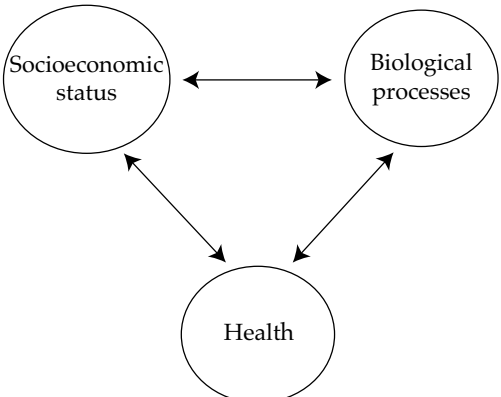
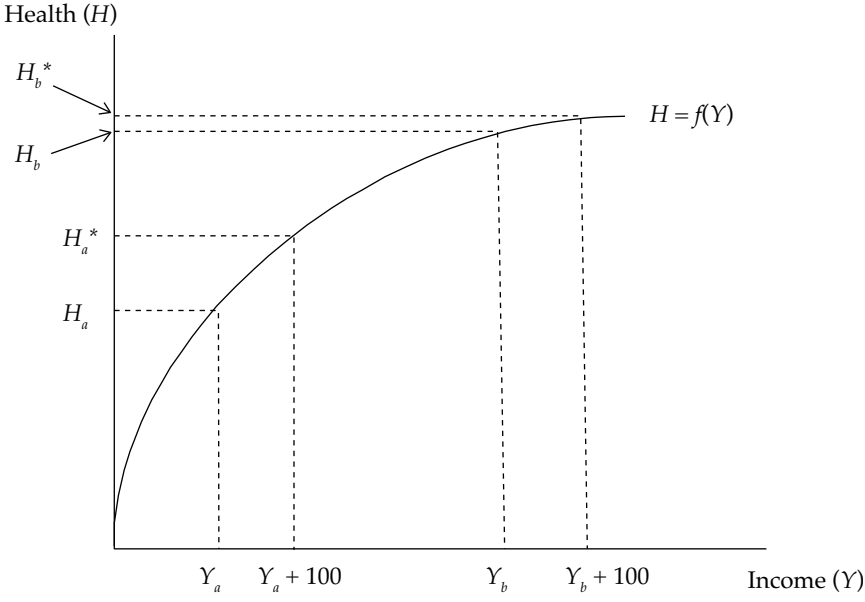
Figure P.1 Interdisciplinary Schematic



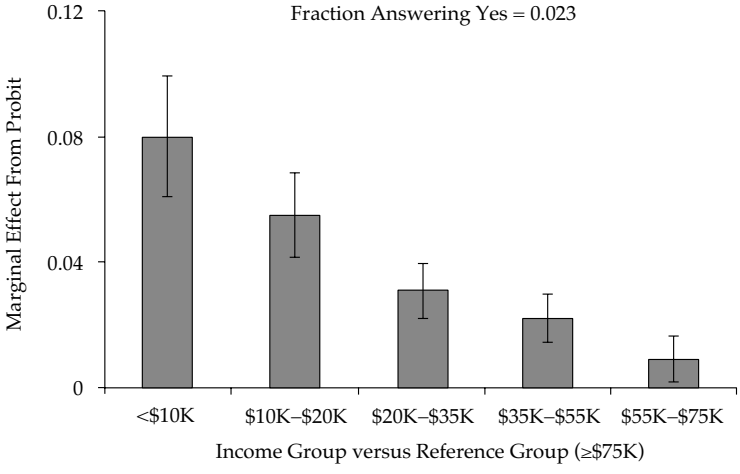
Source: Authors' compilation.

Figure 1.1 The Income-Health Relationship



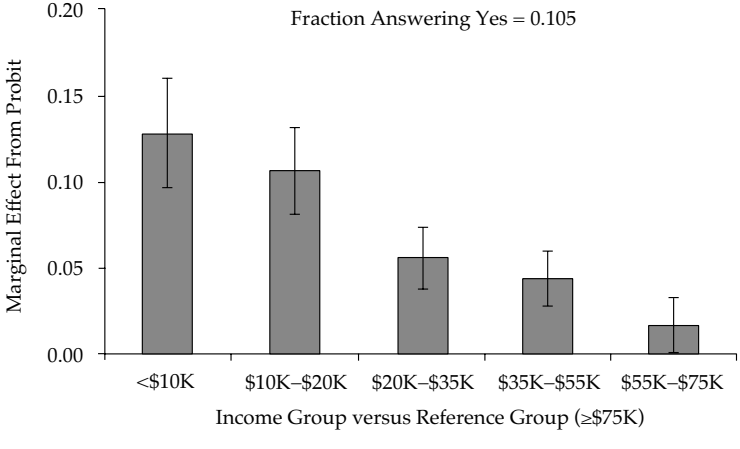
Source: Authors' figure.

Figure 1.2 Marginal Effects on Income Dummy Variables, Children, Fair or Poor Health



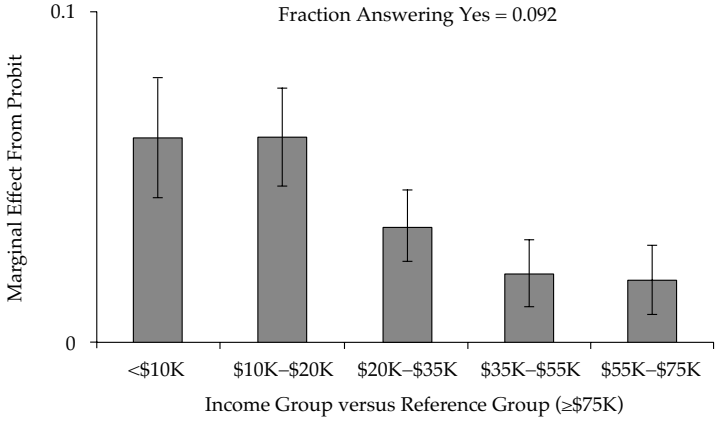
Source: Authors' calculations based on National Health Interview Survey 2001–2003 (National Center for Health Statistics n.d.).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.3 Marginal Effects on Income Dummy Variables, Children, School Absence Ten Days or Longer



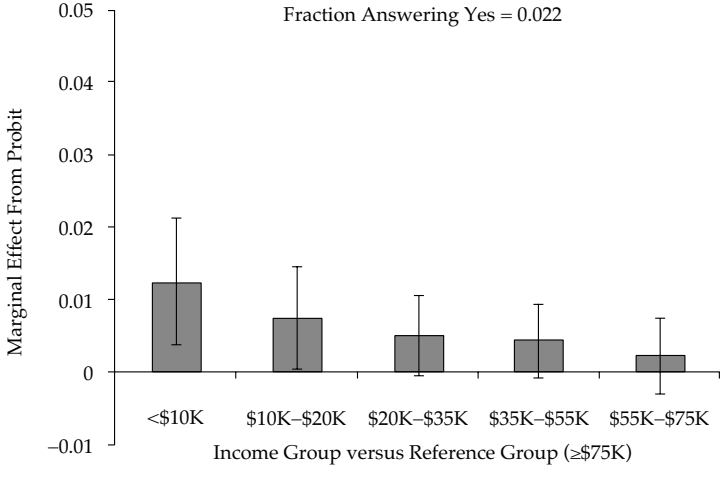
Source: Authors' calculations based on National Health Interview Survey 2001–2003 (National Center for Health Statistics n.d.).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.4 Marginal Effects on Income Dummy Variables, Children, Limitation on Activity



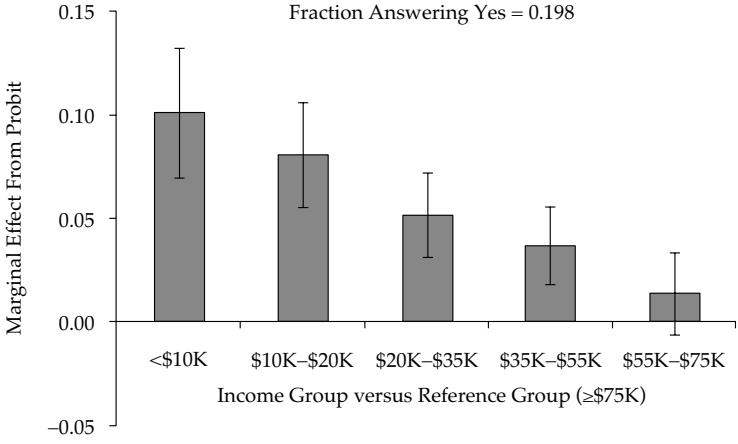
Source: Authors' calculations based on National Health Interview Survey 2001–2003 (National Center for Health Statistics n.d.).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.5 Marginal Effects on Income Dummy Variables, Children, Hospital Stay



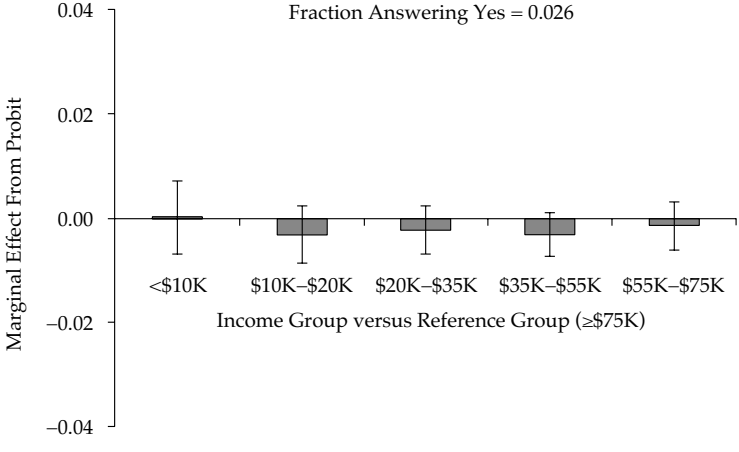
Source: Authors' calculations based on National Health Interview Survey 2001–2003 (National Center for Health Statistics n.d.).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.6 Marginal Effects on Income Dummy Variables, Children, Emergency Room Visit



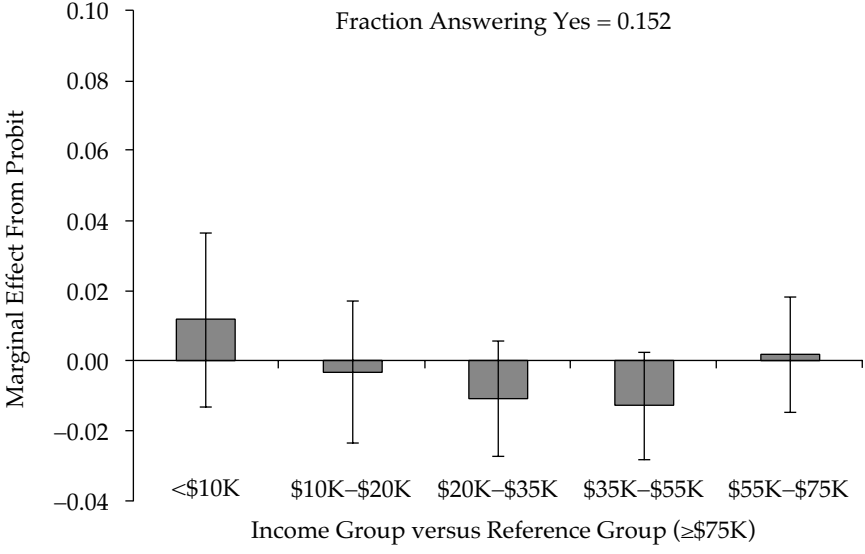
Source: Authors' calculations based on National Health Interview Survey 2001–2003 (National Center for Health Statistics n.d.).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.7 Marginal Effects on Income Dummy Variables, Children, Injury or Poisoning



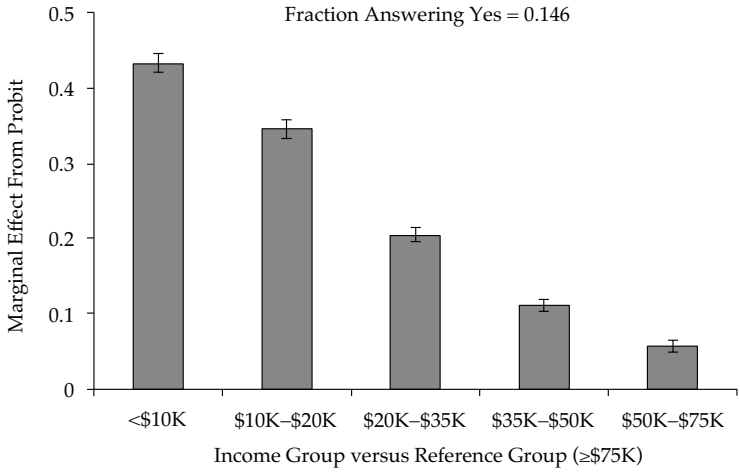
Source: Authors' calculations based on National Health Interview Survey 2001–2003 (National Center for Health Statistics n.d.).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.8 Marginal Effects on Income Dummy Variables, Children, Asthma



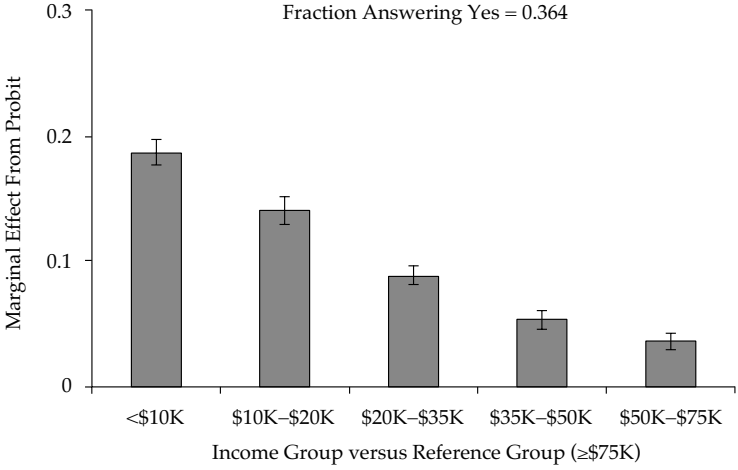
Source: Authors' calculations based on National Health Interview Survey 2001–2003 (National Center for Health Statistics n.d.).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.9 Marginal Effects on Income Dummy Variables, Adults, Fair or Poor Health



