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Keywords

African Americans; Ambulatory Care Sensitive Conditions; Ambulatory medical care; Discrimination in medical care; Medicare; Poor; Poverty; Race; Social status – Health aspects

Cover Page Footnote

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Key Words: Race, Poverty, Ambulatory Care Sensitive Conditions, African Americans, Medicare.

INTRODUCTION

Lower quality of care and worse health status experienced by African Americans in the United States have been previously presented in the literature (Smedley, Stith and Nelson, 2003). Despite greater disease burden among African Americans, health care services are often lacking (LaVeist et al., 2003). Ambulatory care sensitive conditions- diseases, disabilities, and deaths that are deemed potentially avoidable through prevention or through appropriate treatment- have been found to be a useful measure for assessing quality (Rutstein et al.1976). Prior examinations of rates of hospitalization for ACS conditions have shown a racial disparity that persists over time even among those with health insurance (Howard et al., 2007). This brings to focus an inequity in healthcare whose source remains uncertain.

Socioeconomic status measured through income and education at the individual and aggregate levels has been shown by several researchers to be correlated with ACS condition hospitalization rates. Preventable hospitalizations have been shown to be higher among those of lower socioeconomic status (Pappas, et al., 1997) even after adjustments for severity of illness (Blustein, Hanson and Shea, 1998). Differences have also been found among zip codes, with low-income areas having higher hospitalization rates than high-income areas (Billings et al., 1993; Bierman et al., 1999; Roos et al., 2005). Roos et al. (2005), also found that residents of the lowest income neighborhoods have more hospital visits than their counterparts in higher income areas.

According to Williams (2002) socioeconomic status is a central determinant of racial/ethnic disparities in health. Another study found that health is unevenly distributed across socioeconomic status. Persons of lower income, education or occupational status experience worse health and die earlier than do their better-off counterparts (Fiscella and Williams, 2004). Schulz et al. (2002), in their examination of health disparities, also scrutinize the complex relationships between race and socioeconomic status along with macro social processes that create and maintain racial differences in access to resources. Williams and Collins (2001) further reiterate that racial residential segregation is an institutional manifestation of racism. The failure to reduce residential segregation and/or the conditions created by it may limit the utility of well-intentioned efforts to reduce racial disparities in health.

Our study examined the rates of hospitalization for African Americans in comparison to Whites in the Medicare population, whose access to health care barriers are reduced due to insurance. By controlling for the effects of socioeconomic status we hypothesized that the racial differences in ACS condition hospitalization rates would be reduced or eliminated. The important issues that this study addressed are an assessment of the quality of care received by African Americans and an examination of race variations in the quality of care at various socioeconomic levels for the state of North Carolina.

METHODS

Data Sources

Data for this study was obtained from the Centers for Medicare and Medicaid Services (CMS) Denominator files for 1999 and from the 2000 US Decennial Census. Demographic data including age, race, sex and zip code and Medicare eligibility data was extracted from the CMS Denominator database. In addition, claims information for each hospital discharge, including diagnosis and procedure codes, was obtained from the MEDPAR data sets. Previous studies provide details of the CMS Denominator and MEDPAR data sets (Kestenbaum, 1992; Parnell and Owens, 1999; Husaini, Blasi and Miller, 1999; Howard et al., 2007). Individual-level socioeconomic characteristics were not available for beneficiaries therefore the North Carolina segment of the 2000 US Census was merged with the enrollment and discharge data by zip code, to obtain socioeconomic data on the areas/neighborhoods in which beneficiaries lived. Despite the limitations of aggregate data, zip code-level data has been previously used in health studies with useful results (Krieger, 1992; Gornick et al., 1996). To better approximate race-variations in these aggregate measures, race-specific estimates were used as available (Williams, 2005; Williams and Jackson, 2005).

The 1999 Denominator database included 1,173,411 cases. The final sample for this study included 807,791 beneficiaries who resided in North Carolina during the study period and whose race was African American (N=127,496) or White (N=680,295). Individuals who were under 65 years of age were excluded since in the Medicare population these beneficiaries are generally disabled individuals with substantial pre-existing morbidities. Cases whose five digit zip code could not be matched with the 2000 US Census data and those whose eligibility was based upon disability or end-stage renal disease (ESRD) were also excluded. These groups were excluded because ESRD cases are severely and chronically ill and generally do not benefit from proactive treatment.

