diabetes counted as diabetes; borderline diabetes was coded as not having diabetes. Variable-level coding rules for each chronic condition are provided in Supplementary Table 7.

The primary chronic-condition count required complete data for all chronic-condition components. Multimorbidity was defined as two or more chronic conditions. Chronic kidney disease was not included in the primary self-reported chronic-condition count because laboratory-based CKD classification would require additional laboratory measures and a different weighting strategy. CKD-stratified findings based on laboratory/MEC data are presented as a supplementary analysis.

Functional limitation was defined using the adult Washington Group Short Set disability indicator (FNDADI) in NHANES [10,11]. High health care need was defined as at least three chronic conditions and at least one functional limitation. This definition was chosen to capture clinical complexity and functional vulnerability, two features commonly used to describe high-need older adults in health services research [4–6,10,11]. The definition identifies a subgroup with both clinical complexity and functional vulnerability; it does not imply that every person in this subgroup required telemedicine.

Covariates

Covariates were chosen to represent demographic characteristics, socioeconomic position, and clinical need, consistent with an access-oriented framework of predisposing, enabling, and need factors [23]. Model A included age group (65–74, 75–79, ≥ 80 years), sex, collapsed race and ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, and other race/ethnicity, including non-Hispanic Asian and multiracial participants), educational attainment, marital status, family income-to-poverty ratio category, chronic-condition count, and functional limitation. Health insurance and routine place for care are reported in supplementary descriptive analyses but were not included in Model A because variation was limited in this older sample. Polypharmacy was retained as a descriptive marker of treatment burden but was not included in adjusted models because it overlaps conceptually with chronic-condition burden. Age 80 was treated as the NHANES top-coded age category and interpreted as ≥ 80 years [12].

Depressive symptoms were measured with the Patient Health Questionnaire-9 (PHQ-9). Complete-case PHQ-9 scoring was used only in the MEC-weighted extension model: the total score was calculated only

when all nine items were nonmissing, and depressive symptoms were defined as PHQ-9 total score ≥ 10 [13,14]. Because PHQ-9 was collected in the DPQ/MEC component and had substantial missingness, depressive symptoms were not included in the primary Model A or the primary interview-weighted Table 1. PHQ-9 prorating was evaluated only as a MEC-weighted sensitivity analysis.

Table 1
Characteristics by telemedicine use

Characteristic	Level	Overall	No use	Use	P value
Unweighted N		1,655	983	672	
Age, years	Mean (SE)	73.1 (0.2)	73.4 (0.2)	72.7 (0.2)	0.024
Age group, years	65–74	979 (58.9%; SE 1.2)	568 (57.1%; SE 1.7)	411 (61.8%; SE 1.8)	0.204
	75–79	317 (19.1%; SE 0.9)	191 (19.8%; SE 1.0)	126 (18.2%; SE 1.7)	
	≥ 80	359 (21.9%; SE 1.2)	224 (23.1%; SE 1.6)	135 (20.1%; SE 1.6)	
Sex	Male	738 (44.9%; SE 0.8)	430 (44.2%; SE 1.1)	308 (46.0%; SE 1.4)	0.336
	Female	917 (55.1%; SE 0.8)	553 (55.8%; SE 1.1)	364 (54.0%; SE 1.4)	
Race/ethnicity	Mexican American	59 (3.1%; SE 1.2)	38 (3.1%; SE 1.3)	21 (3.2%; SE 1.4)	0.888
	Other Hispanic	119 (5.7%; SE 1.7)	63 (5.1%; SE 1.6)	56 (6.5%; SE 2.1)	
	Non-Hispanic White	1152 (73.1%; SE 2.2)	686 (74.0%; SE 2.2)	466 (71.7%; SE 3.4)	
	Non-Hispanic Black	171 (9.4%; SE 1.8)	104 (9.4%; SE 2.1)	67 (9.3%; SE 2.0)	
	Non-Hispanic Asian	51 (2.8%; SE 0.5)	32 (2.6%; SE 0.6)	19 (3.1%; SE 1.0)	
	Other/multiracial	103 (5.9%; SE 0.7)	60 (5.8%; SE 0.8)	43 (6.2%; SE 1.2)	
Education	< 9th grade	109 (4.7%; SE 0.7)	74 (5.4%; SE 0.8)	35 (3.8%; SE 0.8)	0.008
	9th–11th grade	166 (8.0%; SE 0.8)	113 (8.8%; SE 1.1)	53 (6.8%; SE 1.0)	

