

ORIGINAL RESEARCH

Flipping the Script on the Digital Divide: Low-Income Cancer Survivors Lead in Telehealth Use

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Abstract

Background: Low-income patients with cancer have long been viewed as facing the most significant barriers to telehealth because of limited broadband access, lower digital literacy, and unstable insurance coverage. Using more than a decade of national data, this study shows the opposite: low-income cancer survivors used telehealth more often than their higher-income peers.

Objective: To compare telehealth use between low- and higher-income U.S. cancer survivors and identify factors linked to higher use among low-income patients.

Methods: This analysis used the 2011–2023 National Health Interview Survey data, excluding 2019, and included 37,571 adults with a prior cancer diagnosis. Household income was classified as below 200% or at/above 200% of the federal poverty level. Telehealth use, defined as at least one video or telephone visit in the past 12 months, was examined using survey-weighted multivariable logistic regression. Models were stratified into pre-COVID-19 pandemic (2011 to 2018) and pandemic (2020 to 2023) periods adjusted for sociodemographic and enabling factors guided by the Andersen's Behavioral Model.

Results: Low-income survivors had 8% higher odds of telehealth use compared with higher-income survivors (adjusted odds ratio 1.08; 95% confidence interval [CI]: 1.02 to 1.15).

Conclusion: Low-income cancer survivors are leading in telehealth use and challenging the digital divide narrative. Sustaining Medicaid reimbursement parity, broadband subsidies, and device-loan programs might help close socioeconomic disparities in oncology care and advance health equity.

Plain Language Summary

Each year, more than 1.9 million Americans are diagnosed with cancer, yet the United States does not have enough oncology providers to meet their needs. Telehealth can alleviate these challenges by reducing travel, saving time, and maintaining a patient's connection to their care teams. For years, experts assumed patients with lower incomes would use telehealth the least because of barriers such as poor internet service, limited digital skills, and lack of insurance.

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This study examined over 37,000 U.S. cancer survivors over 12 years. Patients with lower incomes were slightly more likely to use telehealth than wealthier patients. Within the low-income group, people who were employed, more educated, middle-aged, or women were the most frequent users.

The author concludes that for health systems, telehealth should be built into standard cancer care, especially for

patients facing challenges with travel or time away from work. For policymakers, programs that expand affordability and internet access should not be temporary. Keeping these supports in place will ensure that vulnerable patients continue to benefit from virtual oncology care.

In the United States, nearly 1.9 million new cancer diagnoses occur annually, creating high demand for timely and coordinated care.¹ At the same time, a shortage of

oncology providers constrains access and widens disparities.² These pressures highlight the importance of telehealth as a strategy to extend capacity, reduce barriers, and connect patients with needed services.

Telehealth is now integral to oncology, enabling survivors to manage symptoms, attend follow-up visits, and remain engaged with their care teams. Historically, low-income patients were viewed as the least likely to adopt telehealth because of inadequate broadband, limited digital literacy, and financial constraints.³⁻⁵ Yet, the results of national studies suggest a different pattern, with evidence that low-income patients use telehealth at rates comparable to or higher than those of their higher-income peers.⁶⁻⁸

This pattern is especially relevant in survivorship, which depends on regular follow-up and coordination among oncology, primary care, and supportive services, and timely symptom monitoring.^{9,10} Federal and state policies introduced during the COVID-19, including Medicaid and Medicare telehealth waivers, broadband subsidies, and device-loan programs, reduced barriers and enabled rapid growth of virtual care for disadvantaged populations.¹¹⁻¹⁵

Professional bodies such as the American Society of Clinical Oncology recommend embedding telehealth into standard cancer care, citing its potential to improve engagement and reduce disparities.¹⁶ National cancer reports similarly emphasize its role in addressing systemic challenges.¹⁰

Methods

Study design and data source

This pooled cross-sectional analysis used publicly available data from the 2011 to 2023 National Health Interview Survey (NHIS), an annual, nationally representative household survey administered by the National Center for Health Statistics to assess health status, healthcare access, and health behaviors in the civilian, non-institutionalized U.S. population.¹⁶ Data were accessed via the Integrated Public Use Microdata Series (IPUMS) Health Surveys platform, which harmonizes NHIS variables across survey years for comparability.¹⁷ The 2019 survey year was excluded because a major NHIS redesign removed non-face-to-face care items, resulting in a gap in telehealth measurement.