Finally, we excluded those beneficiaries that did not have both Medicare Part A and B insurance coverage and those with HMO coverage. Medicare Part A insurance covers hospitalization costs while Part B insurance covers outpatient services including preventive care services, thus it was necessary to require inclusion of both types of insurance coverage. Likewise, those with HMO coverage are likely to have hospital claims that are not included in the Medicare data files, thus they were excluded from the analysis sample.

Measures

Dependent Variables

ACS conditions were determined as specified by a recent report from the DHHS Agency for Healthcare Research and Quality (AHRQ, 2004) for populations age 65 years and older. Admission for the following ACS conditions were coded as a binary (yes or no) variable: bacterial pneumonia, congestive heart

failure (CHF), diabetes, chronic obstructive pulmonary disease (COPD), primary dehydration, urinary tract infection, angina and adult asthma. International Classification of Disease (ICD-9-CM) coding was used in determination of diagnosis for each condition (Billings et al., 1993).

We also assessed 'marker' conditions that are generally considered to not vary substantially according to access to care (Saha et al., 2003, Ady and Bindman, 2003). Marker conditions include the following conditions: appendicitis with appendectomy, gastrointestinal obstruction and fracture of the hip/femur. Each of these conditions was coded as a binary (yes or no) variable and then aggregated for total admissions for marker conditions. These conditions are not substantially subject to prevention and prediction in the general population. Therefore they can be used as a point of reference from which to view ACS conditions in the population studied.

Independent Variables

Two independent variables used in this study are race and poverty. Only African Americans and Whites are included in the study. Race was determined from the CMS denominator enrollment database. Poverty was determined for each patient using area-based socioeconomic indicators. Data was obtained from the 2000 U.S. Decennial Census by matching at the zip code level. Five indicators of socioeconomic status (SES) were examined: percent homes owned (race-specific), percent less than high-school education (race-specific) percent female-headed households (race-specific), percent unemployed (race-specific) and percent below poverty (race-specific). The measure percent (of zip code) below poverty was further dichotomized for comparison of areas with 20% or more households below poverty(high poverty areas) and those with less than 20% of households below poverty (low poverty areas) (Chow et al., 2003). Additional measures examined included rural vs. urban status using the zip-code approximation of the Rural-Urban commuting area codes (Hall et al., 2006), and percent Black/African American and percent White in zip code to measure residential segregation (Williams, 2001).

Analysis

The primary outcome was a multivariate analysis of rates of hospitalization for ACS conditions using race and area socioeconomic status as explanatory variables. Rates for ACS conditions were determined as a percent of the entire sample. Descriptive statistics by race and poverty were computed. Odds ratios and 95% confidence intervals were obtained from logistic regression. Cochran-Mantel-Haenszel tests were used to test association between hospitalization rates for African Americans and Whites controlling for socioeconomic and demographic factors. Poisson regression was used for multivariate analysis of ACS admission rates with adjustment for clustering within zip code using generalized estimating equations. All analyses were conducted using SAS/STAT Software (SAS Version 9.1, SAS Institute, Cary, NC).

RESULTS

Demographics

Table 1 shows the sample demographics and neighborhood socioeconomic characteristics by race. The sample was mostly female and white. Mean age for white patients was 74.8 years (with standard deviation [SD] =7.1). Mean age for African Americans was 74.9 years (SD=7.4). African American beneficiaries included a higher percent of females, percent 85 years and older and percent residing in rural areas compared to whites. Data from the 2000 US Decennial Census showed significant differences in race-specific socioeconomic indicators of the zip codes where white and African American beneficiaries lived. Notably, African Americans were in areas with lower home ownership (55.8% vs. 75.8%), higher percent of less than high-school graduates (32.8% vs. 19.8%), more female-headed households (29.1% vs. 8.0%) and higher percent below poverty (25.1% vs. 8.9%). Over 68% of African American beneficiaries lived in areas with 20% or more Black/African Americans households below poverty while only 1.2% of white beneficiaries lived in areas with same levels of poverty for whites. Residential segregation was evident with white beneficiaries living in zip codes that were on average 17.4% black/African American compared to 38.3% for African American beneficiaries.

