Contribution of Psychosocial Factors to Socioeconomic Differences in Health

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MIDLIFE IS THE PERIOD OF LIFE, AFTER THE FIRST year, at which socioeconomic differences in mortality are most manifest (Goldblatt 1990; Marmot and Shipley 1996). Studies in the United Kingdom, the United States, and other countries show widening inequalities in mortality (Pappas et al. 1993; Drever, Whitehead, and Roden 1996). Although there is ample information on differentials in mortality rates from a variety of sources, fewer data exist on socioeconomic differences in morbidity. Such data as there are suggest that differences do exist and may be of great importance (Blaxter 1987; Royal College of General Practitioners et al. 1986). In the Whitehall II Study of British Civil Servants, men and women at the bottom of the employment hierarchy had six times the rate of absence due to sickness as those at the top (North et al. 1993).

An important implication of the Whitehall Studies of British Civil Servants has been not only that morbidity and mortality rates are higher at the bottom of the social hierarchy than at the top, but also that they follow a social gradient. People at each point in the hierarchy have worse health than those above them and better health than those of lower

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position (Marmot, Shipley, and Rose 1984; Marmot et al. 1991; North et al. 1993). Comparisons among the Whitehall II study, the Wisconsin Longitudinal Study of 1958 high school graduates, and the U.S. National Survey of Families and Households demonstrated that social gradients in ill health observed in the United States were similar in magnitude and direction to those observed in the United Kingdom (Marmot et al. 1997).

A rich literature now makes it clear that the current task is no longer simply to document social inequalities in morbidity but to understand the reasons for them. (See, for example, Black et al. 1988; Whitehead and Dahlgren 1991; Dahlgren and Whitehead 1995; Marmot and Mustard 1994; Marmot, Bobak, and Davey Smith 1995; Mackenbach 1995.) Most data sets that allow the description of inequalities have limited data to explore possible explanations.

The MIDUS survey (National Survey of Mid-life Development in the United States) was designed to examine an array of psychosocial factors that might account for the expected social gradients in health and disease. We examine three health outcomes that demonstrate the breadth of association between socioeconomic status and health:

1. *Self-reported physical health*. This is an integrated measure of health that is affected by specific diseases but predicts mortality independent of markers of physical disease (Kaplan, Barell, and Lusky 1988; Grant, Piotrowski, and Chappell 1995).
2. *Waist:hip ratio*. This is a specific biomedical marker of central adiposity that is related to diabetes and cardiovascular risk (Brunner et al. 1998).
3. *Psychological well-being*. Positive measures of health have hitherto not been a major focus of research on social inequalities in health but are important for their relation to quality of life and as a possible marker for resilience against disease risk.

There are three steps in our analytical approach. First, we examine the nature of the social gradient in these three indicators of physical and psychological health. Second, we examine the association between the three health outcomes and a number of other variables that theory or previous empirical work suggest should be related to these measures of health. Third, we ask how much of the social gradient can be explained by these hypothesized explanatory factors. In Britain, influ-

enced by the *Black Report*, the search for explanations has concentrated either on behavior and lifestyle or on material circumstances (Working Group on Inequalities in Health 1980). The hypothesis being tested here is that a combination of factors—social, environmental, and individual—may be important and that no single psychosocial factor is likely to explain differentials in health. Experiences from early life, health behaviors, and the environment in which people live and work may all contribute. We therefore look at the cumulative effect of these factors. The variables measured were designed to capture a wide range of aspects of people's lives: early environment (parents' education); characteristics of area of residence; household income; marriage and social supports; perceptions of inequality; work environment; smoking; and perceptions of control and self-efficacy.

A question that is posed regularly when examining social differentials in health is that of health selection: does socioeconomic position determine health status, or might the reverse be true? Longitudinal studies show that health selection cannot be the main explanation for the social gradient (Wadsworth 1986; Goldblatt 1990; Power, Manor, and Fox 1991; Power and Hertzman 1997). The MIDUS survey cannot deal with this issue directly, as the data are cross-sectional. We have, however, used education as the main marker of socioeconomic position. As, for the most part, achievement of educational status precedes the development of ill health in midlife, it is unlikely that health selection is the explanation for the findings we report in this paper.

Methods

The data for this study came from the 1995 MIDUS survey, part of an interdisciplinary investigation of patterns, predictors, and consequences of midlife development in the areas of physical health, psychological well-being, and social responsibility. MIDUS respondents are a nationally representative U.S. population sample of noninstitutionalized persons aged 25 to 74 who have telephones. The sample for the analyses presented here is the subsample of respondents (N = 3,032) who completed both the telephone interview and the self-administered questionnaires. Sampling weights correcting for selection probabilities and nonresponse allow this sample to match the composition of the U.S. population on age, sex, race, and education. In this report, the intention

is not to produce measures representing the U.S. average, but rather to examine relations within the sample; unweighted figures are therefore presented. We repeated several analyses with the weighted data and obtained no substantial difference in results.

MIDUS respondents first participated in a telephone interview that lasted approximately 40 minutes. The response rate for the telephone questionnaire was 70 percent. Respondents to the telephone survey were then asked to complete two self-administered mailback questionnaires. The response rate for the mailback questionnaire was 86.8 percent of telephone survey respondents. This yielded an overall survey response rate of 60.8 percent for both parts of the survey.

Health Outcome Measures

Three measures of health were chosen to examine the relation between social class and health:

1. Self-Rated Physical Health.   Although self-reported physical health is a subjective assessment and therefore liable to various sources of reporting bias, it has nonetheless been shown that a general measure of health is predictive of mortality (Appels et al. 1996; Bosma and Appels 1997). Respondents rated their present state of physical health on a 5-point scale (1 = poor, 5 = excellent). The scale was dichotomized to poor/fair versus moderate/good/excellent health; the latter category was used as the reference group.

2. Waist:Hip Ratio.   Respondents were provided with a tape measure, a diagram, and instructions on where and how to measure the waist and hip circumference. It is calculated by dividing the waist circumference by the hip circumference; higher values indicate greater central adiposity. This measure was included because it was considered less subject to measurement bias, it is a biological indicator of cardiovascular disease risk, and it is reportedly linked to social class (Brunner et al. 1998). Respondents in the top quintile were considered to be in the least favorable category, and this was taken as the health outcome.

3. Psychological Well-Being.   Psychological well-being was measured with a composite score for six dimensions of positive psychological functioning (autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance). These were derived from the theoretical literature on adult psychological development and positive mental health (Ryff 1989). In addition to being an important aspect of health itself, psychological well-being provides

critical protective resources in the face of life adversity, and if it is related to social class, its attenuation could augment the vulnerability of persons lower in the social hierarchy. Respondents in the lowest quintile were considered to be in the least favorable category.

Explanatory Variables

Socioeconomic status can be measured according to various indicators: occupational category or prestige; income; and/or educational attainment. Reliance on cross-sectional data could lead to the conclusion that either income or occupation is the result of poor health, whereas educational attainment in childhood and young adulthood occurs prior to midlife health status and is therefore less likely to be influenced by present health status. Educational attainment was categorized into the following four categories from highest to lowest: at least a college degree; some college but less than a BA degree; a high school diploma; less than a high school diploma.

The other explanatory variables represent ways in which social position may influence poor health. After examining a comprehensive set, we chose for our analyses a number of potential mediators based on their known or hypothesized association with either ill health or socioeconomic status: father and mother's educational attainment as an indicator of childhood socioeconomic environment; household income; a poverty index based on the combination of proportion of households in the zip code area living below the poverty line and the proportion of unemployed persons residing in the area (U.S. Bureau of the Census 1993); smoking as a measure of health behavior; social relations, which include marital status; positive support from family and friends; strain based on demands from family and friends; perceived inequalities that assess the degree to which individuals subjectively experience social inequalities in their neighborhood, work, home, and family domains. The scale for each domain is based on the total score of the individual items that constitute the scale. Then an overall scale is calculated from the mean of the three latter scales—work, home, and family—and the mean score is divided into tertiles for the analyses.

The psychosocial work environment was assessed from items derived from questionnaires based on the Karasek model of job control and modified for use in the Whitehall II study (Marmot et al. 1991): four items assessed decision authority; four items examined skill discretion. The work environment's importance to health has been shown in both

cross-sectional (Karasek and Theorell 1990) and longitudinal studies (Bosma et al. 1997), and its relationship to socioeconomic position has also been demonstrated (Marmot et al. 1991, 1997). The total score was divided into tertiles; high decision authority and high skill discretion were considered the reference groups. Sense of control, a construct related to—but not synonymous with—personality, is a learned social behavior that reflects coping strategies and has been reported to be associated with health in older samples (Rodin 1986). In MIDUS sense of control was operationalized with two dimensions: personal mastery and perceived constraints (Lachman and Weaver 1998). Personal mastery refers to the sense of efficacy or effectiveness in carrying out one's goals. Perceived constraints indicate the extent to which one believes there are factors beyond one's control that obstruct achievement of one's goals. Each dimension is based on the mean of the individual items. The scores ranged from 1 (strongly agree) to 7 (strongly disagree); the items are reverse coded, with higher scores indicating greater mastery and more constraints. The total score is then divided into tertiles, with high mastery and low constraints used as the reference groups.