Pandemic versus pre-pandemic data handling

To account for temporal changes in telehealth access and policy, the data were stratified into two periods: pre-pandemic (2011 to 2018) and pandemic-era (2020 to 2023). This approach reflects both methodological consistency and substantive differences in utilization patterns following COVID-19-driven policy changes, such as expanded reimbursement and relaxed geographic

restrictions. Separate logistic regression models were estimated for each period to examine temporal differences.

Study population

The analytic sample included adults at least 18 years of age who reported a prior cancer diagnosis, excluding those who reported only non-melanoma skin cancer. Cancer history was determined using the NHIS item, 'Have you ever been told by a doctor or other health professional that you had cancer or a malignancy of any kind?' Respondents missing data on the dependent variable or key independent variables were excluded. Missing income data were addressed using the NHIS-provided multiple imputation files.¹⁶

Measures

Dependent variable

Telehealth utilization coded as 0 for no telehealth use and 1 for any use (video or telephone consultation) in the past 12 months. In pre-pandemic years, telehealth was identified through supplemental NHIS items on non-face-to-face care. In pandemic-era years, standardized NHIS telehealth questions were used.

Focal predictor

Household income was categorized as at least 200% of the federal poverty level (FPL) versus 200% or greater FPL, consistent with federal definitions of economic vulnerability and prior telehealth equity research.

Conceptual framework and covariates

Covariates were selected and organized using Andersen's Behavioral Model of Health Service Use,¹⁸ which suggests that healthcare utilization is shaped by three domains: predisposing characteristics, enabling resources, and need factors (Table 1). This model provided the theoretical basis for examining sociodemographic influences on telehealth use and for interpreting income-related disparities among cancer survivors.

Categorical variables were collapsed (e.g. age into four groups) to ensure adequate cell sizes, facilitate interpretation, and align with prior telehealth equity studies. Complete variable definitions, coding, and reference categories are provided in Table 2.

Model specification

The general model form was:

$$\text{logit}(P_i) = \beta_0 + \beta_1(\text{Income}_i) + \sum_{k=2}^K \beta_k(\text{Covariates}_i) + \varepsilon_i$$

where P_i is the probability that respondent i reported any telehealth use in the past 12 months, β_0 is the intercept, β_1 represents the focal predictor (income), and β_k represents

Table 1. Three domains of healthcare utilization based on Andersen's Behavioral Model of Health Service Use¹⁸

Factor	Demographics
Predisposing factors	<ul style="list-style-type: none"> • Age group (18–34 [ref], 35–49, 50–64, ≥65 years) • Sex (male [ref], female) • Race/ethnicity (non-Hispanic White [ref], non-Hispanic Black, Hispanic, non-Hispanic Other).
Enabling factors	<ul style="list-style-type: none"> • Education (<high school [ref], high school/GED, some college, bachelor's degree or higher) • Employment in the past 12 months (no [ref], yes), • Health insurance (private [ref], public, uninsured).
Need-based factor	<ul style="list-style-type: none"> • Self-reported cancer diagnosis (excludes non-melanoma skin cancer)

GED: General Educational Development.

Table 2. Definition and coding of study variables, NHIS 2011 to 2023

Variable	Variable name/NHIS source	Coding and categories	Reference category	Years available*
Outcome	Telehealth use (video or telephone visit in the past 12 months)	0 = No, 1 = Yes	N/A	2011–18 2020–23
Predisposing factors	Age	18–34, 35–49, 50–64, ≥65 years	18–34 years	2011–23
	Sex	Male, Female	Male	2011–23
	Race/ethnicity	Non-Hispanic White; Non-Hispanic Black; Hispanic; Non-Hispanic Other (Asian, American Indian/Alaska Native, Native Hawaiian/Other Pacific Islander, multiracial)	Non-Hispanic White	2011–23
Enabling factors	Education	<High school; high school graduate/GED; some college; Bachelor's degree or higher	<High school	2011–23
	Employment in past 12 months	Yes, No	No	2011–23
	Health insurance	Private; public; uninsured	Private	2011–23
	Household income relative to FPL	<200% FPL; ≥200% FPL	≥ 200% FPL	2011–23
Need-based factors	Cancer diagnosis	Self-reported; excludes non-melanoma skin cancer	N/A	2011–23

N/A: not available; NHIS: National Health Interview Survey; FPL: Federal Poverty Level.

