A Multilevel Analysis of the Relationship Between Institutional and Individual Racial Discrimination and Health Status

Recent research indicates that racism is one of the mechanisms explaining and expanding racial disparities in health. Racism can be defined as "an oppressive system of racial relations, justified by ideology, in which one racial group benefits from dominating another and defines itself and others through this domination. Racism involves harmful and degrading beliefs and actions expressed and implemented by both institutions and individuals."[1]

One stream of literature has documented the association between individually perceived discrimination and health, while a second stream has investigated the relationship between institutional discrimination and health.[2–26] These complementary works have provided empirical support for theories positing that discrimination and health are produced and maintained at multiple levels.[27–34] Context matters when it comes to race and health.[28] For example, O'Campo et al. found that the effect of individual-level variables diminished when neighborhood-level variables were included; the exception was race, which became significant once neighborhood variables were included.[35] Others have argued that segregation, as one measure of institutional discrimination, produces differential access to resources and hazardous exposures among members of minority groups.[17–20,25,32,36–38]

However, there are limitations to the current literature. First, researchers have rarely investigated both levels of discrimination simultaneously, despite a growing interest in multilevel analyses.[32,39–44] One study examined institutional racism, racial climate, and personal discrimination.[45] However, measures at all 3 levels were self-reported, and thus higher level measures were of

Objectives. This study examined whether individual (self-perceived) and institutional (segregation and redlining) racial discrimination was associated with poor health status among members of an ethnic group.

Methods. Adult respondents (n=1503) in the cross-sectional Chinese American Psychiatric Epidemiologic Study were geocoded to the 1990 census and the 1995 Home Mortgage Disclosure Act database. Hierarchical linear modeling assessed the relationship between discrimination and scores on the Medical Outcomes Study Short-Form 36 and revised Symptom Checklist 90 health status measures.

Results. Individual and institutional measures of racial discrimination were associated with health status after control for acculturation, sex, age, social support, income, health insurance, employment status, education, neighborhood poverty, and housing value.

Conclusions. The data support the hypothesis that discrimination at multiple levels influences the health of minority group members. (*Am J Public Health*. 2002;92:615–623)

questionable validity (i.e., the atomistic fallacy). Another study examined the impact of neighborhood context on the mortality of African American women but did not directly measure discrimination.[46]

Second, there is limited understanding of discrimination faced by groups other than African Americans.[32] It is possible that risk factors and mechanisms among African Americans differ from those among Asian Americans. Two studies have examined the link between discrimination and mental health among Asians, but both were conducted in Canada, limiting their generalizability to US populations; furthermore, neither addressed physical health status.[10,16] Third, studies examining residential institutional discrimination have primarily used the index of dissimilarity. However, just as there are different aspects of socioeconomic status (SES) (e.g., occupation and education), there are several aspects of institutional discrimination.[36,47,48]

To address these limitations, the present study examined the joint associations between institutional and individual discrimination and the health of Chinese Americans. The main

hypothesis was that institutional and individual discrimination would independently predict poorer health status. Investigating discrimination among Chinese Americans provided a "tougher test" of the discrimination hypothesis than such an investigation conducted among African Americans. The reason is that African Americans are seen to experience continued discrimination, while Chinese Americans are (erroneously) assumed to be members of a "model minority" who have overcome racism.[49] In addition, the Asian American category is extremely heterogeneous; studying Chinese Americans ameliorates potential heterogeneity biases.[49]

Housing discrimination against Asian Americans has been noted by several authors.[50–52] Given this, the present study used 2 measures of institutional housing discrimination, the index of dissimilarity and redlining. The dissimilarity index measures racial group segregation across neighborhoods. Redlining contributes to segregation, occurring when lending institutions are biased in regard to their loan dealings with members of racial minorities.[37,53,54] Redlining has been

discussed as a policy issue, but no studies have investigated the association between redlining and health.[37,53,55–58] The next section turns to the methods used to investigate the research questions.

