Cultural Factors Associated with Racial Disparities in Lung Cancer Care

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Abstract

Rationale: Minority patients with lung cancer are less likely to receive stage-appropriate treatment. Along with access to care and provider-related factors, cultural factors such as patients' lung cancer beliefs, fatalism, and medical mistrust may help explain this disparity.

Objectives: To determine cultural factors associated with disparities in lung cancer treatment.

Methods: Patients with newly diagnosed lung cancer were recruited from four medical centers in New York City from 2008 to 2011. Using validated tools, we surveyed participants about their beliefs regarding lung cancer, fatalism, and medical mistrust. We compared rates of stage-appropriate treatment among blacks, Hispanics, and nonminority patients. Multiple regression analyses and structural equation modeling were used to assess whether cultural factors are associated with and/or mediate disparities in care.

Measurements and Main Results: Of the 352 patients with lung cancer in the study, 21% were black and 20% were Hispanic.

Blacks were less likely to receive stage-appropriate treatment (odds ratio [OR], 0.50; 95% confidence interval [CI], 0.27–0.93) compared with whites, even after adjusting for age, sex, marital status, insurance, income, comorbidities, and performance status. No differences in treatment rates were observed among Hispanics (OR, 1.05; 95% CI, 0.53–2.07). Structural equation modeling showed that cultural factors (negative surgical beliefs, fatalism, and medical mistrust) partially mediated the relationship between black race and lower rates of stage-appropriate treatment (total effect: -0.43 , indirect effect: -0.13 ; 30% of total effect explained by cultural factors).

Conclusions: Negative surgical beliefs, fatalism, and mistrust are more prevalent among minorities and appear to explain almost one-third of the observed disparities in lung cancer treatment among black patients. Interventions targeting cultural factors may help reduce undertreatment of minorities.

Keywords: lung neoplasms; therapeutics; healthcare disparities; culture; beliefs

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Lung cancer incidence in the United States is highest among blacks, and blacks are also diagnosed at younger ages and present with more advanced disease than other patients (1, 2). Mortality among blacks with lung cancer is also higher than that of other racial groups, owing not only to diagnosis at advanced stages but also due to treatment disparities (3). Researchers have demonstrated that blacks are less likely to receive surgical resection, chemotherapy, and/or radiation than other patients (3–5). Similar care inequalities, although less pronounced, have been observed among Hispanics (6).

The underlying reasons for these disparities are not fully understood, but they appear to be multifactorial. Systems-level issues, such as access to care, insurance, and hospital-level factors, may be partially responsible (2, 3, 7–9). Provider-related factors such as limited cultural sensitivity, stereotyping, and worse patient–physician communication may also be involved, but supporting evidence regarding these aspects of care is limited (10). Even after controlling for these factors (4, 11, 12), however, treatment disparities persist, suggesting that patient-level factors, which might be culturally related, may also contribute to lung cancer differences.

Prior research has shown that minority patients may hold beliefs different from those of nonminorities related to risk perception, fatalism, and fear of cancer diagnosis (13–16). In particular, we found that blacks and Hispanics were more likely to hold fatalistic beliefs and that blacks were more likely to believe that surgery could cause lung cancer to spread (16).

This study was conducted to determine whether these racial differences regarding beliefs about lung cancer and its treatment, fatalistic beliefs, and mistrust of the medical system may underlie disparities in lung cancer treatment.

Methods

Recently diagnosed patients with lung cancer were recruited from four New York City hospitals (Mount Sinai Hospital, Montefiore Hospital, New York–Presbyterian Hospital, and Harlem Hospital) between January 2008 and November 2011. Potential participants were identified using centralized registries

from the hospitals' pathology departments and/or tumor registries. We also regularly contacted lung cancer treatment providers at the hospitals; screened oncology, radiotherapy, and pulmonary clinics weekly; posted flyers advertising the study; and collaborated with clinicians serving on tumor boards.

Eligible patients (English- or Spanish-speaking, age 18 yr or older, and diagnosed with primary lung cancer within the previous 12 mo) were invited to participate in the study. Patients were excluded if they had been diagnosed with another malignancy within the previous 5 years or were without decision-making capacity. Once patients signed an informed consent form, they underwent standardized in-person baseline interviews. We attempted to enroll patients early after their lung cancer diagnosis. Patients were followed for 12 months after enrollment. Medical records were reviewed using a standardized instrument. The study was approved by the institutional review boards of each of the four hospitals.

