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Cancer pain in relation to metropolitan area segregation and nursing home racial/ethnic composition

Bill M. Jesdale, PhD^a, Deborah S. Mack, MS^a, Sarah N. Forrester, PhD^a, Kate L. Lapane, PhD^a

^aPopulation and Quantitative Health Sciences, University of Massachusetts Medical School, 55 Lake Avenue North, Worcester, MA, USA

Abstract

Objectives: To estimate pain reporting among residents with cancer in relation to metropolitan area segregation and NH racial/ethnic composition.

Design: Cross-sectional study.

Setting and Participants: 383,757 newly admitted Black (B), Hispanic (H), or White (W) residents with cancer in 12,096 US NHs (2011–2013)

Methods: Using the Minimum Data Set 3.0, pain in past 5 days was determined by self-report or use of pain management. Theil's entropy index, a measure of metropolitan area segregation, was categorized [high (up to 0.20), very high (0.20–0.30), or extreme (0.30–0.53)].

Results: Pain prevalence decreased across segregation level [Black: high: 77%, very high: 75%, extreme: 72%; Hispanic: high: 79%, very high: 77%, extreme: 70%; White: high: 80%, very high: 77%, extreme: 74%]. In extremely segregated areas, all residents were less likely to have recorded pain (adjusted prevalence ratios: B: 4.6% less likely, 95% Confidence interval (CI): 3.1%–6.1%; H: 6.9% less likely, 95% CI: 4.2%–9.6%; W: 7.4% less likely, 95% CI: 6.5%–8.2%) than in the least segregated areas. At all segregation levels, pain was recorded more frequently for residents (B or W) in predominantly White (>80%) NHs than in mostly Black (>50%) NHs or residents (H or W) in predominantly White NHs than mostly Hispanic (>50%) NHs.

Conclusions and Implications: We observed decreased pain recording in metropolitan areas with greater racial/ethnic segregation. This may occur through the inequitable distribution of resources between NHs, resident-provider empathy, provider implicit bias, resident trust, and other factors.

Brief Summary:

This study finds that Black, Hispanic, and White nursing home residents with cancer report pain less frequently in more segregated metropolitan areas, potentially reflecting unequal resource distribution.

Keywords

cancer; nursing homes; racial/ethnic segregation; pain

Introduction

Racial/ethnic neighborhood segregation, measured at the metropolitan area level, reflects the degree to which racial/ethnic hierarchy has informed residential living patterns.¹⁻³ These patterns tend to be maintained into the present,^{4,5} with ramifications for investments in medical care,⁶⁻⁸ schooling,^{9,10} policing,¹¹ and environmental amenities.¹²

Resource allocation across nursing homes is likely more unequal in settings with greater social separation between racial/ethnic groups.¹³ Nursing home racial/ethnic composition may affect care quality, with nursing homes mostly occupied by Black and/or Hispanic residents under-resourced relative to homes with predominantly White residents.¹⁴ We expect residential segregation to be reiterated within nursing homes and that resource allocation is influenced by structural racial biases.

Nursing homes remain an important healthcare setting for older adults with cancer; approximately ten percent of residents have cancer.¹⁵ Pain is commonly experienced among residents with cancer.¹⁵⁻¹⁹ Twenty years have passed since the first major report on racial/ethnic disparities in cancer pain prevalence and management in US nursing homes.²⁰ Recent studies document that racial/ethnic disparities persist.²¹ Nursing homes are highly racially segregated,¹³ and adverse impacts of racial segregation on Black and Hispanic nursing home residents have been reported.^{9,22}