Table 1. Characteristics of North Carolina Medicare Beneficiaries age 65 and older (1999)[a]

	African American N=127,496	White N=680,295	OR (95% CI) [b]
Male, %	35.4	39.8	
Female, %	64.6	60.2	1.20(1.19,1.22)
Age, mean(SD)	74.9(7.4)	74.8(7.1)	
65-74, %	54.2	54.5	0.99(0.98,1.00)
75-84, %	33.7	34.6	0.96(0.95,0.97)
85+, %	12.2	10.9	1.13(1.11,1.16)
Area Socioeconomic Indicators [c]			
Rural Residence, %	42.7	40.1	1.11(1.10,1.13)
% Homes Owned, mean(SD)	55.8(16.4)	75.8(9.0)	0.40(0.40,0.40)
% < High School Graduate, mean(SD)	32.8(10.0)	19.8(9.1)	1.97(1.97,1.98)
% Female-Headed Households, mean(SD)	29.1(6.3)	8.0(2.3)	4.75(4.74,4.75)
% Unemployed, mean(SD)	40.8(9.4)	35.7(6.9)	1.24(1.24,1.24)
% Below Poverty, mean(SD)	25.1(9.3)	8.9(3.9)	3.44(3.44,3.45)
<20% Below Poverty, %	31.1	98.8	
≥20% Below Poverty, %	68.8	1.2	
% Black/African American, mean(SD)	38.3(20.1)	17.4(15.8)	2.94(2.94,2.94)
% White, mean(SD)	55.6(20.7)	77.4(17.2)	0.37(0.37,0.37)

a Data from the 1999 Denominator Files and 2000 Decennial Census. b Unadjusted odds ratios and 95% confidence interval for African Americans vs. Whites obtained from logistic regression. c Based on zip code of residence. All indicators except rural, % black and %white are race-specific. SD, standard deviation; ACS, ambulatory care sensitive condition.

Characteristics by Race for ACS patients

Table 2 examines demographics and neighborhood socioeconomic status by race for beneficiaries with ACS hospitalizations. Many of the differences observed in the entire sample persisted, with African Americans having lower odds of residing in areas with owned homes (odds ratio (OR)=0.40; 95% CI [0.40, 0.40]), and higher odds of residing in areas with more female-headed households (OR=4.63; 95% CI [4.61, 4.66]), more non-high school graduates (OR=1.86; 95% CI [1.85,1.87]) and higher poverty (OR=3.31; 95% CI [3.29, 3.34]). However, there was no significant difference in rural residence for African Americans with ACS hospitalizations compared to their white counterparts. African American beneficiaries with ACS hospitalizations were younger with more 65-74 year olds (39.4% vs. 36.1%, p<0.001), less 75-84 year olds (39.1% vs. 42.0%, p<0.001), and a similar proportion of 85 and older beneficiaries (21.5% vs. 21.9%, p=0.452) compared to whites.

Table 2. Demographics and zip code-level socioeconomic indicators by race for beneficiaries with at least one hospitalization for ACS condition [a]

	Beneficiaries with ACS(N=45,174)		
	African American	White	
Characteristics	N=8,279	N=36,895	OR(95% CI)
Male, %	37.8	39.8	
Female, %	62.2	60.2	1.09(1.04,1.14)
Age, %			
65-74	39.4	36.1	1.15(1.10,1.21)
75-84	39.1	42.0	0.88(0.84,0.93)
85+	21.5	21.9	0.98(0.92,1.04)
Area Socioeconomic Indicators [c]			
Rural Residence, %	45.2	45.7	0.98(0.94,1.03)
% Homes Owned, mean(SD)	56.0(16.3)	76.0(8.7)	0.40(0.40,0.40)
% < High School Graduate, mean(SD)	33.3(9.9)	21.2(8.7)	1.86(1.85,1.87)
% Female-Headed Households, mean(SD)	29.2(6.4)	8.2(2.3)	4.63(4.61,4.66)
% Unemployed, mean(SD)	41.2(9.6)	35.9(6.6)	1.25(1.25,1.26)
% Below Poverty, mean(SD)	25.4(9.3)	9.3(3.9)	3.31(3.29,3.34)
% Black/African American, mean(SD)	38.1(20.2)	18.2(16.2)	2.76(2.74,2.77)
% White, mean(SD)	55.8(20.9)	76.6(17.5)	0.39(0.38,0.39)

a Data from 1999 Denominator Files and 2000 Decennial Census. ACS status determined as 1 or more inpatient claims for ACS condition in 1999. b Unadjusted odds and confidence intervals for African American vs. White characteristics obtained from logistic regression. c All indicators except rural, % black and %white are race-specific. ACS, ambulatory care sensitive condition; SD standard deviation; OR odds ratio; CI confidence interval.