Data were collected on participants' sociodemographic characteristics. Using patients' self-reported information regarding race and ethnicity, we classified patients as black, Hispanic, or nonminority (*see* Table E1 in the online supplement). Individuals of Hispanic ethnicity were classified as Hispanic, regardless of race. Asians were classified as nonminority because their results did not differ significantly from those of whites. Patients were grouped according to the tumor, node, metastasis staging criteria on the basis of reviews of medical records (11). Comorbidity information (chronic obstructive pulmonary disease, asthma, heart disease, diabetes, renal disease, liver disease, and depression) was collected by self-report and chart review. Performance status was assessed using the Eastern Cooperative Oncology Group instrument.

We used the theoretical framework of the Self-regulation Model (SRM) to evaluate participants' disease and treatment beliefs (17). The SRM proposes that patients' health-seeking behaviors and treatment decisions are motivated by their underlying cognitive and emotional representation of disease and treatment. The five components of the SRM are (1) identity (interpretation of symptoms), (2) causes (etiology), (3) timeline (trajectory of disease), (4) consequences (perceived

impact), and (5) control (expectations for cure). Questions pertaining to illness representations in these domains were adapted from the Revised Illness Perception Questionnaire and prior work (18, 19). These questions have been validated in English and Spanish versions of the questionnaire (20).

Common folk beliefs about cancer treatment as well as spiritual beliefs were adapted from prior studies (21, 22). We used the Group-Based Medical Mistrust Scale (GBMMS) to evaluate medical mistrust and discrimination experiences (23). The scale includes three domains—suspicion, group disparities, and provider support—and has been shown to be reliable and valid for analysis of medical mistrust among minorities (24). All survey responses related to beliefs and attitudes were recorded on a four-point Likert scale. Patients who responded “strongly agree” or “agree” were classified as holding the specific belief.

The study outcome—stage-appropriate treatment (including surgery, chemotherapy, and/or radiotherapy)—was defined on the basis of the most recent National Comprehensive Cancer Network (NCCN) recommendations for lung cancer treatment. Patients were classified as having received stage-appropriate treatment if they underwent NCCN-concordant therapy within 1 year of diagnosis.

Statistical Analysis

We evaluated differences in the sociodemographic characteristics of black, Hispanic, and nonminority participants using a χ^2 test, Kruskal-Wallis test, or analysis of variance and assessed the unadjusted association between minority status and treatment. Items measuring cultural factors such as lung cancer and treatment beliefs, spirituality, fatalism, and medical mistrust were compared among racial/ethnic groups, and associations between these items and treatment were tested using χ^2 tests. We used logistic regression analysis to assess whether race/ethnicity was associated with stage-appropriate treatment after controlling for age, sex, marital status, income, insurance, number of comorbidities, and performance status. The impact of negative surgical beliefs was also evaluated in analyses limited to

patients with cancer at potentially resectable stages (I–IIIA).

We used structural equation modeling (SEM) to evaluate whether cultural factors mediated racial disparities in treatment. On the basis of published literature, theoretical considerations, and results of the univariate analyses, we selected a subset of items to represent the cultural factors of negative surgical beliefs, fatalism, and mistrust for the mediation analysis. Because these factors represent abstract constructs and are not directly measured (i.e., they are latent factors), we used exploratory factor analysis to identify which measured items best represented the cultural factors of interest. We identified two items as indicators for negative surgical beliefs, two items for fatalism, and six items representing the GBMMS suspicion subscale for medical mistrust. Given this parsimonious set of potential mediators, we evaluated the structural model shown in Figure 1. Path coefficients in the figure represent direct-effect estimates from one variable to another. Direct-effect estimates from race/ethnicity to the cultural factors (negative surgical beliefs, fatalism, and mistrust) represent the change in standard deviation (SD) from the mean scores of these cultural factors for blacks and Hispanics compared with nonminorities. Estimated direct effects from the cultural factors to treatment represent the change in the probability of treatment associated with a 1-SD change in the cultural factor score. Direct-effect estimates of race and ethnicity on treatment represent the difference in the probability of receiving treatment between blacks and Hispanics compared with nonminorities. The SEM was also used to assess the indirect effect that race and ethnicity have on treatment through its effect on the latent factors (negative surgical beliefs, fatalism, and mistrust). The proportion of the total effect of race on treatment attributable to the mediators was calculated by taking the ratio of the indirect effect divided by the total effect. The SEM was adjusted for age, sex, marital status, income, insurance, comorbidities, and performance status. Estimates using the SEM were calculated using weighted least squares. The Root Mean Square Error of Approximation and Comparative Fit Index were used to assess goodness of fit. Analyses were conducted with SAS 9.2 software (SAS Institute Inc., Cary, NC) and Mplus7 software (Muthén and Muthén, Los Angeles, CA).

