County-Level Medical Debt and Its Associations With Cancer Stage and Survival in the United States

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Abstract

Background: Medical debt is recognized as a social determinant of health. This study examines associations of county-level medical debt in collections with diagnosis stage and survival among individuals newly diagnosed with cancer in the United States. **Patients and Methods:** A cohort of individuals aged ≥18 years newly diagnosed with cancer in 2011–2019 was identified from the National Cancer Database and followed through December 31, 2019. The county-level share of adults with medical debt in collections was combined with patient-level data. Hierarchical multivariable logistic and Cox proportional hazard models estimated associations of county-level medical debt with cancer diagnosis stage and overall survival, respectively, for all patients and by cancer type, clinical, and socioeconomic subgroups. **Results:** A total of 7,558,658 individuals with cancer were identified, with median county-level medical debt of 18%, ranging from 0% to 56%. Patients in the highest medical debt quartile had the highest proportion with stage IV disease and lowest 5-year survival rate. After adjusting for other patient- and county-level characteristics, patients living in counties in the highest quartile of medical debt were more likely to be diagnosed with stage IV disease (odds ratio, 1.079; 95% CI, 1.064–1.094) and had poorer survival (hazard ratio, 1.072; 95% CI, 1.061–1.082) than those living in counties in the lowest quartile of medical debt, with a statistically significant dose–response relationship (*P* for trend <.001). Patterns were observed across major cancer types and were consistent across socioeconomic and clinical subgroups. **Conclusions:** County-level medical debt was associated with advanced-stage diagnosis and worse survival among individuals newly diagnosed with cancer. Future research is warranted to evaluate the recent and ongoing US policy changes on medical debt prevalence and their effects on cancer care and outcomes.

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Background

Individuals diagnosed with cancer often bear significant health care costs and productivity losses, with more than half of US cancer survivors reporting cancer-related medical debt in a recent national survey.[1,2] Although medical debt is most prevalent among people without health insurance, it affects patients with cancer and cancer survivors regardless of insurance coverage. Most debts exceeded $5,000 and were carried for more than 1 year.[1,2] In response to the substantial burden of medical debt, patients with cancer and cancer survivors often delay or forgo needed care; cut back on food, clothing, and basic household expenses; experience declines in their credit scores; and, in extreme cases, file for bankruptcy.[1–3] Many cancer survivors turn to crowdfunding to help pay for medical care and daily living expenses.[4] Recent research has found that patients with cancer and cancer survivors experiencing financial hardship were more likely to be diagnosed with late-stage disease and had a higher risk of mortality.[3,5,6]

Medical debt is increasingly recognized as a social determinant of health.[7] In 2020, nearly 1 in 5 adults had medical debt in collections reported on their credit files, with the highest prevalence in Southern and low-income communities.[8] Higher county-level medical debt is strongly correlated with younger population age distribution, a higher proportion of racial and ethnic minority residents, lower income, lower educational attainment, higher uninsured and unemployment rates, and a greater prevalence of chronic conditions.[9,10] Moreover, county-level medical debt may reflect variations in local health care resources (such as the availability of charity care and financial navigation programs), hospital and physician practices related to patients with unpaid medical bills (such as liens, wage garnishment, and limits on care provision), and policies (such as Medicaid expansion, consumer protection policies, and debt forgiveness policies).[9–13] A recent study found that US counties with a higher share of the population experiencing medical debt had poorer overall health status, more years of life lost due to premature death, and higher mortality rates across all leading causes of death, including cancer mortality.[10]

As an indicator of area-level socioeconomic disadvantage, county-level medical debt may reflect limited access to affordable care, including inadequate health care resources and hospital and physician practices related to pursuing patients with unpaid bills. A high prevalence of area-level medical debt may create barriers to cancer screening and other preventive services, hinder timely evaluation of early signs of cancer, and delay or impede receipt of effective treatment after diagnosis, ultimately affecting cancer diagnosis and outcomes (Supplementary Figure S1, available in the supplementary materials). However, the associations of county-level medical debt and cancer diagnosis or survival after diagnosis remain unknown. Furthermore, most prior research on individual-level financial hardship and cancer outcomes has been conducted in a single state or a limited number of states, focused on a single cancer type, or been limited to long-term cancer survivors many years after diagnosis.[3,14,15] Using a nationwide

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hospital-based cancer registry database and newly released medical debt information, this study aimed to (1) describe the distribution of county-level medical debt, and (2) examine the associations of county-level medical debt with stage at diagnosis and survival among individuals newly diagnosed with cancer in the United States.

Methods

Data and Sample

We used data from the National Cancer Database (NCDB)[16,17] linked to county-level medical debt information from the Urban Institute Credit Bureau Panel,[18] based on patients' county of residence and year of diagnosis. The NCDB is a hospital-based cancer registry co-sponsored by the American College of Surgeons and the American Cancer Society, capturing >70% of all new cancer cases each year collected from >1,500 Commission on Cancer–accredited facilities in the United States.[17] In our NCDB dataset, patients' county of residence was available. The Urban Institute Credit Bureau Panel includes an annually collected nationally representative 2% sample of consumers from a major credit bureau over the study period of 2011–2019.[18] The consumer panel is refreshed at each data pull to keep the sample representative at the national level. Because patients in the NCDB are de-identified, Institutional Review Board exemption was obtained from the Morehouse School of Medicine.

Specifically, we identified 8,233,657 men or women aged ≥18 years who were newly diagnosed with a first primary cancer between 2011 and 2019 in all 50 states and the District of Columbia (DC) from the NCDB and followed them through December 31, 2019. We excluded patients diagnosed in 2020 or later to avoid potential confounding effects of the COVID-19 pandemic. As part of routine NCDB analytic practice, we included individuals who received part of or all of their initial treatment at the reporting facility. We excluded patients with stage 0 diagnosis (except bladder cancer) or missing stage information (n=37,111), missing medical debt data (n=266,790), missing key covariates (race/ethnicity, metropolitan status, or insurance status; n=258,026), or missing diagnosis or last contact dates (n=83,308), as well as those who survived <3 days (n=29,764), leaving 7,558,658 in the survival analysis. For analyses of stage at diagnosis, we further excluded 717,012 patients with cancers for which staging is not applicable (eg, leukemia and brain cancer), leaving 6,841,646 patients in that analysis. A detailed exclusion/inclusion flowchart is presented in Supplementary Figure S2.