Racial/ethnic disparities in pain among nursing home residents with cancer may be affected by resident, provider, and resident-provider interaction factors.²³ Black and Hispanic residents with cancer acclimated to a racially hostile social environment may downplay pain to avoid “standing out”.²⁴ Black and Hispanic residents responding to a lifetime of discrimination in and outside healthcare settings may self-censor to avoid stereotype threat, or may not feel entitled to demand adequate treatment for pain.²⁵ Providers, informed by implicit biases, may evoke fewer experiences of pain from Black and Hispanic residents,^{26,27} perhaps from social distance fostered in a segregated social milieu. Racial/ethnic “match” between residents and care staff may not overcome implicit biases.²⁸ Providers may even have biases about racially differential “pain thresholds”, and in a more segregated setting have less incentive to question this dangerous myth.^{29,30} Trust between residents and staff may be influenced by racial/ethnic relations in and outside the nursing home setting; lack of trust may influence how Black and Hispanic residents express pain to providers.³¹

The study sought to examine the relationship between racial/ethnic segregation and nursing home racial/ethnic composition to pain reporting in residents with cancer and to provide exploratory analyses on potential mediating pathways. We hypothesize 1) Black and Hispanic residents are less likely to have pain documented in more segregated metropolitan areas; and 2) pain documentation among Black, Hispanic, and White residents with cancer

will be lowest in mostly Black or mostly Hispanic nursing homes, and highest in predominantly White nursing homes.

Methods

The University of Massachusetts Medical School Institutional Review Board approved the study.

Data Sources

The Minimum Data Set 3.0 (MDS) is a comprehensive resident-level assessment conducted in US nursing homes.³² We identified newly admitted residents with cancer from 1/1/2011 to 12/31/2013 with assessed pain. Covariates (detailed below) included demographics and potentially painful conditions. We matched these data to neighborhood racial/ethnic segregation within metropolitan areas from Census data, and to nursing home-level measures from the Nursing Home Compare and Provider of Services files from the Centers for Medicare and Medicaid Services.

Study Population

The study population consisted of 384,048 newly admitted adult residents of 12,096 nursing homes in the United States and Puerto Rico who: 1) had an active cancer diagnosis, 2) had pain assessed, 3) were Hispanic of any race, non-Hispanic White, or non-Hispanic Black, 4) lived in a nursing home with at least 10 residents of known race/ethnicity, 5) in a metropolitan area,³³ 6) were able to make themselves understood (MDS item B0700 “Ability to express ideas and wants, consider both verbal and non-verbal expression” coded as “Understood”), and 7) had complete information on resident- and nursing home-level covariates. We restricted the analysis to Hispanic, non-Hispanic Black, and non-Hispanic White residents because these groups were widespread across metropolitan areas. We excluded nursing homes with populations who were mostly Asian, American Indian or Alaska Native, Native Hawaiian or other Pacific Islander, or multiracial. A flow chart describing population sizes at each of these stages is shown in Figure 1.

Pain Prevalence

We used MDS item J0300 and items J0100 (a, b, and c) to create a binary variable indicating reported pain. Inter-rater agreement between staff nurses and gold-standard research nurses indicates excellent reliability ($\kappa > 0.92$).³⁴ For residents able to self-report (90%)³⁵, staff asked “Have you had pain or hurting at any time in the last 5 days?”. Affirmative answers indicated reported pain. Residents receiving non-medication intervention for pain (J0100c), scheduled pain medication (J0100a), or as needed pain medication (J0100b) in the 5 days before assessment (completed by nurses based on medical record review) were considered to have reported pain. Residents with non-missing information for all items were included.

Race/ethnicity

Race/ethnicity is collected on MDS item A1000 (a through f). The person administering the assessment is instructed to ask the resident or their proxy which racial/ethnic identifier “most closely corresponds to his or her race/ethnicity” and to check all that apply.³²