For all analyses, the explanatory variables that were based on a total or mean continuous score were categorized into tertiles or into the worst quintile versus all others, with the exception of income, which was separated into quartiles. When at least 75 percent of the items of any scale were completed, the mean of the items was imputed to the missing items of the scale. If fewer than 75 percent were completed, the scale was considered missing.

Statistical Analyses

Chi-square analysis was used to describe the sample for the variables of interest and their distribution along the educational hierarchy. The Mantel–Haenszel chi-square was estimated to determine whether a linear trend was observed for each variable of interest.

Multiple logistic regression analysis (SAS PROC Logistic) (SAS Institute 1990) was used to estimate the strength of the association between the health outcomes and each explanatory variable, adjusting first for age and race and then including educational attainment in the model. The odds ratio (OR), which is derived from the estimated beta coefficient, reflects the relative increase in the odds of the occurrence of the health outcome of interest per unit increase of the explanatory variable. The reference group is shown with an odds ratio of 1.0, and odds ratios

are calculated for each unit increase in the explanatory variable. An odds ratio in the range of 1.0 is indicative of no increased relative risk; as the odds ratio increases in value, so does the risk of occurrence of the health outcome in those with the specified level of the variable compared to those without it. The 95 percent confidence intervals are also reported, and when 1.0 is within the confidence limits, there is no (significant) evidence for an increased risk as compared with the reference group (Rothman 1986).

Results

The distribution of the MIDUS sample according to educational status, for women and men, is shown in table 1. This table also shows the outcome measures and the potential explanatory variables used in subsequent analyses and how they distribute by education. For the three outcome variables—poor/fair physical health, waist:hip ratio, and psychological well-being—there is a clear gradient: progressively more adverse levels as one descends the educational hierarchy. Similarly, for each of the explanatory variables, there is a social gradient. There was no significant trend for race by education; however, whites were less frequently in the lowest educational group than in the other educational groups.

Table 2 shows the relations of the three outcomes to education. In this and subsequent analyses, the outcomes are treated as categorical variables: poor/fair physical health; upper quintile of waist:hip ratio; lowest quintile of psychological well-being. In every case, the group with the lowest education had strikingly worse levels than those with at least college degrees. In all six analyses, the gradient was also clearly in evidence, as each group had worse health than the one above it in the hierarchy. The magnitude of the difference and the slope of the gradient suggest that educational level may be the most important correlate of these health outcomes in this national sample.

The relations between the potential explanatory variables and the health outcomes are reported in tables 3, 4, and 5. The tables show the effects adjusted for age and race. Odds ratios with confidence intervals for the same relations, additionally adjusted for education, are also shown.

The results for poor/fair physical health are shown in table 3. Nonwhite women report worse physical health than white women, but this difference by race was not seen among men. An alternative measure of

TABLE 1

Numbers and Percents of Health Outcome, Sociodemographic, and Explanatory Variables by Educational Attainment:
MIDUS National Sample

Variable	N (%)[b]								P value for trend
	BA/grad degree		Some college		High school grad		<High school		
WOMEN[a]									
Physical health (ave/good/exc)	358		439		404		98		
Poor/fair	25	(6.5)	83	(15.9)	89	(18.1)	65	(39.1)	0.0001
Waist:hip ratio (lower 80%)	312		367		351		93		
Worst quintile	41	(11.6)	96	(20.7)	83	(19.1)	49	(34.5)	
Mean (±SD)	0.79	(0.07)	0.83	(0.16)	0.83	(0.09)	0.87	(0.11)	0.0001
Psychological well-being (high 80%)	348		434		365		101		
Worst quintile	35	(9.1)	88	(16.9)	120	(24.7)	58	(36.5)	
Mean (±SD)	66.8	(10.0)	63.0	(11.2)	60.9	(11.0)	57.5	(12.6)	0.0001
N (%)	383	(24.5)	522	(33.4)	493	(31.6)	163	(10.4)	
Mean age (SD)	44.4	(11.6)	46.9	(13.5)	47.9	(13.0)	53.9	(13.7)	0.0001
Age group									
25–34	90	(23.7)	118	(23.0)	94	(19.2)	19	(11.8)	0.0001
35–44	103	(27.1)	122	(23.7)	110	(22.5)	24	(14.9)	
45–54	106	(27.9)	110	(21.4)	110	(22.5)	33	(20.5)	
55–64	62	(16.3)	102	(19.8)	121	(24.7)	47	(29.2)	
65–74	19	(5.0)	62	(12.1)	54	(11.0)	38	(23.6)	
Race									
White	330	(87.1)	449	(88.6)	428	(88.8)	117	(76.5)	0.08
Black	31	(8.2)	38	(7.5)	33	(6.8)	24	(15.7)	
Other	18	(4.7)	20	(3.9)	21	(4.4)	12	(7.8)	

Household income									
Highest quartile	110	(28.7)	74	(14.2)	64	(13.0)	18	(11.0)	0.0001
2nd quartile	119	(31.1)	147	(28.2)	101	(20.5)	31	(19.0)	
3rd quartile	99	(25.9)	129	(24.7)	168	(34.1)	38	(23.3)	
Lowest quartile	55	(14.4)	172	(32.9)	160	(32.5)	76	(46.6)	
Area poverty/unemployment index									
Lowest	149	(41.7)	154	(30.4)	103	(22.1)	21	(13.8)	0.0001
Moderate	148	(41.5)	211	(41.7)	205	(43.9)	56	(36.8)	
Worst	60	(16.8)	141	(27.9)	159	(34.0)	75	(49.3)	
Parental education									
Mother									
BA/graduate degree	87	(23.4)	45	(9.1)	12	(2.6)	2	(1.6)	0.0001
Some college	74	(19.9)	84	(17.1)	36	(7.9)	6	(5.0)	
High school graduate	140	(37.6)	194	(39.4)	181	(39.6)	22	(18.2)	
Junior high	57	(15.3)	140	(28.5)	180	(39.4)	46	(38.0)	
No junior high	14	(3.8)	29	(5.9)	48	(10.5)	45	(37.2)	
Father									
BA/graduate degree	125	(35.7)	74	(16.4)	15	(3.7)	3	(2.8)	0.0001
Some college	54	(15.4)	56	(12.4)	21	(5.2)	2	(1.9)	
High school graduate	98	(28.0)	150	(33.3)	143	(35.2)	14	(13.2)	
Junior high	52	(14.9)	129	(28.7)	161	(39.7)	36	(34.0)	
No junior high	21	(6.0)	41	(9.1)	66	(16.3)	51	(48.1)	
Smoking behavior									
Never smoked	240	(62.7)	255	(48.8)	236	(47.9)	64	(39.5)	0.0001
Ex-smoker	105	(27.4)	136	(26.1)	129	(26.2)	44	(27.2)	
Current smoker	38	(9.9)	131	(25.1)	128	(25.9)	54	(33.3)	

TABLE 1 *continued*

Variable	N (%)[b]								P value for trend
	BA/grad degree		Some college		High school grad		<High school		
Social relations									
Marital status									
Married/cohabiting	235	(73.2)	305	(63.0)	338	(72.1)	86	(57.0)	0.07
Not presently married	86		179		131		65		
Family/friend support									
High/moderate	319		423		399		115		0.03
Lowest quintile	62	(16.3)	94	(18.2)	85	(17.6)	43	(27.2)	
Family/friend strain									
Low/moderate	300		405		375		119		0.40
Highest quintile	81	(21.3)	112	(21.7)	109	(22.5)	39	(24.7)	
Perceived inequalities									
Neighborhood quality: subjective									
Better 80%	320		413		391		110		0.0001
Worst quintile	63	(16.5)	109	(20.9)	102	(20.7)	53	(32.5)	
Index (home, family, work)									
Lowest tertile	173	(44.3)	160	(30.6)	103	(29.6)	28	(17.7)	0.0001
Moderate tertile	112	(29.3)	193	(37.0)	205	(35.1)	48	(30.4)	
Worst tertile	97	(25.4)	169	(32.4)	159	(35.3)	82	(51.9)	
Work characteristics									
High authority	101	(32.8)	95	(26.7)	68	(23.2)	17	(28.8)	0.0001
Med authority	123	(39.9)	127	(35.7)	93	(31.7)	16	(27.1)	