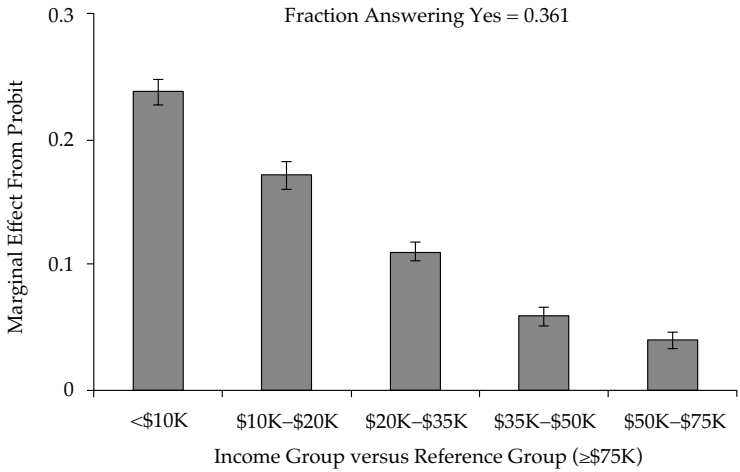
Source: Authors' calculations based on Behavioral Risk Factor Surveillance System (Centers for Disease Control and Prevention 2005–2008).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.10 Marginal Effects on Income Dummy Variables, Adults, Mental Health Days



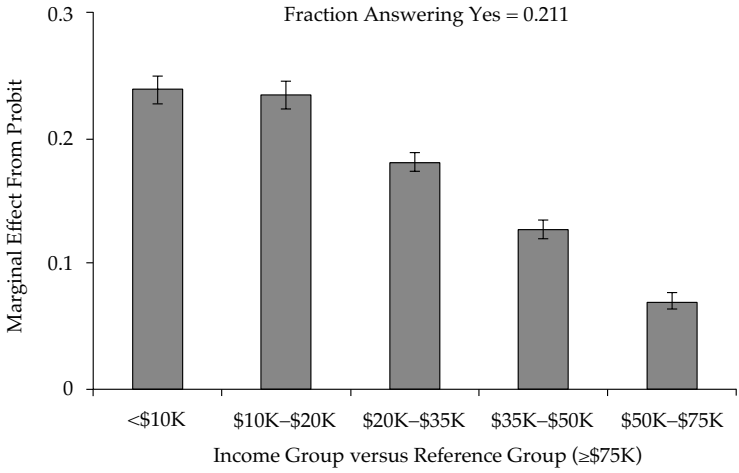
Source: Authors' calculations based on Behavioral Risk Factor Surveillance System (Centers for Disease Control and Prevention 2005–2008).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.11 Marginal Effects on Income Dummy Variables, Adults, Bad Physical Health Days



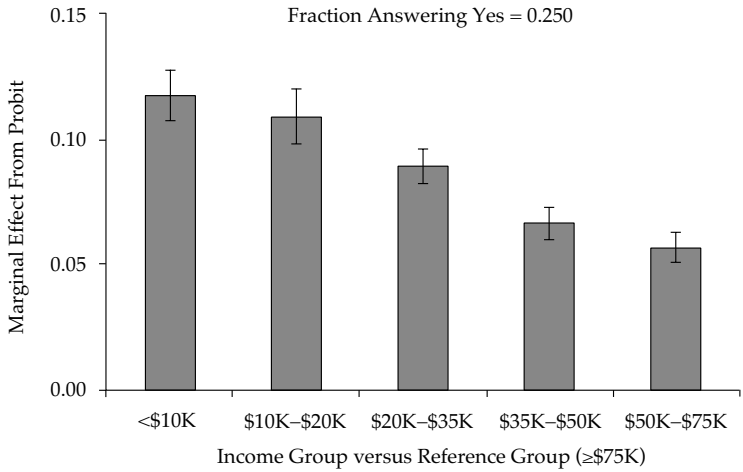
Source: Authors' calculations based on Behavioral Risk Factor Surveillance System (Centers for Disease Control and Prevention 2005–2008).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.12 Marginal Effects on Income Dummy Variables, Adults, Current Smoker



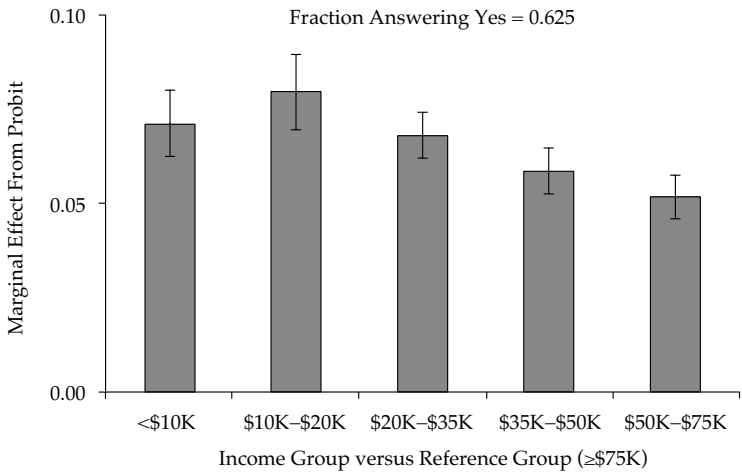
Source: Authors' calculations based on Behavioral Risk Factor Surveillance System (Centers for Disease Control and Prevention 2005–2008).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.13 Marginal Effects on Income Dummy Variables, Adults, Obese



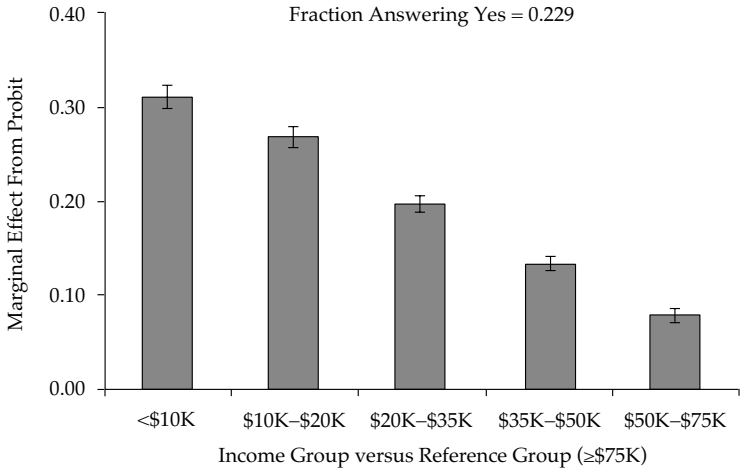
Source: Authors' calculations based on Behavioral Risk Factor Surveillance System (Centers for Disease Control and Prevention 2005–2008).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.14 Marginal Effects on Income Dummy Variables, Adults, Overweight



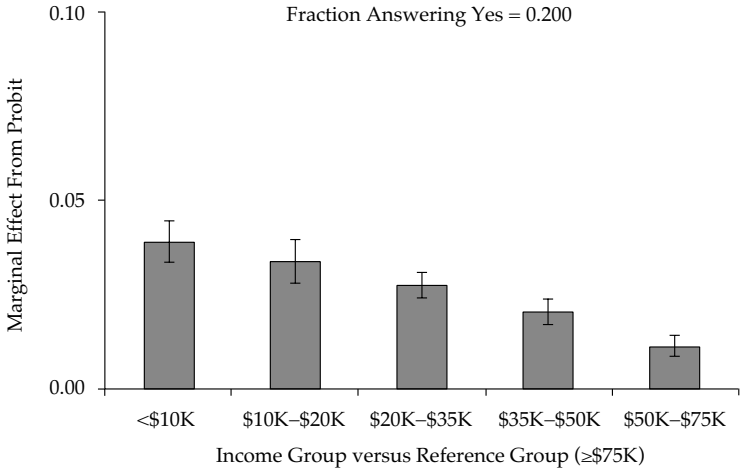
Source: Authors' calculations based on Behavioral Risk Factor Surveillance System (Centers for Disease Control and Prevention 2005–2008).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.15 Marginal Effects on Income Dummy Variables, Adults, No Exercise



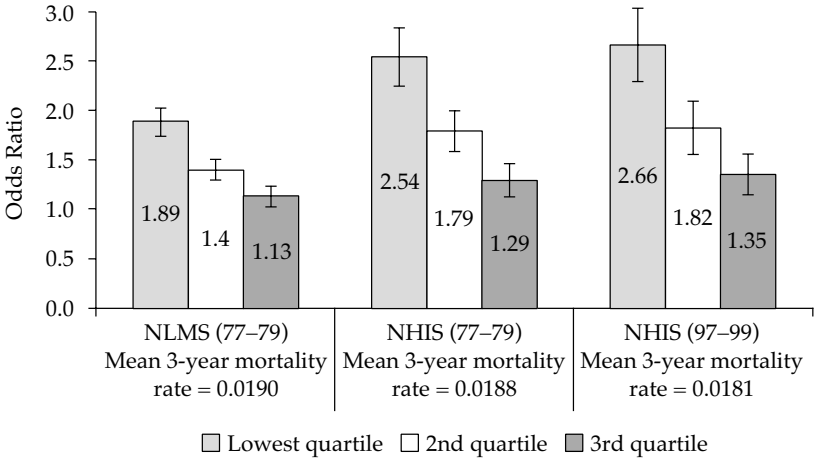
Source: Authors' calculations based on Behavioral Risk Factor Surveillance System (Centers for Disease Control and Prevention 2005–2008).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.16 Marginal Effects on Income Dummy Variables, Adults, Ages Eighteen to Seventy-Four, Limited Fruits and Vegetables



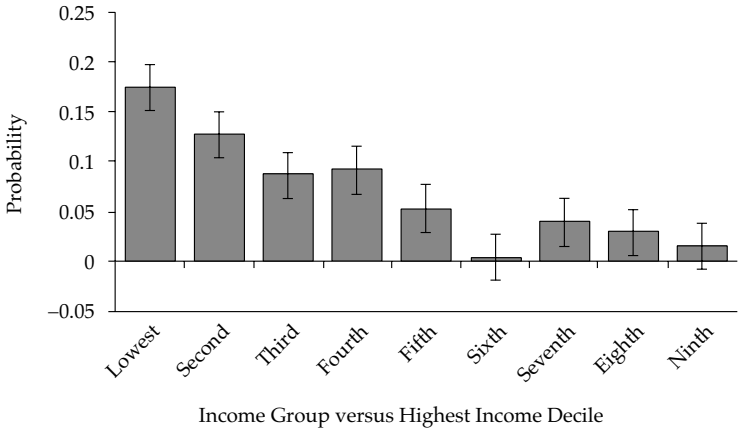
Source: Authors' calculations based on Behavioral Risk Factor Surveillance System (Centers for Disease Control and Prevention 2005–2008).
Note: Error bars represent 95 percent confidence intervals.

Figure 1.17 Odds Ratio for Income Variables, Adults



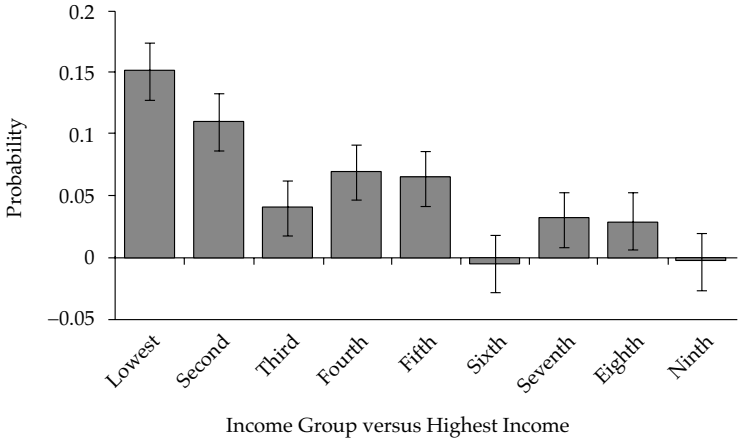
Source: Authors' calculations based on the National Longitudinal Mortality Survey 1987–1989 (National Heart, Lung, and Blood Institute 1995) and Public-use National Health Interview Survey Linked Mortality Files 1997–1999 (National Center for Health Statistics 2010).

Figure 1.18 Marginal Effects of Household Income, Australian Adults, Fair or Poor Health



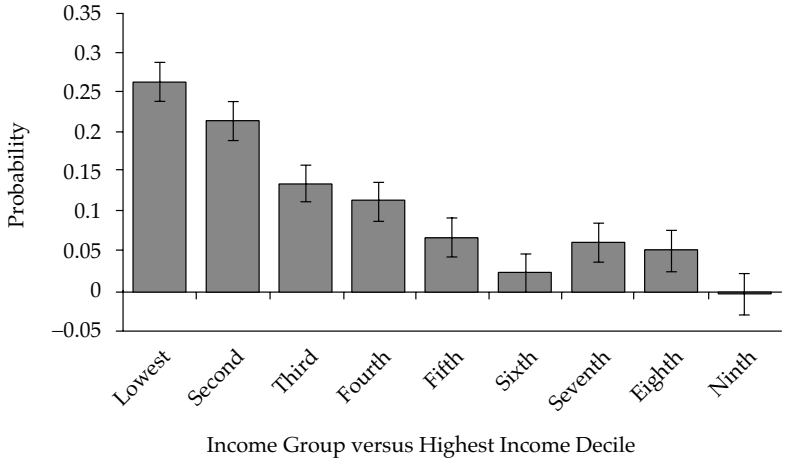
Source: Authors' calculations, with Jacqueline Homel, using the Household, Income and Labour Dynamics in Australia Survey (HILDA; Melbourne Institute 2006).
Note: Income is equivalized household income for 2005. Error bars represent 95 percent confidence intervals.