METHODS

Study Population

This study used data from the Chinese American Psychiatric Epidemiologic Study (CAPES), the 1990 census, and the 1995 Home Mortgage Disclosure Act (HMDA). CAPES was a population-based survey of Chinese Americans living in Los Angeles. The study's multistage sampling scheme has been described previously and is only summarized here.[59,60] Thirty-six census tracts were selected from 1652 such tracts in Los Angeles. Because this study focused exclusively on Chinese Americans, tracts were purposely selected according to race and income characteristics to allow cost-efficient sampling. In 1993 and 1994, 16 916 households within these 36 tracts were screened, producing 1747 respondents aged 18 to 65 years. The response rate among eligible respondents was 82%. Of these respondents, 1503 were reinterviewed at a 15-month follow-up. This article focuses on the reinterview because all respondents were asked about discrimination.

Individual-Level Variables

Data on all individual-level variables, including the measures of health status and individual discrimination, were obtained from the CAPES follow-up.

Dependent variables. Two instruments were used in measuring health status. The first was the Medical Outcomes Study Short-Form 36 (SF-36).[61] Three of the SF-36 scales were chosen to represent a continuum from physical functioning to general health and mental health. The SF-36 scales have been shown to predict a variety of health outcomes; higher scores reflect better health.

The second instrument, used to measure psychological symptom patterns, was the revised Symptom Checklist 90 (SCL-90-R).[62] The SCL-90-R's summary indices, the Global Severity Index (GSI), the Positive Symptom Distress Index (PSDI), and the Positive

Symptom Total (PST), measure general psychological distress, psychological symptom intensity, and psychological symptom breadth, respectively. Higher scores indicate greater distress. These scales provide a more refined measure of psychological distress than the mental health scale of the SF-36.

Independent variables. Individual-level (self-perceived) discrimination was operationalized through affirmative responses to either or both of the following questions: "Now, thinking over your whole life, have you ever been treated unfairly or badly (1) because of your race or ethnicity" and (2) ". . . because you speak with a different language or you speak with an accent?"

Acculturation, SES, and social support were measured as potential contributors to the relationship between racial discrimination and health. Studies have reported that acculturation, a measure of the degree to which individuals have adopted the cultural practices of the "majority" group, has independent effects on health.[63,64] In addition, acculturated individuals are more likely to report racial discrimination.[12,65] Acculturation was measured with a 14-item scale including questions such as the following: "How often do you celebrate Chinese festivals?" and "What is your language of thinking?"[66] Higher scores indicate greater acculturation.

Family income, education, employment status, and medical insurance status ("Do you have health insurance?") were used in measuring SES. A 6-item scale measured social support. Sex and age were included as control variables that could influence reports of health and discrimination.

Institutional-Level Variables

Respondents were geocoded to census tracts. Each tract included between 16 and 62 respondents (average=42). The census provided data on tract characteristics (e.g., poverty percentages, median housing values) and was used to create the first measure of institutional discrimination, the index of dissimilarity.[47] This index was computed with block groups and was scored from 0 to 100, with higher scores representing greater segregation of Chinese Americans within tracts.

HMDA data were linked to tracts to address redlining. The HMDA requires all

banks, savings and loan associations, and large credit unions to report information about loan applications, including the type and amount of the loan, tract of the property, applicant characteristics (e.g., race, income), and loan disposition. In 1994, the Federal Reserve Board passed revisions requiring earlier public availability of HMDA data, simplification of reporting procedures, and improved accuracy (through institutions' checking their data before submitting them). The 1995 data were subject to these revisions, but full compliance was not enforced until 1996. Given the transition, some of the 1995 data may be less than optimal.

Redlined areas were operationalized as tracts where Asian home mortgage loan applicants were disfavored by 40% in comparison with White applicants. This 40% cut point has been used in other studies to define poverty neighborhoods and was chosen before substantive analyses were conducted.[67,68] An odds ratio was created for each tract and included the applicant's race and the ratio of loan request to applicant income. Applicant sex and coapplicant race were also considered but were omitted because of nonsignificant results.