Low authority	84	(27.3)	134	(37.6)	132	(45.1)	26	(44.1)	
High skill	151	(49.0)	112	(31.5)	62	(21.1)	11	(18.6)	0.0001
Med skill	94	(30.5)	105	(29.6)	84	(28.7)	11	(18.6)	
Low skill	63	(20.5)	138	(38.9)	147	(50.2)	37	(62.7)	
Control/efficacy									
Mastery									
Lowest tertile	115	(30.0)	203	(38.9)	196	(39.8)	64	(39.3)	0.02
Medium tertile	126	(32.9)	144	(27.6)	138	(28.0)	45	(27.6)	
Highest tertile	142	(37.1)	175	(33.5)	159	(32.2)	54	(33.1)	
Constraints									
Lowest tertile	165	(43.1)	151	(28.9)	123	(24.9)	25	(15.3)	0.0001
Medium tertile	123	(32.1)	178	(34.1)	168	(34.1)	46	(28.2)	
Highest tertile	95	(24.8)	193	(37.0)	202	(41.0)	92	(56.4)	
MEN[c]									
Physical Health (ave/good/exc)	476		367		330		88		0.0001
Poor/fair	38	(7.4)	56	(13.2)	67	(16.9)	49	(35.8)	
Waist:hip ratio (lower 80%)	406		328		273		86		0.0001
Worst quintile	66	(14.0)	64	(16.3)	89	(24.6)	31	(0.36)	
Mean (±SD)	0.95	(0.08)	0.95	(0.12)	0.97	(0.12)	0.97	(0.10)	
Psychological well-being (high 80%)	455		343		302		87		0.0001
Worst quintile	57	(11.1)	78	(18.5)	92	(23.4)	49	(26.0)	
Mean (±SD)	65.9	(9.6)	63.2	(11.5)	62.9	(11.1)	60.3	(12.4)	
N (%)	514	(34.9)	423	(28.8)	397	(27.0)	137	(9.3)	
Mean age (SD)	46.6	(13.0)	44.6	(12.8)	47.2	(12.9)	51.4	(13.7)	0.0001

continued

TABLE 1 *continued*

Variable	N (%)[b]								P value for trend
	BA/grad degree		Some college		High school grad		<High school		
Age group									
25–34	107	(20.9)	107	(25.5)	72	(18.2)	20	(14.7)	0.003
35–44	121	(23.7)	114	(27.2)	106	(26.8)	27	(19.8)	
45–54	140	(27.4)	102	(24.3)	95	(24.1)	24	(17.7)	
55–64	86	(16.8)	61	(14.6)	81	(20.5)	36	(26.5)	
65–74	57	(11.2)	35	(8.4)	41	(20.4)	29	(21.3)	
Race									
White	457	(91.0)	355	(86.8)	340	(88.0)	108	(83.7)	0.13
Black	18	(3.6)	24	(5.9)	22	(5.7)	11	(8.5)	
Other	27	(5.4)	30	(7.3)	21	(5.5)	10	(7.8)	
Household income									
Highest quartile	272	(52.9)	127	(30.0)	77	(19.4)	16	(11.7)	0.0001
2nd quartile	122	(23.7)	108	(25.5)	126	(31.7)	32	(23.4)	
3rd quartile	67	(13.0)	99	(23.4)	97	(24.4)	42	(30.7)	
Lowest quartile	53	(10.3)	89	(21.1)	97	(24.4)	47	(34.3)	
Area poverty/unemployment index									
Lowest	196	(39.8)	115	(28.2)	88	(23.1)	19	(14.6)	0.0001
Moderate	199	(40.5)	177	(43.4)	164	(43.0)	48	(36.9)	
Worst	97	(19.7)	116	(28.4)	129	(33.9)	63	(48.5)	
Parental education									
Mother									
BA/graduate degree	106	(21.0)	42	(10.6)	17	(4.6)	3	(2.6)	0.0001
Some college	93	(18.4)	51	(12.9)	21	(5.9)	3	(2.6)	

High school graduate	207	(41.1)	184	(46.5)	68	(45.5)	36	(31.6)	
Junior high	70	(13.9)	95	(24.0)	122	(33.1)	47	(41.2)	
No junior high	28	(5.6)	24	(6.1)	41	(35.1)	25	(21.9)	
Father									
BA/graduate degree	143	(25.9)	61	(16.4)	12	(3.4)	4	(4.3)	0.0001
Some college	76	(15.9)	36	(9.7)	20	(5.7)	2	(2.1)	
High school graduate	148	(31.0)	147	(39.5)	118	(33.6)	14	(14.9)	
Junior high	73	(15.3)	88	(23.7)	131	(37.3)	35	(37.2)	
No junior high	38	(7.9)	40	(10.7)	70	(19.9)	39	(41.5)	
Smoking behavior									
Never smoked	283	(55.2)	182	(43.0)	122	(30.7)	27	(19.7)	
Ex-smoker	173	(33.7)	133	(31.4)	153	(38.5)	57	(38.0)	0.0001
Current smoker	57	(11.1)	108	(25.5)	122	(30.7)	58	(42.3)	
Social relations									
Marital status									
Married/cohabiting	388	(86.8)	313	(83.5)	313	(83.2)	107	(84.9)	0.27
Not presently married	59		62		63		19		
Family/friend support									
High/moderate	428		323		299		97		0.001
Lowest quintile	82	(16.1)	91	(22.0)	93	(23.7)	34	(26.0)	
Family/friend strain									
Low/moderate	409		301		309		97		0.28
Highest quintile	101	(19.8)	113	(27.3)	83	(21.2)	34	(26.0)	
Perceived inequalities									
Neighborhood quality—subjective									
Better 80%	419		321		302		90		0.0001
Worst quintile	95	(18.5)	102	(24.1)	95	(23.9)	47	(34.3)	

continued

TABLE 1 *continued*

Variable	N (%)[b]								P value for trend
	BA/grad degree		Some college		High school grad		<High school		
Index (home, family, work)									
Lowest tertile	196	(39.8)	115	(28.2)	88	(23.1)	19	(14.6)	0.0001
Moderate tertile	199	(40.5)	177	(43.4)	164	(43.0)	48	(36.9)	
Worst tertile	97	(19.7)	116	(28.4)	129	(33.9)	63	(48.5)	
Work characteristics									
High authority	166	(39.9)	112	(34.0)	107	(35.5)	27	(32.9)	0.01
Med authority	143	(34.4)	102	(31.0)	89	(29.6)	25	(30.5)	
Low authority	107	(25.7)	115	(35.0)	105	(34.9)	30	(36.6)	
High skill	121	(29.1)	89	(27.1)	76	(25.3)	15	(18.0)	0.0001
Med skill	212	(51.0)	137	(41.6)	113	(37.5)	34	(41.0)	
Low skill	83	(19.9)	103	(31.3)	112	(37.2)	34	(41.0)	
Control/efficacy									
Mastery									
Lowest tertile	165	(32.1)	139	(32.9)	101	(25.4)	43	(31.4)	0.09
Medium tertile	159	(30.9)	124	(29.3)	136	(34.3)	35	(25.5)	
Highest tertile	190	(37.0)	160	(37.8)	160	(40.3)	59	(43.1)	
Constraints									
Lowest tertile	207	(40.3)	150	(35.5)	116	(29.2)	34	(24.8)	0.0001
Medium tertile	211	(41.0)	166	(39.2)	155	(39.0)	45	(32.9)	
Highest tertile	96	(18.7)	107	(25.3)	126	(31.7)	58	(42.3)	

[a]N = 1,561.
[b]Results are unweighted.
[c]N = 1,471.

TABLE 2
Relation of Educational Attainment and the Three Health Outcome
Measures in MIDUS National Sample[a]

Variable	Women		Men	
Poor/fair physical health	OR	*95 % CI*	OR	*95 % CI*
Model base[b]				
BA/graduate degree	1.0		1.0	
Some college	2.63	*1.6–4.2*	2.07	*1.3–3.2*
High school graduate	3.06	*1.9–4.9*	2.47	*1.6–3.8*
<High school graduate	8.00	*4.7–13.5*	5.96	*3.6–9.8*
Waist:hip ratio (upper quintile)	OR	*95 % CI*	OR	*95 % CI*
Model base[b]				
BA/graduate degree	1.0		1.0	
Some college	1.92	*1.3–2.9*	1.28	*0.9–1.9*
High school graduate	1.63	*1.1–2.5*	1.96	*1.4–2.8*
<High school graduate	3.03	*1.8–5.0*	2.16	*1.3–3.6*
Psychological well-being	OR	*95 % CI*	OR	*95 % CI*
Model base[b]				
BA/graduate degree	1.0		1.0	
Some college	2.00	*1.3–3.1*	1.83	*1.3–2.7*
High school graduate	3.41	*2.3–5.1*	2.44	*1.7–3.5*
<High school graduate	5.91	*3.6–9.7*	4.83	*3.0–7.6*

[a]N = 3,032. Results are unweighted and expressed as odds ratio (OR), comparing each group with the most highly educated group.
[b]Adjusted for age group and race.

socioeconomic circumstances, household income, was related to poor health independent of education. A third measure, poverty/unemployment in area of residence, was classified on the basis of two variables available from the census: proportion below the poverty line and proportion unemployed. This measure of deprivation of the area of residence was associated with poor/fair health independent of education. When further adjusted for household income, the odds ratios of 1.58 (women) and 1.67 (men) for those in the worst areas, compared with the best, decreased to 1.48 (1.0–2.2) and 1.41 (0.9–2.2) for women and men, respectively.