Figure 1. Structural equation model of the relationship between race, ethnicity, cultural factors and stage-appropriate treatment. Model was adjusted for age, sex, marital status, income, insurance, comorbidities, and performance status. Numbers on SEM paths represent direct-effect estimates from predictor to outcome. *Indicates effect estimate with P value < 0.05 . Blacks and Hispanics are more likely to hold beliefs reflecting medical mistrust and fatalism. Medical mistrust is negatively associated with receipt of stage-appropriate treatment.

Results

A total of 1,542 patients were screened for eligibility between January 2008 and November 2011. Among these patients, 1,058 did not meet our entry criteria (58% without lung cancer, 33% diagnosed more than 1 year prior, 3% with other malignancies, and 6% for other reasons). Among the 484 eligible patients, 368 (76%) were enrolled. Those patients who were not enrolled either refused to participate or were could not be contacted. Cancer stage

information was missing in 16 patients, leaving a final cohort of 352 participants.

Overall, 74 participants (21%) were black and 70 (20%) were Hispanic. Participants' sociodemographic and lung cancer characteristics are reported in Table 1. There were no differences in age, sex, smoking history, or performance status between blacks, Hispanics, and nonminorities ($P > 0.05$ for all comparisons). Blacks and Hispanics were less likely to be married ($P < 0.001$), more likely to have an income less than \$15,000

Table 1. Patient characteristics by race and ethnicity

Characteristic	Nonminority (N = 208)	Black (N = 74)	Hispanic (N = 70)
Age (yr), median (IQR)	66.5 (15)	64.9 (12)	65.8 (14)
Male, n (%)	103 (50)	33 (45)	32 (46)
Married, n (%)	135 (65)	28 (38)	30 (43)
Health insurance, n (%)			
Private insurance or HMO	117 (57)	29 (39)	29 (43)
Any Medicare	77 (37)	32 (42)	27 (40)
Medicaid	11 (5)	12 (16)	9 (13)
No insurance	1 (1)	2 (3)	3 (4)
Annual income, n (%)			
$\leq \$15,000$	23 (11)	26 (36)	20 (29)
$> \$15,001$	110 (53)	24 (33)	12 (17)
Not reported	73 (35)	23 (32)	37 (54)
Stage, n (%)			
I–II	129 (62)	34 (46)	31 (44)
III–IV	79 (38)	38 (51)	37 (53)
Extensive SCLC	0 (0)	2 (3)	2 (3)
Current smoker, n (%)	36 (19)	18 (27)	15 (24)
Comorbidities, n (%)			
None	99 (48)	30 (42)	20 (29)
One	67 (33)	21 (29)	27 (39)
Two or more	40 (19)	21 (29)	22 (32)
ECOG functional status: fully active, n (%)	104 (51)	32 (44)	37 (53)

Definition of Abbreviations: ECOG = Eastern Cooperative Oncology Group; HMO = health maintenance organization; SCLC = small cell lung cancer

($P < 0.001$), more likely to have Medicaid or no insurance ($P = 0.02$), more likely to have more comorbidities than nonminority patients ($P = 0.04$), and more likely to be diagnosed at more advanced cancer stages ($P = 0.002$).

Race/Ethnicity and Stage-Appropriate Treatment

Blacks were less likely than Hispanics and nonminorities to receive stage-appropriate treatment (40% vs. 60% and 57%, respectively; $P = 0.01$). After we adjusted for age, sex, marital status, income, insurance, comorbidities, and performance status, blacks had half the odds (odds ratio [OR], 0.50; 95% confidence interval [CI], 0.27–0.93) of receiving treatment compared with nonminorities. No treatment differences were observed between Hispanics and nonminorities (OR, 1.30; 95% CI, 0.68–2.52).