Figure 1.19 Marginal Effects of Household Income, Australian Adults, Psychological Distress Risk



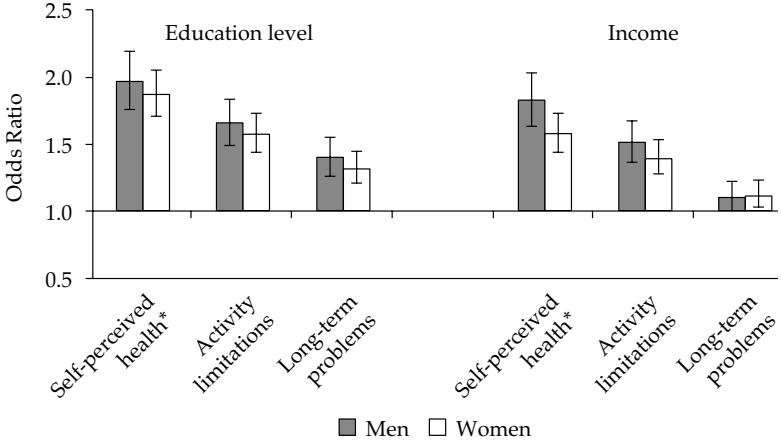
Source: Authors' calculations, with Jacqueline Homel, using the Household, Income and Labour Dynamics in Australia Survey (HILDA; Melbourne Institute 2006).
Note: Income is equivalized household income for 2005. Error bars represent 95 percent confidence intervals.

Figure 1.20 Marginal Effects of Household Income, Australian Adults, Long-Term Health Condition



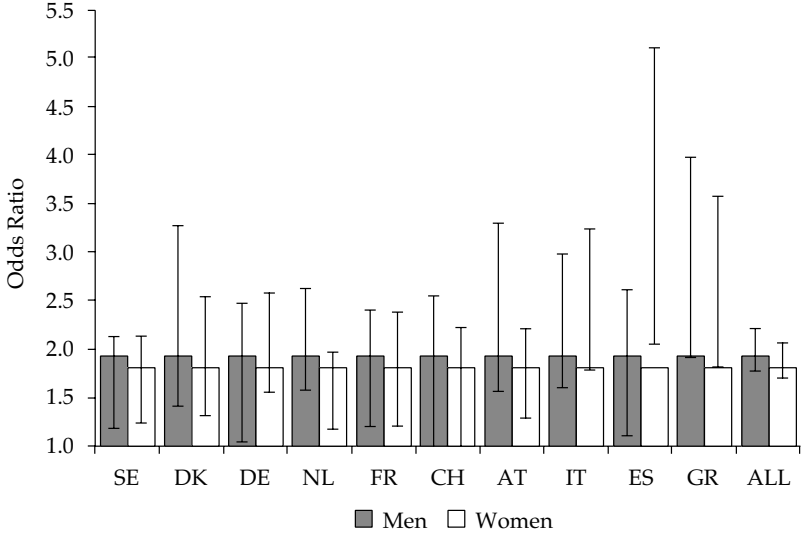
Source: Authors' calculations, with Jacqueline Homel, using the Household, Income and Labour Dynamics in Australia Survey (HILDA; Melbourne Institute 2006).
Note: Income is equivalized household income for 2005. Error bars represent 95 percent confidence intervals.

Figure 1.21 Odds Ratio of General Physical Health Measures, Europe



Source: Avendano, Aro, and Mackenbach (2005, p. 90), reprinted with permission.
Note: *Less than good self-perceived health.

Figure 1.22 Odds Ratio of Self-Perceived Health, Europe



Source: Avendano, Aro, and Mackenbach (2005, p.93), reprinted with permission.
Note: Outcome is less than good self-perceived health.
SE = Sweden; DK = Denmark; DE = Germany; NL = Netherlands; FR = France; CH = Switzerland; AT = Austria; IT = Italy; ES = Spain; GR = Greece.

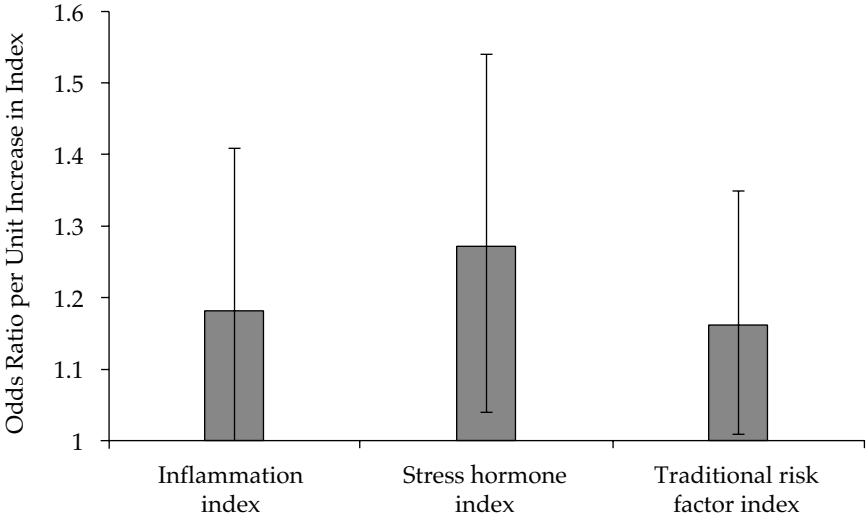
Table 1.1 Disparities in Health by Socioeconomic Status

Country	Year-OECD Data	Perceived Health Status ≥ Good Q1	Perceived Health Status ≥ Good Q5	Ratio Q1/Q5
Australia	2004	76.5	93.1	82%
United States	2007	77.0	95.6	81%
France	2006	57.9	85.0	68%
New Zealand	2007	89.7	93.2	96%

Source: Authors' calculations based on OECD (2012).

Note: OECD = Organisation for Economic Co-operation and Development; Q = quarter.

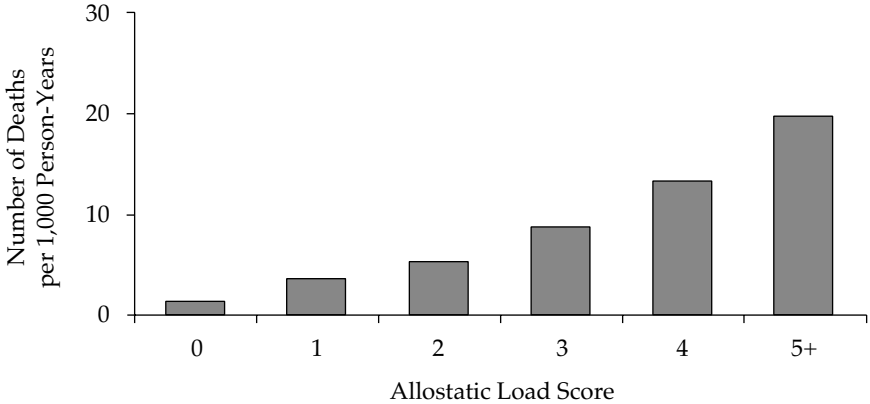
Figure 2.1 Adjusted Seven-Year All-Cause Mortality Odds



Source: Authors' calculations based on Seeman et al. (2004).

Note: Odds ratios per unit increase, after adjusting for age (continuous, in years), gender, race (African American versus Caucasian), and education (less than high school versus high school or more). Error bars denote 95 percent confidence intervals. Inflammation index includes C-reactive protein, interleukin-6, fibrinogen, and albumin; range 0 to 4. Stress hormone index includes urine cortisol, urine epinephrine, urine norepinephrine, and blood dehydroepiandrosterone sulfate; range 0 to 4. Traditional risk factor index includes systolic and diastolic blood pressure, high-density lipoprotein cholesterol, ratio of total to high-density lipoprotein cholesterol, glycosylated hemoglobin, and waist-hip circumference ratio; range 0 to 6.

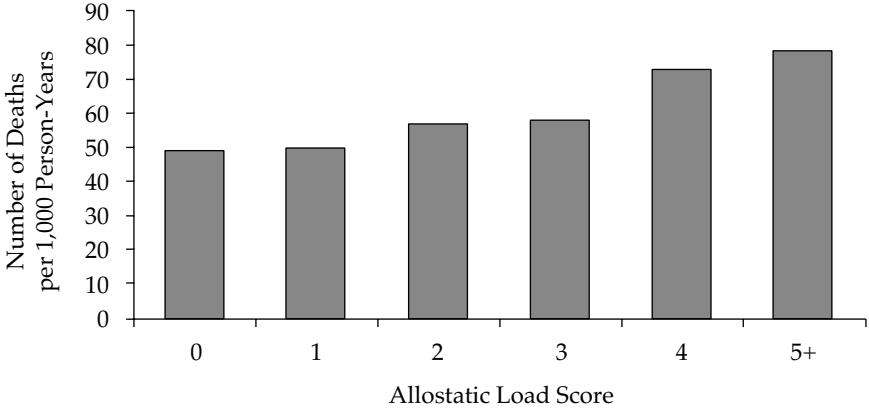
Figure 2.2 All-Cause Mortality Rate in Those Younger than Sixty-Five Years Old



Source: Authors' calculations based on data from the Third National Health and Nutrition Examination Survey (National Center for Health Statistics 1996).

Note: Each score group (0, 1, 2, . . . , 5+) age-standardized to the age distribution (under age sixty-five) of the United States at the time of the 2000 census. Allostatic load score (range, 0 to 9) was created by counting the number of biomarkers that meet the clinical high-risk criteria of table 2.2.

Figure 2.3 All-Cause Mortality Rate in Those Sixty-Five Years Old or Older



Source: Authors' calculations based on data from the Third National Health and Nutrition Examination Survey (National Center for Health Statistics 1996).

Note: Each score group (0, 1, 2, . . . , 5+) age-standardized to the age distribution (sixty-five years or older) of the United States at the time of the 2000 census. Allostatic load score (range, 0 to 9) was created by counting the number of biomarkers that meet the clinical high-risk criteria of table 2.2.

Table 2.1 Major Physiological Systems and Corresponding Biomarkers[a]

Physiological Systems	Biomarkers
Hypothalamic-pituitary-adrenal axis	Cortisol—Saliva (diurnal samples[b]), urine (overnight) Dehydroepiandrosterone sulfate (blood)
Sympathetic neuro-hormonal system	Norepinephrine (overnight or 24-hour urine) Epinephrine (overnight or 24-hour urine) Alpha-amylase (saliva)
Parasympathetic neuro-hormonal system	Heart rate variability (continuous pulse rate recording)
Inflammatory/immune system	C-reactive protein (blood or dried blood spot) Erythrocyte sedimentation rate (blood) Interleukens (blood) Lymphocyte number and function (blood) Circulating serum albumin (blood or saliva)
Cardiovascular	Diastolic/systolic blood pressure (sphygmomanometer) Resting heart rate
Glucose metabolism	Fasting glucose (blood or dried blood spot) Glycosylated hemoglobin (blood or dried blood spot) Fasting insulin (blood)
Lipid metabolism	Cholesterol and lipoprotein fractions (blood) Body mass index Waist circumference, waist-to-hip circumference ratio Total body fat (DXA scan[c])
Hematological	Serum hemoglobin (blood or dried blood spot) Clotting factors and clotting time (blood)
Renal	Creatinine (serum or 24-hour urine) Urine albumin leakage (24-hour or spot urine) Cystatin C (serum or dried blood spot)
Hepatic	Circulating serum albumin (blood or saliva)
Reproductive	Serum testosterone and/or estradiol (blood) Follicle-stimulating hormone (blood)
Pulmonary	Arterial oxygen saturation (pulse oximeter) Peak expiratory flow (hand-held spirometer)
Bone	Bone density (DXA scan or peripheral ultrasound) Bone turnover markers (blood or fasting urine)
Muscle	Skeletal muscle mass (DXA scan or body impedance) Grip strength (dynamometer)

Source: Authors' compilation.

[a]With a few exceptions, all of these biomarkers have predictive value in children, adults, and older persons, although the range of observed values is generally smaller in younger populations. In particular, sex steroid hormones (including the reproductive system biomarkers and dehydroepiandrosterone sulfate) and skeletal measures (including the bone and muscle biomarkers) have less value in growing children.

[b]Salivary cortisol sampled at waking, thirty minutes after waking (to capture diurnal peak), mid-day, and bedtime.

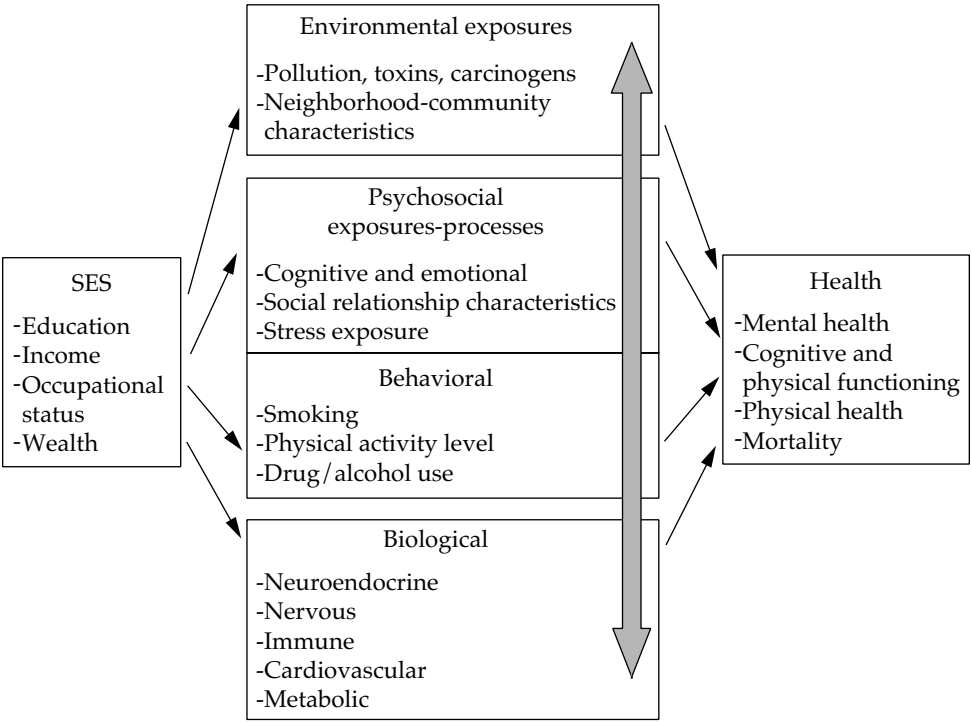
[c]DXA = Dual-energy X-ray absorbtiometry.