Metropolitan Area Segregation

We used Theil's entropy index to measure metropolitan area-level segregation across census tracts from the 2010 Census. Theil's index measures unevenness, summarizing the degree to which racial/ethnic distributions within neighborhoods departs from the racial/ethnic distribution of a metropolitan area.³⁶

$$H = \frac{1}{E} \sum_{m=1}^M \Pi_m \sum_{j=1}^J \frac{t_j}{T} \left(\frac{\pi_{jm}}{\Pi_m} \ln \left(\frac{\pi_{jm}}{\Pi_m} \right) \right)$$

$$E = \sum_{m=1}^M \Pi_m \ln \left(\frac{1}{\Pi_m} \right)$$

Theil's Entropy Index (H) is calculated by summing across 7 racial/ethnic groups (m) across census tracts (j) in a metropolitan area, where t_j is the number of residents in tract j , T the number of residents in the metropolitan area, π_{jm} the proportion of residents of race/ethnicity m in tract j , and Π_m the proportion of residents in the metropolitan area of race/ethnicity m .

The lowest entropy index is 0 (all tracts in a metropolitan area have the same racial/ethnic distribution); the highest is 1, (each tract is occupied by members of one group). We arbitrarily classified metropolitan areas as highly segregated (entropy index <0.20), very highly segregated (0.20 to 0.30), or extremely segregated (0.30 to 0.45), using round number cutpoints near tertiles of the Black and Hispanic population.

On-line Appendix Table 1 shows select demographics of metropolitan areas in each segregation level. Larger metropolitan areas tend to be more segregated, as do those with larger Black populations, and those in the North central and Northeast regions.

Nursing Home Racial/Ethnic Composition

We characterized the racial/ethnic composition of nursing homes in each quarter by collapsing all assessments (Prospective Payment System, admission, quarterly, annual, and significant change in status assessments), randomly selecting one assessment (regardless of eligibility for this cancer pain analysis). We classified nursing homes into four mutually exclusive categories: predominantly White (>80% White residents), mostly Black (>50% Black residents), mostly Hispanic (>50% Hispanic residents), or integrated (<80% White, and <50% of any other racial/ethnic group). These categories represent arbitrary cutpoints intended to be readily interpretable.

Resident-level Covariates

We considered the following covariates: resident sex, age (19–64, 65–74, 75–84, 85 and older), activities of daily living,³² Cognitive Function Score (intact, mildly, moderately, or severely impaired),³⁷ and life expectancy under 6 months. Potentially painful non-cancer conditions included: heart failure, respiratory failure, ulcerative colitis, wound infection,

arthritis, osteoporosis, hip fracture, other fracture, mouth pain, high grade pressure ulcer, foot problems, surgical wounds, other open lesions, and burns.

Analytic Approach

Our theoretical framework rests on the supposition that racial/ethnic disparities in pain prevalence are largely due to reporting of pain, rather than the experience of pain. We estimated the prevalence of documented pain among Blacks, Hispanics, and Whites across metropolitan area segregation; and within levels of segregation across nursing home racial/ethnic composition. We adjusted for predictors of pain we judged unlikely to be the result of metropolitan area segregation or nursing home racial/ethnic composition. We used a Poisson model to estimate prevalence ratios directly,³⁸ with a generalized estimating equation specification (exchangeable correlation matrix), to adjust for within-home correlation between residents. Using a nested model, we included race/ethnicity as a main effect and an interaction between race/ethnicity and the categorical segregation variable, with highly segregated as the reference group. We then nested nursing home racial/ethnic composition (mostly Black, mostly Hispanic, or integrated, relative to predominantly White) within metropolitan area segregation.

Sensitivity Analysis

We conducted two sensitivity analyses. Metropolitan areas with smaller populations tend to be predominantly White, and less highly segregated. We performed a subset analysis restricted to metropolitan areas with at least 250,000 population. Second, Puerto Rico's history is quite different from that of the continental United States, we performed a subset analysis excluding Puerto Rico.