Because of the present study's focus on home mortgage discrimination, the analyses eliminated applications that (1) were incomplete or withdrawn (these loans are not processed by lending institutions and hence do not measure loan disposition bias), (2) did not involve owner-occupied units, (3) involved multifamily units, and (4) involved home improvement loans. Tract racial composition could have been included in alternative models, but this was not done because such compositions would be considered in substantive models. Four tracts had missing or unstable data owing to low numbers of applicants; their odds ratios were estimated by averaging the values of adjacent tracts.

Statistical Analysis

Multilevel analyses modeled the simultaneous associations between individual and institutional racial discrimination. Because individuals were sampled within tracts, autocorrelation of respondents would violate the assumption of independence for ordinary least squares regression analyses, potentially

shrinking standard errors and increasing type I error rates. Hierarchical linear modeling (HLM 5 for Windows) was used to account for problems related to hierarchically arranged data, including autocorrelation.[69–71]

Each multivariate model included, as individual-level covariates, self-reported discrimination, family income, employment status, education, health insurance status, age, sex, and acculturation. A second model added redlining and dissimilarity. Final models included neighborhood poverty and median housing value. Exploratory models included Chinese American and Asian American dissimilarity percentages, but these variables were omitted from the final analysis because they were nonsignificant. Each equation modeled the intercept as a random effect. Significant random effects involving individual-level variables were included as appropriate. Finally, institutional-level variables were added to individual-level discrimination to allow examination of potential cross-level interactions. Random effects were double-checked in final models. Analyses were weighted to account for the sampling design.

RESULTS

The 1503 CAPES respondents were relatively well educated, young, and healthy. However, 30% of the respondents lacked medical insurance, and another 31% earned less than $20 000 a year. Furthermore, 21% of the respondents reported experiencing discrimination because of their race, ethnicity, language, or accent.

Table 1 presents respondent characteristics, stratified by reports of racial discrimination. In comparison with those who did not report discrimination, those who reported discrimination were significantly more acculturated, were of higher SES, and had poorer mental health and more psychological distress. However, there were no significant differences in regard to social support, sex, physical functioning, or general health.

The 36 tracts varied according to several characteristics. For example, poverty rates ranged from 2% to 34%, and median housing values ranged from $130 000 to $500 000. Asian and Pacific Islander Americans averaged 38% of the population and

constituted 80% in one tract. Whites averaged 24% of the population, Hispanics averaged 31%, and African Americans averaged less than 2%. The mean within-tract dissimilarity

score was 21. Keeping in mind that CAPES purposely sampled tracts in Los Angeles with high proportions of Chinese Americans, these results suggest a moderate degree of

TABLE 1—Selected Characteristics of Respondents and Areas, by Report of Discrimination and Redlining: CAPES, 1993–1995

Characteristic	Respondents		Areas	
	Reported Discrimination (n=314)	Did Not Report Discrimination (n=1189)	Redlined (n=6)	Other (n=30)
Physical health, mean	96.0	95.2	97.5	95.2*
General health, mean	69.8	70.3	77.0	69.7*
Mental health, mean	75.5	79.3*	81.0	78.4*
GSI, mean	0.2	0.1*	0.1	0.1
PSDI, mean	1.1	0.9*	9.4	10.1
PST, mean	15.7	8.7*	1.0	1.0
Acculturation, mean	2.5	2.2*	2.5	2.2*
Childhood spent in United States, %	37.5	18.1*	12.8	7.3*
Age, y, mean	37.2	38.6	34.7	38.6*
Social support, mean	3.2	3.2	3.3	3.2*
Female, %	49.2	50.6	60.9	49.5
Education, %				
0–11 years	13.8	23.7*	10.8	22.6*
High school	16.9	20.5	18.3	19.9
Some college	21.8	21.0	22.4	21.1
College	47.5	34.8	48.5	36.4
Income, $, %				
<10 000	7.4	7.3*	8.8	7.2
10 000–19 999	18.7	27.4	24.1	25.8
20 000–34 999	20.0	27.2	24.7	25.9
35 000–49 999	20.9	15.6	10.7	17.1
50 000–69 000	14.9	13.5	22.1	13.2
≥70 000	18.1	9.0	9.7	10.8
Insured, %	75.2	63.1*	74.1	64.8*
Employed, %	69.9	61.9*	63.7	63.4
Reported discrimination, %			27.0	19.0*
No. of CAPES respondents			191	1312
Chinese dissimilarity index score, mean			16.1	21.7
African American, %			2.7	1.6
Asian/Pacific Islander, %			25.9	40.6*
Chinese American, %			10.7	26.2*
Hispanic, %			19.8	33.7**
Non-Hispanic White, %			51.8	24.4*
Poverty, %			8.9	14.2*
Unemployment, %			4.7	6.3
Median houshold income, %			49 684	38 442
Median housing value, $			344 817	238 243*
Median year house built			1959	1961