Table 2.2 Clinical High-Risk Criteria for Commonly Used Biomarkers

Biomarker	High-Risk Criteria
C-reactive protein	≥0.3 mg/dL
Serum albumin	<3.8 g/dL
Systolic blood pressure	≥140 mm Hg
Diastolic blood pressure	≥90 mm Hg
Resting heart rate	≥90 per minute
Glycosylated hemoglobin	≥6.4 %
Waist-to-hip circumference ratio	>0.90 for men; > 0.85 for women
Total cholesterol	≥240 mg/dL
High-density lipoprotein cholesterol	<40 mg/dL

Source: Authors' compilation.

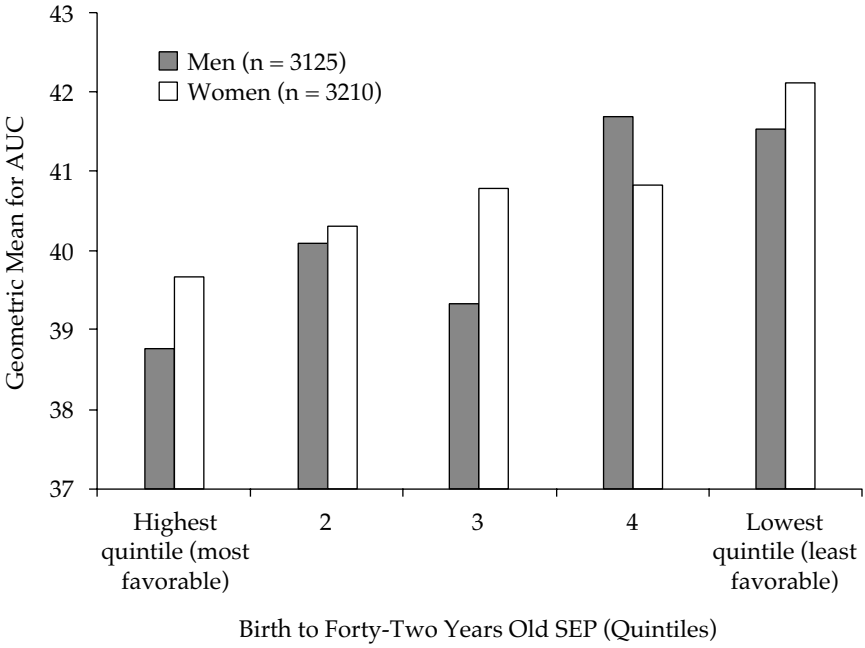
Figure 3.1 Conceptual Model of SES and Health Links



Source: Authors' figure.

Note: SES = socioeconomic status.

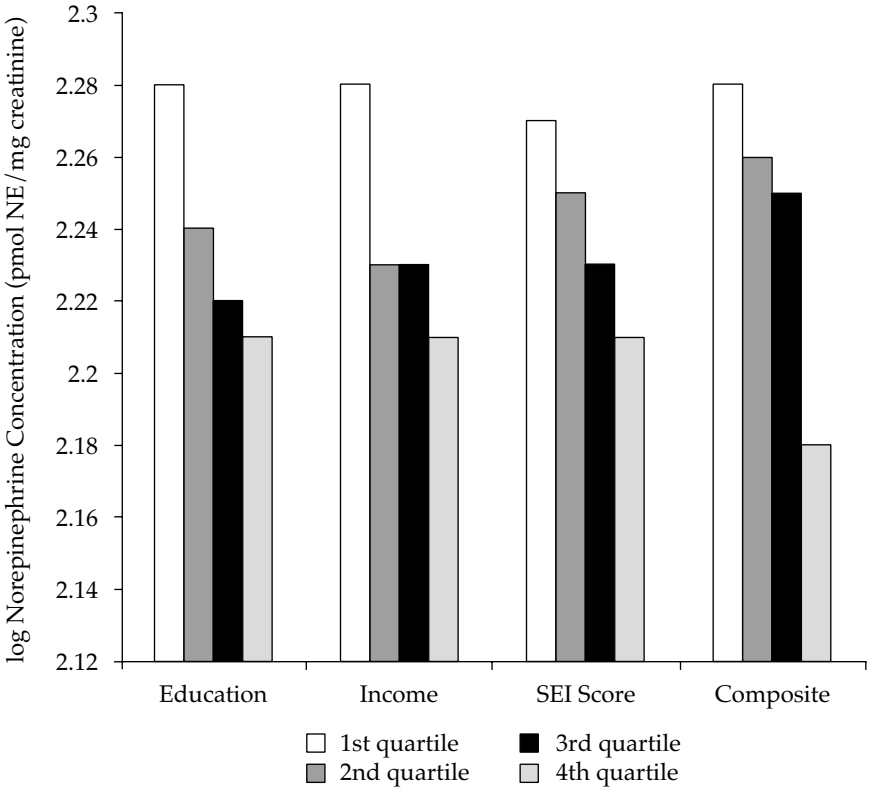
Figure 3.2 AUC Cortisol Area as Function of Quintile of SEP



Source: Li et al. (2007), reprinted with permission from Elsevier.

Note: Data are from the 1958 British Birth Cohort Study. AUC = area under curve; SEP = socioeconomic position.

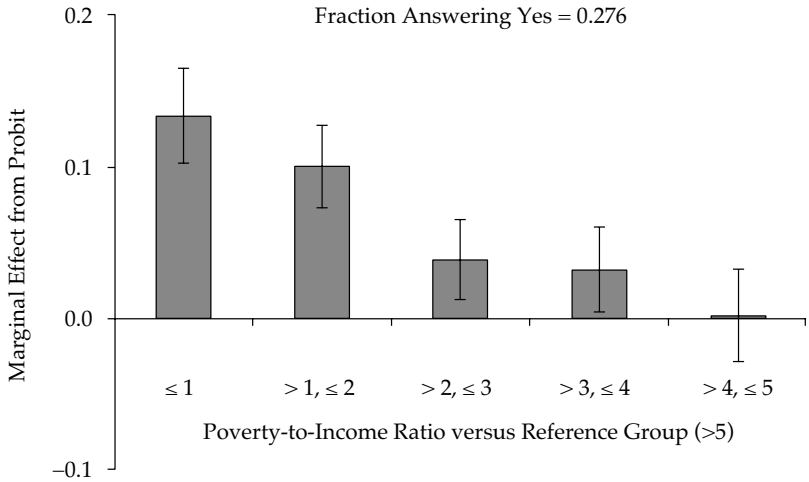
Figure 3.3 Mean Overnight Norepinephrine Levels



Source: Janicki-Deverts et al. (2007), reprinted with permission.

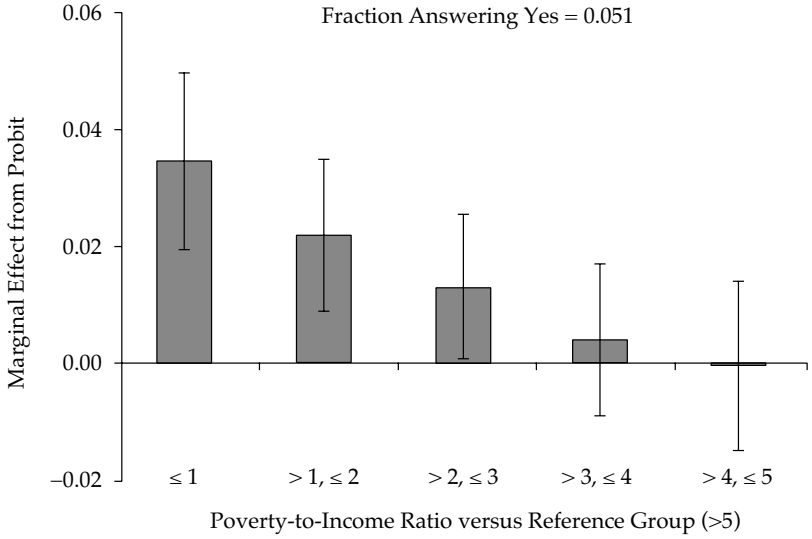
Note: Levels adjusted for age, race, and gender and given by quartiles of education, income, occupational status (socioeconomic index [SEI] score), and a composite socioeconomic status index, in the Coronary Artery Risk Development in Young Adults (CARDIA) Study.

Figure 3.4 Marginal Effects, C-Reactive Protein



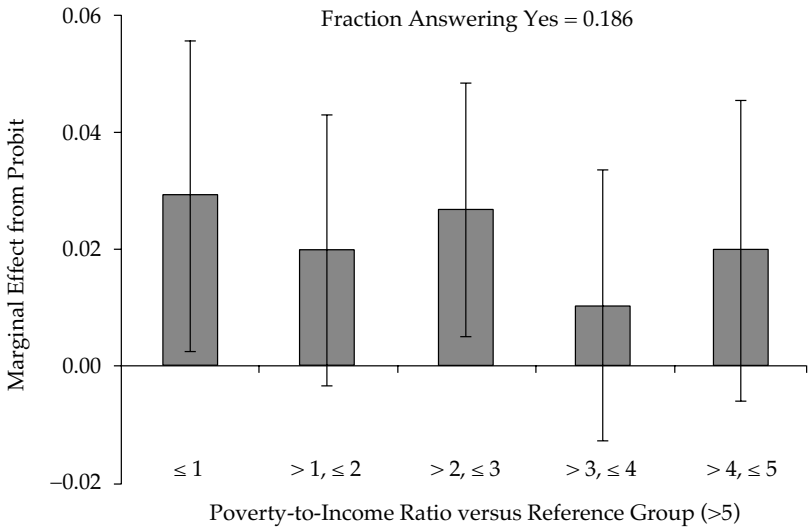
Source: Authors' calculations based on the Third National Health and Nutrition Examination Survey (NHANES III; Centers for Disease Control and Prevention n.d.).
Note: Risky level of biomarker outcomes, NHANES III, adults age twenty to seventy-four. Error bars represent 95 percent confidence intervals.

Figure 3.5 Marginal Effects, Glycated Hemoglobin Levels



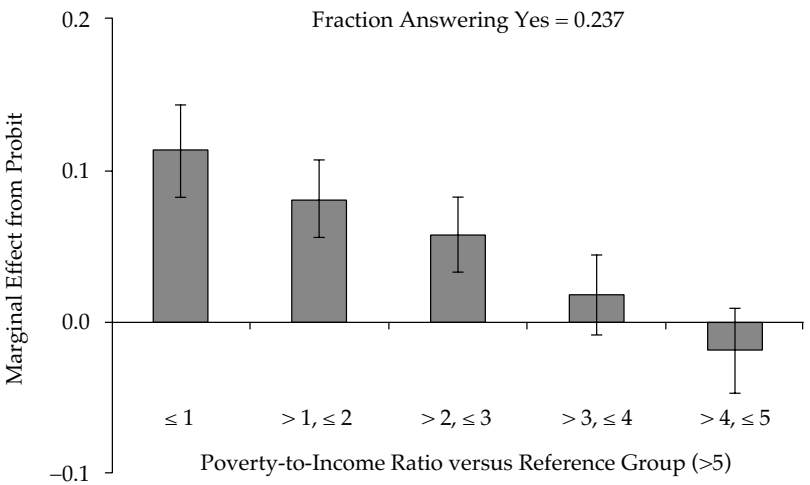
Source: Authors' calculations based on the Third National Health and Nutrition Examination Survey (NHANES III; Centers for Disease Control and Prevention n.d.).
Note: Risky level of biomarker outcomes, NHANES III, adults age twenty to seventy-four. Error bars represent 95 percent confidence intervals.

Figure 3.6 Marginal Effects, Total Cholesterol



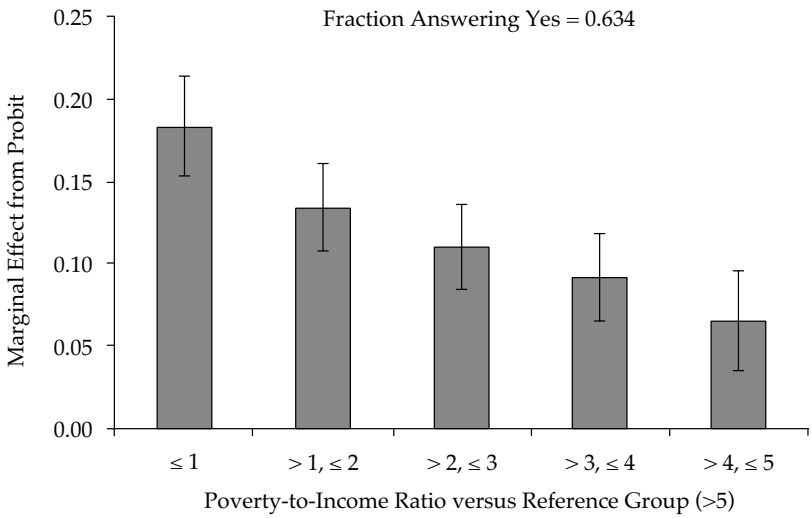
Source: Authors' calculations based the Third National Health and Nutrition Examination Survey (NHANES III; Centers for Disease Control and Prevention n.d.).
Note: Risky level of biomarker outcomes, NHANES III, adults age twenty to seventy-four. Error bars represent 95 percent confidence intervals.