Measures

Our primary exposure of interest—residential county-level share of adults with medical debt in collections in their credit files at the year of diagnosis—was obtained by linkage to the Urban Institute Credit Bureau Panel in 2011–2019.[18] County is the smallest geographic unit for debt information provided in the dataset. The county-level debt information was not reported when based on <50 people. Medical debt in collections was identified when the original creditor was a medical provider and the debt was either sent to a third-party collections agency or assigned to a creditor's internal collections department. Debt in collections was typically at least 180 days past due, indicating that the creditor attempted but was unable to collect the unpaid balance. Medical bills paid using a credit card that ultimately went into collections were not captured.[9]

The NCDB reviews patients' medical records and collects their demographic and clinical information, such as age, sex, race and ethnicity, insurance status, cancer type, stage at diagnosis, and comorbidities. Stage at diagnosis—the first outcome of our study (ie, I, II, III, IV, unknown, or occult)—was defined for cancer sites with an applicable AJCC TNM staging system and based on pathologic stage, or clinical stage if pathologic stage was not available. Overall survival—the other primary outcome of our study—was defined as time from diagnosis to death, last contact, or December 31, 2019, whichever came first.

Charlson-Deyo comorbidity score was calculated to indicate the severity of comorbidities.[19] We obtained patients' metropolitan status according to their residential county's 2013 Rural-Urban Continuum Codes,[20] which is updated each decade. Based on patients' county of residence and year of diagnosis, we also obtained county-level characteristics, including Health Resources and Services Administration (HRSA) designation of Medically Underserved Area (MUA)[21] and the Social Deprivation Index (SDI),[22] a validated measure of social deprivation (range, 1–100; higher values indicate greater deprivation) derived from 7 components: poverty, educational attainment, single-parent households, overcrowded housing, home ownership, car ownership, and unemployment.

Statistical Analysis

We mapped spatial patterns of county-level medical debt in 2011, 2015, and 2019. We described the distribution of county-level medical debt in the study population overall and by sociodemographic and clinical factors. We further categorized county-level medical debt into quartiles and described the study population in each quartile. We also calculated the distribution of stage at diagnosis across quartiles and generated Kaplan–Meier survival curves by quartile group. Hierarchical multivariable logistic regression models were fitted to examine the association between county-level medical debt quartiles and stage IV at diagnosis (late-stage or distant metastatic diagnosis) using PROC GLIMMX in SAS, given the data structure of individuals nested within counties. The models accounted for data dependence by including fixed effects for diagnosis year, age, sex, race and ethnicity, insurance status, comorbidity score, metropolitan status, county-level SDI and MUA designation, and state of residence, and random intercepts for county to account for potential clustering effects at the county level as well as unmeasured county-specific characteristics. Similarly, hierarchical multivariable Cox proportional hazard models were fitted to estimate the associations of county-level medical debt quartiles with overall survival using PROC PHREG in SAS, adjusting for the same fixed effects and a random effect at county level. The proportional hazards assumption was confirmed by assessing the parallel log–log survival curves. *P* for trend was calculated by including the medical debt quartile as a continuous variable in the models to assess the dose–response relationship between medical debt and outcomes. Stratified analyses were conducted by cancer type and sociodemographic and clinical factors. Supplemental analyses were conducted for associations between county-level medical debt and stage I at diagnosis (early-stage diagnosis).

The maps were generated using ArcGIS 10.8.2 (ESRI), and all other analyses were conducted in SAS 9.4 (SAS Institute Inc.). All statistical tests were 2-sided, with a significance level of 0.05.