Rates of ACS hospitalizations by Race and Poverty

Table 3 shows results of a comparison of ACS hospitalization rates for low poverty (<20% below poverty) and high poverty (≥20% below poverty) areas by race using race-specific indicators of area poverty. We observed race differentials for all conditions in low poverty areas and for most conditions in high poverty areas. In low poverty areas African Americans had a 13% higher rate of ACS hospitalization compared to whites (rate ratio (RR)=1.13; 95% CI [1.08, 1.17]) while the ratio of rates was non-significant in high poverty areas (RR=0.97; 95% CI [0.89, 1.05]). Conditions that did not have significant differences in rates in high poverty areas were urinary tract infection and adult asthma. In both high and low poverty areas rates were higher for African Americans than whites for congestive heart failure, diabetes, and primary dehydration; and lower for African Americans than whites for bacterial pneumonia, COPD and angina. For each ACS diagnosis, hospitalization rates for African American beneficiaries remained relatively stable for both high and low poverty areas, while hospitalization rates for white beneficiaries were notably higher in high poverty areas for some conditions. In particular, hospitalization rates per 1,000 for bacterial pneumonia were 17.2 in low poverty areas compared to 25.6 in high poverty areas and COPD hospitalization rates were 10.9 and 15.1 respectively per 1,000 for white beneficiaries.

Adjusted Relative Hospitalization Rates

Multivariate regression analysis of ACS hospitalization rates using race as a predictor and controlling for age, gender and area socioeconomic indicators are presented in Table 4. Models were adjusted for clustering within zip code. Compared to whites, African Americans had 30% higher rate of ACS hospitalizations than whites prior to age, gender and neighborhood SES adjustments (RR=1.30; 95% CI [1.25, 1.36]). After adjustments the relative rate remained higher for African Americans with a non-significant decrease of 0.03 (RR=1.27; 95% CI [1.12, 1.43]).

Rural residence, higher percent less than high school graduates, higher poverty and higher percent of blacks/African Americans in zip code were associated with higher rate of ACS hospitalization. Conversely, higher percent unemployed was associated with lower rates of ACS hospitalizations.

Table 3. Hospitalization rates for ACS diagnoses by area poverty status and race [a]

	<20% below poverty			≥ 20% below poverty		
Primary Diagnosis	**African American N=39,657**	**White N=672,112**	**RR (95% CI)[b]**	**African American N=87,701**	**White N=8,092**	**RR (95% CI)[b]**
ACS Condition Total	61.0	54.1	1.13(1.08, 1.17)***	66.7	68.8	0.97(0.89,1.05)
Bacterial Pneumonia	15.3	17.2	0.89 (0.82, 0.97)**	16.8	25.6	0.66 (0.57,0.76)***
Congestive Heart Failure	19.9	15.9	1.25 (1.17, 1.35)***	23.0	17.5	1.31 (1.11, 1.55)**
Diabetes	5.0	1.7	2.88 (2.48, 3.34)***	5.7	1.9	3.09 (1.85, 5.17)***
Chronic Obstructive Pulmonary Disease	7.0	10.9	0.64 (0.57, 0.72)***	8.1	15.1	0.54 (0.44, 0.65)***
Primary Dehydration	7.7	5.4	1.44 (1.28, 1.62)***	8.4	5.8	1.44 (1.08, 1.94)*
Urinary Tract Infection	8.6	5.7	1.52 (1.36, 1.69)***	8.4	7.3	1.16 (0.89, 1.51)
Angina	1.3	1.6	0.67 (0.51, 0.88)***	2.2	3.5	0.62 (0.42, 0.93)*
Adult Asthma	2.3	1.6	1.45 (1.18, 1.80)***	2.7	3.0	0.90 (0.59, 1.37)
Marker Conditions	9.0	12.7	0.71 (0.64, 0.79)***	9.1	13.6	0.67 (0.55, 0.81)***

a Hospitalization data from 1999 MEDPAR inpatient claims. Race-specific poverty status determined from percent of individuals below the 1999 federal poverty level obtained by zip code from the 2000 Census. Rates are crude estimates per 1,000.
b Unadjusted risk ratio for African American versus White beneficiaries. *p<0.05. **p<0.01. ***p<0.001.
ACS, ambulatory care sensitive; CI, confidence interval