Figure 3.7 Marginal Effects, High-Density Lipoprotein



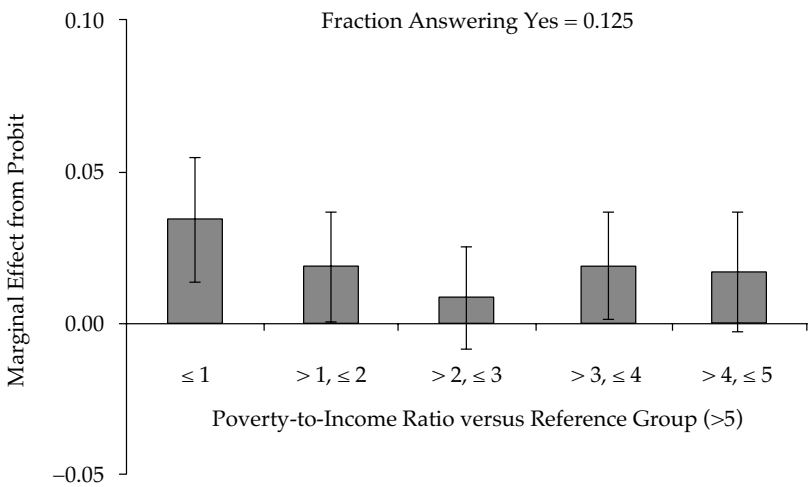
Source: Authors' calculations based on the Third National Health and Nutrition Examination Survey (NHANES III; Centers for Disease Control and Prevention n.d.).
Note: Risky level of biomarker outcomes, NHANES III, adults age twenty to seventy-four. Error bars represent 95 percent confidence intervals.

Figure 3.8 Marginal Effects, Waist-to-Hip Ratio



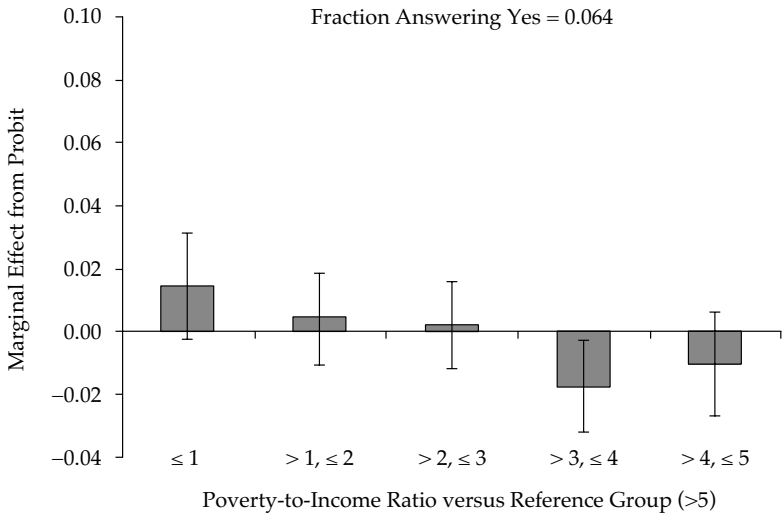
Source: Authors' calculations based on the Third National Health and Nutrition Examination Survey (NHANES III; Centers for Disease Control and Prevention n.d.).
Note: Risky level of biomarker outcomes, NHANES III, adults age twenty to seventy-four. Error bars represent 95 percent confidence intervals.

Figure 3.9 Marginal Effects, Systolic Blood Pressure



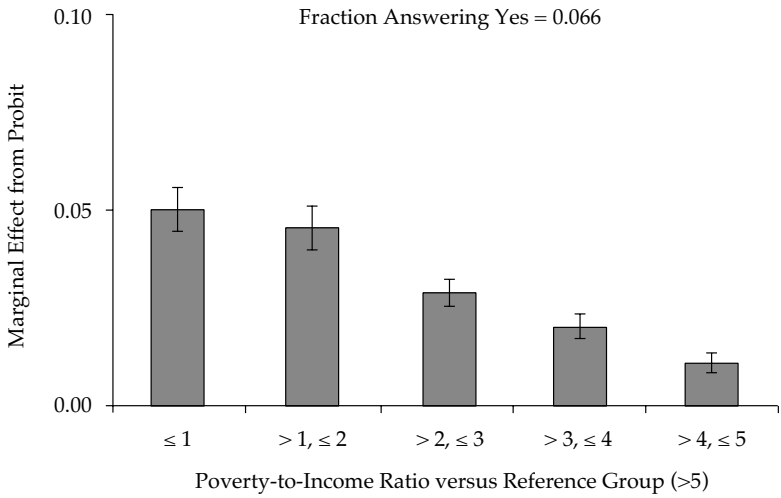
Source: Authors' calculations based on the Third National Health and Nutrition Examination Survey (NHANES III; Centers for Disease Control and Prevention n.d.).
Note: Risky level of biomarker outcomes, NHANES III, adults age twenty to seventy-four. Error bars represent 95 percent confidence intervals.

Figure 3.10 Marginal Effects, Diastolic Blood Pressure



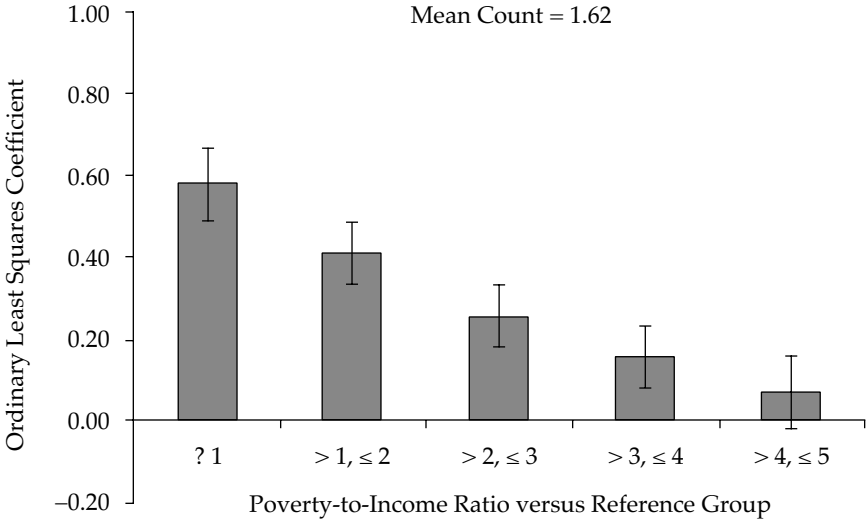
Source: Authors' calculations based on the Third National Health and Nutrition Examination Survey (NHANES III; Centers for Disease Control and Prevention n.d.).
Note: Risky level of biomarker outcomes, NHANES III, adults age twenty to seventy-four. Error bars represent 95 percent confidence intervals.

Figure 3.11 Marginal Effects, Resting Pulse



Source: Authors' calculations based on the Third National Health and Nutrition Examination Survey (NHANES III; Centers for Disease Control and Prevention n.d.).
Note: Risky level of biomarker outcomes, NHANES III, adults age twenty to seventy-four. Error bars represent 95 percent confidence intervals.

Figure 3.12 Regression Coefficients, Allostatic Load



Source: Authors' calculations based on the Third National Health and Nutrition Examination Survey (NHANES III; Centers for Disease Control and Prevention n.d.).
Note: Allostatic load regressions, NHANES III, adults age twenty to seventy-four. Error bars represent 95 percent confidence intervals.

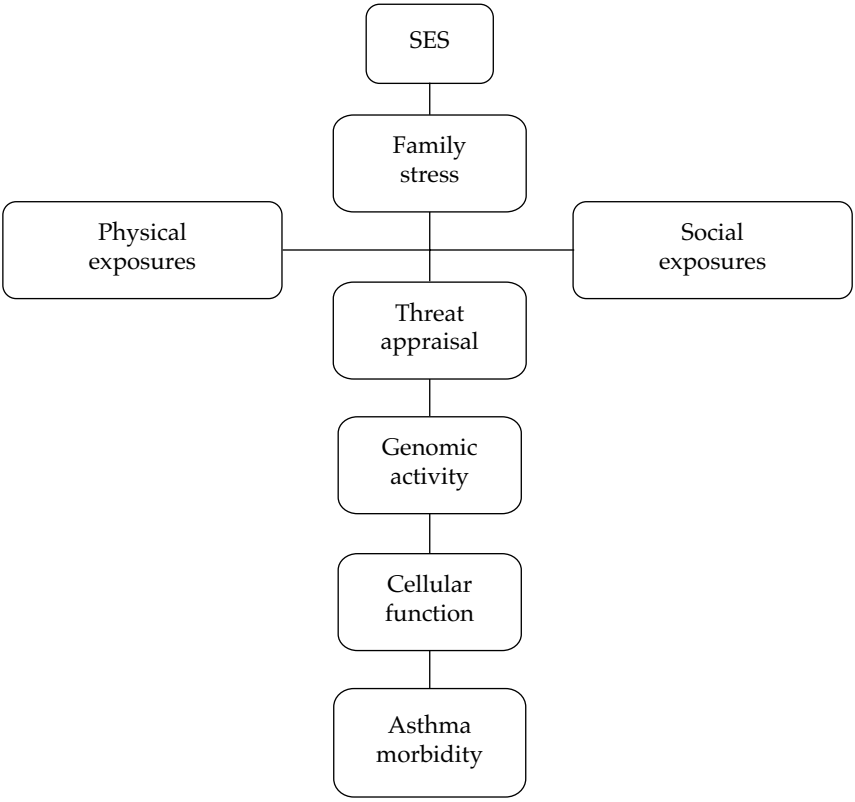
Figure 4.1 SES and Inflammatory Responses

Source: Authors' compilation based on Chen et al. (2006).

Note: Indirect pathway from SES to asthma inflammatory pathways signficant at $p < .05$. SES = socioeconomic status.

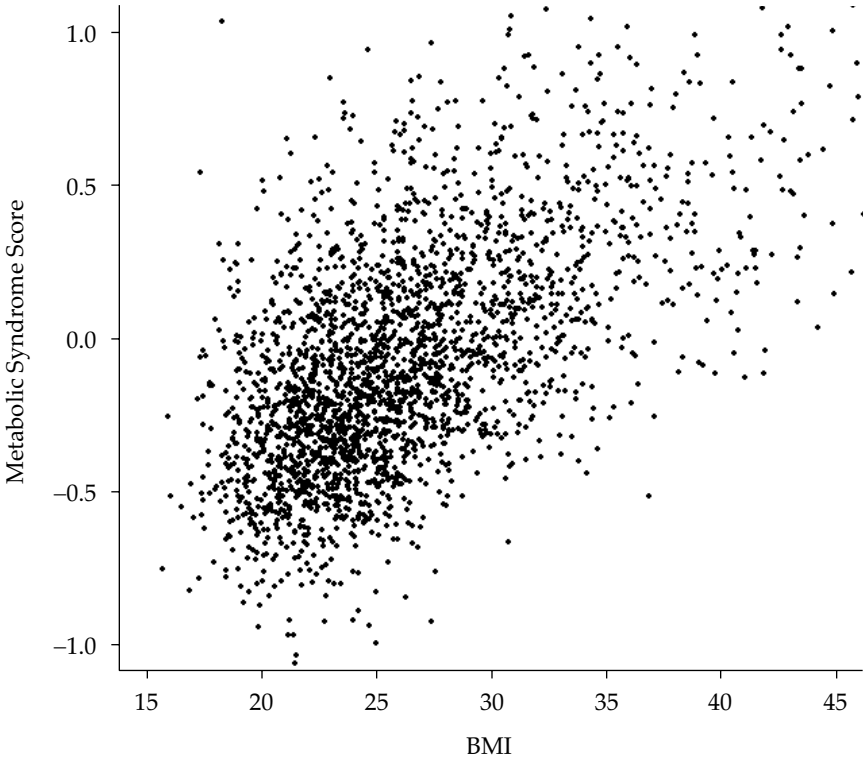
†$p < .10$. *$p < .05$. **$p < .01$

Figure 4.2 Model: SES Effects and Clinical Health Outcomes



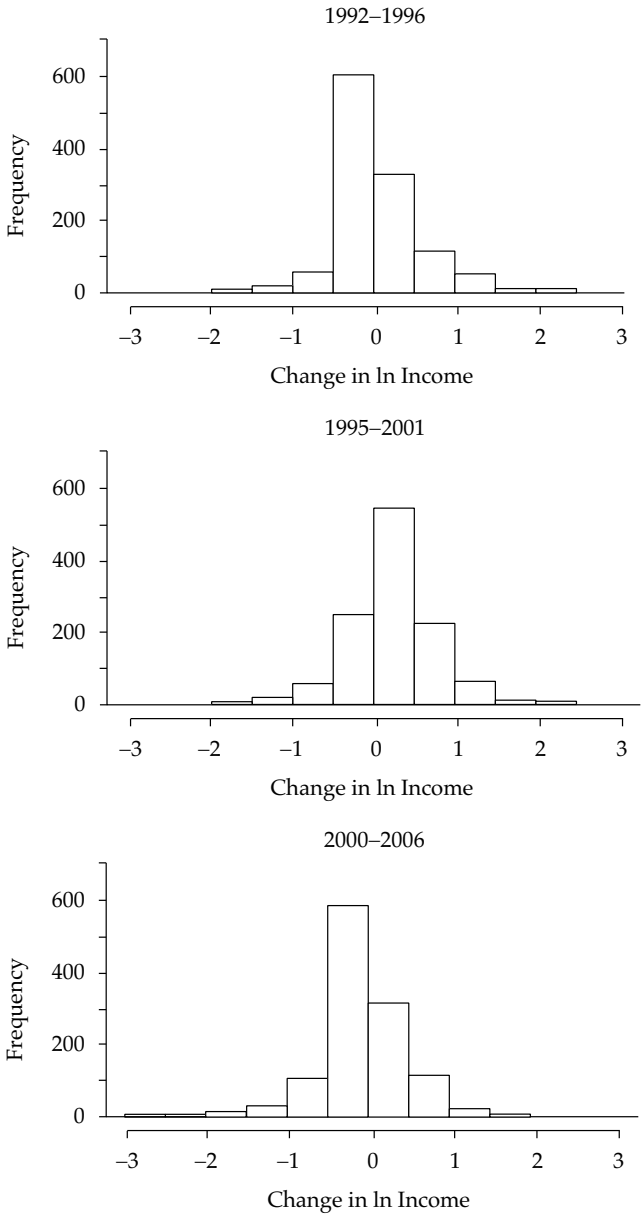
Source: Authors' figure.
Note: SES = socioeconomic status.