Note. CAPES = Chinese American Psychiatric Epidemiologic Study; GSI = Global Severity Index; PSDI = Positive Symptom Distress Index; PST = Positive Symptom Total.
*$P<.05$; **$P<.01$.

segregation within Los Angeles and a modest degree of within-tract segregation. In 1990, the dissimilarity index score for Asian Americans (relative to non-Asians) in Los Angeles was 45.[72]

Table 1 shows that redlined areas differed from other areas. Examination of census-derived characteristics reveals that redlined areas included more Whites, fewer Chinese Americans, and more individuals of higher SES than nonredlined areas. Although the difference was not statistically significant, dissimilarity index scores were lower in redlined areas than in nonredlined areas. The correlations between poverty and housing value, poverty and dissimilarity, and housing value and dissimilarity were −0.62, 0.31, and −0.32, respectively.

CAPES respondents living in redlined areas differed in terms of several characteristics. Those residing in redlined areas were 42% more likely to report discrimination than those residing in other areas. Respondents in redlined areas had higher SF-36 scores, were of higher SES, exhibited higher levels of acculturation and social support, were younger, and were more likely to be female.

Tables 2 and 3 show results from the multivariate hierarchical linear models in regard to SF-36 and SCL-90-R outcomes, respectively. Each outcome involved 2 models. The first model included only individual-level variables; the second added institutional-level variables.

Self-reported racial discrimination predicted lower levels of mental health and higher levels of psychological symptomatology (according to the GSI, PSDI, and PST). Physical functioning and general health were not significantly associated with self-reported discrimination. Acculturation was associated with better general health but also with more psychological distress. Not surprisingly, SES was positively associated with health status; the single exception was medical insurance coverage, which was negatively associated with SF-36 outcomes.

Institutional-level factors also significantly predicted health status. Residing in redlined areas predicted better general health, better mental health, and lower distress (GSI and PST). Residing in segregated areas was marginally predictive ($P<.10$) of lower PST and PSDI scores, and neighborhood poverty was

marginally predictive of lower levels of mental health. Introduction of institutional variables changed the weights of some of the individual variables. For example, in many instances, the weight of employment status increased in multilevel models.

There were no significant interactions between self-reported discrimination and redlining and dissimilarity. Other models (not shown) including percentages of Chinese residents in tracts did not produce substantive differences from the ones reported. Because redlining is hypothesized to contribute to segregation, models were run excluding redlining to determine whether it "overcontrolled" for dissimilarity. These models also did not differ substantively.

DISCUSSION

An important step in eliminating racial disparities in health is to elucidate the mechanisms influencing the health of people of color. Toward this end, the present study suggests that individual and institutional measures of discrimination predict variations in health among Chinese Americans.

Twenty percent of respondents reported that they had experienced racial discrimination at some time, and 10% reported discrimination in the past year. However, given that a 1993 *Los Angeles Times* poll showed that 63% of Asian Americans in Los Angeles reported discrimination, actual prevalence rates were probably underestimated.[73] One explanation may reside in the questions themselves: single-item measures tend to underestimate discrimination.[74] If discrimination was in fact underestimated, health differences between those reporting and those not reporting discrimination would have been biased toward the null. Furthermore, "lifetime discrimination" would bias the results toward the null if past experiences were distant and had no influence on current health.