We note with interest that mother's education, but not father's, was related to poor/fair physical health in women, even after adjustment for their own educational level. Conversely, in men, father's education, but not mother's, was related to poor/fair physical health.

TABLE 3

Odds Ratios[a] of Self-Reported Physical Health by Sociodemographic and Explanatory Variables: MIDUS National Sample[b]

Variable	Women			Men		
	OR[c]	OR[d]	95 % CI	OR[c]	OR[d]	95 % CI
Age group						
25–34	1.0	1.0		1.0	1.0	
35–44	0.94	0.94	0.6–1.5	1.66	1.62	1.0–2.8
45–54	1.46	1.40	0.9–2.2	1.49	1.52	0.9–2.6
55–64	1.63	1.35	0.9–2.1	3.22	2.91	1.7–4.9
65–74	2.54	1.85	1.1–3.0	4.45	3.98	2.3–7.0
Race						
White	1.0	1.0		1.0	1.0	
Black	1.94	1.69	1.1–2.7	0.79	0.63	0.3–1.4
Other	2.36	2.12	1.2–3.8	1.29	1.15	0.6–2.2
Household income						
Highest quartile	1.0	1.0		1.0	1.0	
2nd quartile	1.29	1.16	0.7–1.9	1.62	1.30	0.8–2.1
3rd quartile	1.46	1.20	0.8–1.9	2.66	1.95	1.2–3.1
Lowest quartile	2.28	1.65	1.0–2.6	4.40	3.09	1.9–4.9
Area poverty/unemployment index						
Lowest	1.0	1.0		1.0	1.0	
Moderate	1.53	1.36	0.9–2.0	1.25	1.10	0.7–1.7
Worst	2.07	1.58	1.1–2.4	2.14	1.67	1.1–2.5

Parental education						
Mother						
BA/graduate degree	1.0	1.0		1.0	1.0	
Some college	1.69	1.46	0.6–3.3	0.98	0.99	0.5–2.2
High school graduate	2.19	1.80	0.8–3.8	1.35	1.12	0.6–2.2
Junior high	2.42	1.82	0.8–4.0	1.23	0.91	0.4–1.9
No junior high	3.79	2.39	1.9–5.7	1.08	0.81	0.3–1.9
Father						
BA/graduate degree	1.0	1.0		1.0	1.0	
Some college	1.04	0.91	0.4–1.9	1.92	1.89	0.9–3.9
High school graduate	1.24	0.96	0.5–1.7	1.06	0.90	0.5–1.8
Junior high	1.54	1.08	0.6–2.0	1.56	1.12	0.6–2.2
No junior high	1.55	0.96	0.5–1.9	3.51	2.41	1.2–5.0
Smoking behavior						
Never smoked	1.0	1.0		1.0	1.0	
Ex-smoker	1.40	1.31	0.9–1.8	1.27	1.13	0.8–1.7
Current smoker	2.16	1.69	1.2–2.4	2.28	1.68	1.1–2.5
Social relations						
Marital status						
Married/cohabiting	1.0	1.0		1.0	1.0	
Not presently married	1.01	0.98	0.6–1.8	1.27	1.25	0.8–1.9
Family/friend support						
High/moderate	1.0	1.0		1.0	1.0	
Lowest quintile	1.87	1.74	1.2–2.5	1.36	1.26	0.9–1.8
Family/friend strain						
Low/moderate	1.0	1.0		1.0	1.0	
Highest quintile	1.84	1.87	1.3–2.6	1.64	1.60	1.1–2.3

TABLE 3 *continued*

Variable	Women			Men		
	OR[c]	OR[d]	*95 % CI*	OR[c]	OR[d]	*95 % CI*
Perceived inequalities						
Neighborhood quality—subjective						
Better 80%	1.0	1.0		1.0	1.0	
Worst quintile	1.07	1.04	*0.7–1.5*	0.78	0.76	*0.5–1.2*
Index (home, family, work)						
Lowest tertile	1.0	1.0		1.0	1.0	
Moderate tertile	1.53	1.36	*0.9–2.0*	2.56	2.34	*1.5–3.6*
Highest tertile	3.20	2.61	*1.8–3.8*	4.07	3.41	*2.2–5.4*
Work characteristics						
High authority	1.0	1.0		1.0	1.0	
Medium authority	0.95	1.03	*0.6–1.8*	0.95	0.96	*0.6–1.6*
Low authority	0.90	1.01	*0.6–1.8*	1.08	1.06	*0.6–1.8*
High skill	1.0	1.0		1.0	1.0	
Medium skill	0.88	0.78	*0.4–1.4*	1.79	1.19	*0.7–2.1*
Low skill	1.61	1.17	*0.7–2.0*	2.71	1.52	*0.8–2.8*

Control/efficacy						
Mastery						
Lowest tertile	1.0	1.0		1.0	1.0	
Medium tertile	0.96	0.96	*0.7–1.4*	0.83	0.80	*0.5–1.2*
Highest tertile	0.93	0.87	*0.6–1.3*	1.20	1.03	*0.7–1.6*
Constraints						
Lowest tertile	1.0	1.0		1.0	1.0	
Medium tertile	2.14	1.88	*1.2–3.0*	2.16	2.06	*1.3–3.2*
Highest tertile	4.60	3.71	*2.4–5.7*	4.28	3.46	*2.2–5.5*

Note: Missing value indicator variables were included where appropriate.
[a]Ninety-five percent confidence intervals.
[b]N = 3,032. Results are unweighted.
[c]Adjusted for race and age.
[d]Adjusted for education, race, and age.

TABLE 4

Odds Ratios[a] for Waist:Hip Ratio by Sociodemographic and Explanatory Variables: MIDUS National Sample[b]

Variable	Women			Men		
	OR[c]	OR[d]	95% CI	OR[c]	OR[d]	95% CI
Age group						
25–34	1.0	1.0		1.0	1.0	
35–44	0.99	1.00	0.6–1.6	1.55	1.51	0.9–2.4
45–54	1.60	1.61	1.0–2.5	1.69	1.69	1.1–2.7
55–64	2.13	1.96	1.3–3.1	2.75	2.59	1.6–4.1
65–74	3.30	2.81	1.7–4.6	1.73	1.62	0.9–2.8
Race						
White	1.0	1.0		1.0	1.0	
Black	2.16	2.07	1.3–3.3	0.71	0.66	0.3–1.4
Other	1.39	1.33	0.7–2.6	1.11	1.11	0.6–2.0
Household income						
Highest quartile	1.0	1.0		1.0	1.0	
2nd quartile	1.90	1.77	1.1–2.9	1.45	1.24	0.8–1.8
3rd quartile	1.72	1.58	1.0–2.6	1.80	1.49	1.0–2.3
Lowest quartile	2.94	2.50	1.6–4.0	1.65	1.32	0.9–2.0
Poverty/unemployment index						
Lowest	1.0	1.0		1.0	1.0	
Moderate	1.52	1.46	1.0–2.1	1.11	1.04	0.7–1.5
Worst	1.73	1.53	1.0–2.3	1.35	1.18	0.8–1.7

Parental education						
Mother						
BA/graduate degree	1.0	1.0		1.0	1.0	
Some college	0.86	0.59	*0.4–1.4*	0.68	0.69	*0.4–1.4*
High school graduate	0.68	0.77	*0.3–1.1*	0.96	0.87	*0.5–1.5*
Junior high	0.93	0.85	*0.4–1.4*	0.62	0.54	*0.3–1.0*
No junior high	1.14	0.61	*0.4–1.8*	1.13	0.98	*0.5–2.1*
Father						
BA/graduate degree	1.0	1.0		1.0	1.0	
Some college	1.47	1.38	*0.7–2.7*	1.27	1.22	*0.6–2.4*
High school graduate	1.32	1.16	*0.7–2.0*	1.36	1.19	*0.7–2.1*
Junior high	1.59	1.33	*0.7–2.4*	1.49	1.18	*0.6–2.2*
No junior high	1.39	1.07	*0.5–2.1*	2.63	2.06	*1.1–4.0*
Smoking behavior						
Never smoked	1.0	1.0		1.0	1.0	
Ex-smoker	0.86	0.84	*0.6–1.2*	1.20	1.11	*0.8–1.6*
Current smoker	1.13	0.97	*0.7–1.4*	1.62	1.36	*0.9–2.0*
Social relations						
Marital status						
Married/cohabiting	1.0	1.0		1.0	1.0	
Not presently married	1.06	1.02	*0.7–1.4*	0.93	0.91	*0.6–1.4*
Family/friend support						
High/moderate	1.0	1.0		1.0	1.0	
Lowest quintile	1.39	1.32	*0.9–1.9*	1.30	1.23	*0.9–1.7*
Family/friend strain						
Low/moderate	1.0	1.0		1.0	1.0	
Highest quintile	1.31	1.31	*0.9–1.9*	1.35	1.38	*1.0–1.9*