Results

Overall, 77% of adult nursing home residents with cancer had documented pain at admission (Table 1). Seventy-five percent of Blacks, 75% of Hispanics, and 78% of Whites reported pain. Pain was reported for 81% of women, 73% of men, 87% of residents aged <65 years, and 71% of those aged ≥ 65 years. In the least segregated metropolitan areas, 80% of residents with cancer reported pain, whereas in the most segregated metropolitan areas 73% of residents did. Seventy-nine percent of residents living in nursing homes with a predominantly White population reported pain, as did 75% of residents living in integrated nursing homes, 72% in mostly Black nursing homes, and 67% in mostly Hispanic nursing homes. While 80% of residents with intact cognitive function reported pain, 75% of residents with mild, 66% of residents with moderate, and 72% of residents with severe cognitive function reported pain. Eighty-seven percent of residents with a limited life expectancy reported pain. Reported pain was more common than the overall average of 77% in many of the potentially painful non-cancer conditions we considered (bowel disease, wound infection, arthritis, osteoporosis, fractures, mouth pain, high grade pressure ulcer, foot problems, open lesions, surgical wounds, and burns), but not all (heart failure, respiratory failure; Table 2).

In unadjusted analyses (Table 3), pain reporting decreased as metropolitan area segregation increased, for Blacks (high: 77%; very high: 75%; extreme: 72%), Hispanics (high: 79%; very high: 77%; extreme: 70%) and Whites (high: 80%; very high: 77%; extreme: 74%). Within each category of metropolitan area segregation, Blacks were least likely to report pain in mostly Black nursing homes (extreme segregation: 69%; high segregation: 76%), somewhat more likely in integrated nursing homes (extreme: 74%; high: 76%), and most likely to have documented pain in predominantly White nursing homes (extreme: 77%; very high: 79%). Similarly, Hispanic residents were least likely to report pain in mostly Hispanic nursing homes (extreme: 57%; very high: 71%), somewhat more likely in integrated nursing homes (extreme: 72%; high: 79%), and most likely in predominantly White nursing homes (extreme: 78%; high: 83%). Among White residents, reported pain was also highest in predominantly White nursing homes (extreme: 75%; high: 81%), and lowest in mostly Hispanic nursing homes (very high: 66%; high: 73%).

After adjustment for resident sex, age, cognitive function, ADL, life expectancy under 6 months, and potentially painful conditions, these patterns remain (Table 4). In extremely segregated metropolitan areas, Black residents were 0.954 times as likely (4.6% less likely) to report pain (95% CI: 3.1% to 6.1% less likely), Hispanic residents 0.931 times as likely (6.9% less likely; 95% CI: 4.2% to 9.6% less likely), and White residents 0.926 times as likely (7.4% less likely; 95% CI: 6.5% to 8.2% less likely) than in the least segregated metropolitan areas. Within similarly segregated metropolitan areas, Black residents of mostly Black nursing homes reported pain less often than Black residents of predominantly White nursing homes (2.3% to 7.8% less likely). Hispanic residents of mostly Hispanic nursing homes were also less likely to report pain (8.0% to 21.7% less likely) than Hispanic residents of predominantly White nursing homes. Whites in mostly Black nursing homes also had a lower likelihood of reporting pain (6.0% to 2.1% less likely) than Whites in predominantly White nursing homes, as did Whites in mostly Hispanic nursing homes (7.1% to 11.1% less likely), and Whites in integrated nursing homes (2.9% to 6.1% less likely).

Several additional factors not considered may lie on causal paths of interest; namely resident characteristics that may alter the pain experience (On-line Appendix Table 2), indicators of contact between staff and residents (On-line Appendix Table 3), and nursing home characteristics that predict care quality or resources (On-line Appendix Table 4). Inclusion of these factors in a model tended to attenuate prevalence ratio estimates (On-line Appendix Table 5). However, because formal mediation analysis extends beyond the scope of this analysis, we did not assess which, if any, of these potential downstream mechanisms are dominant.

Neither restricting the analysis to larger metropolitan areas (n=310,584) (see On-line Appendix Table 6), nor exclusion of Puerto Rico (n=383,583) (see On-line Appendix Table 7) had an appreciable impact on prevalence ratio estimates.