*Pre-pandemic telehealth data (2011–2018) were derived from NHIS supplemental questions on non-face-to-face healthcare encounters. Standardized telehealth items were reintroduced in 2020 following the 2019 redesign of the NHIS, which had previously lacked telehealth data.

coefficients for control covariates. Covariates included age group, sex, race/ethnicity, education, employment status, insurance coverage, and self-reported cancer diagnosis, with reference categories specified in Table 3.

Logistic regression was selected because the dependent variable is binary, and the method allows for the estimation of adjusted odds ratios (AORs) while controlling for multiple covariates. This approach is widely used in telehealth disparities research to quantify associations while adjusting for sociodemographic, enabling, and need-based factors.

Statistical analysis

All analyses incorporated NHIS person-level sampling weights, strata, and primary sampling units (PSUs) to account for the complex survey design and produce nationally representative estimates.^{16,17} Multicollinearity was assessed using variance inflation factors (all <2.0).

Statistical significance was set at $\alpha = 0.05$. Analyses were conducted in SPSS Statistics version 29 (IBM Corp., Armonk, NY, USA).

Results

Among the 37,571 cancer survivors in the analytic sample, 15,871 (42.3%) had a low income (<200% FPL). Overall, 11,933 participants (31.8%) reported using telehealth services, defined as at least one video or telephone consultation with a healthcare provider within the past 12 months. Telehealth use was more common among low-income survivors (34.1%) than among higher-income survivors (30.3%) (Table 3).

After adjusting for all predisposing, enabling, and need-based covariates, low-income cancer survivors had 8% higher odds of using telehealth compared with higher-income survivors (AOR = 1.08; 95% CI: 1.02–1.15; $p = 0.006$). This finding indicates that, holding all other factors constant,

Table 3. Characteristics of the study population and telehealth use among U.S. cancer survivors, NHIS 2011–2023 ($n = 37,571$)

Characteristics	<i>n</i>	Weighted %	<i>p</i> *
Income status			
• Low income (<200% FPL)	15,871	42.3	–
• Higher income (≥200% FPL)	21,700	57.7	–
Telehealth use (overall)			
• Yes	11,933	31.8	–
Telehealth use by income			
• Low income (<200% FPL)	5,417	34.1	<0.001
• Higher income (≥200% FPL)	6,516	30.3	–

FPL: federal poverty level.

**P*-value is shown only for the difference in telehealth use between income categories, based on χ^2 tests. Percentages are weighted to represent the U.S. adult population of cancer survivors.

Table 4. Adjusted odds ratios for telehealth use among U.S. cancer survivors, NHIS 2011–2023

Variables	Adjusted odds ratio (AOR)	95% confidence interval	<i>p</i>
Low income (<200% FPL) vs. ≥200% FPL	1.08	1.02–1.15	0.006
Low-income subgroup analyses			
• Some college or higher vs. less than high school	1.15	1.05–1.25	<0.001
• Employed vs. not employed	1.12	1.04–1.21	0.002
• Female vs. male	1.20	1.15–1.25	<0.001
• Age 35–64 vs. ≥65	1.10	1.05–1.15	0.001

FPL: federal poverty level, NHIS: National Health Interview Survey.

Note: Models adjusted for age, sex, race/ethnicity, education, employment, insurance status, and cancer diagnosis using NHIS complex survey weights. Subgroup analyses were limited to respondents with an income of <200% FPL ($n = 15,871$).

low-income survivors were slightly more likely to have used telehealth services over the past year (Table 4).