Figure 5.1 Metabolic Syndrome Score versus BMI



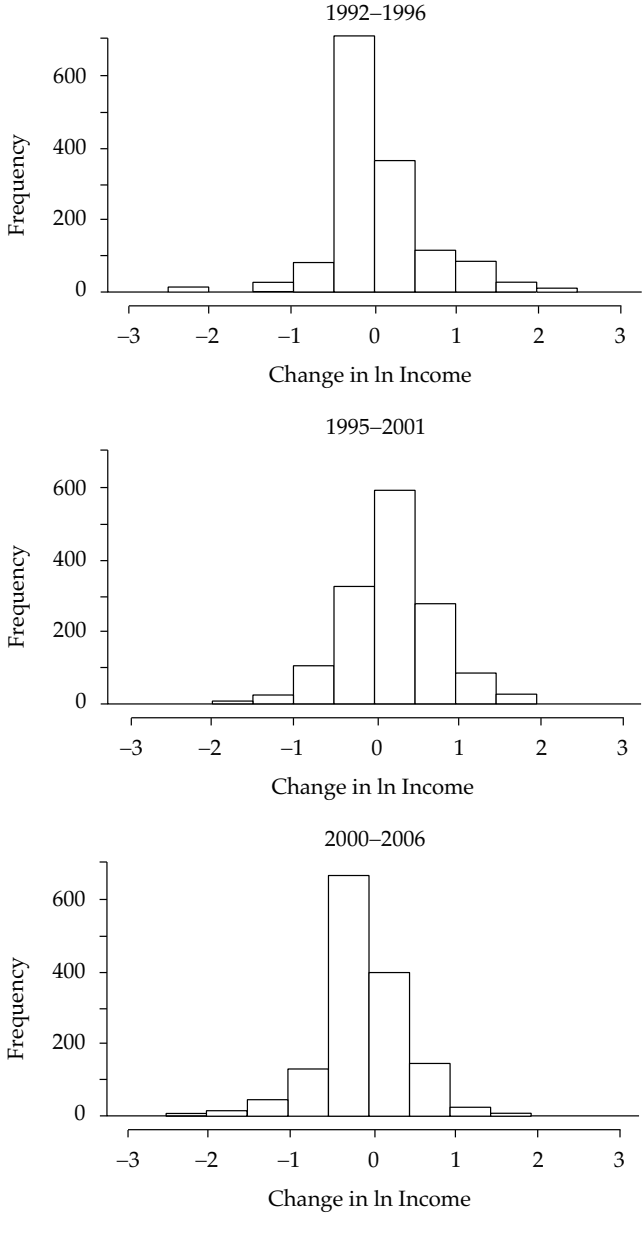
Source: Authors' calculations based on Coronary Artery Risk Development in Young Adults Study (1992).
Note: BMI = body mass index.

Figure 5.2 Income Change Between Exams, Men



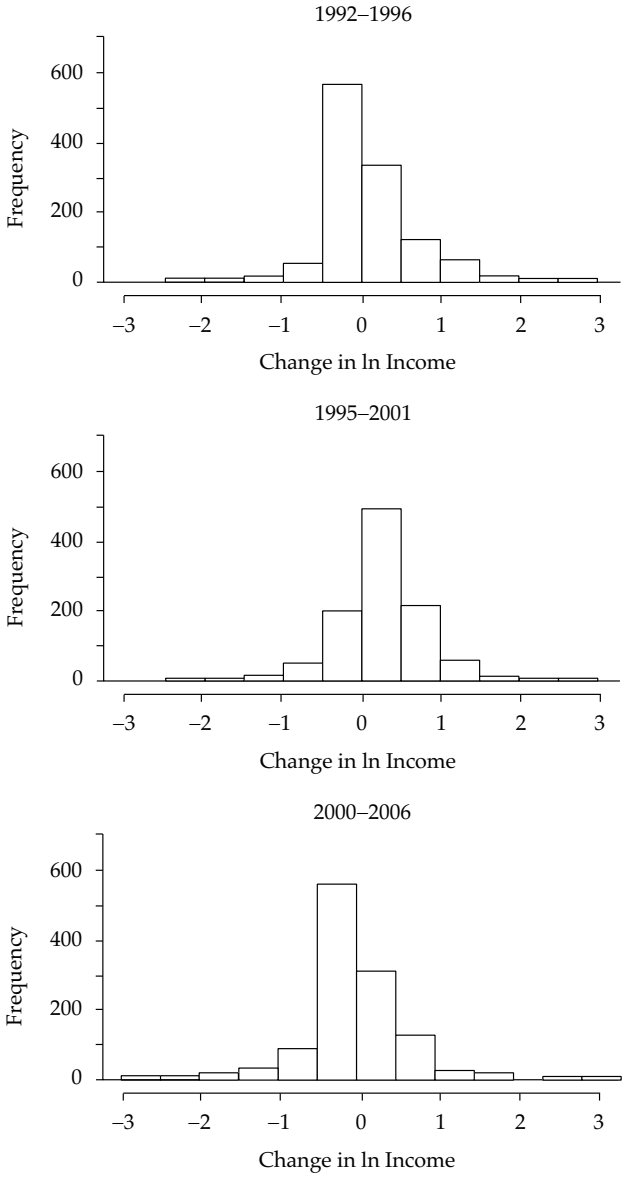
Source: Authors' calculations based on data from Coronary Artery Risk Development in Young Adults Study (1992–2006).

Figure 5.3 Income Change Between Exams, Women



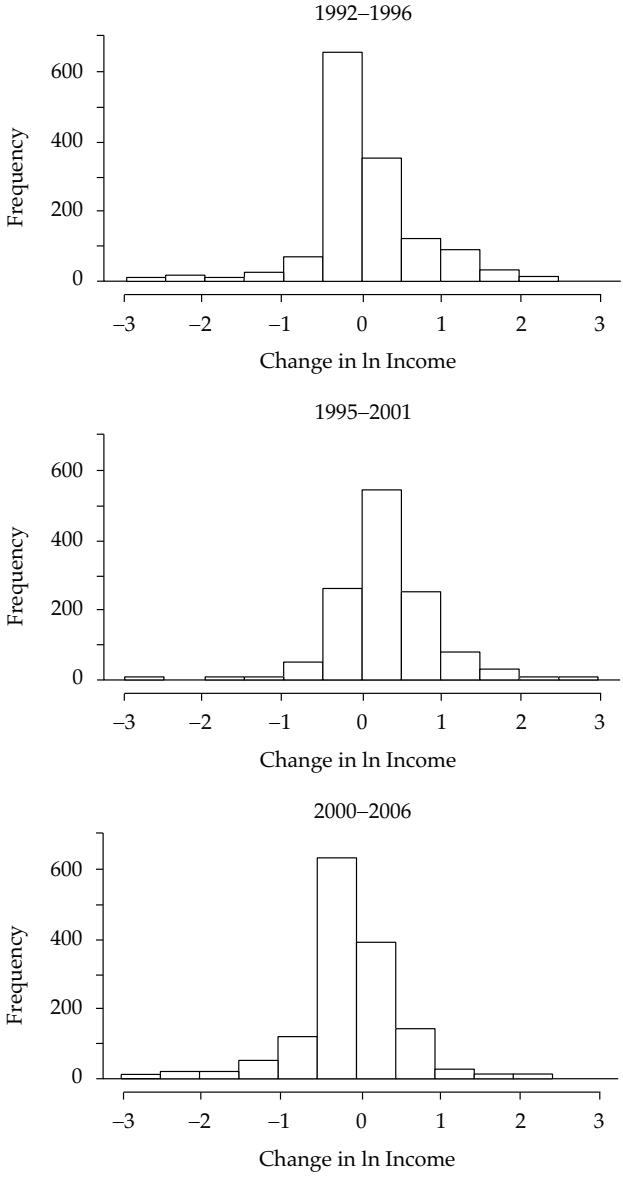
Source: Authors' calculations based on data from Coronary Artery Risk Development in Young Adults Study (1992–2006).

Figure 5.4 Income Change Between Exams, Men Without Marital Change



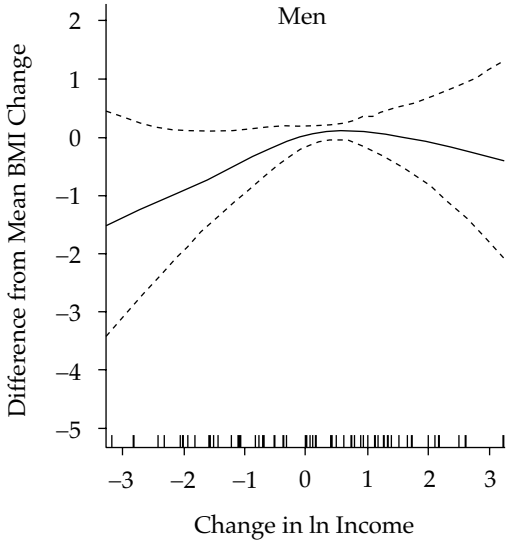
Source: Authors' calculations based on data from Coronary Artery Risk Development in Young Adults Study (1992–2006).

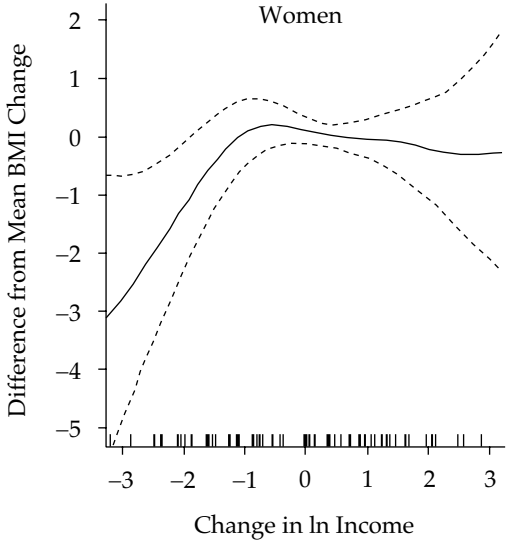
Figure 5.5 Income Change Between Exams, Women Without Marital Change



Source: Authors' calculations based on data from Coronary Artery Risk Development in Young Adults Study (1992–2006).

Figure 5.6 First Difference Nonlinear Models, 1992 to 2006





Source: Authors' calculations based on data from Coronary Artery Risk Development in Young Adults Study (1992–2006).
Note: BMI = body mass index.

Table 5.1 Characteristics of CARDIA Participants

	Full Population		Analysis Sample			
	1992–1993		1992–1993		2005–2006	
	Men	Women	Men	Women	Men	Women
N	1,837	2,249	1,082	1,247	1,082	1,247
Age in years: mean	32	32	32	32	43	43
	(3.6)	(3.6)	(3.5)	(3.6)	(3.5)	(3.6)
Married (%)	58	57	62	59	63	54
	(0.49)	(0.49)	(0.48)	(0.49)	(0.48)	(0.50)
Divorced (%)	7.7	12	5.7	10	9.6	16
	(0.27)	(0.32)	(0.23)	(0.30)	(0.29)	(0.36)
Education in years: mean	15	15	15	15	15	15
	(2.6)	(2.4)	(2.5)	(2.3)	(2.6)	(2.4)
Parent education in years:	14	14	14	14	14	14
mean	(3.0)	(3.1)	(3.1)	(3.2)	(3.1)	(3.2)
Log income (in thousands):	3.7	3.6	3.8	3.7	4.2	3.9
mean	(0.89)	(0.89)	(0.80)	(0.83)	(0.88)	(0.94)
Poverty (less than 100%) (%)	11	14	7.5	11	5.4	8.4
	(0.31)	(0.35)	(0.26)	(0.31)	(0.23)	(0.28)
Poverty (less than 200%) (%)	24	28	18	25	11	19
	(0.43)	(0.45)	(0.39)	(0.43)	(0.32)	(0.39)
Household size: mean	2.9	3.1	2.8	3.0	3.0	2.9
	(1.5)	(1.5)	(1.4)	(1.4)	(1.5)	(1.3)
BMI: mean	26	27	26	26	29	30
	(4.8)	(7.1)	(4.4)	(6.7)	(5.2)	(7.9)
Obese (higher than 30 BMI)	18	27	17	24	32	41
(%)	(39)	(0.45)	(0.38)	(0.43)	(0.47)	(0.49)
Severely obese (higher than	5.2	13	4.1	11	12	24
35 BMI) (%)	(22)	(0.34)	(0.20)	(0.31)	(0.32)	(0.43)
Metabolic syndrome (%)	8.4	4.0	7.4	3.4	21	11
	(28)	(0.20)	(0.26)	(0.18)	(0.41)	(0.31)
Metabolic syndrome score:	0.000	–0.010	–0.034	–0.059	0.39	0.35
mean	(0.62)	(0.62)	(0.57)	(0.55)	(0.68)	(0.75)

Source: Authors' calculations based on data from Coronary Artery Risk Development in Young Adults Study (1992–2006).

Note: Full population is all CARDIA participants examined in 1992 and 1993. Analysis sample is all CARDIA participants with complete data for all analyses from 1992 to 2006. Standard deviations of means and percentages are shown in the parentheses. BMI = body mass index.

Table 5.2 Socioeconomic Indicators, 1992 to 1993

	Men		Women	
	BMI	Metabolic Syndrome	BMI	Metabolic Syndrome
Model 1a				
Log income	0.29	0.0021	–0.82***	–0.10***
	(0.20)	(0.028)	(0.30)	(0.024)
Model 1b				
Education	–0.048	–0.021***	–0.29***	–0.044***
	(0.057)	(0.0078)	(0.091)	(0.0072)
Model 1c				
Parent education	–0.054	–0.014**	–0.12*	–0.019***
	(0.045)	(0.0059)	(0.065)	(0.0052)
Model 1d				
Log income	0.37*	0.026	–0.63**	–0.071***
	(0.22)	(0.027)	(0.30)	(0.024)
Education	–0.081	–0.023***	–0.23**	–0.038***
	(0.060)	(0.0080)	(0.092)	(0.0073)
Model 1e				
Log income	0.37*	0.027	–0.63**	–0.071***
	(0.22)	(0.028)	(0.30)	(0.024)
Education	–0.060	–0.019**	–0.21**	–0.034***
	(0.063)	(0.0082)	(0.098)	(0.0079)
Parent education	–0.048	–0.010*	–0.05	–0.0085
	(0.047)	(0.0060)	(0.068)	(0.0056)

Source: Authors' calculations based on data from Coronary Artery Risk Development in Young Adults Study (1992–1993).