Table 1. Characteristics of Patients Newly Diagnosed With Cancer, NCDB 2011–2019

Characteristic	Total N (%)	County-Level Share of Adults With Medical Debt (Quartile)			
		0%–12.0% n (%)	12.1%–18.0% n (%)	18.1%–23.0% n (%)	23.1%–56.0% n (%)
Total, N	7,558,658	1,852,077	1,988,471	1,695,395	2,022,715
Year of diagnosis					
2011	783,648 (10.4)	169,724 (9.2)	187,009 (9.4)	183,821 (10.8)	243,094 (12.0)
2012	781,258 (10.3)	153,714 (8.3)	183,840 (9.2)	199,626 (11.8)	244,078 (12.1)
2013	803,438 (10.6)	152,418 (8.2)	198,219 (10.0)	176,334 (10.4)	276,467 (13.7)
2014	820,616 (10.9)	160,565 (8.7)	197,175 (9.9)	194,511 (11.5)	268,365 (13.3)
2015	839,112 (11.1)	176,668 (9.5)	225,164 (11.3)	182,953 (10.8)	254,327 (12.6)
2016	861,343 (11.4)	207,325 (11.2)	237,647 (12.0)	188,980 (11.1)	227,391 (11.2)
2017	881,391 (11.7)	252,992 (13.7)	233,277 (11.7)	211,521 (12.5)	183,601 (9.1)
2018	889,509 (11.8)	270,582 (14.6)	251,580 (12.7)	190,304 (11.2)	177,043 (8.8)
2019	898,343 (11.9)	308,089 (16.6)	274,560 (13.8)	167,345 (9.9)	148,349 (7.3)
Age group					
18–44 y	715,073 (9.5)	179,232 (9.7)	191,414 (9.6)	160,495 (9.5)	183,932 (9.1)
45–54 y	1,119,171 (14.8)	270,717 (14.6)	292,944 (14.7)	253,310 (14.9)	302,200 (14.9)
55–64 y	2,050,695 (27.1)	490,148 (26.5)	536,632 (27)	463,646 (27.3)	560,269 (27.7)
65–74 y	2,102,886 (27.8)	508,763 (27.5)	551,120 (27.7)	469,595 (27.7)	573,408 (28.3)
75–84 y	1,165,097 (15.4)	291,093 (15.7)	307,022 (15.4)	260,308 (15.4)	306,674 (15.2)
≥85 y	405,736 (5.4)	112,124 (6.1)	109,339 (5.5)	88,041 (5.2)	96,232 (4.8)
Sex					
Male	3,526,076 (46.6)	855,266 (46.2)	922,975 (46.4)	791,039 (46.7)	956,796 (47.3)
Female	4,032,582 (53.4)	996,811 (53.8)	1,065,496 (53.6)	904,356 (53.3)	1,065,919 (52.7)
Race and ethnicity					
Hispanic	495,821 (6.6)	121,922 (6.6)	153,468 (7.7)	106,933 (6.3)	113,498 (5.6)
Non-Hispanic Black	894,422 (11.8)	149,606 (8.1)	202,156 (10.2)	229,440 (13.5)	313,220 (15.5)
Non-Hispanic White	5,839,347 (77.3)	1,427,070 (77.1)	1,543,599 (77.6)	1,312,859 (77.4)	1,555,819 (76.9)
Non-Hispanic other	329,068 (4.4)	153,479 (8.3)	89,248 (4.5)	46,163 (2.7)	40,178 (2.0)
County level social deprivation index					
0–20 (least deprived)	1,717,763 (22.7)	717,321 (38.7)	656,680 (33.0)	260,424 (15.4)	83,338 (4.1)
21–45	2,047,516 (27.1)	575,720 (31.1)	475,038 (23.9)	536,060 (31.6)	460,698 (22.8)
45–70	1,835,734 (24.3)	237,437 (12.8)	374,273 (18.8)	430,671 (25.4)	793,353 (39.2)
71–100 (most deprived)	1,957,645 (25.9)	321,599 (17.4)	482,480 (24.3)	468,240 (27.6)	685,326 (33.9)
County HRSA designated MUA status					
No	6,451,723 (85.4)	1,758,165 (94.9)	1,807,255 (90.9)	1,447,038 (85.4)	1,439,265 (71.2)
Yes	1,106,935 (14.6)	93,912 (5.1)	181,216 (9.1)	248,357 (14.6)	583,450 (28.8)
Census division at diagnosis					
New England	431,057 (5.7)	325,537 (17.6)	72,520 (3.6)	26,862 (1.6)	6,138 (0.3)
Mid-Atlantic	1,154,395 (15.3)	544,397 (29.4)	381,581 (19.2)	189,197 (11.2)	39,220 (1.9)
East North Central	1,345,593 (17.8)	85,430 (4.6)	510,949 (25.7)	459,784 (27.1)	289,430 (14.3)
West North Central	539,885 (7.1)	249,008 (13.4)	125,025 (6.3)	89,669 (5.3)	76,183 (3.8)
South Atlantic	1,654,947 (21.9)	118,668 (6.4)	297,880 (15.0)	422,947 (24.9)	815,452 (40.3)
East South Central	505,650 (6.7)	19,805 (1.1)	61,425 (3.1)	160,614 (9.5)	263,806 (13.0)
West South Central	651,759 (8.6)	486 (0.0)	54,277 (2.7)	134,715 (7.9)	462,281 (22.9)
Mountain	342,458 (4.5)	37,906 (2.0)	124,751 (6.3)	121,162 (7.1)	58,639 (2.9)
Pacific	932,914 (12.3)	470,840 (25.4)	360,063 (18.1)	90,445 (5.3)	11,566 (0.6)
County metropolitan status in 2013					
Metro ≥1 million population	4,041,974 (53.5)	1,276,062 (68.9)	1,181,826 (59.4)	885,581 (52.2)	698,505 (34.5)
Metro <1 million population	2,405,883 (31.8)	407,752 (22.0)	576,701 (29.0)	583,140 (34.4)	838,290 (41.4)
Nonmetropolitan	1,110,801 (14.7)	168,263 (9.1)	229,944 (11.6)	226,674 (13.4)	485,920 (24.0)
Insurance status					
Uninsured	241,191 (3.2)	25,442 (1.4)	53,410 (2.7)	64,344 (3.8)	97,995 (4.8)
Private	3,215,918 (42.5)	847,188 (45.7)	870,651 (43.8)	711,889 (42.0)	786,190 (38.9)
Medicaid	586,657 (7.8)	158,664 (8.6)	154,019 (7.7)	122,625 (7.2)	151,349 (7.5)
18–64 y Medicare	388,960 (5.1)	77,240 (4.2)	92,623 (4.7)	89,851 (5.3)	129,246 (6.4)
≥65 y Medicare	3,066,844 (40.6)	734,885 (39.7)	805,392 (40.5)	691,452 (40.8)	835,115 (41.3)
Other	59,088 (0.8)	8,658 (0.5)	12,376 (0.6)	15,234 (0.9)	22,820 (1.1)
Charlson-Deyo comorbidity score					
0	5,541,392 (73.3)	1,394,292 (75.3)	1,480,958 (74.5)	1,234,678 (72.8)	1,431,464 (70.8)
1	1,303,680 (17.2)	292,889 (15.8)	324,910 (16.3)	297,292 (17.5)	388,589 (19.2)
≥2	713,586 (9.4)	164,896 (8.9)	182,603 (9.2)	163,425 (9.6)	202,662 (10.0)

(*continued on next page*)

Table 1 (cont.). Characteristics of Patients Newly Diagnosed With Cancer, NCDB 2011–2019

Characteristic	Total N (%)	County-Level Share of Adults With Medical Debt (Quartile)			
		0%–12.0% n (%)	12.1%–18.0% n (%)	18.1%–23.0% n (%)	23.1%–56.0% n (%)
Stage[a]					
I	2,496,362 (33.0)	649,331 (35.1)	664,745 (33.4)	552,265 (32.6)	630,021 (31.1)
II	1,500,783 (19.9)	359,479 (19.4)	393,916 (19.8)	339,453 (20)	407,935 (20.2)
III	1,124,732 (14.9)	266,864 (14.4)	293,435 (14.8)	254,315 (15.0)	310,118 (15.3)
IV	1,377,699 (18.2)	322,022 (17.4)	355,935 (17.9)	310,487 (18.3)	389,255 (19.2)
Not applicable	717,012 (9.5)	178,403 (9.6)	188,863 (9.5)	159,487 (9.4)	190,259 (9.4)
Unknown	342,070 (4.5)	75,987 (4.1)	91,577 (4.6)	79,388 (4.7)	95,127 (4.7)
Cancer site					
Female breast	1,320,624 (17.5)	336,426 (18.2)	352,490 (17.7)	294,232 (17.4)	337,476 (16.7)
Prostate	863,521 (11.4)	224,698 (12.1)	233,650 (11.8)	190,648 (11.2)	214,525 (10.6)
Lung	944,556 (12.5)	203,731 (11)	232,928 (11.7)	216,699 (12.8)	291,198 (14.4)
Colon and rectum	658,341 (8.7)	153,564 (8.3)	169,307 (8.5)	150,316 (8.9)	185,154 (9.2)
Thyroid	271,039 (3.6)	72,853 (3.9)	74,483 (3.7)	59,804 (3.5)	63,899 (3.2)
Melanoma	262,211 (3.5)	68,553 (3.7)	73,114 (3.7)	58,375 (3.4)	62,169 (3.1)
Non-Hodgkin lymphoma	287,578 (3.8)	75,362 (4.1)	77,349 (3.9)	62,094 (3.7)	72,773 (3.6)
Uterus	333,401 (4.4)	84,974 (4.6)	90,414 (4.5)	74,619 (4.4)	83,394 (4.1)
Kidney	305,916 (4.0)	69,043 (3.7)	77,932 (3.9)	70,122 (4.1)	88,819 (4.4)
Bladder	163,711 (2.2)	40,885 (2.2)	43,717 (2.2)	37,158 (2.2)	41,951 (2.1)
Pancreas	213,991 (2.8)	53,313 (2.9)	56,453 (2.8)	47,264 (2.8)	56,961 (2.8)
Ovary	117,584 (1.6)	29,363 (1.6)	31,453 (1.6)	26,228 (1.5)	30,540 (1.5)
Liver	127,419 (1.7)	29,636 (1.6)	31,418 (1.6)	28,595 (1.7)	37,770 (1.9)
Esophagus	80,893 (1.1)	19,076 (1)	21,334 (1.1)	18,469 (1.1)	22,014 (1.1)
Cervix	78,569 (1.0)	16,138 (0.9)	20,168 (1.0)	18,483 (1.1)	23,780 (1.2)
Oral cavity and pharynx	211,447 (2.8)	47,967 (2.6)	54,865 (2.8)	48,352 (2.9)	60,263 (3.0)
Stomach	112,679 (1.5)	29,662 (1.6)	29,743 (1.5)	24,369 (1.4)	28,905 (1.4)
Leukemia	173,929 (2.3)	43,442 (2.3)	46,288 (2.3)	38,097 (2.2)	46,102 (2.3)
Brain and other nervous system	120,571 (1.6)	29,228 (1.6)	32,552 (1.6)	27,625 (1.6)	31,166 (1.5)
Other	910,678 (12.0)	224,163 (12.1)	238,813 (12.0)	203,846 (12.0)	243,856 (12.1)