Race/Ethnicity and Cultural Factors

The distribution of several beliefs about lung cancer causes and treatment was different among minorities and is described in our previous work (see Table 2 in the online supplement) (16). Blacks and Hispanics were more likely than nonminorities to believe that

“high blood pressure can cause lung cancer” ($P = 0.03$), and blacks were more likely than nonminorities to believe that “surgery causes lung cancer to spread” ($P < 0.01$). There was no difference among groups in beliefs about treatment complications or side effects or in beliefs related to the identity, timeline, consequences, and controllability domains of the SRM ($P > 0.05$ for all comparisons).

Fatalism and mistrust were more frequently reported by blacks and Hispanics than by nonminorities. As we previously described, minorities were more likely than nonminorities to hold fatalistic beliefs. Blacks and Hispanics were also more likely to agree with many beliefs in the GBMMS suspicion domain, such as, “People of my ethnic group cannot trust doctors and health-care workers” or “People of my ethnic group should be suspicious of modern medicine” ($P < 0.01$ for all comparisons) (Table 2).

Cultural Factors and Stage-Appropriate Treatment

Beliefs about identity, causality, timeline, control, and consequences were not associated with treatment rates ($P > 0.05$ for all comparisons) (Table 3). Participants who believed that “surgery causes lung cancer to

spread” ($P = 0.04$) and “surgery will have bad side effects or complications” ($P = 0.04$) were less likely to receive stage-appropriate treatment. These findings were also observed among those patients with potentially resectable lung tumors ($P = 0.007$). Beliefs about radiotherapy or chemotherapy were not associated with treatment. Neither specific fatalistic beliefs nor medical mistrust items were associated with treatment ($P > 0.05$ for all comparisons).

Mediation Analysis

Mediation analysis with the SEM including surgical beliefs, fatalism, and medical mistrust as latent factors found a good model fit (Root Mean Square Error of Approximation: 0.013 and Comparative Fit Index: 0.994). Similar to findings in univariate analyses, blacks (estimate: 0.673, $P < 0.001$) and Hispanics (estimate: 0.528, $P = 0.006$) were more likely than nonminorities to hold fatalistic beliefs (Figure 1). The direct-effect estimate of 0.673 in the black race to the latent variable fatalism represents an increase of 0.673 SDs in fatalism scores for blacks compared with nonminorities. Similarly, the SD increase in fatalism scores for Hispanics compared with nonminorities

Table 2. Association between medical mistrust, race/ethnicity, and treatment

Belief/Attitude	Race/Ethnicity, n (%)			P Value	Stage-appropriate Treatment, n (%)		P Value
	Nonminority, N = 208 (59%)	Black, N = 74 (21%)	Hispanic, N = 70 (20%)		No, N = 162 (46%)	Yes, N = 190 (54%)	
Suspicion							
Cannot trust doctors/HCWs	11 (5)	11 (15)	17 (24)	<0.01	23 (14)	16 (8)	0.07
Suspicious of information from doctors/HCWs	15 (7)	13 (18)	17 (24)	<0.01	26 (16)	19 (10)	0.08
Should not confide in doctors/HCW because will be used against myself*	7 (3)	3 (4)	7 (10)	0.08	11 (6)	6 (3)	0.10
Suspicious of modern medicine*	11 (5)	14 (19)	10 (13)	<0.01	19 (12)	16 (8)	0.27
Treated like guinea pigs*	7 (3)	7 (10)	6 (9)	0.08	12 (8)	8 (4)	0.18
Complaints not taken seriously*	10 (5)	13 (18)	13 (19)	<0.01	16 (10)	20 (11)	0.89
Group health disparities							
Treated the same	147 (72)	49 (67)	46 (66)	0.52	107 (68)	135 (71)	0.56
Receive same care	157 (77)	53 (73)	50 (72)	0.62	116 (73)	144 (76)	0.61
Same kind of care	151 (75)	51 (71)	44 (65)	0.27	112 (72)	134 (72)	0.90
Provider support							
Doctors have my best interest in mind	171 (85)	60 (86)	57 (83)	0.95	131 (85)	157 (85)	0.95
Doctors hide information	32 (16)	21 (29)	24 (34)	<0.01	37 (24)	40 (21)	0.59
Been treated poorly/unfairly	8 (4)	9 (12)	8 (11)	0.02	13 (8)	12 (6)	0.42

Definition of Abbreviations: HCW = health-care workers.