Note: Cells show unweighted n with weighted percentage and standard error unless otherwise specified. Continuous variables show weighted mean and standard error. Race/ethnicity is shown in detailed NHANES categories for descriptive purposes; regression models used collapsed categories.

Characteristic	Level	Overall	No use	Use	P value
	High school/GED	398 (29.8%; SE 1.4)	265 (32.8%; SE 2.3)	133 (25.2%; SE 2.0)	
	Some college/AA	492 (29.1%; SE 1.8)	272 (27.3%; SE 1.9)	220 (31.8%; SE 2.4)	
	College graduate or above	488 (28.4%; SE 2.4)	257 (25.7%; SE 2.0)	231 (32.5%; SE 3.5)	
Family income-to-poverty ratio	Mean (SE)	3.0 (0.1)	2.9 (0.1)	3.2 (0.1)	0.026
Family income-to-poverty ratio category	< 1.00	158 (9.1%; SE 0.8)	114 (11.2%; SE 0.9)	44 (6.1%; SE 1.3)	0.057
	1.00-1.99	341 (22.3%; SE 2.6)	201 (23.1%; SE 2.9)	140 (21.1%; SE 2.4)	
	2.00-3.99	451 (34.8%; SE 1.8)	258 (33.4%; SE 2.7)	193 (36.8%; SE 2.5)	
	≥ 4.00	430 (33.8%; SE 2.6)	229 (32.2%; SE 2.7)	201 (36.0%; SE 3.8)	
Number of chronic conditions	Mean (SE)	3.1 (0.0)	3.0 (0.1)	3.2 (0.1)	0.039
Functional limitation	No	1117 (68.3%; SE 1.4)	688 (71.1%; SE 1.3)	429 (64.0%; SE 2.5)	0.011
	Yes	537 (31.7%; SE 1.4)	294 (28.9%; SE 1.3)	243 (36.0%; SE 2.5)	
High health care need	No	1268 (77.0%; SE 1.6)	784 (80.5%; SE 1.5)	484 (71.7%; SE 2.4)	0.001
	Yes	387 (23.0%; SE 1.6)	199 (19.5%; SE 1.5)	188 (28.3%; SE 2.4)	
Polypharmacy	No	724 (45.1%; SE 1.4)	456 (48.0%; SE 1.3)	268 (40.7%; SE 1.5)	0.029

Note: Cells show unweighted n with weighted percentage and standard error unless otherwise specified. Continuous variables show weighted mean and standard error. Race/ethnicity is shown in detailed NHANES categories for descriptive purposes; regression models used collapsed categories.

Characteristic	Level	Overall	No use	Use	P value
		1.8)	2.1)	2.6)	
	Yes	926 (54.9%; SE 1.8)	522 (52.0%; SE 2.1)	404 (59.3%; SE 2.6)	
Note: Cells show unweighted n with weighted percentage and standard error unless otherwise specified. Continuous variables show weighted mean and standard error. Race/ethnicity is shown in detailed NHANES categories for descriptive purposes; regression models used collapsed categories.					

Model B was estimated in the high-need subsample. To reduce overfitting, it used a simplified covariate set: age group, sex, collapsed race and ethnicity, binary education, binary family income-to-poverty ratio, self-rated health, and chronic-condition count.