Discussion

In a context where every metropolitan area in the United States is segregated, we found higher reporting of pain among nursing home residents with cancer in the least highly

segregated metropolitan areas for Black, Hispanic, and White residents. Within comparably segregated contexts, pain among residents with cancer was most frequently documented for residents of predominantly White nursing homes, and least frequently documented for residents of mostly Hispanic nursing homes. In very highly and extremely segregated contexts, pain was reported less often in mostly Black nursing homes as well. Adjustment for age, sex, cognitive function, functional status, limited life expectancy, a wide range of potentially painful conditions, county urbanicity and calendar year did not materially alter these findings.

Previously, we conducted a systematic review to understand the role structural racism plays in explaining racial/ethnic disparities in quality outcomes in nursing homes.²² Of eight studies identified, most documented an adverse impact of racial segregation on racial/ethnic minority residents and quality outcomes,²² reinforcing the notion that segregation is a primary driver of care quality in nursing homes.⁶ Nursing home racial/ethnic composition is strongly associated with nursing home care quality.¹³ The separate experiences of White, Black, and Hispanic residents across nursing homes in more segregated metropolitan areas is likely accompanied by inequities in care for these residents.¹³

It may be tempting to conclude that racial/ethnic integration itself would reduce racial/ethnic disparities in the documentation of pain in nursing home residents with cancer. However, we caution that racial/ethnic segregation itself reflects structural racial biases.^{3,6,25}

We found that reported pain among Whites was lower in more segregated metropolitan areas, to a similar degree as for Blacks and Hispanics. Adverse impacts of residential segregation among Whites have been documented for some health-related outcomes,^{12,39–42} but not all.^{43,44}

The finding that pain reporting was lower in mostly Black and mostly Hispanic nursing homes, and lower for all three racial/ethnic groups studied, suggests that greater familiarity and affiliation with racial/ethnic minority residents may not suffice to prevent lower pain reporting for racial/ethnic minority groups.

Strengths and Limitations

The analysis was conducted in a national dataset of all eligible nursing home residents. It is the first to consider both metropolitan area segregation and nursing home racial/ethnic composition in a measure of nursing home care quality. To reduce measurement error due to reduced documentation of pain among residents with impaired communication, we restricted the analysis to residents able to make themselves understood. To the degree that resident-staff communication about pain is hampered, especially in ways related to resident race/ethnicity, it is possible that our findings do not fully reflect under-reported pain. Although racial/ethnic disparities in pain among residents with cancer persist,²¹ pain ascertainment in this setting is likely more complete than among residents without cancer.

We based our analysis on admission records, care should be exercised when extrapolating these findings to long-stay residents. Given the unique history of racial/ethnic biases in the United States and the structure of healthcare reimbursement in this country, extrapolation to

other national settings should be avoided. We conjectured several potential mechanisms by which segregation may cause separation in nursing home composition (unequal distribution of resources, fraught resident-staff interactions, provider implicit bias and social distancing, resident self-censorship and lack of trust). Formal mediation analysis of these potential mechanisms was beyond the scope of this analysis because of the complexity of interpreting mediation analysis in the context of multi-level models. Mechanisms we did not discuss likely play a substantive role as well. Our measure of segregation was based on the most recent Census enumeration in 2010. Residential patterns have been resistant to change over recent decades.⁴⁵