Chi-square tests comparing county-level medical debt quartiles across characteristic groups were all significant ($P<.001$).
Abbreviations: HRSA, Health Resources and Services Administration; metro, metropolitan; MUA, Medically Underserved Area; NCDB, National Cancer Database.
[a] Stage 1 category includes stage 0 bladder cancer; unknown stage includes a small number of cases of occult lung cancer.

Results

Among the 7,558,658 adults newly diagnosed with cancer in 2011–2019, 51.4% were aged 18–64 years, 53.4% were female, 77.3% were non-Hispanic White, 11.8% were non-Hispanic Black, and 6.6% were Hispanic. Upon diagnosis, 42.5% had private insurance, 40.6% were age ≥65 years and insured by Medicare, 7.8% had Medicaid, and 3.2% were uninsured. Moreover, 14.7% of the patients were from nonmetropolitan areas, and 14.6% of the patients lived in a county with a MUA designation. Furthermore, 33% of patients were diagnosed with stage I disease, 73.3% had Charlson-Deyo comorbidity score of 0, and half of patients (50.1%) were diagnosed with cancers of female breast, prostate, lung, colon or rectum. (Table 1)

As shown on the maps (Figure 1), although medical debt in collections affected counties nationwide, the counties bearing the highest medical debt burden were concentrated in the Southern states, and the burden appeared to be declining since 2015. The county-level share of adults with medical debt for patients with cancer ranged from 0% to 56.0%, with an average of 18.0% and a median of 17.9% (Table 1, Supplementary Table S1). The mean and median county-level medical debt for patients decreased after 2015, and the highest county-level medical debt level was seen for patients who were non-Hispanic Black, uninsured, and living in nonmetropolitan areas and Southern regions; moreover, higher county-level medical debt appeared to be correlated with MUA status and higher county-level SDI (Table 1, Supplementary Table S1).

A strong correlation was observed between higher county-level medical debt and a lower proportion of early-stage diagnoses, along with a higher percentage of late-stage diagnoses at presentation. For example, in counties with the lowest share (0%–12.0%) of adults with medical debt in collections, 38.8% of patients with cancer were diagnosed with stage I disease and 19.2% were diagnosed with stage IV disease; in contrast, in counties with the highest share (23.1%–56.0%) of adults with medical debt in collections, only 34.4% patients were diagnosed with stage I disease and 21.2% were diagnosed with stage IV disease (Figure 2A). In adjusted analyses, associations of county-level medical debt translated to an odds ratio (OR) of 0.951 (95% CI, 0.940–0.962) for stage I at diagnosis and an OR of 1.079 (95% CI, 1.064–1.094) for stage IV at diagnosis in the counties with the highest medical debt compared with the counties with the lowest medical debt, and a strong dose–response relationship between county-level medical debt and stage at diagnosis was observed (P for trend $<.001$; Figure 3A, Supplementary Tables S2 and S3). When stratified by cancer type, a strong dose–response relationship between higher county-level medical debt and higher odds of stage IV diagnosis was observed for 15 of 17 major cancer types in unadjusted analyses and remained statistically significant for prostate, lung, thyroid, bladder, and oral cavity and pharynx

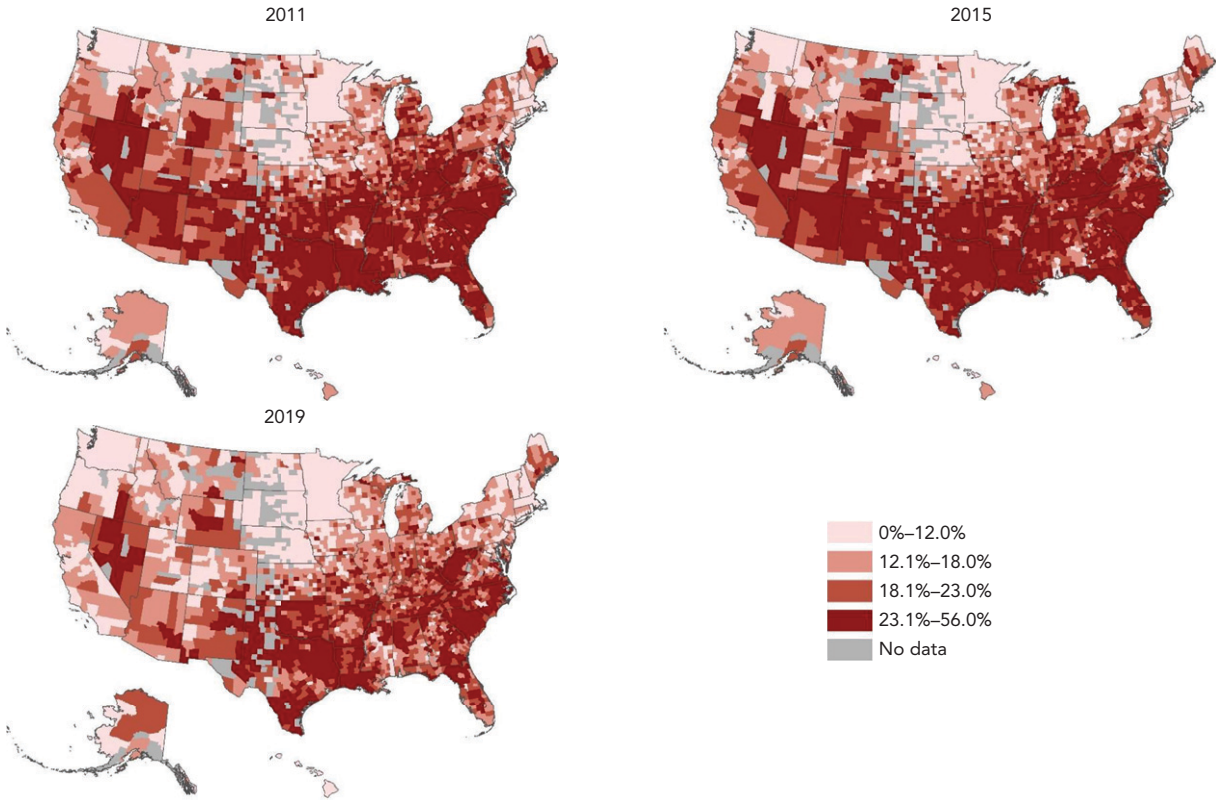

Figure 1. County-level share of adults with medical debt in collections, based on the Urban Institute Credit Bureau Panel, 2011–2019.