Discussion

Significance of the study

Cancer is diagnosed in nearly 1.9 million Americans each year and remains a leading cause of death in the United States.¹ At the same time, the supply of oncologists is insufficient and unevenly distributed, with projected shortfalls that limit timely access to specialty care.² These pressures strain health systems and survivorship programs that must coordinate complex, ongoing care across oncology, primary care, and supportive services, increasing the need for scalable access solutions such as telehealth.¹⁹

Against this backdrop, this study reveals that low-income cancer survivors had higher odds of telehealth use than higher-income survivors, even after controlling

for age, sex, race/ethnicity, education, employment, insurance status, and cancer history. This finding directly challenges longstanding assumptions about the digital divide that portray economically vulnerable patients as less likely to adopt virtual care.^{3–5}

Specific policy actions help explain the pattern observed. Medicaid reimbursement parity supports provider adoption by paying for telehealth at rates comparable to in-person visits and by expanding covered services, including audio-only encounters in many jurisdictions, which reduces technology barriers for patients without video-capable devices or stable broadband.⁹ Broadband subsidies through federal programs lower monthly internet costs and reduce device affordability barriers for low-income households, improving the feasibility and quality of video visits.^{10,11} Device-loan programs funded by U.S. federal and state telehealth initiatives and implemented by health systems and community partners place tablets and clinically useful peripherals (e.g. webcams, microphones, and home-monitoring equipment) directly in patients' hands, addressing common patient blockers necessary to complete a telehealth visit successfully, such as having a working device and a reliable connection.^{10,11} Together, these supports reduce cost, connectivity, and equipment barriers that disproportionately affect low-income survivors, helping to narrow income-related disparities in oncology telehealth access.^{10,11}

In short, telehealth is not a convenience in oncology. It is a necessary capacity tool, given cancer's scale and mortality rates,¹ the shortage and uneven distribution of oncologists,² and the coordination demands of survivorship care.¹⁹ Evidence reveals that with the right support, low-income survivors use telehealth at higher rates, which narrows access gaps. To sustain progress, health systems and policymakers should continue to integrate telehealth into standard oncology pathways, maintain Medicaid reimbursement parity and audio-only coverage, extend broadband subsidies and device-access programs, and incorporate digital navigation with rigorous outcome tracking. These steps can convert utilization into better adherence, timeliness, patient experience, and survival, advancing equity in cancer care.^{9–11,20–23}

Comparison with existing literature

Before the COVID-19 pandemic, lower-income patients were less ready for telehealth. Using 2018 Medicare data, Roberts and Mehrotra⁴ documented substantial digital access gaps that would limit video visits. Around the same pre-2020 period, Fischer et al.²⁴ described U.S. telehealth utilization patterns that reflected similar structural barriers. In oncology, evidence was emerging but limited. Sirintrapun and Lopez¹² summarized telemedicine roles along the cancer care pathway in 2018, and Sabesan and Kelly¹⁴ showed strong acceptability of teleoncology in rural settings in 2014.

During 2020, policy supports coincided with rapid growth and modality shifts. As reimbursement parity and access supports were implemented, Patel et al.⁶ reported broad outpatient telemedicine gains. In the same year, Rodriguez et al.⁷ found that underserved patients often used telephone visits when video was constrained by connectivity or devices, and Eberly et al.⁸ documented similar phone-video differences early in the expansion. In 2021, Zhai²⁵ described how audio-capable coverage, navigation, and device access reduce common barriers, while Lopez et al.²⁶ detailed practical facilitators and obstacles in oncology workflows.

By 2021, professional guidance endorsed permanent integration in oncology. The American Society of Clinical Oncology recommended embedding telehealth into routine cancer care to improve access and coordination,²⁰ echoing longstanding coordination needs in oncology highlighted by the Institute of Medicine in 2013.¹⁹

This study adds cancer-specific national evidence across periods. We compared income-related telehealth use across 2011 to 2018 and 2020 to 2023 using nationally representative NHIS data and harmonized IPUMS (originally the Integrated Public Use Microdata Series) files.^{16,17}

Policy and practice implications

Equitable oncology telehealth requires keeping the policies that drove adoption among low-income survivors, which includes maintaining reimbursement coverage and parity, continuing Affordable Connectivity Program subsidies, and sustaining community device-access programs. These policies supported the 2020 surge in telemedicine across outpatient care^{6–8} and are anchored in federal initiatives from the U.S. Centers for Medicare & Medicaid Services, *Health Resources and Services Administration*, and the Federal Communications Commission.^{9–11} In addition, practical supports such as audio-only coverage, digital navigation (pre-visit coaching, tech checks, and troubleshooting), and access to loaner devices reduce barriers for patients who lack reliable internet or equipment.^{25,26}

Reliable video-based oncology care requires a stable and adequate broadband connection. The ‘last mile’ refers to the final stretch of network that connects the internet backbone to patients’ homes, clinics, and community sites. Programs like U.S. Department of Agriculture ReConnect fund upgrades to this segment in underserved areas, thereby reducing geographic gaps in access.²⁷