Statistical Analysis

Primary interview-only descriptive and regression analyses accounted for the NHANES complex survey design using interview weights (WTINT2YR), masked variance strata (SDMVSTRA), and masked primary sampling units (SDMVPSU). PHQ-9 extension and PHQ-9 prorating sensitivity analyses used MEC weights (WTMEC2YR) because PHQ-9 was collected in the DPQ/MEC component. Table 1 reports core descriptive characteristics as unweighted counts and weighted percentages or means with standard errors, overall and by telemedicine use; supplementary descriptive variables with limited variation are reported separately. Group differences were assessed with survey-weighted t tests for continuous variables and Rao-Scott design-adjusted chi-square tests for categorical variables.

Survey-weighted logistic regression was used to estimate odds ratios (ORs) and 95% confidence intervals (CIs). Model A examined correlates of telemedicine use among older adults with multimorbidity. A PHQ-9 complete-case extension model added depressive symptoms. Model B examined correlates of high-need nonuse among participants with high health care need.

Regression models used covariate complete-case records. Missing-category coding and multiple imputation were not used.

Two sensitivity analyses were prespecified. First, chronic-condition missing components were treated as absent, producing a missing-as-zero multimorbidity definition and chronic-condition count. Second, PHQ-9 total score was prorated when at least seven of nine PHQ-9 items were answered. These analyses were treated as sensitivity analyses only; the primary analysis required complete chronic-condition components. PHQ-9 extension and prorating analyses used MEC weights because PHQ-9 was collected in the DPQ/MEC component.

All analyses were conducted in R using the survey package.

Results

Sample Characteristics

The final primary analytic sample included 1,655 older adults with multimorbidity. The weighted prevalence of past-year telemedicine use was 39.7% (95% CI, 37.3–42.1). Among participants with high health care need, the weighted prevalence of telemedicine use was 48.9% (95% CI, 43.4–54.4), and 51.1% (95% CI, 45.6–56.6) did not report such use. The weighted mean age was 73.1 years (SE, 0.2); 58.9% were aged 65–74 years, 19.1% were aged 75–79 years, and 21.9% were aged ≥ 80 years. Overall, 55.1% were female and 73.1% were non-Hispanic White. In supplementary descriptive analyses, most participants had health insurance (99.3%) and one routine place for care (97.7%).

The weighted mean number of chronic conditions was 3.1 (SE, 0.0). Functional limitation was present in 31.7% of participants, and 23.0% met the high health care need definition. Polypharmacy was present in 54.9% of the analytic sample.

Descriptive characteristics differed by telemedicine use. Participants who reported telemedicine use had higher educational attainment ($p = 0.008$), a higher family income-to-poverty ratio (mean 3.2 vs 2.9, $p = 0.026$), more chronic conditions (mean 3.2 vs 3.0, $p = 0.039$), and a higher prevalence of functional limitation (36.0% vs 28.9%, $p = 0.011$). High health care need was also more common among users than nonusers (28.3% vs 19.5%, $p = 0.001$).

Telemedicine Use Among Older Adults With Multimorbidity

Adjusted regression models used covariate complete-case records, so model-complete sample sizes were smaller than the primary analytic sample, largely because family income-to-poverty ratio values were missing. PIR was missing for 275 of 1,655 participants (16.6%), including 181 of 983 nonusers (18.4%) and 94 of 672 users (14.0%). The primary Model A regression included 1,379 participants: 578 telemedicine users and 801 nonusers.

In the primary weighted logistic regression model for telemedicine use among older adults with multimorbidity, socioeconomic position and health care need were associated with higher odds of use. Compared with participants with less than a high school education, college graduates had higher odds of telemedicine use (OR, 1.96; 95% CI, 1.14–3.37; $p = 0.015$). Compared with participants with a family income-to-poverty ratio below 1.00, those in higher income categories also had higher odds of use: PIR 1.00–1.99 (OR, 1.82; 95% CI, 1.19–2.79; $p = 0.006$), PIR 2.00–3.99 (OR, 2.17; 95% CI, 1.20–3.90; $p = 0.010$), and PIR ≥ 4.00 (OR, 2.06; 95% CI, 1.17–3.63; $p = 0.012$).