TABLE 4 *continued*

Variable	Women			Men		
	OR[c]	OR[d]	95% CI	OR[c]	OR[d]	95% CI
Perceived Inequalities						
Neighborhood quality—subjective						
Better 80%	1.0	1.0		1.0	1.0	
Worst quintile	0.97	0.94	*0.6–1.4*	1.12	1.10	*0.7–1.6*
Index (home, family, work)						
Lowest tertile	1.0	1.0		1.0	1.0	
Moderate tertile	1.51	1.42	*1.0–2.0*	1.27	1.20	*0.8–1.7*
Highest tertile	2.06	1.83	*1.3–2.7*	1.38	1.27	*0.9–1.9*
Work characteristics						
High authority	1.0	1.0		1.0	1.0	
Medium authority	0.92	0.96	*0.6–1.6*	1.12	1.15	*0.7–1.8*
Low authority	1.01	1.03	*0.6–1.8*	1.49	1.48	*0.9–2.4*
High skill	1.0	1.0		1.0	1.0	
Med skill	0.99	0.95	*0.6–1.6*	0.86	0.84	*0.5–1.3*
Low skill	1.53	1.36	*0.8–2.3*	0.96	0.86	*0.5–1.4*

Control/efficacy

Mastery						
Lowest tertile	1.0	1.0		1.0	1.0	
Medium tertile	0.77	0.78	*0.6–1.1*	1.03	0.98	*0.7–1.4*
Highest tertile	0.87	0.86	*0.6–1.2*	1.06	0.96	*0.7–1.4*
Constraints						
Lowest tertile	1.0	1.0		1.0	1.0	
Medium tertile	1.24	1.15	*0.8–1.7*	0.93	0.88	*0.6–1.3*
Highest tertile	1.74	1.53	*1.1–2.2*	1.89	1.65	*1.1–2.4*

Note: Missing value indicator variables were included where appropriate.
[a]Ninety-five percent confidence intervals.
[b]N = 3,032. Results are unweighted.
[c]Adjusted for race and sex.
[d]Adjusted for education, race, and age.

TABLE 5

Odds Ratios[a] for Psychological Well-Being (Worst Quintile) by Sociodemographic and Explanatory Variables: MIDUS National Sample[b]

Variable	Women			Men		
	OR[c]	OR[d]	95 % CI	OR[c]	OR[d]	95 % CI
Age group						
25–34	1.0	1.0		1.0	1.0	
35–44	1.47	1.48	1.0–2.2	1.65	1.61	1.1–2.4
45–54	1.56	1.50	1.0–2.2	1.34	1.36	0.9–2.1
55–64	0.98	0.80	0.5–1.2	1.42	1.26	0.8–2.0
65–74	1.69	1.26	0.8–2.0	0.96	0.82	0.5–1.4
Race						
White	1.0	1.0		1.0	1.0	
Black	1.21	1.08	0.7–1.7	0.72	0.61	0.3–1.2
Other	1.24	1.10	0.6–2.0	0.53	0.48	0.2–1.0
Household income						
Highest quartile	1.0	1.0		1.0	1.0	
2nd quartile	1.09	0.98	0.6–1.6	1.96	1.62	1.1–2.4
3rd quartile	1.35	1.08	0.7–1.7	2.48	1.89	1.2–2.9
Lowest quartile	2.22	1.64	1.1–2.5	4.47	3.32	2.2–5.0
Area poverty/unemployment index						
Lowest	1.0	1.0		1.0	1.0	
Moderate	1.19	1.03	0.7–1.5	1.32	1.16	0.8–1.6
Worst	1.72	1.30	0.9–1.9	1.32	1.02	0.7–1.5

Parental education						
Mother						
BA/graduate degree	1.0	1.0		1.0	1.0	
Some college	1.47	1.26	*0.6–2.5*	1.16	1.18	*0.6–2.2*
High school graduate	1.52	1.19	*0.6–2.2*	1.32	1.13	*0.6–2.0*
Junior high	1.81	1.30	*0.7–2.5*	1.49	1.15	*0.6–2.1*
No junior high	3.50	2.22	*1.1–4.7*	0.93	0.70	*0.3–1.6*
Father						
BA/graduate degree	1.0	1.0		1.0	1.0	
Some college	0.97	0.87	*0.4–1.7*	1.08	1.00	*0.5–1.9*
High school graduate	1.34	0.99	*0.6–1.7*	1.59	1.32	*0.8–2.2*
Junior high	1.59	1.07	*0.6–1.9*	1.30	0.91	*0.5–1.6*
No junior high	1.38	0.84	*0.4–1.6*	1.81	1.16	*0.6–2.2*
Smoking behavior						
Never smoked	1.0	1.0		1.0	1.0	
Ex-smoker	1.06	1.00	*0.7–1.4*	1.49	1.32	*0.9–1.9*
Current smoker	1.18	0.90	*0.6–1.3*	2.10	1.56	*1.1–2.2*
Social relations						
Marital status						
Married/cohabiting	1.0	1.0		1.0	1.0	
Not presently married	1.12	1.15	*0.8–1.6*	1.66	1.68	*1.1–2.5*
Family/friend support						
High/moderate	1.0	1.0		1.0	1.0	
Lowest quintile	4.28	4.29	*3.1–5.9*	3.50	3.36	*2.5–4.6*
Family/friend strain						
Low/moderate	1.0	1.0		1.0	1.0	
Highest quintile	1.85	1.83	*1.3–2.5*	1.75	1.76	*1.3–2.4*

TABLE 5 *continued*

	Women			Men		
Variable	OR[c]	OR[d]	95 % CI	OR[c]	OR[d]	95 % CI
Perceived inequalities						
Neighborhood quality: subjective						
Better 80%	1.0	1.0		1.0	1.0	
Worst quintile	1.32	1.31	0.9–1.8	1.53	1.53	1.1–2.2
Index (home, family, work)						
Lowest tertile	1.0	1.0		1.0	1.0	
Moderate tertile	2.92	2.66	1.7–4.2	2.35	2.17	1.4–3.4
Highest tertile	9.49	8.24	5.3–12.9	9.07	8.01	5.1–12.5
Work characteristics						
High authority	1.0	1.0		1.0	1.0	
Medium authority	1.47	1.61	0.9–2.8	0.97	0.98	0.6–1.5
Low authority	2.17	2.31	1.3–4.0	2.06	2.07	1.3–3.3
High skill	1.0	1.0		1.0	1.0	
Medium skill	2.13	1.91	1.1–3.3	1.22	1.20	0.7–1.9
Low skill	4.01	3.05	1.8–5.2	1.83	1.61	1.0–2.7

Control/efficacy						
Mastery						
Lowest tertile	1.0	1.0		1.0	1.0	
Medium tertile	0.51	0.50	*0.4–0.7*	0.67	0.62	*0.4–0.9*
Highest tertile	0.35	0.31	*0.2–0.5*	0.45	0.38	*0.2–0.6*
Constraints						
Lowest tertile	1.0	1.0		1.0	1.0	
Medium tertile	3.23	2.93	*1.4–6.0*	4.92	4.62	*2.4–8.8*
Highest tertile	23.78	20.68	*10.6–40.2*	29.72	25.27	*13.5–47.4*

Note: Missing value indicator variables were included where appropriate.
[a]Ninety-five percent confidence intervals.
[b]N = 3,032. Results are unweighted.
[c]Adjusted for race and age.
[d]Adjusted for education, race, and age.

If poor self-reported health is indeed a measure of poor physical health, one would expect smokers to have worse health than nonsmokers. This was the case.

Contrary to prediction, there was no relation between marital status and self-reported ill health. There was, however, some relation between a measure of social support and health; those who indicated that there was strain in their social relationships experienced worse health. Perceptions of inequalities were related to ill health. Among work characteristics, low use of skills was related to poor health in men, but not women, after adjustment for education.

The control and self-efficacy measures were separated into mastery and constraints. There was no relation between mastery and poor/fair health for either men or women, but there was a strong relation with constraints: men and women with highest perceived constraints (i.e., low control) had the worst health.

Table 4 shows the same relations for waist:hip ratio. The "middle-aged spread" is a real phenomenon for men and women. Waist:hip ratio increases with age. The apparent decrease in the oldest age group for men could be a survivor effect. Black women have higher waist:hip ratio than other groups. This is not the case for black men. As with poor/fair physical health, so with waist:hip ratio: father's education, but not mother's, was associated with waist:hip ratio in men. However, parent's education was not associated with waist:hip ratio in women. The poverty/unemployment index of area of residence was associated with waist:hip ratio in women, but not in men. Strain in social relationships was associated with higher waist:hip ratio, as was perceived inequality in women. In both sexes, high perceived constraints were associated with higher waist:hip ratio.

The associations with psychological well-being are shown in table 5. In contrast to the data on waist:hip ratio, neither parent's education was related in men; mother's education, but not father's, was related to psychological well-being in women. There were stronger relations between psychosocial factors and psychological well-being than for other health outcomes in tables 3 and 4. This may represent overlap in the measurements. Area of residence, which is externally assessed, was not related to psychological well-being.