Bold type indicates significance ($P < 0.05$).

*Beliefs used in SEM.

Table 3. Association between cultural factors and stage-appropriate treatment

Belief/Attitude	No, n (46%) N = 162 (%)	Yes, n (54%) N = 190 (%)	P Value
Causes			
Cigarettes	133 (85)	157 (82)	0.60
High blood pressure	15 (10)	19 (10)	0.97
Microwave	19 (12)	29 (16)	0.36
Life stress	52 (34)	58 (31)	0.58
Stop smoking for years, no cancer	9 (6)	21 (12)	0.08
Timeline			
Spread at diagnosis	75 (49)	86 (46)	0.62
Treatment			
<i>Surgical Beliefs</i>			
Exposure to air will cause cancer to grow faster*	24 (17)	21 (11)	0.19
Surgery will have bad side effects / complications	78 (53)	77 (42)	0.04
Surgery causes cancer to spread*	32 (22)	24 (13)	0.04
Surgery is worse than disease	18 (13)	16 (9)	0.27
<i>Radiation Therapy Beliefs</i>			
Radiation therapy will have bad side effects/complications	82 (64)	104 (58)	0.29
Radiation therapy weakens body's ability to fight cancer	47 (37)	49 (29)	0.13
Radiation therapy is worse than disease	20 (15)	17 (10)	0.15
<i>Chemotherapy Beliefs</i>			
Chemotherapy will have bad side effects/complications	106 (77)	122 (69)	0.14
Chemotherapy weakens body's ability to fight cancer	48 (36)	58 (33)	0.57
Chemotherapy is worse than disease	24 (18)	31 (17)	0.85
Personal Control			
Better to not know if have lung cancer	7 (5)	9 (5)	0.91
Expect lung cancer will be cured	134 (91)	164 (94)	0.50
Treatment will help live longer	146 (97)	183 (98)	0.47
Can control lung cancer if take care of self	138 (92)	178 (97)	0.06
Spirituality			
Religion is important	125 (80)	147 (77)	0.53
Praying helps heal cancer	32 (26)	36 (25)	0.74
Fatalism			
Accept bad things	67 (44)	99 (53)	0.10
Part of God's plan*	84 (55)	105 (56)	0.91
Bad things meant to be*	73 (48)	82 (44)	0.39

Bold type indicates significance ($P < 0.05$).

*Belief items used in SEM.

was 0.528. Blacks (estimate: 0.518, $P = 0.011$) and Hispanics (estimate: 0.587, $P = 0.002$) were also more likely than nonminorities to harbor medical mistrust. Neither blacks nor Hispanics were more likely to hold negative surgical beliefs. Mistrust was negatively associated with treatment (estimate: -0.231 , $P = 0.03$), corresponding to a 10% decrease in the probability of treatment for 1-SD increase in mistrust scores. Neither fatalism (estimate: 0.060, $P = 0.59$) nor surgical beliefs (estimate: -0.165 , $P = 0.19$) were associated with treatment. The direct path between black race (estimate: -0.305 , $P = 0.14$) or Hispanic ethnicity (estimate:

0.217, $P = 0.35$) and treatment were both nonsignificant when cultural factors were added as mediators. Comparing the total effect of black race on treatment (estimate: -0.433 , $P = 0.03$) with the total indirect effect mediated by cultural factors (estimate: -0.128 , $P = 0.20$) showed that approximately 30% of the reduced rate of treatment in blacks was explained by these mediators.

Discussion

Studies have shown that minorities with lung cancer are more likely than

nonminorities to be diagnosed at advanced stages, less likely to undergo treatment, and consequently have higher mortality rates (3, 4, 9). Even after controlling for potential confounders, we found that blacks were less likely than nonminorities to have received stage-appropriate treatment. Blacks were more likely than nonminorities to harbor negative treatment beliefs, fatalism, and medical mistrust, and mediational analyses suggested that these cultural factors partially explained the observed racial disparities. Conversely, we did not find these treatment inequalities for Hispanics. These findings suggest that attention to certain cultural factors may help improve lung cancer treatment rates among minorities while other mechanisms for the persistent disparities are investigated.