Clinical need was also related to telemedicine use. Each additional chronic condition was associated with higher odds of use (OR, 1.09 per condition; 95% CI, 1.00–1.19; $p = 0.048$). Functional limitation was associated with higher odds of use (OR, 1.52; 95% CI, 1.12–2.06; $p = 0.008$). Selected adjusted odds ratios from Models A and B are shown in Fig. 2; complete model results are shown in Tables 2 and 3.

Table 2
Correlates of telemedicine use

Characteristic	OR (95% CI)	P value
Age 75–79 vs 65–74	0.84 (0.60, 1.17)	0.302
Age ≥ 80 vs 65–74	0.83 (0.61, 1.14)	0.244
Female vs male	1.00 (0.83, 1.21)	0.990
Non-Hispanic Black vs Non-Hispanic White	1.13 (0.69, 1.83)	0.633
Hispanic vs Non-Hispanic White	1.51 (1.01, 2.25)	0.046
Other/multiracial/Asian vs Non-Hispanic White	1.27 (0.79, 2.05)	0.331
High school/GED vs less than high school	1.00 (0.64, 1.56)	0.995
Some college/AA vs less than high school	1.54 (0.97, 2.45)	0.069
College graduate or above vs less than high school	1.96 (1.14, 3.37)	0.015
Widowed/divorced/separated vs married/partnered	1.31 (0.98, 1.76)	0.065
Never married vs married/partnered	0.85 (0.51, 1.44)	0.557
PIR 1.00-1.99 vs < 1.00	1.82 (1.19, 2.79)	0.006
PIR 2.00-3.99 vs < 1.00	2.17 (1.20, 3.90)	0.010
PIR ≥ 4.00 vs < 1.00	2.06 (1.17, 3.63)	0.012
Number of chronic conditions, per condition	1.09 (1.00, 1.19)	0.048
Functional limitation yes vs no	1.52 (1.12, 2.06)	0.008
Note: Primary Model A. Outcome: past-year telemedicine use. Model-complete n = 1,379; events = 578. PHQ-9 is excluded from the primary model because of substantial missingness.		

Table 3
Correlates of high-need nonuse

Characteristic	OR (95% CI)	P value
Age 75–79 vs 65–74	0.89 (0.40, 2.01)	0.780
Age ≥ 80 vs 65–74	1.11 (0.65, 1.90)	0.696
Female vs male	0.84 (0.58, 1.22)	0.373
Non-Hispanic Black vs Non-Hispanic White	0.44 (0.15, 1.30)	0.137
Hispanic vs Non-Hispanic White	0.31 (0.12, 0.80)	0.016
Other/multiracial/Asian vs Non-Hispanic White	0.92 (0.32, 2.65)	0.882
Some college or above vs high school/GED or less	0.61 (0.35, 1.05)	0.073
PIR < 2.00 vs ≥ 2.00	1.92 (1.21, 3.05)	0.005
Fair/poor self-rated health vs good or better	0.73 (0.37, 1.44)	0.364
Number of chronic conditions, per condition	1.01 (0.87, 1.18)	0.908
Note: Exploratory Model B. Outcome: high-need nonuse, defined as no telemedicine use among participants with high health care need. Model-complete n = 332; events = 166.		
Table notes: Primary interview-only analyses use WTINT2YR, SDMVSTRA, and SDMVPSU. Age 80 is interpreted as ≥ 80 because NHANES top-codes age at 80 years. Main chronic-condition analyses require complete chronic-condition components. High-need nonuse is operationalized as high health care need plus no past-year telemedicine use; it is not directly measured unmet need.		