Individually perceived discrimination predicted lower levels of mental health but not of general or physical health. The literature suggests a robust link between perceived discrimination and mental health; however, the findings for physical health are less consistent. Williams and colleagues reported that discrimination was associated with mental health

in the case of both African Americans and Whites but was associated with physical health only among African Americans.[74] One possible explanation for these findings is that the effects of discrimination are threshold dependent, and the threshold for physical health is higher than that for mental health.

Thus, the degree of discrimination faced by Whites and Chinese Americans may be high enough to influence mental health but not physical health. However, African Americans may face greater endemic discrimination, surpassing the physical health threshold. Congruent with this perspective is Geronimus' "weathering hypothesis," which suggests that early cumulative exposures to various structural factors influence the physical health of African Americans.[75,76] Perhaps "weathering" contributes to the threshold-dependent effects of discrimination. A test of this issue awaits future research.

The present study is the first, to my knowledge, to explore the relationship between redlining and health. Here redlining reflects biased institutional practices against minority applicants in certain areas. Contrary to expectations, respondents living in redlined areas were more likely to have better general health and mental health. There are several potential explanations for these findings.

First, it is possible that discriminatory practices among lenders reflect a generalized pattern of discrimination in an area. That is, multiple discriminatory practices exist in an area, and redlining is simply one measure of several. Consistent with this perspective was the finding that respondents were more likely to report individual discrimination in redlined areas. Redlining may serve as a contextual measure of individual discrimination, capturing the experiences of individuals who encounter discrimination but do not report it. However, the overall findings of better health status in redlined areas do not support this interpretation.

Second, it is possible that Chinese American migrants who took up residence in these areas were healthier.[77] A test of this selection effect is not possible given the present cross-sectional design; however, controlling for SES and acculturation weakens such an argument because Asian residential patterns tend to be influenced by SES and cultural assimilation.[78,79]

TABLE 2—Hierarchical Linear Models of Medical Outcomes Study Short-Form 36 Outcomes

	Physical Functioning[a]		General Health[b]		Mental Health[c]	
	Individual Model, Parameter Estimate (SE)	Multilevel Model, Parameter Estimate (SE)	Individual Model, Parameter Estimate (SE)	Multilevel Model, Parameter Estimate (SE)	Individual Model, Parameter Estimate (SE)	Multilevel Model, Parameter Estimate (SE)
Intercept	98.61 (1.10)†	98.46 (1.41)†	76.20 (1.69)†	74.06 (2.49)†	82.62 (1.61)†	82.52 (2.07)†
Poverty in tract,%		0.06 (0.04)*		-0.10 (0.12)		-0.17 (0.10)*
Chinese Dissimilarity		7.5E-04 (0.01)		-0.01 (0.03)		2.2E-03 (0.03)
Median housing value,$						
133 330–193 849		1.00		1.00		1.00
193 850–222 349		-1.00 (0.81)		-0.99 (1.84)		-0.97 (1.55)
222 350–301 799		0.45 (0.77)		1.86 (1.84)		0.83 (1.90)
301 800–500 001		3.1E-03 (1.08)		1.52 (3.11)		-1.01 (1.95)
Redlined area (vs others)		1.63 (1.02)		6.99 (1.79)†		3.28 (0.92)†
Employed (vs not)	1.90 (0.78)**	1.91 (0.77)**	4.00 (1.32)***	5.12 (1.36)†	0.28 (1.05)	0.46 (1.11)
Insured (vs not)	-2.21 (1.08)**	-2.14 (1.09)**	-2.41 (1.12)**	-2.82 (1.20)**	-1.07 (1.08)	-1.36 (1.11)
Family income,$						
<19 999	-1.41 (0.85)	-1.66 (0.83)**	-2.89 (1.36)**	-2.74 (1.37)**	-3.13 (1.05)***	-2.60 (1.14)**
20 000–34 999	1.07 (0.65)	0.94 (0.62)	-1.42 (1.58)	-0.84 (1.63)	-3.44 (0.98)†	-2.97 (1.07)***
35 000 and more	1.00	1.00	1.00	1.00	1.00	1.00
Education						
0–11 years	-3.05 (1.08)***	-3.21 (1.08)***	-4.82 (1.21)†	-4.23 (1.15)†	-0.92 (1.11)	-0.26 (1.06)
High school	0.31 (0.67)	0.22 (0.66)	-0.17 (1.41)	0.49 (1.51)	1.63 (1.09)	1.95 (1.04)*
Any college	1.00	1.00	1.00	1.00	1.00	1.00
Age,y						
18–44	1.00	1.00	1.00	1.00	1.00	1.00
45–54	-2.13 (0.91)**	-2.04 (0.89)**	-6.30 (1.19)†	-6.49 (1.20)†	-1.96 (1.33)	-2.02 (1.33)
55–65	-8.94 (1.22)†	-8.77 (1.22)†	-8.21 (1.70)†	-8.13 (1.73)†	2.05 (1.65)	2.18 (1.68)
Reported discrimination (vs no report)	0.20 (0.53)	0.24 (0.55)	-2.93 (1.95)	-2.57 (1.93)	-3.95 (1.13)†	-3.95 (1.15)†
Female (vs male)	-1.32 (0.75)*	-1.31 (0.75)*	-2.85 (1.01)***	-2.90 (1.00)***	-1.46 (0.84)*	-1.53 (0.85)*
Acculturation	0.62 (0.44)	0.53 (0.43)	2.40 (0.65)†	2.58 (0.62)†	0.31 (0.66)	0.56 (0.67)
Social support	2.47 (0.75)†	2.44 (0.75)***	5.94 (1.15)†	6.02 (1.14)†	8.98 (0.90)†	9.01 (0.91)†