Black men have the highest incidence of and mortality due to lung cancer and do not receive the same lung cancer treatment as whites (25). Patients with early-stage lung cancer may achieve relatively good long-term survival if treated with surgery (26). However, blacks with early-stage lung cancer receive invasive staging less often and do not have surgery at the same rate as whites do (9, 27). Blacks with advanced-stage lung cancer also undergo chemotherapy and radiation less frequently than whites (3). Studies show that such disparities have persisted despite increasing awareness of them among physicians and policymakers (3, 7, 28). These patterns translate into worse outcomes for minorities and highlight the need for a better understanding of their underlying mechanisms.

Similarly to previous studies, we found that blacks were less likely than nonminorities to receive stage-appropriate treatment (2, 3, 7, 9, 27). Conversely, we did not observe treatment disparities among Hispanic patients. There are a few possible explanations for these findings. Hispanics who agreed to participate in our study may have been more engaged with and/or may have had better access to care. However, this potential bias should also apply to blacks because we enrolled all patients from the same hospitals. The urban hospitals from which we recruited serve communities with large numbers of Hispanics. There may have been greater availability of services to provide culturally sensitive care for Hispanics, which may have attenuated disparities in treatment

among this group. Prior data show that disparities in lung cancer care may not be as pronounced among Hispanics as among blacks, which may contribute to our null findings (29). Most Hispanics in our patient sample were of Puerto Rican or Dominican origin. Thus, our findings may not represent the care received by other prevalent U.S. Hispanic groups, such as Mexicans or Central Americans. These findings highlight the complex factors leading to cancer care disparities among different minority populations.

Underuse of surgical resection among blacks with early-stage disease is particularly worrisome, given that two-thirds of these patients could achieve 5-year disease-free survival with surgery (26). Blacks are both less likely to be recommended for and to accept surgical treatment for lung cancer than nonminorities (25, 27, 30). Doubts about surgical effectiveness or beliefs that exposure to air during surgery can cause cancer spread may explain these findings (22, 31). We also found that blacks were more likely than nonminorities to believe that surgery can cause cancer spread; however, our adjusted models showed that these beliefs did not explain treatment disparities and suggested that there are other factors driving decreased rates of surgical treatment among black patients.

Other cultural factors, such as fatalistic beliefs and medical mistrust, may result in lower rates of follow-up with providers, adherence to staging workup or preoperative testing, or higher treatment refusal rates. Fatalism has been found to be negatively associated with cancer screening (21). Similarly, lung cancer patients who have more negative perceptions of postsurgical prognosis are more likely to refuse surgery (28). Medical mistrust has also been associated with lower breast cancer treatment rates (32, 33). Structural equation modeling suggested that cultural beliefs explained 30% of the treatment disparities. These cultural beliefs may influence patients' care-seeking behaviors or treatment decisions. Clinicians should be aware of these belief differences and consider addressing them with their minority patients. Further investigation is needed to determine whether other cultural factors contribute to lung cancer care disparities.

Our study has some limitations. Although our patients had diverse racial/ethnic backgrounds, we recruited them from one urban area. Early-stage lung cancer was also overrepresented in our sample. Therefore, our results may not be generalizable to other clinical settings. Although we attempted to recruit patients early in their disease course (median time from diagnosis to enrollment was 3 mo),

some patients may have been interviewed during their treatment course. Thus, we cannot establish a causal link between patient beliefs and treatment received. We also did not measure provider-related factors, such as potential bias or provider beliefs, that may have contributed to the observed disparities. Furthermore, our sample size may not have been sufficient to detect cultural factors with weaker associations with treatment.

Compared with nonminorities, we found that blacks with lung cancer were less likely to receive stage-appropriate treatment, whereas we did not observe such differences among Hispanics. Cultural factors such as negative surgical beliefs, fatalism, and medical mistrust are found more commonly among minorities than among nonminorities and may influence minority patients' care-seeking behaviors or decisions to undergo treatment, and these factors may partially explain racial disparities in lung cancer care. Clinicians should be aware of these cultural belief differences and address them to reduce gaps in cancer care among minorities. ■

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