Results were similar in the MEC-weighted PHQ-9 complete-case extension; depressive symptoms were not clearly associated with telemedicine use after adjustment.

High Health Care Need and High-Need Nonuse

Among 387 participants who met the high health care need definition in the primary analytic sample, 199 were high-need nonusers and 188 reported telemedicine use. The weighted prevalence of past-year telemedicine use was 48.9% (95% CI, 43.4–54.4) in the high-need subgroup; conversely, 51.1% (95% CI, 45.6–56.6) did not report such use. In the simplified weighted logistic regression model, the model-complete high-need sample included 332 participants, with 166 high-need nonusers and 166 users. Because the high-need analytic sample was modest, Model B was considered exploratory, and estimates other than the primary income contrast should be interpreted cautiously.

Lower income was associated with higher odds of high-need nonuse. Participants with family income-to-poverty ratio below 2.00 had higher odds of high-need nonuse than those with ratio ≥ 2.00 (OR, 1.92; 95% CI, 1.21–3.05; p = 0.005). Having some college education or higher was associated with lower odds of high-need nonuse, although the confidence interval included the null (OR, 0.61; 95% CI, 0.35–1.05; p =

0.073). Chronic-condition count was not associated with high-need nonuse within the high-need subsample (OR, 1.01 per condition; 95% CI, 0.87–1.18; $p = 0.908$).

Sensitivity Analyses

Sensitivity analyses using missing-as-zero chronic-condition coding and PHQ-9 prorating led to similar conclusions. In the high-need missing-as-zero sensitivity analysis, lower income remained associated with higher odds of high-need nonuse (OR, 1.85; 95% CI, 1.19–2.87; $p = 0.007$). CKD-stratified supplementary findings did not materially change the main interpretation. In an exploratory supplementary interaction analysis, there was no clear evidence that the association between lower income and telemedicine use differed by high health care need status (interaction OR, 0.74; 95% CI, 0.46–1.20; $p = 0.222$).

Overall, the sensitivity analyses supported the main interpretation: telemedicine use among older adults with multimorbidity varied by socioeconomic position and health care need, whereas high-need nonuse was most consistently associated with lower income.

Discussion

In this cross-sectional analysis of NHANES August 2021–August 2023 data, telemedicine use among older adults with multimorbidity was related to both clinical need and socioeconomic resources. Approximately two in five older adults with multimorbidity reported past-year telemedicine use, and about half of those in the high health care need subgroup did not report such use. Higher education and higher family income-to-poverty ratio were associated with greater odds of telemedicine use. More chronic conditions and functional limitation were also associated with greater odds of use. Among participants with high health care need, lower income was associated with high-need nonuse.

The results point to a practical tension in geriatric care access. Older adults with greater clinical burden may have more opportunities or indications for remote contact with health professionals. Yet telemedicine use may depend on resources such as digital access, technology experience, social support, and care systems that can accommodate sensory, cognitive, or functional limitations. Prior work on telemedicine unreadiness among older adults, digital access among Medicare beneficiaries, and digital health equity supports the interpretation that socioeconomic and disability-related barriers may affect who can use remote care [2,3,18,19,25,26].

The high-need nonuse analysis gives a more specific view of access and health equity. Among older adults with at least three chronic conditions and a functional limitation, lower income was associated with not using telemedicine. This pattern is consistent with the concern that telemedicine, if implemented without attention to access barriers, may not reach all patients with high care needs. Because high-need nonuse was operationalized rather than directly reported, it should be interpreted as a population-level marker of possible undercoverage of remote-care options, not as an individual-level

indicator of inappropriate care or unmet need. Some older adults with high health care need may require or prefer in-person care.