[a]Random acculturation slope and intercept.
[b]Random employment slope and intercept.
[c]Random intercepts.
*P<.1; **P<.05; ***P<.01; †P<.001.

Third, properties of redlined areas may be salutogenic (health promoting). For example, redlined areas had higher economic indicators, and several studies have suggested that inhabitants of economically advantaged areas are more likely to engage in visible exercise, promoting similar behaviors in their neighbors.[80,81] These advantages may represent a clustering of economic capital in redlined areas.[82] To a limited extent, individual SES and neighborhood poverty and housing values controlled for such factors. However, future studies should investigate the potential roles of neighborhood resources and buffering systems (e.g., improved health care systems, parks, community organizations).

Other studies have suggested that social cohesion, the integration of individuals into their communities, may promote health.[83] Cohesion is a less likely explanation for redlining, given that the present study controlled for social support and that there were fewer Chinese American residents in redlined areas.

Fourth, illness-producing factors may be more prominent in nonredlined areas. For example, areas with high concentrations of minority groups and poverty are more likely to have toxic waste facilities and cigarette and alcohol advertisements.[84–86] Economically depressed areas may have compromised institutional resources for improving health, such as a distressed medical system, poorer schools, and overburdened kinship networks.[46] Future studies should examine the potential influences of physical and psychosocial environmental toxins.

Thus, the data suggest that redlining practices exclude Chinese Americans from more desirable areas and contain them in less desirable ones. Given that the present study involved an exploratory use of this construct,