cancers after adjustment for sociodemographic and clinical factors and county-level clustering (Figure 3A, Supplementary Table S2). When stratified by sociodemographic factors, the dose–response relationship between medical debt and stage at diagnosis was consistent across all subgroups (Figure 3B, Supplementary Table S3).

Patients living in counties with the lowest share (0%–12.0%) of adults with medical debt in collections had the best survival, whereas those living in counties with the highest medical debt (23.1%–56.0%) had the worst survival. The 5-year survival rates were 66.3%, 63.4%, 61.2%, and 58.6% for the first (lowest), second, third, and fourth (highest) quartiles of county-level medical debt, respectively (Figure 2B). After adjusting for sociodemographic and clinical factors, patients living in the counties with the highest medical debt had a 7% increased risk of death compared with those living in the counties with the lowest medical debt (hazard ratio, 1.072; 95% CI, 1.061–1.082), with a strong dose–response relationship between county-level medical debt and survival (P for trend $<.001$; Figure 4A, Supplementary Table S4). Patterns were consistent when stratified by cancer type or sociodemographic and clinical factors (Figure 4, Supplementary Tables S4 and S5).

Discussion

Using nationwide cancer registry data combined with newly available county-level medical debt information, we identified strong associations between a higher county-level share of adults with medical debt in collections in a patient's county of residence and later-stage cancer at diagnosis and worse survival in the United States. The associations were observed among major cancer types and were consistent across subpopulations of different sociodemographic and clinical characteristics, even after adjusting for county-level social deprivation and availability of health care resources. The association between county-level medical debt and late-stage diagnosis of certain cancer types with established screening services and/or early signs and symptoms suggests a potential role for county-level medical debt in limiting access to preventive care. Taken together, our findings suggest that policies and programs that either directly prevent or mitigate medical debt, or that structurally promote economic development in vulnerable communities and thereby strengthen residents' financial resilience, have the potential to improve access to affordable care and further enhance cancer outcomes and health equity. Conversely, current and future policies that reduce health insurance coverage, cut safety-net programs, or weaken regional economic conditions may increase risk of medical debt, undermine progress and widen disparities in cancer care and outcomes in the United States.

Affordable, high-quality, comprehensive health insurance coverage is essential for protecting individuals from medical debt. Insurance coverage is one of the strongest determinants of access to care and reduced likelihood of medical financial hardship in the United States, both in the general population and among cancer survivors.[5,23] Urban Institute research has shown that counties with the highest rates of medical debt also have high shares of uninsured individuals.[9] In our cohort of patients newly diagnosed with cancer, uninsured individuals tended to live in counties with the highest medical debt. Notably,

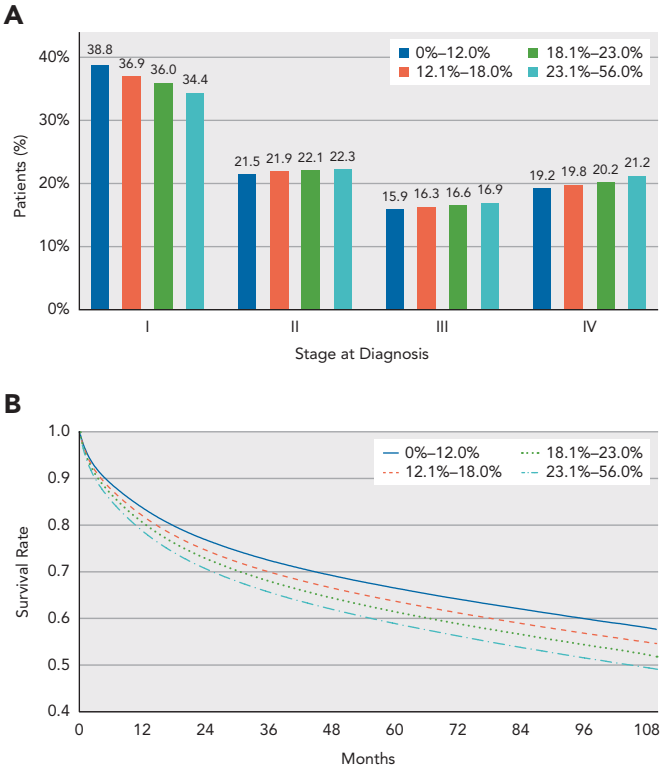

Figure 2. **(A)** Stage at diagnosis and **(B)** survival by county-level medical debt quartile among patients newly diagnosed with cancer, using the National Cancer Database, 2011-2019.

we observed that county-level medical debt began to decline in 2015, which may be attributable, in part, to the implementation of the Affordable Care Act (ACA) in 2014.[24,25] Under the ACA, Medicaid expansion and the creation of the Health Insurance Marketplace, which offers subsidized individual health insurance plans that meet ACA requirements, have been shown to increase insurance coverage rates and improve care affordability, particularly among low-income and medically vulnerable populations, including patients with cancer and cancer survivors.[26–28] Furthermore, prior research has shown that Medicaid expansion was associated with reductions in medical debt.[8]

Although having health insurance significantly improves access to care and alleviates financial hardship, it does not eliminate the risk of medical debt. For example, in the 2023 ACS-CAN Survivor Views study of a predominantly insured sample of cancer survivors, medical debt was common, especially among survivors enrolled in high-deductible health plans without a health savings account.[1,2] Consumers with short-term, limited-duration (STLD) health plans, which are exempt from ACA's comprehensive coverage requirements and may not cover cancer screenings, often face overwhelming medical costs and can incur thousands of dollars in medical debt when unexpected health circumstances arise.[29] Policies focusing on the quality of health insurance, such as high-deductible health plans without a health savings account and STLD health plans, may help address medical debt.