These findings are relevant to geriatric care delivery. For older adults with multimorbidity, telemedicine should be considered as one part of chronic care continuity, not simply as a technical platform. Remote-care models may need to account for functional limitations, sensory or cognitive barriers, caregiver involvement, and preferences for telephone-compatible care. From a health equity perspective, the association between lower income and high-need nonuse suggests that telemedicine expansion may need digital navigation support, caregiver-assisted telehealth, community-based support, and accessible design to reach older adults with substantial care needs.

The association between functional limitation and higher telemedicine use in the overall multimorbidity sample needs careful interpretation. Functional limitation may increase clinical need and make in-person care more burdensome, which could increase telemedicine use. At the same time, disability-related barriers can reduce telemedicine readiness, especially for video-based care. Because the NHANES telemedicine item combines video and phone appointments, the observed association may partly reflect telephone-based care among people who would face barriers to video visits.

PHQ-9 extension and prorating sensitivity analyses did not materially change the interpretation, which supports the decision not to base the primary findings on depressive symptoms.

Strengths and Limitations

This study has several strengths. It used a recent nationally representative NHANES cycle, focused on older adults with multimorbidity, and kept the primary analysis separate from sensitivity analyses for chronic-condition missingness and PHQ-9 scoring. It also placed telemedicine use within a geriatric health care access framework by distinguishing general telemedicine use from high-need nonuse, an operational construct intended to identify older adults with substantial health care need who did not report telemedicine use.

Several limitations should be considered. First, the cross-sectional design precludes causal interpretation. Second, the telemedicine outcome combined video and telephone appointments and did not capture modality, frequency, quality, appropriateness, satisfaction, or unmet need. Because NHANES does not measure telemedicine preferences, appropriateness, digital literacy, device access, or broadband availability in this analytic framework, the mechanisms underlying nonuse could not be determined. Third, high-need nonuse was derived from chronic-condition burden, functional limitation, and telemedicine nonuse; it was not directly reported as unmet care. Fourth, the chronic-condition count was based primarily on self-reported clinician diagnoses, and chronic conditions may be subject to recall or reporting error. Fifth, PHQ-9 data had substantial missingness, so depressive symptoms were treated as secondary. Sixth, the high-need subsample was modest, and Model B should therefore be interpreted as exploratory; race and ethnicity estimates in this subsample should also be interpreted cautiously because subgroup sample sizes were limited after restriction to participants with high health care need.

Finally, NHANES excludes institutionalized older adults, whose care needs and telemedicine access patterns may differ.

Conclusions

Among U.S. older adults with multimorbidity in NHANES August 2021–August 2023, video-or-telephone telemedicine use was associated with higher socioeconomic position and greater clinical need. Among older adults with high health care need, lower income was associated with video-or-telephone telemedicine nonuse. Access to video-or-telephone telemedicine may therefore remain uneven among older adults with substantial health care need, although nonuse may also reflect preferences, care needs, or the appropriateness of in-person care.

Abbreviations

- CDC/NCHS
Centers for Disease Control and Prevention/National Center for Health Statistics
- CI
confidence interval
- MEC
mobile examination center
- NHANES
National Health and Nutrition Examination Survey
- OR
odds ratio
- PHQ-9
Patient Health Questionnaire-9
- PIR
family income-to-poverty ratio

Declarations

Ethics Approval and Consent to Participate

NHANES protocols are reviewed and approved by the National Center for Health Statistics Research Ethics Review Board, and participants provide informed consent [15]. This secondary analysis used publicly available, deidentified NHANES data and did not require additional institutional review board approval.

Consent for Publication

Not applicable.

Availability of Data and Materials

The data used in this study are publicly available from the National Health and Nutrition Examination Survey (NHANES) 2021-2023 cycle on the Centers for Disease Control and Prevention/National Center for Health Statistics website [7]. The analytic dataset was derived from publicly available, deidentified NHANES data.

Code Availability

The analytic code used for data cleaning, analysis, and generation of tables and figures will be provided as a review file at submission and will be publicly archived upon publication. Until then, the statistical code is available from the corresponding author upon reasonable request.