Policy Implications

Our findings provide evidence of unequal care in the presence of racial/ethnic segregation in the United States. Opportunities to improve access and quality include: (1) enforcing Title VI of the 1964 US Civil Rights Act, (2) Medicaid reimbursement, (3) value-based purchasing programs, and (4) quality improvement initiatives. Title IV bans racial discrimination in institutions receiving federal funding, but enforcement actions in nursing homes have been limited.⁶ Many nursing homes charge private payers more than Medicaid.⁴⁶ Given that higher Medicaid payments are positively associated with nursing home quality,⁴⁷ and Medicaid coverage increases with the proportion of racial/ethnic minority residents in nursing homes,⁴⁸ increasing Medicaid payments could reduce resource gaps. Evidence of biased admission practices based on payer type exists.⁴⁹ In Minnesota, legislation requires nursing homes to charge private payers the same as Medicaid to counter biased admission practices. A Federal equalization bill could help equalize access. Value-based purchasing programs provide incentives to improve quality across and within facilities, but may leave majority Black and Hispanic nursing homes at a structural disadvantage.⁵⁰ These programs could be coupled with quality initiatives that target and support nursing homes disproportionately serving racial/ethnic minorities.⁵¹ The fact that we saw lower documentation of pain across the three largest racial/ethnic groups, and systematically across nursing home compositions and metropolitan areas, suggests a large burden of under-ascertained pain in this population, despite what may appear to be modest effect estimates.

Conclusions and Implications

This analysis supports the idea that cancer pain remains under-reported among Blacks, Hispanics, and Whites. This under-recognition of pain may be driven, in part, by racial/ethnic segregation resulting in more separate and less equal experiences for Black, Hispanic, and White residents. We were limited in our ability to directly assess pathways by which these effects may occur, such as resident-provider interactions, resident trust in medical care, or provider implicit bias.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Conflicts of Interest

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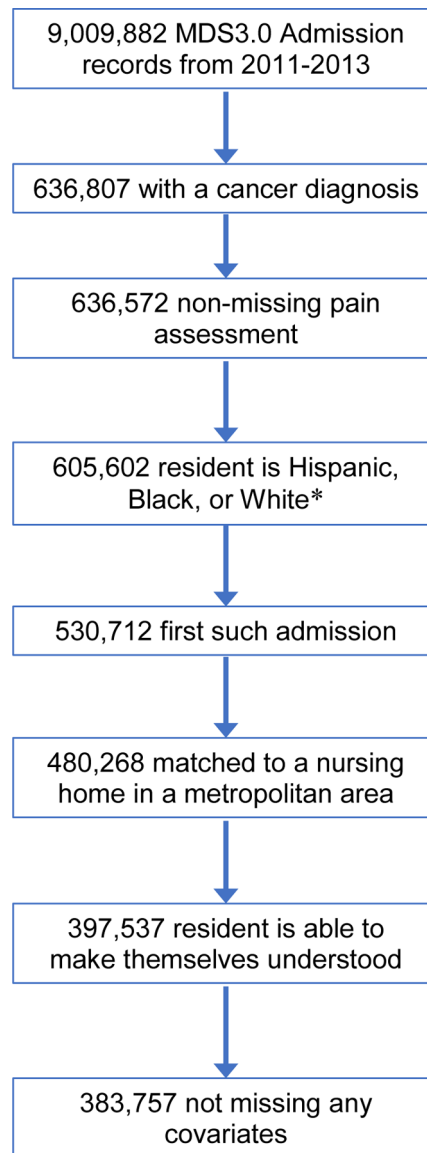


Figure 1.

Flowchart depicting sample construction. *Hispanic residents of any race(s) were coded as “Hispanic, of any race(s)”; non-Hispanic residents who were black or white and no other race(s) were coded as “black only, not Hispanic” or “white only, not Hispanic,” respectively. All other residents, including non-Hispanic multiracial residents were excluded from further consideration.

Table 1.