Policies regulating physician, hospital, and health care system billing and collection practices may affect the burden of medical debt in an area. Past-due hospital bills have been reported to be a main source of medical debt,[30] especially when hospitals send bills to collections, file reports with credit agencies, place liens or foreclose on homes, and garnish wages. Hospital and health care systems can instead play an important role in preventing and alleviating patients' medical debt by providing financial navigation and enrolling patients in financial assistance programs,[31] and these individual-level interventions may be especially effective when implemented in states with policies that mitigate structural determinants. Some states have enacted policies that require hospitals to maintain financial assistance programs and establish minimum standards for those programs; streamline screening and application processes for financial assistance; require hospitals to offer payment plans; cap interest on medical debt; restrict debt collection practices; and require hospitals to report data on financial assistance.[13,32] However, early assessment of these policies revealed limited impact and highlighted challenges, and future evaluations are warranted.[32]

Beyond policies that expand health insurance coverage and improve care affordability, addressing the upstream and structural determinants of medical debt represents a more fundamental, albeit more challenging, approach. As shown in our analyses, county-level SDI and medical debt were highly correlated, suggesting that policies and programs promoting regional economic development, such as sustained investments, job skills training programs, and tax incentives in socioeconomically vulnerable areas, may play an important role in promoting household financial resilience, thus mitigating medical debt and advancing health outcomes over the long term.

Although we did not use data from 2020 onward to avoid confounding from the effects of the COVID-19 pandemic on economic stability and cancer outcomes,[33–35] the policy landscape has since changed. In 2022, the Consumer Financial Protection Bureau (CFPB) and the 3 nationwide credit reporting companies introduced several policies, including removing paid medical collections from credit reports, extending the grace period before unpaid medical debt appears on credit reports from 6 months to 1 year, excluding medical debt in collections from VantageScore calculations, and removing medical collections <$500 from consumer credit reports.[18,36] Although consumers still owe their medical debts, these changes substantially reduced the number of Americans with medical debt in collections reported on their credit files and improved their credit scores.[18] These changes were notable because credit reports are frequently used as part of employment, home loan, and car loan applications; historically individuals with poor credit scores faced challenges with employment and higher loan interest rates. In 2024, rulemaking prohibited medical debt from being included on credit reports and called on states and localities to take further actions to reduce medical debt.[37] More recently, however, the exclusion of medical debt from credit reports was reversed, and the future of other initiatives is uncertain following reductions in the size and scope of the CFPB.[38] Additionally, in 2025, the US Congress passed legislation that included significant federal funding cuts to Medicaid and added work requirements for some Medicaid recipients, and allowed enhanced premium subsidies for ACA Marketplace coverage to expire. Collectively, these changes are expected to dramatically increase the number of uninsured individuals, reduce

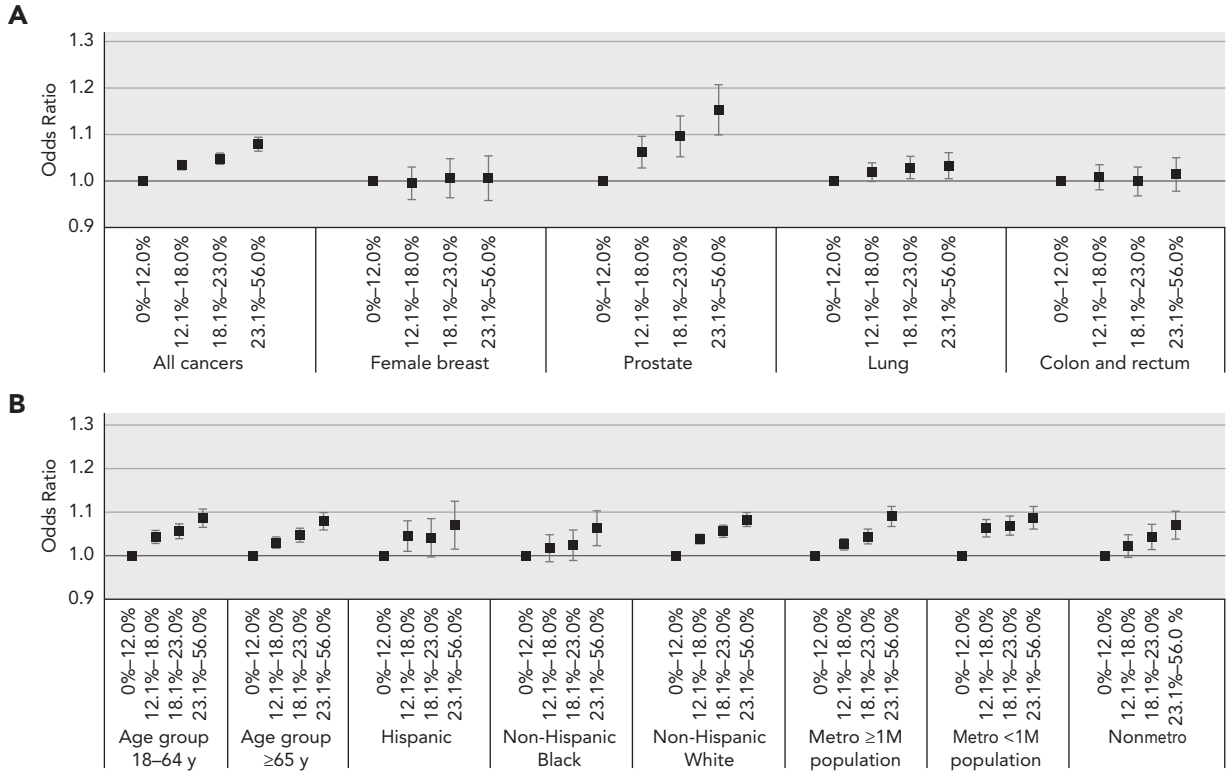

Figure 3. Adjusted odds ratios for the association of county-level medical debt quartile with stage IV diagnosis by **(A)** major cancer type and **(B)** sociodemographic factors, using the National Cancer Database, 2011–2019. Hierarchical multivariable logistic models accounted for data dependency by including fixed effects for diagnosis year, age, sex, race and ethnicity, insurance status, comorbidity score, metropolitan status, county-level SDI and MUA designation, and state of residence, as well as a random effect for county to account for potential clustering and unmeasured county-specific characteristics.
Abbreviations: 1M, one million; HRSA, Health Resources and Services Administration; metro, metropolitan; MUA, Medically Underserved Area; SDI, Social Deprivation Index.

access to care, and increase prevalence and amount of medical debt.[39] Future research examining the effects of recent and ongoing policy changes related to medical debt on health outcomes and equity is warranted.