Note: Each cell presents the results of one of five separate regression models for each outcome and each gender; overall, the main effects of twenty separate regression models are presented. Models also include age, age-squared, married, divorced, household size, site, and race. Standard errors are shown in parentheses and are robust standard errors. BMI = body mass index.

*$p < .10$, **$p < .05$, ***$p < .01$

Table 5.3 Log Income, 1992 to 2006

	Men		Women	
	BMI	Metabolic Syndrome	BMI	Metabolic Syndrome
No lag				
Fixed-effect	0.33**	–0.010	–0.018	–0.0093
	(0.14)	(0.025)	(0.015)	(0.018)
Long-difference	0.51***	0.039	0.038	–0.023
2005 to 1992	(0.19)	(0.039)	(0.264)	(0.032)
One wave income lag[a]				
Fixed-effect	0.12	0.037	–0.13	0.018
	(0.17)	(0.031)	(0.16)	(0.022)
One wave BMI/metabolic syndrome lag[b]				
Fixed-effect	0.17	0.027	0.22*	–0.0039
	(0.14)	(0.031)	(0.13)	(0.028)

Source: Authors' calculations based on data from Coronary Artery Risk Development in Young Adults Study (1992–2006).

Notes: Fixed-effect models include indicator variables for year; long-difference models include age, age-squared, married (in each year), divorced (in each year), household size (in each year), site, and race. BMI = body mass index.

[a] One wave income lag is for the fixed-effect model examining the association between the prior measure of log income (for example, 1992–1993 income and 1995–1996 BMI or metabolic syndrome).

[b] One wave BMI–metabolic syndrome lag is for the fixed-effect model examining the association between the prior measure of BMI–metabolic syndrome (for example, 1992–1993 BMI–metabolic syndrome and 1995–1996 log income).

Standard errors are shown in parentheses and are robust standard errors.

*$p < .10$, **$p < .05$, ***$p < .01$

Table 5.4 Random-Effect, Fixed-Effect, and Long-Difference Models

	Men				
	BMI			Metabolic Syndrome	
	CARDIA	NLSY		CARDIA	NHANES
	Family	Family	Individual	Family	Family
Cross-sectional models					
Model 1a					
Log income	0.29	0.17	–0.16	0.026	0.021
	(0.19)	(0.10)	(0.14)	(0.027)	(0.094)
Model 1d					
Log income	0.37*	–0.055	–0.056	0.054*	0.021
	(0.22)	(0.14)	(0.15)	(0.029)	(0.094)
Longitudinal models					
Fixed-effect	0.33**	0.061	0.072	NA	
	(0.14)	(0.054)	(0.058)		
Long-difference	0.51***	0.11	0.16	NA	
2005–1992	(0.19)	(0.079)	(0.11)		

Source: Authors' calculations based on data from Coronary Artery Risk Development in Young Adults Study (CARDIA; 1992–2006), National Health and Nutrition Examination Survey (NHANES; 2005–2006), and National Longitudinal Survey of Youth (NLSY; 1992–2006).

Note: Cross-sectional models from CARDIA data for BMI are repeated from table 5.2 and longitudinal models using CARDIA 1992–2006 are repeated from table 5.3 for ease of comparison. BMI = body

Women				
BMI			Metabolic Syndrome	
CARDIA	NLSY		CARDIA	NHANES
Family	Family	Individual	Family	Family
–0.82***	–0.71***	–0.32**	–0.11***	–0.18
(0.30)	(0.15)	(0.14)	(0.023)	(0.13)
–0.63**	–0.50***	–0.17	–0.066***	–0.18
(0.30)	(0.16)	(0.15)	(0.023)	(0.12)
–0.018	0.059	0.11*	NA	
(0.015)	(0.070)	(0.067)		
0.038	0.062	0.13	NA	
(0.264)	(0.093)	(0.090)		

mass index. NA indicates not applicable: comparison not possible due to cross-sectional nature of the NHANES data.

Data for the BMI comparison are between 1992 and 1993, data for the metabolic syndrome comparison are 2005 and 2006.

*$p < .10$, **$p < .05$, ***$p < .01$

Table 5.5 Models Run with Alternative Categorizations of Outcome Variables, Odds Ratios

	Men			Women		
	Obese (Class I)	Severely Obese (Class II)	Metabolic Syndrome (Clinical)	Obese (Class I)	Severely Obese (Class II)	Metabolic Syndrome (Clinical)
Cross-sectional models						
Model 1a						
Log income	1.0	1.0	0.73**	0.79**	0.77**	0.54***
	(0.14)	(0.22)	(0.092)	(0.076)	(0.091)	(0.063)
Model 1e						
Log income	1.1	1.2	0.78	0.87	0.79*	0.64***
	(0.15)	(0.28)	(0.12)	(0.089)	(0.10)	(0.088)
Longitudinal models						
Fixed-effect	3.2***	8.8**	1.3	1.6*	0.89	1.0
	(1.2)	(8.2)	(0.38)	(0.41)	(0.27)	(0.26)
Long-difference	1.1	1.1	1.14	1.0	0.93	0.74**
2005 to 1992	(0.16)	(0.21)	(0.17)	(0.13)	(0.15)	(0.11)

Source: Authors' calculations based on data from Coronary Artery Risk Development in Young Adults Study (1992–2006).

Note: The clinical definition of metabolic syndrome is being beyond three or more of the following thresholds among five clinical components (men, ≥102 cm waist, women, ≥88 cm waist; trigylcerides ≥150 mg/dL; men, <40 mg/dL HDL cholesterol, women, <50 mg/dL HDL cholesterol; blood pressure ≥130 systolic or ≥85 diastolic; fasting glucose ≥100 mg/dL).

Categories of BMI used are both obese (obese class I) and above (BMI ≥30 kg/m^2) and severely obese (obese class II) and above (BMI ≥35 kg/m^2). HDL = high-density lipoprotein; BMI = body mass index.

*$p < .10$, **$p < .05$, ***$p < .01$

Table 5.6 Models Run with Alternative Categorizations of Income Exposure Variables

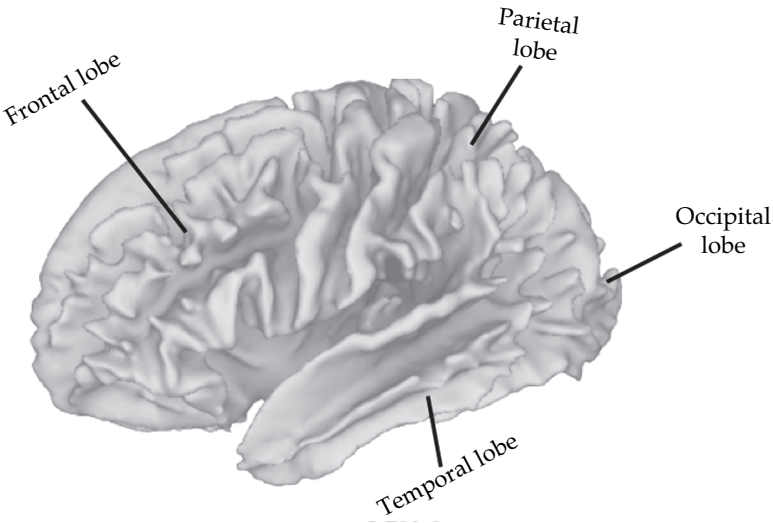
	Men		Women	
	BMI	Metabolic Syndrome	BMI	Metabolic Syndrome
Less than 100 percent poverty cross-sectional models				
Model 1a				
Poverty (<100%)	–1.03**	–0.099*	1.07*	0.19***
	(0.48)	(0.057)	(0.56)	(0.049)
Model 1e				
Poverty (<100%)	–1.04**	–0.095	0.59	0.13**
	(0.49)	(0.060)	(0.61)	(0.053)
Less than 100 percent poverty longitudinal models				
Fixed-effect	–0.057	0.062	0.065	–0.0083
	(0.31)	(0.068)	(0.29)	(0.036)
Long-difference 2005 to 1992	–0.21	0.042	0.28	0.0081
	(0.50)	(0.12)	(0.52)	(0.062)
Less than 100 percent poverty cross-sectional models				
Model 1a				
Poverty (<200%)	0.10	0.019	1.37***	0.18***
	(0.34)	(0.043)	(0.42)	(0.040)
Model 1e				
Poverty (<200%)	0.093	0.019	1.13**	0.12***
	(0.35)	(0.044)	(0.45)	(0.040)
Less than 200 percent poverty longitudinal models				
Fixed-effect	–0.25	0.029	–0.12	–0.0040
	(0.20)	(0.039)	(0.17)	(0.026)
Long-difference 2005 to 1992	0.029	–0.061	–0.081	0.023
	(0.39)	(0.073)	(0.33)	(0.040)

Source: Authors' calculations based on data from Coronary Arterty Risk Development in Young Adults Study (1992–2006).

*$p < .10$, **$p < .05$, ***$p < .001$

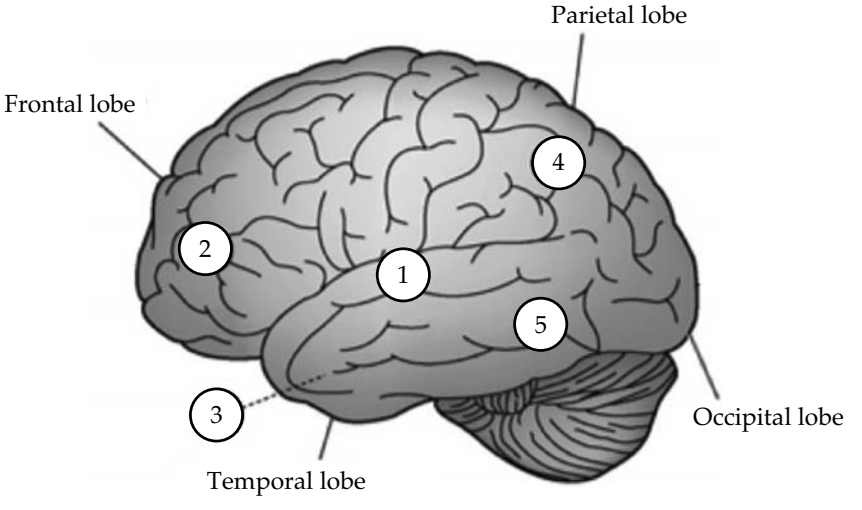
Note: BMI = body mass index.

Figure 6.1 Four Basic Lobes of the Brain



Source: Author-generated image based on data from NIH MRI Study of Normal Brain Development (National Institutes of Health 2012).

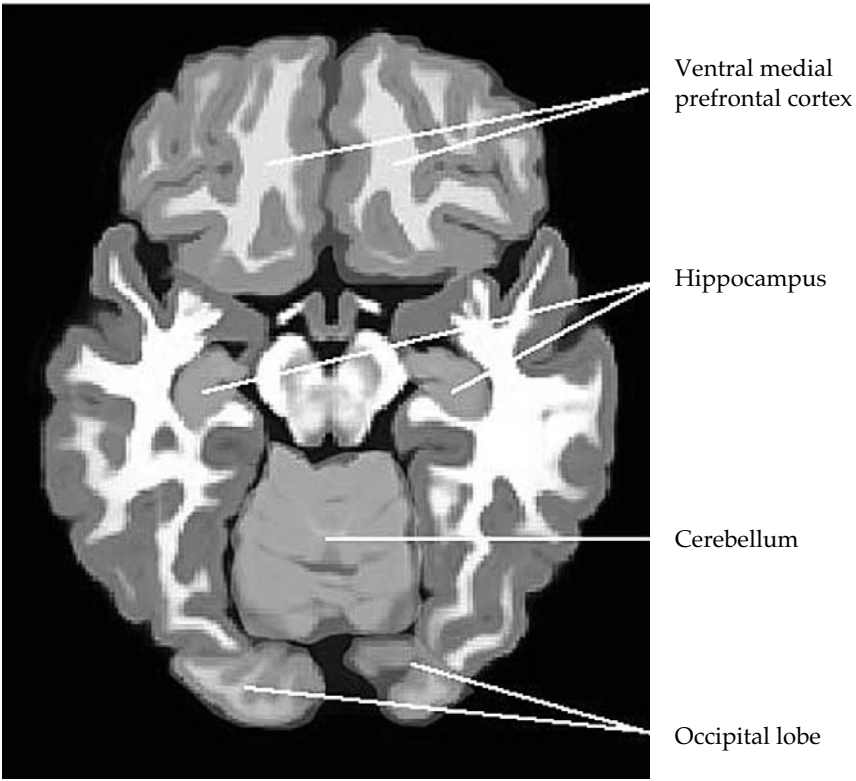
Figure 6.2 Five Neurocognitive Systems of Interest



1. Left perisylvian/language
2. Prefrontal/executive
3. Medial temporal/memory
4. Parietal/spatial cognition
5. Occipitotemporal/visual cognition

Source: Hackman and Farah (2009), with permission from Elsevier.