Table 4. Results of multivariate regression of ACS hospitalization rates for African Americans and White North Carolina Medicare beneficiaries, 1999[a]

	RR(95% CI)	P-value
Race Model		
African American vs. White	1.30(1.25, 1.36)	<.001
Race, Gender, Age and Area SES Model		
African American vs. White	1.27(1.12, 1.43)	<0.001
Male vs. Female	1.16(1.14, 1.19)	<0.001
Age 75-84 vs. 65-74	1.80(1.76, 1.84)	<0.001
Age 85+ vs. 65-74	3.08(2.99, 3.18)	<0.001
Rural vs. Urban Residence	1.19(1.14, 1.25)	<0.001
% Homes Owned (unit=10)	1.04(1.02, 1.06)	<0.001
% < High School Graduate (unit=10)	1.13(1.10, 1.16)	<0.001
% Female-Headed Households (unit=10)	0.94(0.89, 1.00)	0.062
% Unemployed (unit=10)	0.91(0.88, 0.93)	<0.001
% Below Poverty (unit=10)	1.06(1.01, 1.11)	0.017
% Black/African American (unit=10)	1.01(1.00, 1.03)	0.017

a Adjusted for clustering within zip code using generalized estimating equations. SES, socioeconomic status; RR, risk ratio

DISCUSSION

The premise of ACS conditions is that the increased rate of the conditions is an indicator of a problem with the health care delivery system, more specifically, a lack of services and quality for one group compared with another. The current study sought to expand upon previous research by exploring neighborhood poverty as an explanatory variable for disparities in ACS condition hospitalization rates among elderly Medicare beneficiaries. ACS rates have been shown to be higher among low-income zip codes than in high-income zip codes, therefore we hypothesized that racial differences would be diminished after adjusting for neighborhood poverty. Contrary to our hypothesis, the results demonstrate the persistence of racial differences within both high poverty and low poverty areas, but when both races reside in high poverty areas, the difference is much less.

While our results support the findings of others by showing that those in high poverty zip codes have higher rates of ACS hospitalizations than those in low poverty areas, area poverty level alone did not explain the race differences in rates within each area. It may be that African Americans had less wealth even within areas of low poverty since these results remained when smaller

poverty level groupings were examined. However, this is not an isolated finding since similar results were found in an analysis of SES and national mortality and life expectancy statistics (Williams, 1999). The authors showed that racial disparities persist at similar levels of SES and suggested that SES, though part of a causal pathway to poorer health among minorities, is secondary to residential segregation.

Williams and Rucker (2000) and Williams and Collins (2001) propose that the persistence of this differential effect could be attributed to institutional racism. Other researchers point out that systematic discrimination is not the aberrant behavior of a few but is often supported by institutional policies and unconscious bias based on negative stereotypes (Ahmed et al., 2007; Schulz et al., 2002). Accordingly, effective reduction in disparities requires improved data systems, increased regulatory vigilance, and new initiatives to appropriately train medical professionals and recruit more providers from minority backgrounds (Williams and Rucker, 2000).

Neighborhood effects that had reverse effects in our multivariate analysis included percent homes owned which was associated with an increase in ACS hospitalizations and percent unemployed which was associated with lower ACS hospitalizations. When examined individually these relationships were reversed. However, examined jointly with other indicators of neighborhood SES effect modification was evident revealing a more complex interplay between these measures. Our race-specific measure of neighborhood home ownership was markedly higher for whites than African Americans. Also beneficiaries age 75 and older in our sample lived in zip codes with higher mean unemployment rates. Other neighborhood measures examined including less than high school graduates, rural residence, and percent below poverty were associated with increases in ACS hospitalization rates as expected.