Our study has several limitations. First, the NCDB is not population-based, which may limit the generalizability of the findings to patients treated in community settings. However, the database includes all 50 states and DC and captures approximately 70% of newly diagnosed cancer cases in the United States. Demographic and clinical characteristics are also largely similar to those of cases reported in population-based cancer registries.[40] Second, the NCDB does not collect cause of death; thus, we were unable to evaluate cancer-specific survival in relation to medical debt. Third, our medical debt statistics were based on only consumers with established credit records and may not include some of the most financially vulnerable populations, such as undocumented immigrants and individuals with a history of incarceration, potentially leading to an underestimation of medical debt prevalence.[41] Additionally, we used medical debt at the county level, the smallest geographic unit available in the data. Fourth, we did not consider the amount of county-level medical debt because it was not reported for approximately one-third of counties, which were likely to be wealthier and/or less populous. Fifth, although we controlled for various patient characteristics and county-level indicators for socioeconomic status and health care resources in hierarchical models, the associations may still be affected by unmeasured confounders. To account for unmeasured county-specific characteristics and potential clustering effects at the county level, we included a county-level random effect in our models. This may partially absorb variation in county-level medical debt and could lead to an underestimation of the associations between county-level medical debt and cancer outcomes. Nonetheless, we still observed robust and strong associations between medical debt and cancer outcomes. Lastly, county-level medical debt in collections was measured at the time of cancer diagnosis; however, because medical debt collections are typically pursued 6 months after a payment is due, the occurrence of medical debt in the county predates both the cancer diagnosis and survival outcomes in our sample. As with all observational studies, we cannot infer causality between our exposure—the share of medical debt in collections—and cancer outcomes. Furthermore, future studies are warranted to examine how area-level medical debt may interact with environmental exposures (eg, landfills, radon, coal mining), which are more common in socioeconomically vulnerable communities, and their relationships with cancer risk using population-based cancer incidence data.

Conclusions

Using national cancer registry data and newly available medical debt information, we identified strong associations of higher county-level medical debt with more advanced cancer diagnoses and worse survival, consistent across socioeconomics and clinical subgroups. Future research is warranted to evaluate the effects of recent and ongoing policy changes on medical debt. Studies using individual-level medical debt data to assess its

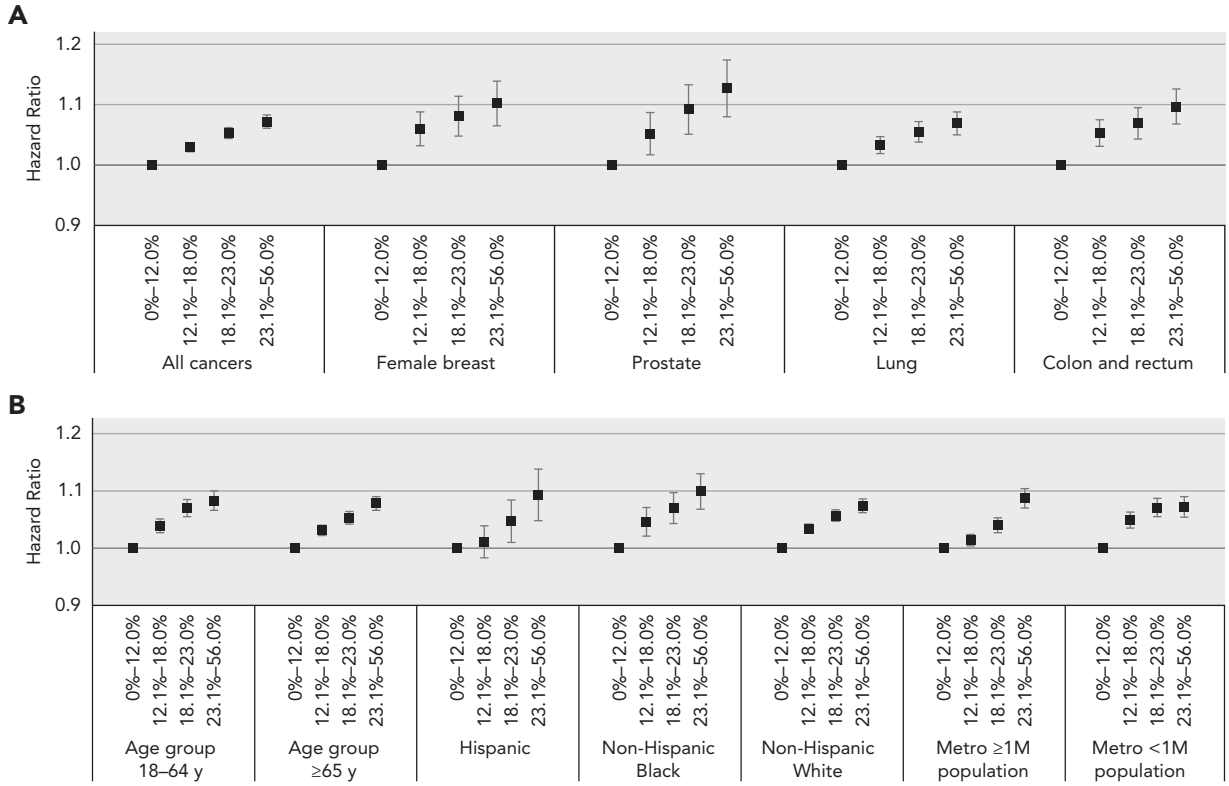

Figure 4. Adjusted hazard ratios for the association of county-level medical debt quartile with risk of death by **(A)** major cancer type and **(B)** sociodemographic and clinical factors, using the National Cancer Database, 2011–2019. Hierarchical multivariable Cox proportional hazard models accounted for data dependency by including fixed effects for diagnosis year, age, sex, race and ethnicity, insurance status, comorbidity score, metropolitan status, county-level SDI and MUA designation, and state of residence, as well as a random effect for county to account for potential clustering and unmeasured county-specific characteristics.
Abbreviations: 1M, one million; HRSA, Health Resources and Services Administration; MUA, Medically Underserved Area; SDI, Social Deprivation Index.

impact across the cancer care continuum are also needed to inform future policy reforms and clinical practices, with the goal of improving access to affordable care and cancer outcomes.

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References

1. American Cancer Society Cancer Action Network. Survivor views: cancer & medical debt. February 2022 survey findings summary. Accessed October 16, 2024. Available at: https://www.fightcancer.org/sites/default/files/national_documents/survivor_views_cancer_debt_0.pdf
2. Burki T. Medical debt of people with cancer in the USA. Lancet Oncol 2024;25:e235.
3. Ramsey SD, Bansal A, Fedorenko CR, et al. Financial insolvency as a risk factor for early mortality among patients with cancer. J Clin Oncol 2016;34:980–986.
4. Zheng Z, Yu S, Islami F, et al. Natural language processing-assessed unmet medical and social needs in cancer crowdfunding stories. JAMA Oncol 2024;10:1726–1728.
5. Yabroff KR, Han X, Song W, et al. Association of medical financial hardship and mortality among cancer survivors in the United States. J Natl Cancer Inst 2022;114:863–870.
6. Warren JL, Mariotto AB, Stevens J, et al. Association of major adverse financial events and later-stage cancer diagnosis in the United States. J Clin Oncol 2024;42:1001–1010.
7. Mendes de Leon CF, Griggs JJ. Medical debt as a social determinant of health. JAMA 2021;326:228–229.
8. Kluender R, Mahoney N, Wong F, Yin W. Medical debt in the US, 2009–2020. JAMA 2021;326:250–256.
9. Blavin F, Braga B, Gangopadhyaya A. Which County Characteristics Predict Medical Debt? Urban Institute; 2022.