Competing Interests

The authors declare no competing interests.

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Authors' Contributions

A conceived the study. A and B designed the analysis, interpreted the results, drafted and critically revised the manuscript, and approved the final manuscript.

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Figures

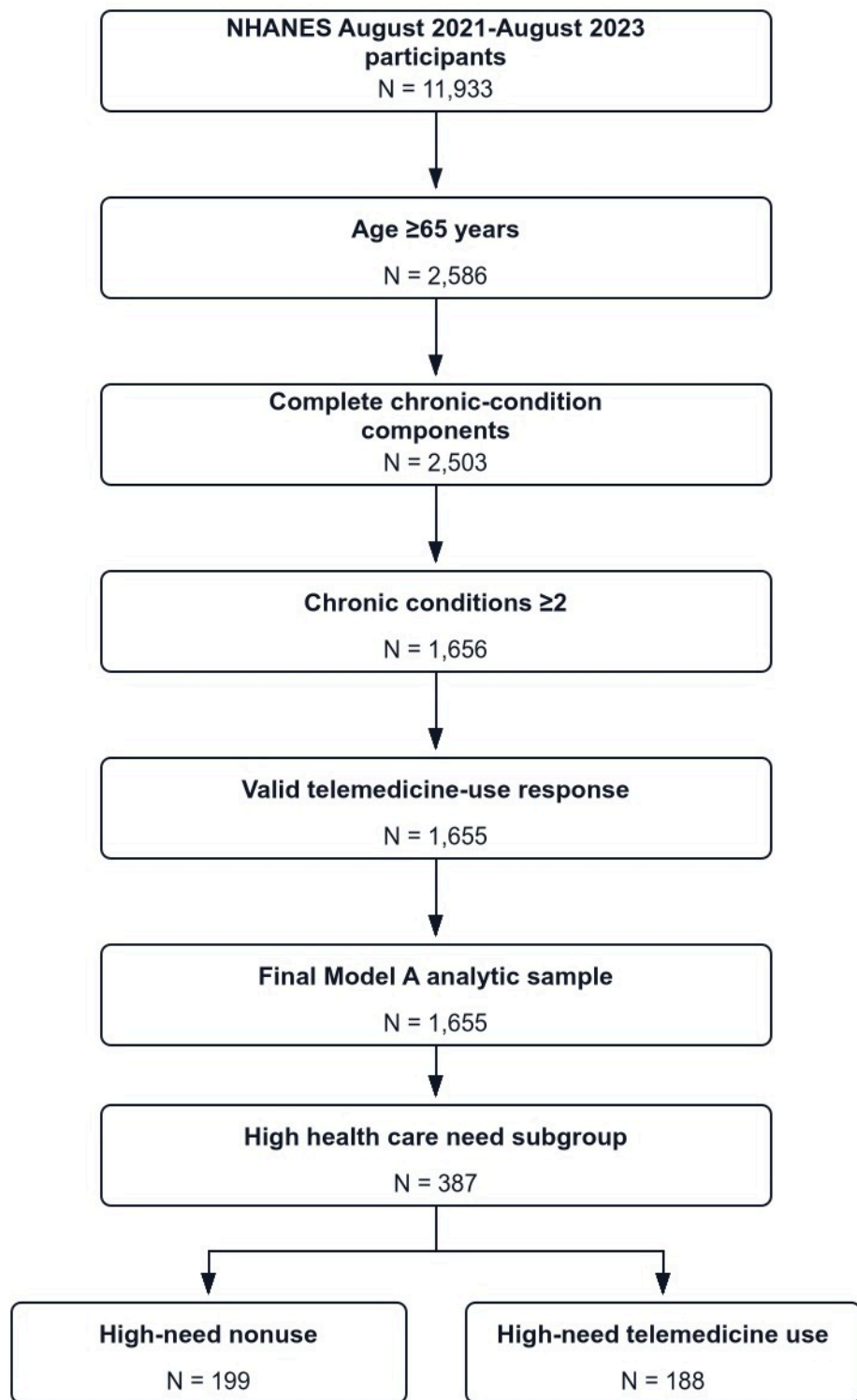
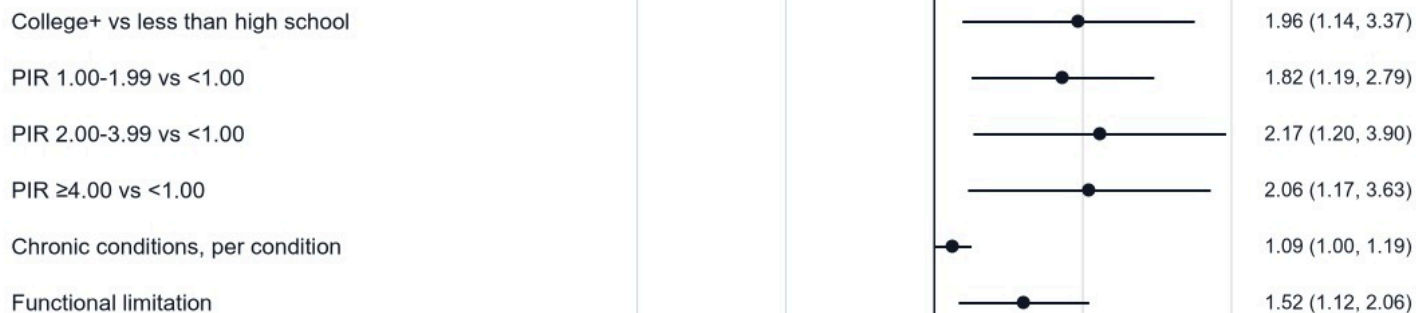