Since disparity in quality of care among the elderly via ACS hospitalization is not fully explained by differences in area poverty other factors such as access, type of care and spatial utilization patterns by racial/ethnic minorities also need to be explored so as to determine whether situating a health care facility close to low SES area has an effect on utilization by the poor. In our multivariate model we examined percent of blacks in zip code as an indicator of residential segregation and this measure was found to be positively associated with higher rates of ACS hospitalizations. This provides an indication that minority neighborhoods are adversely affected.

Research has documented a nexus between access to appropriate health care, and reduction in health disparities. For example, Politzer et al., (2001) found that health centers are successful in minimizing health access disparities by establishing themselves as a usual source of care. This is important among racial/ethnic minority groups whose lack of continuity of care has been attributed in part to not having a regular place for care and less use of physicians' offices (Doescher et al., 2001). This sentiment is echoed by Rust et al. (2004), who state that the three modifiable factors of area poverty, uninsur-

ance, and having a primary care medical home, have a dramatic effect in patterns of care for African American patients and can be independently targeted for intervention. Stronger and more stable patient/provider relationships are associated with lower hospitalizations and better use of preventive services, (Weis and Blustein, 1996; O'Connor et al., 1998) which, along with healthcare coverage to make these services affordable, may serve to decrease the existing disparity.

Even among those with a regular source of care, quality of care received and timeliness of care contribute to how effective such intervention would be in reducing the probability of an ACS hospitalization. The disproportionate dependence on hospital outpatient departments for ambulatory care service by poor, uninsured, and minority patients challenges the level of care these organizations are able to provide (Delia et al., 2004). Lower quality of care is associated with less satisfaction among patients and dissatisfied patients are less likely to follow through with treatment course (Narayan et al., 2003) and more likely to experience discontinuity in care (Marquis et al., 1983). Additionally, patients may delay seeking care due to the prospect of inadequate treatment by healthcare providers among other reasons (Banks and Malone, 2005; Finnegan et al., 2000). Still these and other system and individual factors which were not available for this analysis, remain to be examined in the context of the disparity in ACS hospitalizations.

The important issues that our study addressed are a comprehensive assessment of the relationship between neighborhood SES and racial disparities in ACS hospitalizations among elderly North Carolina Medicare beneficiaries. This study builds upon an earlier study by Howard et al., (2007) which established the existence of a disparity in ACS hospitalizations in this cohort. ACS hospitalization rates are a useful indicator for assessing quality of care (Rutstein et al., 1976) and in this study we show that disparities persisted even after controlling for neighborhood SES characteristics.

An expansion of our work will allow us to examine the relationships of ACS rate, health care utilization, and hyper-segregation with race. Some of the questions that we need to explore are the social, political and psychosocial dimensions to residential segregation that contribute to this disparity. Do some communities have lower morbidity rates because of more equitable distribution of health care utilization facilities? What, if any, are the effects of macro level social factors, on disparities in quality of care?

Limitations

The absence of prospectively collected social class information for individuals was an unavoidable limitation of this study that could lead to the problem of an ecological fallacy, since we are generalizing about a specific population from residential patterns. However, linking census tract or locality social indices with a patient's address is a useful methodology that has been validated by Krieger (1992). By using race-specific indicators we were able to

capture how each group experiences poverty within the same geographic area. Additionally, since data used in this study included only North Carolina residents caution should be used when applying to geographic regions with dissimilar characteristics.

Implications

The implications of these findings for future disparity research are quite important and demonstrate a nexus between socioeconomic status and health outcomes. Problems in public health, immigration, refugees, environmental degradation, and broader social and political breakdown are the new challenges that proliferate in a context of untrammeled global inequality. We need to focus on building a society and economy that respects differences, protects the weak and regulates the strong (Sen, 1994; Shaffer, 1998; Human Development Report, 1999). Instead of focusing merely on the economic dimension of area poverty, researchers should also focus on its social, political, and behavioral components in order to reduce its deleterious effect on health. There remains a further need to explore the healthcare utilization factors and hyper-segregation that lead to racial disparity in health outcomes. Future studies can and should examine these complex issues from multidisciplinary perspectives. These should include sociological factors such as social support systems, local health infrastructure and family cohesion as well as the broader role played by society and the governmental policies that are formulated, as new research in this area suggests that the solution to the precedents and antecedents to the SES-health disparities problem may actually lie outside the medical arena.

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