

# Socioeconomic Status and Health Among Californians: An Examination of Multiple Pathways

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Health inequalities manifest as a gradient, rather than as a distinction between “haves” and “have nots.” Therefore, eliminating health inequalities will require targeting interventions at segments of the entire population, not just particular subgroups at the disadvantaged end of the social hierarchy. Developing such interventions, however, has been stymied by an unclear understanding of how socioeconomic status (SES) influences health. The literature offers 5 fundamental explanations, including 1) selection effects, 2) differences in lifestyle patterns, 3) differential exposure to life stresses, 4) differences in psychosocial resources, and 5) differential access to, and poorer quality health care resources.<sup>1–9</sup> A major limitation of this literature is that these explanations are frequently viewed as competing hypotheses, rather than complementary explanations representing the broad context of social experiences conditioned by location in the social structure.<sup>1,10–13</sup> Evidence indicates that no single explanation has accounted for as much variance as all of the explanations combined,<sup>12,14,15</sup> and different causal mechanisms for the SES–health relationship may be operative at different socioeconomic levels.

In this study, we examine the ability of different mediators to account for socioeconomic differences in health status at different points in the social hierarchy.

## METHODS

### Data and Study Cohort

Our data came from the 1998–2000 California Work and Health Survey (CWHS).<sup>13</sup> Survey instruments and methodology can be found at the Web site of the Institute for

**TABLE 1—Weighted Descriptive Statistics for Pooled Data: 1998–2000 California Work and Health Survey (n = 3464)<sup>13</sup>**

Class of Variable	Variable	Percentage or Mean
Outcomes	Obesity <sup>a</sup>	35
	Fair or poor health	12
	Depression <sup>b</sup>	6
Basic model	Educational attainment	
	Less than high school education	5
	High school education or some college	56
	Bachelor's degree	25
	Graduate degree	14
	Female	50
	Race	
	White	75
	Black	8
	Asian	5
	Other	9
	Missing	3
	Latino ethnicity	14
	Age group	
	25–39	40
	40–54	39
	55–69	21
Lives in a rural area	10	
County unemployment rate, mean	5.40 (SD = 3.06)	
Social relationships	Marital status	
	Married or cohabiting	52
	Divorced, separated, or widowed	24
	Never married	24
	Has children under age 5	13
	Has children aged 5 to 17	28
	Has at least 1 close friend	94
Has at least 1 close family member	91	
Health behaviors	Current smoker	21
	Former smoker	27
	Engaged in physical activity at least once during the past month	83
Financial strain	Quality of sleep (4 = best, 0 = worst), mean	2.19 (SD = 1.23)
	Ability to live on household income (4 = most difficult, 0 = least difficult), <sup>c</sup> mean	0.77 (SD = 1.04)
	Likelihood of hardships or reductions in standard of living (3 = most likely, 0 = least likely), <sup>d</sup> mean	0.45 (SD = 0.72)
Health care access	Has any health insurance	85
	Has a usual source of medical care	84

Note. SD = standard deviation. Education, race, age group, and marital status are entered into the regression models as a series of dichotomous indicators for each category, with 1 category omitted.

<sup>a</sup>Body mass index is greater than 27.3 for women and greater than 27.8 for men.

<sup>b</sup>Reported at least 7 of 15 depressive symptoms from the Short Geriatric Depression Scale during the past week.

<sup>c</sup>Response to question: “How difficult is it for you to live on your total household income right now: not at all difficult, somewhat difficult, difficult, very difficult, or extremely difficult?”

<sup>d</sup>Average of reverse-coded responses to the following 2 questions: (1) “In the next 2 months, how likely is it that you and your family will experience actual hardships, such as inadequate housing, food, or medical attention: very likely, somewhat likely, not too likely, or not at all likely?” and (2) “In the next 2 months, how likely is it that you and your family will have to reduce your standard of living to the bare necessities in life: very likely, somewhat likely, not too likely, or not at all likely?”