Tables 6, 7, and 8 address the question of how much of the education gradient in the outcome measures can be accounted for statistically by the potential mediators. Most of the explanatory variables considered in

TABLE 6

Odds Ratios[a] for Self-Reported Physical Health by Educational Attainment Adjusted for Each of the Explanatory Variables Showing the Effect of these Variables on the Relation between Education and the Health Outcome: MIDUS National Sample[a]

Variable: Poor/fair physical health	Women		Men	
	OR	95 % CI	OR	95 % CI
Base model				
Adjusted for age group and race				
BA/graduate degree	1.0		1.0	
Some college	2.64	*1.6–4.2*	2.07	*1.3–3.2*
High school graduate	3.07	*1.9–4.9*	2.47	*1.6–3.8*
<High school graduate	8.00	*4.7–13.5*	5.96	*3.6–9.8*
Base model plus				
Adjusted for parents' education				
BA/graduate degree	1.0		1.0	
Some college	2.43	*1.5–4.0*	2.13	*1.4–3.4*
High school graduate	2.66	*1.6–4.4*	2.44	*1.5–3.9*
<High school graduate	6.55	*3.7–11.7*	5.53	*3.2–9.6*
Base model plus				
Adjusted for area poverty index				
BA/graduate degree	1.0		1.0	
Some college	2.49	*1.6–4.0*	1.99	*1.3–3.1*
High school graduate	2.83	*1.8–4.6*	2.31	*1.5–3.6*
<High school graduate	7.27	*4.3–12.4*	5.40	*3.3–8.9*
Base model plus				
Adjusted for smoking behavior				
BA/graduate degree	1.0		1.0	
Some college	2.42	*1.8–3.9*	1.93	*1.2–3.0*
High school graduate	2.81	*1.8–4.5*	2.24	*1.4–3.5*
<High school graduate	7.00	*4.1–11.9*	5.12	*3.1–8.5*
Base model plus				
Adjusted for social relations				
BA/graduate degree	1.0		1.0	
Some college	2.62	*1.6–4.2*	2.03	*1.3–3.2*
High school graduate	3.02	*1.9–4.9*	2.48	*1.6–3.8*
<High school graduate	7.53	*4.4–12.8*	5.81	*3.5–9.6*
Base model plus				
Adjusted for work characteristics				
BA/graduate degree	1.0		1.0	
Some college	2.39	*1.5–3.9*	1.97	*1.3–3.1*
High school graduate	2.57	*1.6–4.2*	2.35	*1.5–3.6*
<High school graduate	6.06	*3.5–10.5*	5.39	*3.3–8.9*

TABLE 6 *continued*

Variable:	Women		Men	
Poor/fair physical health	OR	95 % CI	OR	95 % CI
Base model plus				
Adjusted for perceived inequalities				
BA/graduate degree	1.0		1.0	
Some college	2.45	*1.5–3.9*	1.82	*1.2–2.9*
High school graduate	2.71	*1.7–4.4*	2.23	*1.4–3.4*
<High school graduate	6.31	*3.7–10.8*	4.90	*2.9–8.1*
Base model plus				
Adjusted for efficacy/control				
BA/graduate degree	1.0		1.0	
Some college	2.26	*1.4–3.7*	1.98	*1.3–3.1*
High school graduate	2.52	*1.6–4.1*	2.19	*1.4–3.4*
<High school graduate	5.99	*3.5–10.3*	4.93	*3.0–8.2*

[a]Unweighted results are expressed as odds ratio (OR), comparing each group with the most highly educated group.
[b]N = 3,032.

univariate fashion do appear to make a contribution. In men, the four variables that make the largest contribution to explaining the social gradient in all three outcomes are smoking, psychosocial work characteristics, perceived inequalities, and low control. These variables are also important in women.

The clearest finding from each of these tables, however, is that no one factor plays a crucial role in accounting for the gradient, but the total contribution is quite substantial. With adjustment for all the variables simultaneously (table 9), the odds ratio for poor/fair physical health associated with being in the lowest educational group is reduced from 5.96 to 3.25 in men, and from 8.00 to 3.21 in women. For waist:hip ratio and psychological well-being, the odds ratios are reduced, although the magnitude of the effect is smaller.

Discussion

In this study of a U.S. national sample there is an inverse social gradient in the three measures of health: self-reported physical health, waist:hip

TABLE 7

Odds Ratios[a] for Waist:Hip Ratio (Worst Quintile) by Educational Attainment Adjusted for Each of the Explanatory Variables Showing the Effect of these Variables on the Relation between Education and the Health Outcome: MIDUS National Sample[b]

Variable: *Waist:hip ratio*	Women		Men	
	OR	*95 % CI*	OR	*95 % CI*
Base model				
Adjusted for age group and race				
BA/graduate degree	1.0		1.0	
Some college	1.92	*1.3–2.9*	1.28	*0.9–1.9*
High school graduate	1.63	*1.1–2.5*	1.96	*1.4–2.8*
<High school graduate	3.03	*1.8–5.0*	2.16	*1.3–3.6*
Base model plus				
Adjusted for parents' education				
BA/graduate degree	1.0		1.0	
Some college	1.97	*1.3–3.0*	1.31	*0.9–1.9*
High school graduate	1.69	*1.1–2.7*	1.94	*1.3–2.9*
<High school graduate	3.22	*1.9–5.6*	2.00	*1.2–3.4*
Base model plus				
Adjusted for area poverty index				
BA/graduate degree	1.0		1.0	
Some college	1.90	*1.3–2.9*	1.27	*0.9–1.9*
High school graduate	1.54	*1.0–2.3*	1.92	*1.3–2.8*
<High school graduate	2.80	*1.7–4.6*	2.08	*1.3–3.4*
Base model plus				
Adjusted for smoking behavior				
BA/graduate degree	1.0		1.0	
Some college	1.92	*1.3–2.9*	1.22	*0.8–1.8*
High school graduate	1.63	*1.1–2.5*	1.84	*1.3–2.7*
<High school graduate	3.04	*1.8–5.0*	1.95	*1.2–3.2*
Base model plus				
Adjusted for social relations				
BA/graduate degree	1.0		1.0	
Some college	2.06	*1.4–3.1*	1.26	*0.9–1.8*
High school graduate	1.77	*1.2–2.7*	1.99	*1.4–2.9*
<High school graduate	3.10	*1.9–5.1*	2.12	*1.3–3.5*
Base model plus				
Adjusted for work characteristics				
BA/graduate degree	1.0		1.0	
Some college	1.75	*1.2–2.6*	1.24	*0.8–1.8*
High school graduate	1.40	*0.9–2.1*	1.91	*1.3–2.7*
<High school graduate	2.43	*1.5–4.1*	2.06	*1.2–3.4*

TABLE 7 *continued*

Variable:	Women		Men	
Waist:hip ratio	OR	95 % CI	OR	95 % CI
Base model plus				
Adjusted for perceived inequalities				
BA/graduate degree	1.0		1.0	
Some college	1.80	*1.2–2.7*	1.23	*0.8–1.8*
High school graduate	1.49	*1.0–2.3*	1.90	*1.3–2.7*
<High school graduate	2.60	*1.6–4.3*	1.97	*1.2–3.3*
Base model plus				
Adjusted for efficacy/control				
BA/graduate degree	1.0		1.0	
Some college	1.79	*1.2–2.7*	1.24	*0.8–1.8*
High school graduate	1.48	*1.0–2.2*	1.85	*1.3–2.7*
<High school graduate	2.63	*1.6–4.4*	1.93	*1.2–3.2*

[a]Unweighted results are expressed as odds ratio (OR), comparing each group with the most highly educated group.
[b]N = 3,032.

ratio, and psychological well-being. As with studies of mortality differentials (Marmot, Shipley, and Rose 1984), the point to emphasize is that there is a gradient in morbidity. People in the lowest socioeconomic group, comprising, in this study, those who did not complete high school, have worse health than others, but the social differentials do not stop there. Each educational group has worse health than the one above it in the hierarchy.

Does It Matter Which Measures of Health?

For these analyses, we chose three measures of "health." The first, self-reported physical health, is attractive as a global measure of health status. Although it tells us little of specific biomedical problems and is potentially subject to the vagaries of all subjective measures, it has been shown in many studies to be a powerful predictor of mortality (Idler and Angel 1990; Appels et al. 1996). It is likely, therefore, that determinants of self-reported health will prove to be determinants of more specific biomedical disorders.