Figure 1

Analytic sample selection. Counts are unweighted participant counts from NHANES August 2021–August 2023.

Panel A. Telemedicine use



Panel B. High-need nonuse

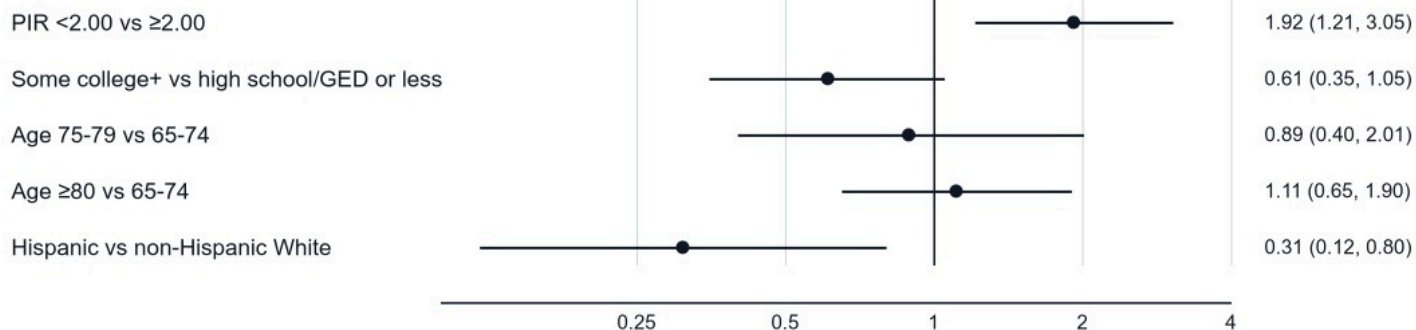


Figure 2

Selected adjusted odds ratios for telemedicine use and high-need nonuse. Panel A shows selected covariates from Model A, in which the outcome was past-year telemedicine use among older adults with multimorbidity. Panel B shows selected covariates from Model B, in which the outcome was high-need nonuse among participants with high health care need. Odds ratios are shown on a log scale; complete model results are reported in Tables 2 and 3.