Prevalence of Documented Pain among Residents with Cancer, by Resident Race/Ethnicity, Metropolitan Area Segregation, Nursing Home Racial/Ethnic Composition, and Demographic Characteristics

Characteristic	Nursing Homes	Residents	Documented Pain
	N*	N	Percent
Total	12,096	383,757	77.4
Resident Race/Ethnicity			
Black only, not Hispanic		42,317	74.6
Hispanic, of any race(s)		12,290	75.4
White only, not Hispanic		329,150	77.8
Metropolitan area segregation [†]			
Highly segregated (0.004–0.199)	6,648	178,262	79.9
Very highly segregated (0.200–0.299)	3,481	108,719	76.8
Extremely segregated (0.300–0.451)	1,967	96,776	73.3
Nursing home racial/ethnic composition [‡]			
Mostly Black	781	18,974	72.3
Mostly Hispanic	182	3,295	66.9
Integrated	3,196	82,994	75.1
Predominantly White	8,649	278,494	78.5
Resident sex			
Male		177,347	73.0
Female		206,410	81.1
Resident age			
18 to 64		54,686	87.3
65 to 74		87,547	81.5
75 to 84		134,493	75.9
85 and older		107,031	70.8
Cognitive Function Score			
Intact		259,053	80.0
Mildly impaired		86,837	74.5
Moderately impaired		35,628	65.6
Severely impaired		2,239	72.0
Activities of Daily Living (RUG-IV scale)			
Independent (0–5)		110,873	74.2
Moderately dependent (6–10)		160,750	76.9
Dependent (11–16)		112,134	81.2
Life expectancy less than 6 months			
Yes		20,089	87.2
No		363,668	76.8

* The number of nursing homes generally does not sum to the total, because any given nursing home may switch categories from one year to another.

[†]Metropolitan area segregation measured with Theil's Entropy Index across census tracts using the total 2010 Census population.

[‡]Mostly Black: 50% Black residents in a given quarter; Mostly Hispanic: 50% Hispanic residents in a given quarter; Predominantly White: 80% White residents in a given quarter; Integrated: <80% White residents, and <50% every other racial/ethnic group in a given quarter.

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Table 2.

Prevalence of Documented Pain in Potentially Painful Conditions among Residents with Cancer

Potentially Painful Condition	Residents	Documented Pain
	N	Percent
Total	383,757	77.4
Heart failure	64,650	73.6
Respiratory failure	10,282	74.3
Ulcerative colitis, Crohn's disease, or inflammatory bowel disease	5,286	80.2
Wound infection	8,960	86.2
Arthritis	91,996	83.8
Osteoporosis	37,356	82.2
Hip fracture	20,881	94.0
Other fracture	31,236	92.2
Mouth pain	7,417	86.6
Grade 2–4 pressure ulcer(s)	50,087	81.0
Foot problems	6,619	81.4
Open lesions other than ulcers, rashes, or cuts	13,542	80.1
Surgical wound	115,810	86.3
Burns	1,015	87.0

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Table 3.

Prevalence of Documented Pain among Residents with Cancer, by Race/Ethnicity, Metropolitan Area Segregation, and Nursing Home Racial/Ethnic Composition

Metropolitan area segregation	Nursing homes		Black only residents, not Hispanic			Hispanic residents of any race(s)			White only residents, not Hispanic		
	N	Percent	Residents	Documented pain	Percent	Residents	Documented pain	Percent	Residents	Documented pain	Percent
Nursing home composition											
High segregation (0.004–0.199)	6,648	76.8	11,464	76.8	78.5	5,351	78.5	80.2	161,447	80.2	
Mostly Black nursing home	141	75.5	1,385	75.5	*		*	78.7	944	78.7	
Mostly Hispanic nursing home	121	*		*	70.8	1,012	70.8	73.2	533	73.2	
Integrated nursing home	1,486	76.1	5,839	76.1	78.7	2,712	78.7	78.1	23,745	78.1	
Predominantly White nursing home	5,241	78.4	4,189	78.4	82.9	1,604	82.9	80.6	136,225	80.6	
Very high segregation (0.200–0.299)	3,481	75.3	14,754	75.3	77.3	2,779	77.3	77.1	91,186	77.1	
Mostly Black nursing home	351	72.7	5,109	72.7	*		*	47.7	2,083	47.7	
Mostly Hispanic nursing home	24	*		*	71.0	217	71.0	66.1	118	66.1	
Integrated nursing home	1,110	75.6	6,220	75.6	76.3	1,755	76.3	75.6	17,742	75.6	
Predominantly White nursing home	2,248	78.8	3,394	78.8	81.2	686	81.2	77.5	71,243	77.5	
Extreme segregation (0.300–0.451)	1,967	72.4	16,099	72.4	70.1	4,160	70.1	73.7	76,517	73.7	
Mostly Black nursing home	289	69.4	6,915	69.4	*		*	71.6	2,047	71.6	
Mostly Hispanic nursing home	37	*		*	57.4	979	57.4	71.2	236	71.2	
Integrated nursing home	600	73.9	6,527	73.9	72.4	2,227	72.4	69.9	16,227	69.9	
Predominantly White nursing home	1,160	76.8	2,539	76.8	78.1	607	78.1	74.8	58,007	74.8	