Embedding telehealth into routine oncology should align with established quality frameworks and specialty standards. Health systems should map phone and video visits to survivorship and follow-up pathways, add digital navigation, set clear triage rules for virtual versus in-person care, and track equity metrics, consistent with the Institute of Medicine’s call for coordinated cancer care and ASCO’s telehealth recommendations.^{19,20}

Program success should be judged by outcomes, not just use. Evaluations should track treatment adherence, timeliness, patient experience, and clinical outcomes. Early oncology evidence shows favorable results in some settings.²¹ Broader reviews find positive effects when programs are well designed and implemented,^{22,23} and radiation oncology studies report high patient satisfaction.¹³

Future research

Future research should assess whether these utilization patterns persist as pandemic-era policies expire. Longitudinal studies that integrate detailed clinical data with telehealth usage metrics are needed to clarify the determinants linking income, access, and sustained engagement over time. Comparative analyses across cancer types, treatment phases, and geographic regions could help identify where telehealth provides the greatest benefit and where inequities remain. Sustaining equitable telehealth access in oncology will require targeted policies, comprehensive clinical–telehealth data integration, and comparative research to ensure that the benefits of virtual care are maximized for all cancer patients while closing the gaps that persist.²³

Limitations

Several limitations should be acknowledged. First, telehealth utilization was self-reported, which may introduce recall bias and social desirability bias, potentially leading to an underestimation or overestimation of actual use. Second, the NHIS lacks cancer-specific clinical details, such as stage at diagnosis, treatment modality, recurrence status, or survivorship phase, which limits the ability to perform disease-specific subgroup analyses. Third, the cross-sectional design precludes establishing causality; observed associations may be influenced by unmeasured or residual confounding. Fourth, telehealth measurement items differed between pre-pandemic and pandemic-era surveys and did not distinguish between video and audio-only visits, which might have introduced classification variability. Finally, the findings apply only to the non-institutionalized U.S. population and may not be generalizable to institutionalized cancer patients or those outside the U.S. healthcare system. These limitations should be considered when interpreting the findings and highlight the need for future research using longitudinal designs, modality-specific telehealth measures, and datasets with richer clinical detail. They also highlight the need for longitudinal and mixed-method studies to examine causal pathways, assess modality-specific outcomes, and inform policies for sustaining equitable telehealth access in oncology.

Conclusion

Low-income cancer survivors in the United States are more likely to use telehealth services than their higher-income counterparts, even after accounting for sociodemographic and enabling factors. These findings counter longstanding

assumptions about the digital divide, showing that economically vulnerable patients can actively participate in virtual oncology care when supported by policies such as reimbursement parity, broadband subsidies, and access to digital devices.

To translate these utilization gains into lasting improvements in cancer outcomes, policymakers and healthcare systems should institutionalize hybrid care pathways, maintain reimbursement policies supporting telehealth across modalities, and invest in community-based digital navigation programs. Oncology practices should strategically integrate telehealth into survivorship care plans, treatment follow-ups, and supportive services to reduce logistical barriers and enhance patient-centered care.

Future research should assess whether higher telehealth use among low-income survivors leads to measurable improvements in treatment adherence, timely follow-ups, symptom control, and quality of life. Longitudinal and mixed-method studies that incorporate cancer-specific clinical data are essential for determining the durability of these patterns in a post-pandemic policy environment and identifying which interventions most effectively sustain equitable access to high-quality virtual care.

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Conflicts of Interest

This study received no external funding. The author declares no conflicts of interest.

Author Contributions

The author affirms sole responsibility for the conception, design, data collection, analysis, interpretation, and writing of this manuscript. Post this to the Contributions section.

Data Availability Statement (DAS), Data Sharing, Reproducibility, and Data Repositories

This study involved analysis of publicly available, de-identified secondary.

The data supporting the findings of this study are openly available from the National Health Interview Survey (NHIS) for the years 2011–2023, accessed via the Integrated Public Use Microdata Series (IPUMS) Health Surveys platform.^{16,17} The author confirms that all data supporting the findings of this study are included within the article and its supplementary materials.

Application of Ai-Generated Text or Related Technology

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