Health Policy Studies at the University of California, San Francisco (<http://medicine.ucsf.edu/programs/cwhs>). Although the CWHHS was designed to be longitudinal, attrition rates were high, so longitudinal sample sizes were inadequate. Thus, our analyses were based on pooled cross-sectional data from 1998 to 2000 for approximately 3000 US-born respondents between the ages of 25 and 69. Missing data for covariates other than education were imputed by using propensity scores to match respondents,<sup>16</sup> and then using the data from a randomly selected matched data “donor” to impute the value of the missing variable.

### Variables

Outcomes were whether the respondent (1) was obese, based on body mass index,<sup>17</sup> (2) reported being in fair or poor health, and (3) reported experiencing at least 7 of 15 depressive symptoms from the Short Geriatric Depression Scale<sup>18–20</sup> during the past week. We chose respondent's education as the SES measure, to attenuate problems of reverse causality and to allow greater comparability with earlier studies. Table 1 summarizes all of the other covariates.

### Statistical Analyses

We calculated weighted descriptive statistics for all variables used in the analysis (Table 1). We estimated multiple logistic regression models of the impact of education on the health outcomes using Huber–White robust standard errors, survey weights, and generalized estimating equations<sup>21</sup> to adjust standard errors for within-person correlation. The tables report relative risks<sup>22</sup> and 95% empirical confidence intervals, derived by bootstrapping with replacement (1000 repetitions).<sup>23</sup>

### RESULTS

Relative to having less than a high school education, having a bachelor's or graduate degree was associated with about a one-quarter and a one-third reduction in the probability of obesity, respectively, whereas having a high school degree was not significantly associated with obesity risk (Table 2). A comparison of the basic model with the mediated models suggested that the educational gradient in obesity could not be explained by any of the factors examined in this study.

**TABLE 2—Relative Risks of Poor Health Outcomes by Educational Attainment<sup>13</sup> and Analytic Model**

	High School or Some College (95% CI)	Bachelor's Degree (95% CI)	Graduate Degree (95% CI)
<b>Obesity (n = 3338)</b>			
Basic model	0.94 (0.75, 1.19)	0.72 (0.55, 0.96)*	0.62 (0.47, 0.86)*
Basic + social relationships	0.94 (0.75, 1.20)	0.74 (0.56, 0.98)*	0.63 (0.47, 0.88)*
Basic + health behaviors	0.93 (0.74, 1.20)	0.74 (0.56, 1.00)*	0.63 (0.46, 0.88)*
Basic + financial strain	0.95 (0.76, 1.21)	0.75 (0.57, 0.99)*	0.65 (0.49, 0.91)*
Basic + health care access	0.92 (0.73, 1.18)	0.71 (0.54, 0.94)*	0.60 (0.45, 0.84)*
Full model	0.93 (0.75, 1.19)	0.75 (0.57, 0.99)*	0.63 (0.47, 0.91)*
<b>Fair or poor health (n = 3454)</b>			
Basic model	0.39 (0.29, 0.53)*	0.17 (0.12, 0.27)*	0.27 (0.17, 0.42)*
Basic + social relationships	0.40 (0.29, 0.56)*	0.18 (0.12, 0.29)*	0.29 (0.19, 0.47)*
Basic + health behaviors	0.41 (0.29, 0.59)*	0.27 (0.17, 0.45)*	0.41 (0.25, 0.67)*
Basic + financial strain	0.43 (0.31, 0.63)*	0.25 (0.16, 0.40)*	0.40 (0.25, 0.64)*
Basic + health care access	0.39 (0.29, 0.53)*	0.17 (0.12, 0.27)*	0.27 (0.17, 0.42)*
Full model	0.43 (0.31, 0.65)*	0.34 (0.22, 0.56)*	0.54 (0.32, 0.87)*
<b>Depression (n = 3044)</b>			
Basic model	0.65 (0.39, 1.20)	0.31 (0.15, 0.68)*	0.16 (0.06, 0.43)*
Basic + social relationships	0.70 (0.40, 1.44)	0.36 (0.17, 0.84)*	0.19 (0.07, 0.55)*
Basic + health behaviors	0.89 (0.52, 1.69)	0.63 (0.28, 1.34)	0.32 (0.12, 0.88)*
Basic + financial strain	1.01 (0.56, 1.87)	0.78 (0.36, 1.76)	0.41 (0.14, 1.15)
Basic + health care access	0.69 (0.41, 1.33)	0.34 (0.16, 0.79)*	0.18 (0.07, 0.52)*
Full model	1.12 (0.60, 2.24)	1.20 (0.51, 2.74)	0.55 (0.16, 1.61)

Note. CI = confidence intervals. The relative risk equals the probability of the outcome if the sample had the given educational attainment, divided by the probability of the outcome if the sample had less than a high school education. Because the reference category is less than high school education, all relative risks for less than high school education equal 1.0. "Full model" controls for all variables in the basic model, plus marital status, having any close friends, current smoking, sleep quality, exercise, and the 2 financial strain variables.