TABLE 3—Hierarchical Linear Models of Symptom Checklist 90 Outcomes

	Global Severity Index[a]		Positive Symptom Total[a]		Positive Symptom Distress Index[b]	
	Individual Model, Parameter Estimate (SE)	Multilevel Model, Parameter Estimate (SE)	Individual Model, Parameter Estimate (SE)	Multilevel Model, Parameter Estimate (SE)	Individual Model, Parameter Estimate (SE)	Multilevel Model, Parameter Estimate (SE)
Intercept	0.082 (0.020)†	0.068 (0.029)**	6.21 (1.18)†	6.74 (1.75)†	0.87 (0.06)†	0.962 (0.075)†
Poverty in tract, %		0.001 (0.001)		0.08 (0.05)		-1.1E-04 (0.002)
Chinese Dissimilarity		-3.9E-04 (2.6E-04)		-0.03 (0.02)*		-0.001 (0.001)*
Median housing value, $						
133 330–193 849		1.000		1.00		1.000
193 850–222 349		0.014 (0.024)		0.18 (1.61)		-0.107 (0.064)
222 350–301 799		0.023 (0.025)		0.38 (1.46)		-0.098 (0.057)*
301 800–500 001		0.024 (0.029)		0.62 (1.65)		-0.127 (0.068)*
Redlined area (vs others)		-0.049 (0.012)†		-1.34 (0.66)**		0.003 (0.043)
Employed (vs not)	-0.021 (0.014)	-0.021 (0.014)	-1.17 (0.81)	-1.39 (0.91)	-0.05 (0.04)	-0.046 (0.034)
Insured (vs not)	0.011 (0.015)	0.011 (0.015)	0.43 (0.87)	0.42 (0.96)	0.02 (0.04)	0.021 (0.041)
Family income, $						
<19 999	0.059 (0.017)†	0.058 (0.019)***	3.43 (0.89)†	3.68 (0.97)†	0.01 (0.03)	-0.006 (0.038)
20 000–34 999	0.041 (0.018)**	0.040 (0.019)**	2.15 (0.86)**	2.64 (1.00)***	0.03 (0.04)	0.022 (0.042)
35 000 and more	1.000	1.000	1.00	1.00	1.00	1.00
Education						
0–11 years	0.027 (0.015)*	0.025 (0.017)	1.82 (0.88)**	1.09 (1.00)	0.02 (0.04)	0.003 (0.043)
High school	-0.019 (0.013)	-0.019 (0.013)	-1.06 (0.74)	-1.62 (0.80)**	-0.06 (0.05)	-0.072 (0.047)
Any college	1.000	1.000	1.00	1.00	1.00	1.00
Age, y						
18–44	1.000	1.000	1.00	1.00	1.00	1.00
45–54	0.022 (0.020)	0.022 (0.020)	1.44 (1.12)	1.85 (1.18)	0.04 (0.03)	0.043 (0.029)
55–65	0.007 (0.018)	0.005 (0.018)	0.59 (1.11)	0.66 (1.09)	0.14 (0.05)***	0.148 (0.048)***
Reported discrimination (vs no report)	0.118 (0.026)†	0.121 (0.027)†	7.39 (1.33)†	7.13 (1.49)†	0.18 (0.04)†	0.185 (0.036)†
Female (vs male)	0.016 (0.013)	0.017 (0.013)	1.47 (0.73)**	1.80 (0.74)**	0.08 (0.03)***	0.085 (0.029)***
Acculturation	0.044 (0.013)***	0.044 (0.013)***	2.52 (0.64)†	2.46 (0.65)†	0.05 (0.02)***	0.049 (0.020)**
Social support	-0.115 (0.020)†	-0.115 (0.020)†	-6.81 (0.99)†	-6.98 (0.92)†	-0.16 (0.04)†	-0.165 (0.035)†

[a]Random acculturation, racism, and intercept slopes.
[b]Random intercept slope.
*$P<.1$; **$P<.05$; ***$P<.01$; †$P<.001$.

future research should validate these findings and elucidate mechanisms.

Regarding segregation, the data indicate that respondents living in tracts with greater Chinese dissimilarity index values had lower PST and PSDI scores. These findings were of marginal statistical significance but should not be ignored, because neighborhood effects are expected to be causally related to more proximal factors. The effects of segregation may indeed be important but may be obscured by individual factors determined by segregation—for example, employment opportunities. The present results, suggesting that people living in more integrated areas have a more intense and wider range of psychological symptoms, run counter to those of other studies showing that African Americans residing in segregated areas have worse health outcomes.[17–19,25]

The findings of the present study may have been the result of the multiple comparisons problem or the sampling methodology. The 36 census tracts were selected because they contained high proportions of Chinese American residents. However, this limited geographical variation could have influenced the ecological measures because the areas selected were areas in which Chinese Americans were segregated from the city as a whole.

Information on the remaining 1616 tracts in Los Angeles was not collected. If these excluded areas are more health aversive than the ones sampled, the results may be biased toward the null.