* Results for Black residents of mostly Hispanic nursing homes and Hispanic residents of mostly Black nursing homes are not reported due to unstable estimates.

Table 4.

Adjusted* Prevalence Ratios of Documented Pain among Residents with Cancer, by Race/Ethnicity, Metropolitan Area Segregation, and Nursing Home Racial/Ethnic Composition

	Black only residents, not Hispanic		Hispanic residents of any race(s)		White only residents, not Hispanic	
	Prevalence ratio	95% Confidence interval	Prevalence ratio	95% Confidence interval	Prevalence ratio	95% Confidence interval
Metropolitan area segregation, not adjusted for nursing home racial/ethnic composition						
High segregation (0.004–0.199)		(ref)		(ref)		(ref)
Very high segregation (0.200–0.299)	0.977	(0.963–0.991)	0.986	(0.962–1.011)	0.966	(0.959–0.972)
Extreme segregation (0.300–0.451)	0.954	(0.939–0.969)	0.931	(0.904–0.958)	0.926	(0.918–0.935)
Nursing home racial/ethnic composition, within strata of metropolitan area segregation						
High segregation (0.004–0.199)						
Mostly Black nursing home	0.977	(0.943–1.013)		†	0.979	(0.944–1.015)
Mostly Hispanic nursing home		†	0.854	(0.814–0.897)	0.929	(0.882–0.978)
Integrated nursing home	0.976	(0.955–0.997)	0.956	(0.928–0.985)	0.971	(0.962–0.980)
Predominantly White nursing home		(ref)		(ref)		(ref)
Very high segregation (0.200–0.299)						
Mostly Black nursing home	0.944	(0.918–0.970)		†	0.959	(0.932–0.986)
Mostly Hispanic nursing home		†	0.920	(0.839–1.009)	0.889	(0.763–1.036)
Integrated nursing home	0.968	(0.946–0.991)	0.939	(0.898–0.982)	0.970	(0.959–0.982)
Predominantly White nursing home		(ref)		(ref)		(ref)
Extreme segregation (0.300–0.451)						
Mostly Black nursing home	0.922	(0.893–0.952)		†	0.940	(0.907–0.975)
Mostly Hispanic nursing home		†	0.783	(0.698–0.878)	0.924	(0.852–1.001)
Integrated nursing home	0.959	(0.933–0.985)	0.938	(0.893–0.985)	0.939	(0.922–0.956)
Predominantly White nursing home		(ref)		(ref)		(ref)

* Poisson models of prevalence ratios, adjusted for resident sex, age, cognitive function, dependence in activities of daily living, life expectancy under 6 months, potentially painful conditions, county urbanicity, and calendar year; a generalized estimating equation specification was used (exchangeable correlation matrix) to adjust for within-nursing home correlation.

† Results for Black residents of mostly Hispanic nursing homes and Hispanic residents of mostly Black nursing homes are not reported due to unstable estimates.