\* $P \leq .05$ .

Although all 3 higher education categories were significantly associated with large reductions in the probability of poor or fair self-assessed health when compared with less than high school education, the effects looked more U-shaped. The basic model suggested that respondents with a bachelor's degree were only 0.17 times as likely to report poor or fair health as those with less than a high school education, whereas those with a graduate degree were 0.27 times as likely to report being in poor or fair health.

In contrast to obesity, part of the educational gradient for self-assessed health did appear to be mediated by the study variables. Moreover, the proportion of the effect explained by the mediators increased for higher levels of educational attainment. For example, the difference in risk associated with high

school education was reduced by 7% in the full model. The corresponding figures for bachelor's and graduate degrees were 20% and 37%, respectively. Finally, financial strain and lifestyle behaviors seemed to have an additive effect in explaining the educational gradient for persons with college degrees and higher, but not for those with high school only, suggesting that these mediators may be more closely related among the latter group.

Although we detected a linear educational gradient in depression, none of the associations of high school education with depression achieved statistical significance. After controlling for potential mediating factors, especially health behaviors and financial strain, the strong association of bachelor's degree with a reduced risk of depression became insignificant. Similarly, the relative risk of depression associated

with having a graduate degree lost significance after controlling for potential mediators.

## DISCUSSION

Our analyses showed a strong association of education with physical and mental health. More important, virtually none of the educational gradient for obesity and very little of the educational gradient for fair or poor health could be explained by a variety of mediating factors representing the domains of social relationships, health behaviors, financial strain, and health care access. In contrast, the strong educational gradient in depression was substantially reduced and lost statistical significance after controlling for differences in health behaviors and financial strain.

Our analyses were subject to certain limitations. The analyses were based on California residents, so the findings may not generalize. Statistical power may be low, and multiple comparisons were made, suggesting that interpretation should focus on broad patterns of findings rather than individually significant effects. The potential for reverse causality exists in many of these relationships. If physical activity, sleep impairment, or financial problems are endogenous to depression, then the education gradient is likely to be underestimated, and education itself may be endogenous to health. Finally, incomplete assessment of the mediating variables and measurement error may have resulted in an underestimate of the extent to which mediating factors may explain the association between educational attainment and health.

Earlier studies have also encountered this last limitation, suggesting the need for prospective studies with adequate measurement of a comprehensive array of mediators. For example, measures of diet and better measures of exercise might have attenuated the correlation between education and obesity, the only outcome for which the mediators did not seem to be important.

Population health inequalities are a persistent challenge for public health professionals. Clearly it is important to eliminate the disproportionate burden of poor health among the most disadvantaged Americans; however, our study suggests that important gains to population health can also be achieved by reducing

the more modest health inequalities among the majority of Americans, who have not acquired the personal and social resources associated with high status, yet are not deprived. Our pattern of results suggests that financial strain and lifestyle behaviors may be more closely related among those with a lower level of educational attainment than among those with a college degree or more. Thus, practitioners need to recognize and address the financial obstacles associated with adopting and maintaining certain positive lifestyle behaviors among individuals with less education.<sup>23</sup> Finally, eliminating health inequalities in the population may require a coordinated effort targeting multiple individual and contextual factors, such as health behaviors and financial strain, that contribute to poor health. ■

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### Contributors

Both authors designed the study, interpreted the results, and contributed to writing the conclusions section. In addition, S. L. Ettner analyzed the data and wrote the methods and results sections, and J. G. Grzywacz formulated the conceptual model and wrote the introduction.

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### Human Participant Protection

No protocol approval was needed for this study.

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