10. Han X, Hu X, Zheng Z, et al. Associations of medical debt with health status, premature death, and mortality in the US. JAMA Netw Open 2024;7:e2354766.
11. Uppal N, Woolhandler S, Himmelstein DU. Alleviating medical debt in the United States. N Engl J Med 2023;389:871–873.
12. Levitt L. Medical debt-the canary in the coal mine for health care affordability. JAMA Health Forum 2024;5:e243368.
13. The Commonwealth Fund. State Protections Against Medical Debt. Accessed October 29, 2024. Available at: https://www.commonwealthfund.org/publications/maps-and-interactives/state-protections-against-medical-debt
14. Banegas MP, Guy GP, de Moor JS, et al. For working-age cancer survivors, medical debt and bankruptcy create financial hardships. Health Aff (Millwood) 2016;35:54–61.
15. Hanly P, Maguire R, Ceilleachair AO, Sharp L. Financial hardship associated with colorectal cancer survivorship: the role of asset depletion and debt accumulation. Psychooncology 2018;27:2165–2171.
16. Palis BE, Janczewski LM, Browner AE, et al. The National Cancer Database conforms to the standardized framework for registry and data quality. Ann Surg Oncol 2024;31:5546–5559.
17. American College of Surgeons. National Cancer Database. Accessed October 16, 2024. Available at: https://www.facs.org/quality-programs/cancer-programs/national-cancer-database/
18. Urban Institute. The changing medical debt landscape in the United States. Accessed October 16, 2024. Available at: https://apps.urban.org/features/medical-debt-over-time/
19. Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. J Clin Epidemiol 1992;45:613–619.
20. US Department of Agriculture Economic Research Service. Rural-Urban Continuum Codes. Accessed October 22, 2024. Available at: https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/
21. Agency for Healthcare Research and Quality. Social Determinants of Health Database. Accessed October 22, 2024. Available at: https://www.ahrq.gov/sdoh/data-analytics/sdoh-data.html
22. Robert Graham Center. Social Deprivation Index (SDI). Accessed October 22, 2024. Available at: https://www.graham-center.org/evidence-based-research/featured-work/social-deprivation-index
23. Yabroff KR, Zhao J, Han X, Zheng Z. Prevalence and correlates of medical financial hardship in the USA. J Gen Intern Med 2019;34:1494–1502.
24. Caswell KJ, Waidmann TA. The Affordable Care Act Medicaid expansions and personal finance. Med Care Res Rev 2019;76:538–571.
25. Hu L, Kaestner R, Mazumder B, et al. The effect of the Affordable Care Act Medicaid expansions on financial wellbeing. J Public Econ 2018;163:99–112.
26. Han X, Jemal A, Zheng Z, et al. Changes in noninsurance and care unaffordability among cancer survivors following the Affordable Care Act. J Natl Cancer Inst 2020;112:688–697.
27. Zhao J, Mao Z, Fedewa SA, et al. The Affordable Care Act and access to care across the cancer control continuum: a review at 10 years. CA Cancer J Clin 2020;70:165–181.
28. Sommers BD. Health insurance coverage: what comes after the ACA? Health Aff (Millwood) 2020;39:502–508.
29. Baron Z. Lawsuit challenges administration requirements for short-term limited duration plans. Accessed April 28, 2026. Available at: https://www.healthaffairs.org/content/forefront/lawsuit-challenges-administration-requirements-short-term-limited-duration-plans
30. Karpman M. Most adults with past-due medical debt owe money to hospitals. Accessed April 28, 2026. Available at: https://www.urban.org/research/publication/most-adults-past-due-medical-debt-owe-money-hospitals
31. American Cancer Society Cancer Action Network. Medical debt and cancer. Accessed October 29, 2024. Available at: https://www.fightcancer.org/policy-resources/medical-debt-and-cancer
32. Karpman M, Wengle E, Blavin F, Morriss S. Early experiences with state medical debt protection laws. Accessed April 28, 2026. Available at: https://www.urban.org/research/publication/early-experiences-state-medical-debt-protection-laws
33. Han X, Yang NN, Nogueira L, et al. Changes in cancer diagnoses and stage distribution during the first year of the COVID-19 pandemic in the USA: a cross-sectional nationwide assessment. Lancet Oncol 2023;24:855–867.
34. Nogueira LM, Schafer EJ, Fan Q, et al. Assessment of changes in cancer treatment during the first year of the COVID-19 pandemic in the US. JAMA Oncol 2024;10:109–114.
35. Fulford S, Jain S, Li G, et al. Making Ends Meet in 2022: insights from the CFPB Making Ends Meet survey. Accessed April 28, 2026. Available at: https://files.consumerfinance.gov/f/documents/cfpb_making-ends-meet-in-2022_report_2022-12.pdf
36. Blavin F, Braga B, Karpman M. Medical debt was erased from credit records for most consumers, potentially improving many Americans' lives. Accessed April 28, 2026. Available at: https://www.urban.org/urban-wire/medical-debt-was-erased-credit-records-most-consumers-potentially-improving-many
37. The American Presidency Project. FACT SHEET: Vice President Harris announces proposal to prohibit medical bills from being included on credit reports and calls on states and localities to take further actions to reduce medical debt. Accessed October 29, 2024. Available at: https://www.presidency.ucsb.edu/documents/fact-sheet-vice-president-harris-announces-proposal-prohibit-medical-bills-from-being
38. Wise A. Americans' medical debt can stay in credit reports, judge rules. What does that mean? Accessed October 29, 2024. Available at: https://www.npr.org/2025/07/15/nx-s1-5468438/medical-debt-credit-reports-ruling
39. Gaffney A, Himmelstein DU, Woolhandler S. Projected effects of proposed cuts in federal Medicaid expenditures on Medicaid enrollment, uninsurance, health care, and health. Ann Intern Med 2025;178:1334–1342.
40. Mallin K, Browner A, Palis B, et al. Incident cases captured in the National Cancer Database compared with those in U.S. population based central cancer registries in 2012-2014. Ann Surg Oncol 2019;26:1604–1612.
41. Brevoort KP, Grimm P, Kambara M. Credit invisibles and the unscored. Cityscape 2016;18:9–34.