However, if valid, the findings contradict studies showing a positive association between segregation and illness among African Americans.[17–22,25] In the case of African Americans, segregation may negatively influence health via the cascade of related secondary effects such as poverty and other stressors.[25,37,87] It is possible that these mechanisms do not exist for other populations or operate to a lesser extent. Halpern has

argued that increasing ethnic group density in an area protects the mental health of minority group members by increasing mutual social support and reducing exposure to discrimination.[77,88]

Among Chinese Americans, segregation may reflect the establishment of ethnic enclaves. Segregation into ethnic enclaves may help to ameliorate "culture shock" and other stressors, including discrimination, and this adaptation process may influence the well-being of immigrant Chinese Americans.[89] Chinatowns (one type of ethnic enclave) have historically provided services and shelter to Chinese Americans, especially during times of racial persecution.[90] These services have included indigenous medical practices and political advocacy. LaVeist has demonstrated that political empowerment promotes the health of minority groups.[91] In the case of Chinese Americans, segregation may represent the clustering of resources, not stressors.

Other research suggests that the nature of segregation differs for African Americans in comparison with other minority groups. While Asian American and Hispanic segregation varies according to SES, African American segregation does not.[37] LeClere et al. reported that neighborhood effects on health differ for African Americans and Mexican Americans.[26] Given these findings, one should not assume a "one race fits all" conceptualization of contextual effects. Future research should elucidate the universal and group-specific mechanisms underlying the relationship between segregation and health, including salutogenic as well as health-aversive factors.

The present data suggest that individual-level discrimination has more of an influence on health status than does institutional discrimination. However, this should not imply that individual factors trump institutional ones. Institutional factors may have a weak relationship to individual outcomes but a profound impact on group outcomes, and thus they may drive macro-level racial disparities. In addition, institutional factors may determine individual factors and hence show weak effects, because they are captured at lower levels of analysis. Interestingly, individual discrimination had no significant relationship to

general health, whereas redlining did exhibit such a relationship. This suggests that institutional discrimination may influence health in the absence of individual recognition of discrimination.

Socioeconomic indicators at both the individual and census-tract levels were associated with health status, a finding echoed in the literature.[26,34,40,44,46,81,92] Individual-level variables had a more robust relationship to health than did tract-level variables. Given that neighborhood SES and individual SES are recursively related, the weak findings in regard to neighborhood socioeconomic characteristics are not surprising.

Finally, these data mirror the mixed findings in the literature regarding acculturation. While acculturation was associated with better general health, it was also associated with more psychological symptoms. Although a detailed exploration of acculturation is beyond the scope of this article, it should be noted that individuals reporting discrimination were more acculturated; however, there were no significant interactions between acculturation and discrimination.

Several potential limitations should be noted in addition to those already discussed. First, all of the individual-level variables were self-reported, leaving open the possibility of response biases (e.g., socially desirable reporting). This is a universal problem in studies involving self-reported data.

Second, the redlining measure created with the HMDA data set—designed explicitly to monitor unfair lending practices—is imperfect.[56,93] Although this data set provides information regarding applicant income and loan amount, it lacks information regarding applicant occupation and wealth, a potential limitation in that the wealth gap between minority groups may be higher than the income gap.[94] Despite these caveats, the HMDA data set is widely used and is probably the best publicly available source for monitoring redlining.[55–57,93,95–97]

Third, the cross-sectional design precluded establishment of causal relationships. Prospective studies are needed to establish temporal sequencing. Finally, the census data were collected several years before the initiation of CAPES and may not have accurately reflected individual exposures. This potential

limitation is a common issue among studies that involve census data.

In summary, the results suggest that both institutional and individual factors influence variations in health status. Self-reported racial discrimination at the individual level predicted poor health status, whereas redlining and segregation predicted better health status. Mental health appears to be more strongly linked to discrimination than does physical or general health. The present findings support the argument that discrimination is a "risk factor" for minority populations living in the United States. In addition, the results highlight the utility of a balanced research design involving both individual and institutional factors. To improve health and reduce social disparities, future research should elucidate the reciprocal link between individuals and the macro environment. ∎

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