TABLE 8

Odds Ratios[a] for Psychological Well-Being (Worst Quintile) by Educational Attainment Adjusted for Each of the Explanatory Variables Showing the Effect of These Variables on the Relation between Education and the Health Outcome: MIDUS National Sample[a]

Variable: *Psychological well-being*	Women		Men	
	OR	*95 % CI*	OR	*95 % CI*
Base model				
Adjusted for age group and race				
BA/graduate degree	1.0		1.0	
Some college	2.01	*1.3–3.1*	1.83	*1.3–2.7*
High school graduate	3.41	*2.3–5.1*	2.44	*1.7–3.5*
<High school graduate	5.92	*3.6–9.7*	4.83	*3.1–7.6*
Base model plus				
Adjusted for parents' education				
BA/graduate degree	1.0		1.0	
Some college	1.91	*1.2–3.0*	1.78	*1.2–2.6*
High school graduate	3.12	*2.0–4.9*	2.45	*1.7–3.6*
<High school graduate	5.02	*2.9–8.6*	4.94	*3.0–8.2*
Base model plus				
Adjusted for area poverty index				
BA/graduate degree	1.0		1.0	
Some college	1.94	*1.3–3.0*	1.82	*1.3–2.6*
High school graduate	3.27	*2.2–4.9*	2.42	*1.7–3.5*
<High school graduate	5.54	*3.4–9.1*	4.83	*3.0–7.7*
Base model plus				
Adjusted for smoking behavior				
BA/graduate degree	1.0		1.0	
Some college	2.04	*1.3–3.1*	1.73	*1.2–2.5*
High school graduate	3.48	*2.3–5.3*	2.21	*1.5–3.2*
<High school graduate	6.12	*3.7–10.1*	4.18	*2.6–6.7*
Base model plus				
Adjusted for social relations				
BA/graduate degree	1.0		1.0	
Some college	2.09	*1.3–3.2*	1.78	*1.2–2.6*
High school graduate	3.83	*2.5–5.9*	2.58	*1.8–3.8*
<High school graduate	5.70	*3.4–9.6*	4.96	*3.1–8.1*
Base model plus				
Adjusted for work characteristics				
BA/graduate degree	1.0		1.0	
Some college	1.65	*1.1–2.5*	1.54	*1.0–2.5*
High school graduate	2.58	*1.7–3.9*	2.84	*1.8–4.5*
<High school graduate	4.39	*2.6–7.3*	3.87	*2.2–6.8*

TABLE 8 *continued*

Variable:	Women		Men	
Psychological well-being	OR	95 % CI	OR	95 % CI
Base model plus				
Adjusted for perceived inequalities				
BA/graduate degree	1.0		1.0	
Some college	1.73	*1.1–2.7*	1.46	*1.0–2.2*
High school graduate	2.92	*1.9–4.5*	2.05	*1.4–3.0*
<High school graduate	3.83	*2.3–6.5*	3.21	*2.0–5.3*
Base model plus				
Adjusted for efficacy/control				
BA/graduate degree	1.0		1.0	
Some college	1.54	*1.0–2.5*	1.72	*1.1–2.6*
High school graduate	2.84	*1.8–4.5*	2.16	*1.4–3.3*
<High school graduate	3.87	*2.2–6.8*	3.95	*2.3–6.8*

[a]Unweighted results are expressed as odds ratio (OR), comparing each group with the most highly educated group.
[b]N = 3,032.

Waist:hip ratio was chosen as a more specific biomedical marker because of its demonstrated relation with diabetes mellitus, cardiovascular disease, and mortality (McKeigue, Shah, and Marmot 1991). The evidence suggests that central obesity may have different metabolic effects from a more general pattern of obesity. It is the typically male pattern of obesity, but it also characterizes menopausal women. The findings here show clearly the increase in waist:hip ratio with increasing age. Whereas there is some fall-off in men in the oldest age group (65–74), this is not the case for women. It is of interest that studies of nonhuman primates show social differentials in central adiposity: subordinate female rhesus macaque monkeys have a greater degree of central adiposity than do dominant female monkeys further up the hierarchy (Shively et al. 1987).

Numerous prior studies have documented age, gender, class, and cultural differences in aspects of well-being (Ryff and Singer 1998). For the present investigation, the central question was the extent to which lower educational level was linked with lower profiles of well-being, thereby extending the social inequalities literature to consider not just increased likelihood of negative health, but also diminished chances for

TABLE 9
Odds ratios[a] for Three Health Outcomes and Educational Attainment Fully Adjusted for All Explanatory Variables Simultaneously: MIDUS National Sample[b]

Variable: *Poor/fair physical health*	Women		Men	
	OR	*95 % CI*	OR	*95 % CI*
Base model plus				
Fully adjusted for covariates				
BA/graduate degree	1.0		1.0	
Some college	1.84	*1.1–3.1*	1.67	*1.0–2.7*
High school graduate	1.73	*1.0–3.0*	1.71	*1.0–2.8*
<High school graduate	3.21	*1.7–6.0*	3.25	*1.8–5.9*
Waist:hip ratio	OR	*95 % CI*	OR	*95 % CI*
Base model plus				
Fully adjusted for covariates				
BA/graduate degree	1.0		1.0	
Some college	1.82	*1.2–2.8*	1.15	*0.8–1.7*
High school graduate	1.40	*0.9–2.3*	1.70	*1.1–2.6*
<High school graduate	2.33	*1.3–4.2*	1.47	*0.8–2.6*
Psychological well-being	OR	*95 % CI*	OR	*95 % CI*
Base model plus				
Fully adjusted for covariates				
BA/graduate degree	1.0		1.0	
Some college	1.58	*0.9–2.7*	1.56	*1.0–2.5*
High school graduate	2.79	*1.6–4.8*	2.22	*1.3–3.7*
<High school graduate	3.07	*1.6–6.1*	3.81	*2.0–7.3*

[a]Unweighted results are expressed as odds ratio (OR), comparing each group with the most highly educated group.
[b]N = 3,032.

positive mental health among those occupying lower positions in the educational hierarchy. Diminished psychological well-being among the less educated further contributes to their vulnerabilities.

Does It Matter Which Measures of Class?

There are at least two reasons for examining the relation of socioeconomic status to health: description and explanation. Description is a pragmatic exercise: use what works. The argument here is that any

measure of socioeconomic status will "do" to describe the relation be-
tween social position and health. From this perspective, education has
two distinct advantages. Superficially, at least, it has the attraction of a
graded scale that lends itself to obvious cut-off points with social mean-
ing: did not complete high school; high school graduate; some college;
college degree or higher. Other classifications, like those based on oc-
cupation, need further work to put them into this simple form (Erikson
and Goldthorpe 1992). An exception can be found in the Whitehall
studies, which indicated that a grading based on occupation was a better
predictor of ill health than was education, perhaps because the occupa-
tional hierarchy in the civil service is defined precisely; hence, employ-
ment grade was a more precisely graded measure than years of education.

   The second advantage of using education as a measure is that it deals,
to a large extent, with the issue of health selection. In principle, it is
possible to argue that people in worse health end up in a lower socio-
economic position and that this accounts for the relation between so-
cioeconomic status (SES) and health. This position becomes less plausible
when education is used as the marker for SES. Educational status is by
definition achieved when people finish full-time education. This pre-
cedes the development of ill health for most people. For health status to
determine the relation of education to health, ill health in childhood
would have to affect both educational achievement and health in adult-
hood. Although this may happen, the evidence suggests that it is a
minor part of the explanation for the relation between socioeconomic
status and ill health (Wadsworth 1986; Power, Manor, and Fox 1991;
Power and Hertzman 1997). In our preliminary analyses for this paper,
we included self-reported physical and mental health at age 16. Despite
the fact that recall of past health status is likely to be influenced by
present health status, thus overstating the connection between past and
present health, these variables did not eliminate the SES gradient in
health in adulthood.

   Turning from description to explanation, the particular measure of
socioeconomic status may indeed matter. It is no longer simply the
pragmatic question of what works but, rather, what may convey mean-
ing: insight into how the social structure may translate into forces that
determine a social gradient in health status. Different measures of social
status convey different meaning (Bartley et al. 1996; Krieger and Fee
1996). In this data set we have, as yet, made only a limited exploration
of alternate measures of socioeconomic status. Household income was

related to the three health measures independent of educational level, and the relation of education to health was independent of household income. We do not interpret education, or income, as necessarily being causal. The existence of independent relations with health does not necessarily mean that level of income or number of years of education is the cause, in the sense that providing more income or increasing educational opportunities necessarily reduces inequalities in health. They may be, but our approach to speculation on causation is to ask which factors may mediate the relation between education and health.

One particular area that has led to some speculation is the level at which causes operate: the individual or the group. Wilkinson points to the fact that within societies income is related to life expectancy, whereas at the level of whole societies, countries, or states of the United States (Kaplan et al. 1996), not income level but inequality of income is related to life expectancy (Wilkinson 1996). This suggests that the character of whole societies may be related to ill health; hence, the relation between measures of social capital and mortality in the United States (Kawachi and Kennedy 1997). In the Alameda County study, people living in poverty areas had higher mortality than people living in other areas, independent of a range of personal characteristics, including income (Haan, Kaplan, and Camacho 1987). In the MIDUS sample, health varied according to area of residence, based on a classification derived from level of poverty and unemployment in the area. This relation was independent of household income and education. It is consistent with the proposition that characteristics of neighborhoods may relate to differences in health status.

Explanations for Inequalities in Health

The *Black Report* set the debate in Britain on causes of social inequalities in health (Black et al. 1988). The Black committee suggested four types of explanation: artifact; selection; culture/behavior; material/structural. MacIntyre has recently reviewed the subsequent debate, which tended to take hard positions as to which explanation was primary (MacIntyre 1997). "Softer" positions allow for a more balanced view of the relative contribution of each of these. We have already dealt briefly with the issue of selection.

Although the evidence suggests that the oft-found relation between SES and health is not the result of artifact, we should consider what role artifact may have played in the present study. First, there is the issue of self-report bias. Both the exposures and the outcomes were generally based on self-reports. This raises the possibility of contamination: an unfavorable self-view of one area of life—for example, poor health— may lead to an unfavorable view or unfavorable reporting of other areas of life. Alternatively, there may be a common antecedent (a third variable): people in an unfavorable socioeconomic position may tend to report unfavorably on all areas of life, resulting in an apparent relation between them. Although this could, in all likelihood, account for some of the relation between the constraints dimension of low control and psychological well-being, it is less likely to account for relations like that between parents' education and central adiposity and could not account for the relation between area of residence, classified on the basis of census characteristics, and ill health. Even with two self-report measures that have a high degree of subjectivity, like control and self-reported health, contamination may not be the explanation for the association. If it were, why would there be a strong relation between constraints and self-reported health but not between mastery and health? It is not obvious why one measure would be more affected by the bias of having assessed one's health as poor, or of occupying a low status, than the other. To the extent that there is such contamination, it will overstate the contribution to an explanation of the educational gradient and will understate the independent effect of education.

A second issue that makes causal interpretation difficult is that the study is cross-sectional in design. We are not, therefore, examining the determinants of incidence of disease or, more generally, of change in health status. This leads to the possibility of reverse causation or of survival effects. Reverse causation, akin to the health selection issue, would arise if health determined the exposure rather than the reverse. If, for example, central adiposity led to a feeling of lack of control, we would be wrong in our interpretation of the association as showing the influence of psychosocial factors on the development of a high waist:hip ratio. As we argued earlier in the discussion of health selection, because education is the marker of socioeconomic position, reverse causation is unlikely to be the reason for the observed socioeconomic gradient in health. Reverse causation could, however, weaken the interpretation of

whether the factors studied are truly intermediaries between socioeconomic status and health.

The possibility of survival effects is shown through the apparent decline with age in waist:hip ratio among the oldest men. This could result from a higher mortality among men with the highest waist:hip ratio. These issues cannot be settled in this cross-sectional study. Nevertheless, a causal interpretation is possible and consistent with the hypotheses we elaborated at the start of the study, and it informed the choice of measures that were included.

The findings are indeed compatible with a model of causation of social inequalities in physical health and psychological well-being that suggests that no one factor is responsible. Various factors each appear to make a small contribution to the explanation of the social gradient, but they add up to a substantial explanation.

It is perhaps not meaningful to ask precisely how much of the gradient is explained by these variables for three reasons: the cross-sectional nature of the study; measurement imprecision; and the mode of statistical analysis. We have treated each of these variables as single variables with independent effects. That is simplistic. There will be complex interactions of variables acting at various stages of the life course. This study is not well suited for testing out models that really require a longitudinal birth cohort study of the sort that has been conducted in Britain (Wadsworth 1991; Power, Manor, and Fox 1991). The advantage of the present study, however, is that we were able to include a rich array of variables from multiple domains describing people's situation in midlife.

Policy Implications

Amid these caveats we should not lose sight of the potential significance of the study. It confirms that midlife is a time when there are substantial socioeconomic differences in health, in markers of disease risk, and in psychological well-being. These socioeconomic differences follow a gradient. They are not confined to people at the bottom of the social hierarchy. Although one cross-sectional study cannot, by itself, settle the issue of causation, conclusions about the role of the potential causal factors we have analyzed here are consistent with other evidence.

Upstream or Downstream?

An important question for policy is the degree to which we should focus on the causes of social inequalities, on the reasons for the link between social position and the potential mediator, or simply on the mediator itself. This can be illustrated with smoking as, perhaps, typical of health behaviors. The evidence here suggests that smoking makes a contribution to social inequalities in health. A "downstream" focus might concentrate on measures to reduce smoking prevalence in the population. These would include (increasing cigarette prices through) taxes and the creation of smoke-free settings, in addition to health education. To the degree to which this was successful, it would benefit the whole population.

A more "upstream" focus, on the other hand, would point to the social gradient in smoking demonstrated in this and other studies as evidence that smoking policies do not benefit the whole population to the same extent. This suggests that smoking policies should take into account the social distribution of smoking (Townsend, Roderick, and Cooper 1994). The present study did not address reasons for the social gradient in smoking but confirms it as an area that cannot be ignored. The extreme version of the upstream focus would suggest that the issue is not smoking but social inequalities. Action to reduce inequalities in health should therefore focus on the causes of social inequalities. Our analyses, described here, suggest the possibility of an approach somewhat short of this fundamental one. By examining factors that may mediate the link between social status and health, it provides information on possible intervention points. Health behaviors exemplified by smoking, material circumstances related to income and neighborhood characteristics, psychosocial factors in the workplace, lack of control, and perceived constraints all appear to contribute to state of health.

Deprivation through the Life Course

The relation between parents' education and health of participants is consistent with a view that the causes of health inequalities in midlife begin in childhood and may cumulate through the life course (Bartley et al. 1994; Power and Hertzman 1997). Some speculation is in order here. One interpretation of life course effects on health in adults is that material deprivation in childhood has long-lasting effects. Somewhat

against this material deprivation explanation in the present study is the differential effect of parental education in men and women. Father's education was more strongly related to ill health in men; mother's education, in women. Although it is possible that this connection could be linked to differential exposure to material deprivation in men and women, a more likely interpretation is that the effect is psychosocial. Whether because of role models, or for some other reason, a male whose father is more highly educated experiences better health, independent of his own achieved education, whereas, in the case of a female, the mother's education appears to be the dominant factor.

Is Education Important?

It is tempting to believe that if part of the educational gradient can be explained by the psychosocial factors that were examined, the unexplained part must be the result of education itself. Such a conclusion would be premature: First, the degree to which the gradient can be explained may relate to precision of measurement and form of statistical analysis. Second, education may be a marker, although, of course, the question is, a marker of what? It may be a marker of the background from which people come. The evidence we have on the effect of education independent of parent's education does not support this explanation, but there is evidence, for example, that the best predictor of a child's performance in school is level of parental interest (Wadsworth 1991). Education may indeed be part of the causal pathway, in the sense that better education leads to a greater likelihood of favorable work and living conditions, as well as habits and behaviors, in later life. These, in turn, may lead to better health.

The fact that educational attainment may be part of the causal pathway linking socioeconomic status to health does not by itself suggest a policy remedy. Mortimore and Whitty (1997) discuss whether school improvement could overcome the effects of disadvantage; their conclusion is guarded. It would be difficult to argue that school improvement could be anything but good. Mortimore and Whitty discuss evidence, however, that children from advantaged backgrounds derive greater benefit from school improvement than do children from disadvantaged backgrounds. An unintended consequence of overall school improvement could therefore be a greater gap in educational attainment be-

tween those with more and less social advantage. The logic of investment in preschool education is precisely to overcome this social disadvantage before children enter the school system. The results are encouraging (Schweinhart et al. 1993). The way to improve the "returns" to educational investment of disadvantaged children may be to invest in high-quality preschool programs.

Taking Action on the Gradient

If the link between social inequality and ill health was confined to worse health among those in poverty, there would be little conceptual difficulty in devising potentially effective policies. Anything that helped to relieve poverty might be expected to improve the health status of those living in poverty. This is not to underestimate the political and practical difficulties of devising and implementing such policies, but to emphasize that the poverty question is conceptually tractable.

Inequality, on the other hand, poses greater conceptual difficulties in devising policies. These findings imply, as did the Whitehall studies (Marmot, Shipley, and Rose 1984; Marmot et al. 1991; North et al. 1993), that a social gradient runs across the whole spectrum. In this analysis, we have used education as our indicator of social position to illustrate the gradient. Income can also be used; this can be illustrated by the panel study of income dynamics (McDonough 1997). People in the poorest group of households (less than $15,000 in 1993) had mortality 3.9 times higher than that of the richest group of households (greater than $70,000). About 7 percent of the population fell into this poorest category. By contrast, those in households with incomes in the $30–$50,000 range had a relative mortality of 1.6, but 30 percent of the population was in this third highest income category. The smaller relative excess therefore applied to a much larger population subgroup. Concentrating only on those in poverty would, one hopes, benefit them, but it would not address the question of inequalities in health in the total population.

The MIDUS study provides a potential menu of factors that may be playing a role in generating socioeconomic differences in health. It is to some extent artificial to separate features of a complex social existence in order to ask which is most important. The evidence we have presented suggests that it may not be possible. It is nevertheless reasonable to ask where appropriate intervention points might be. If the perspective is to

improve things by narrowing social inequalities in health, it is important to ask which of a number of factors might be amenable to intervention and might interrupt the pathways leading to inequalities in health. No one study can answer this question, but our study does contribute to the body of evidence (Wilkinson 1996; Blane, Brunner, and Wilkinson 1996) suggesting that the social environment is an important determinant of the health of populations and should be the appropriate focus for action.

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