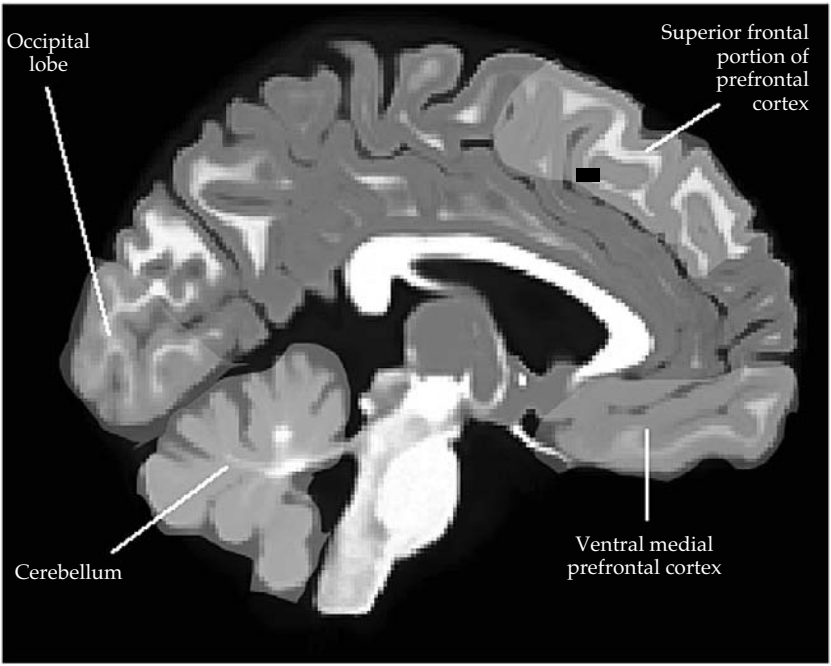
Figure 7.1 Axial Brain Slice



Source: Authors' figure.

Note: Brain structure is depicted in this axial brain slice (going from the bottom of the neck to the top of the head) with the hippocampus, the cerebellum, the ventral medial prefrontal cortex, and the occipital lobe.

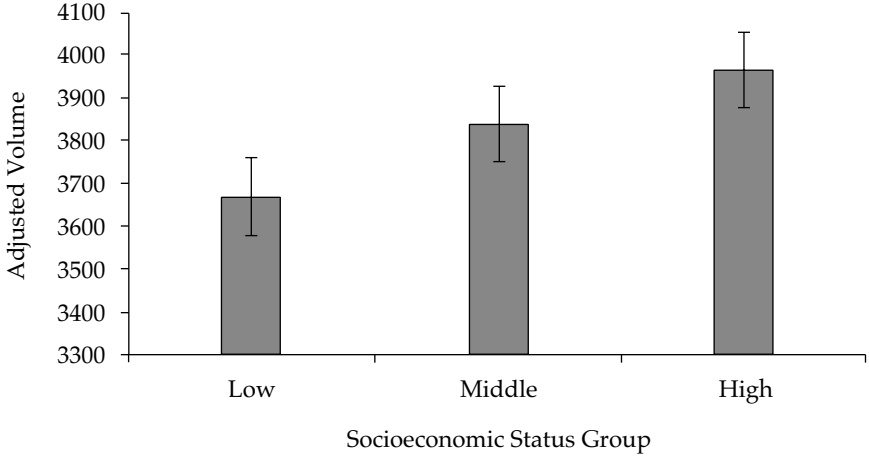
Figure 7.2 Sagittal Brain Slice



Source: Authors' figure.

Note: Sagittal brain slice (going from ear to ear) with the superior frontal portion of the prefrontal cortex, the ventral medial prefrontal cortex, the cerebellum, and the occipital lobe.

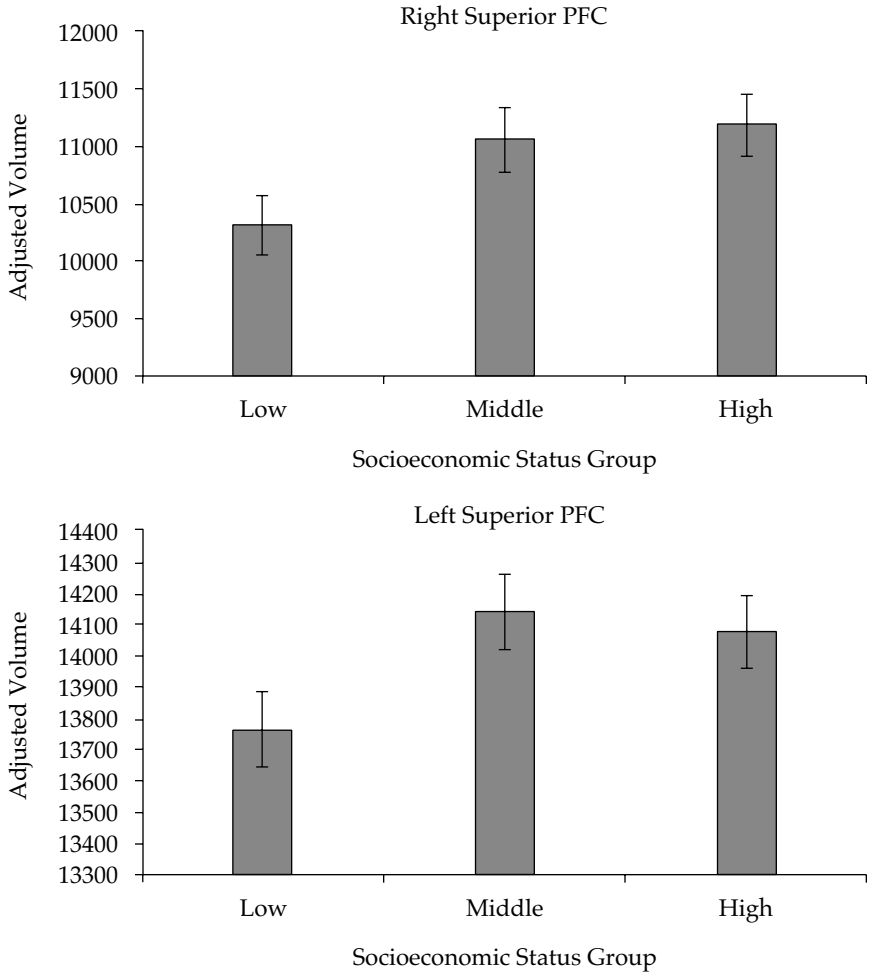
Figure 7.3 Association Between Hippocampal Volume and Family Income



Source: Authors' compilation based on NIH MRI Study of Normal Brain Development (National Institutes of Health 2012).

Note: Values adjusted for demographic variables. Unit of measure is number of gray matter voxels, a measure of regional volume commonly used in structural neuroimaging analyses. Error bars show the standard error for each group.

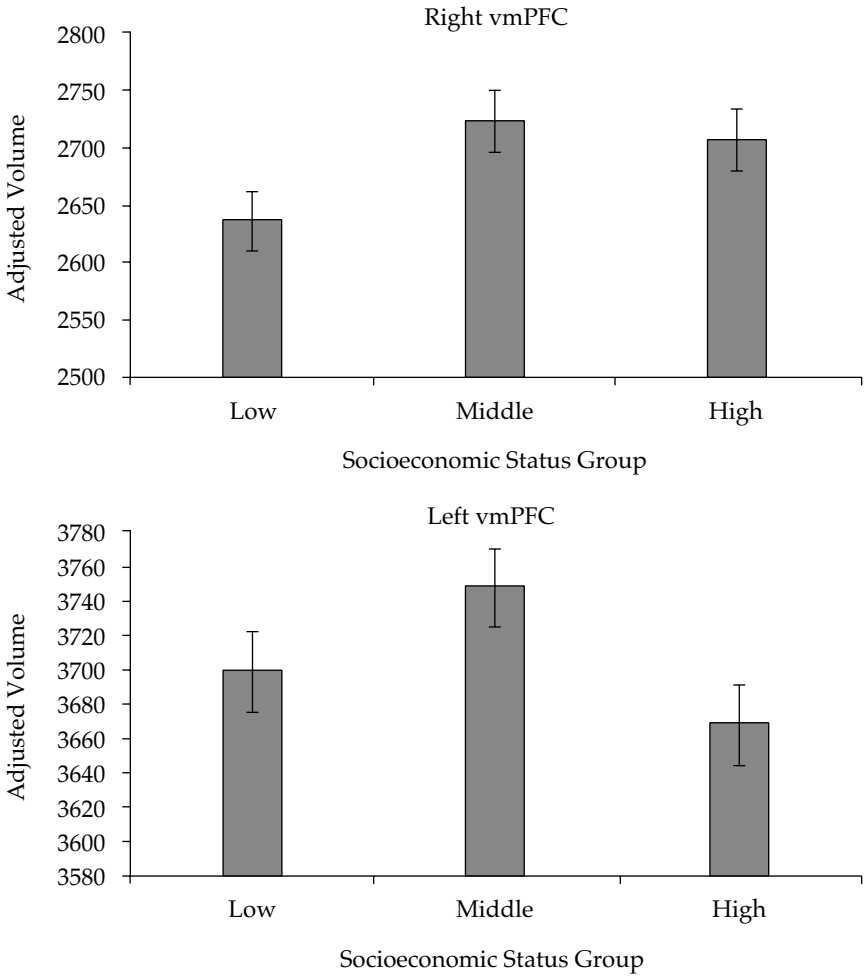
Figure 7.4 Association Between Superior Prefrontal Cortex Volume and Family Income



Source: Authors' compilation based on NIH MRI Study of Normal Brain Development (National Institutes of Health 2012).

Note: Values adjusted for demographic variables. Unit of measure is number of gray matter voxels, a measure of regional volume commonly used in structural neuroimaging analyses. Error bars show the standard error for each group. PFC = prefrontal cortex.

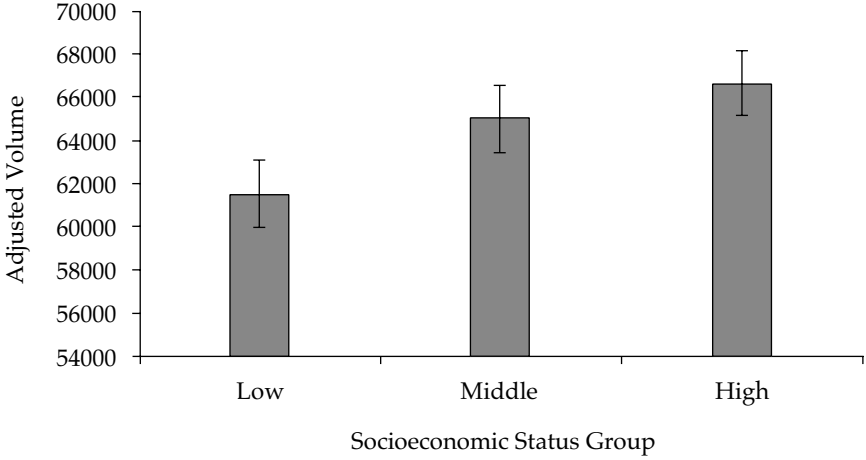
Figure 7.5 Association Between Ventral Medial Prefrontal Volume and Family Income



Source: Authors' compilation based on NIH MRI Study of Normal Brain Development (National Institutes of Health 2012).

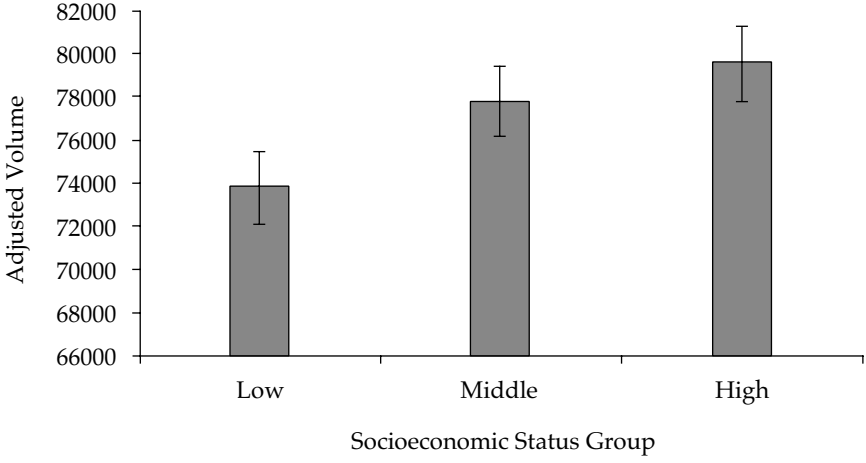
Note: Values adjusted for demographic variables. Unit of measure is number of gray matter voxels, a measure of regional volume commonly used in structural neuroimaging analyses. Error bars show the standard error for each group. vmPFC = ventral medial prefrontal cortex.

Figure 7.6 Association Between Cerebellar Gray Matter Volume and Family Income



Source: Authors' compilation based on NIH MRI Study of Normal Brain Development (National Institutes of Health 2012).
Note: Values adjusted for demographic variables. Unit of measure is number of gray matter voxels, a measure of regional volume commonly used in structural neuroimaging analyses. Error bars show the standard error for each group.

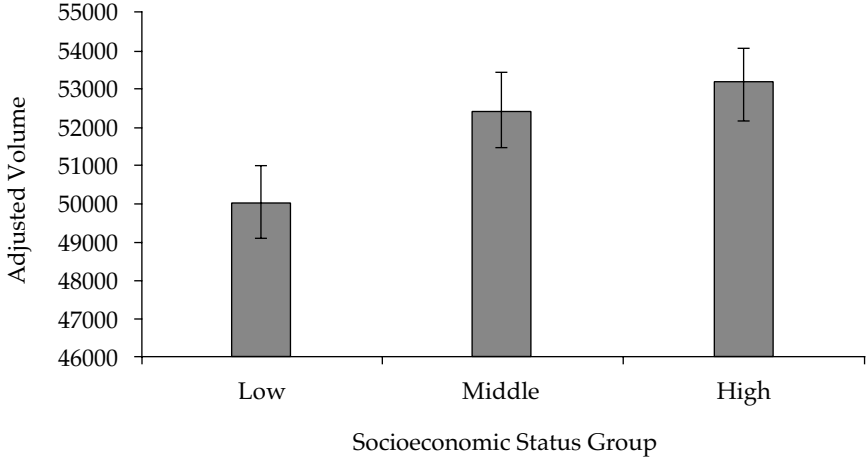
Figure 7.7 Association Between Total Cerebellar Volume and Family Income



Source: Authors' compilation based on NIH MRI Study of Normal Brain Development (National Institutes of Health 2012).

Note: Values adjusted for demographic variables. Unit of measure is number of gray matter voxels, a measure of regional volume commonly used in structural neuroimaging analyses. Error bars show the standard error for each group.

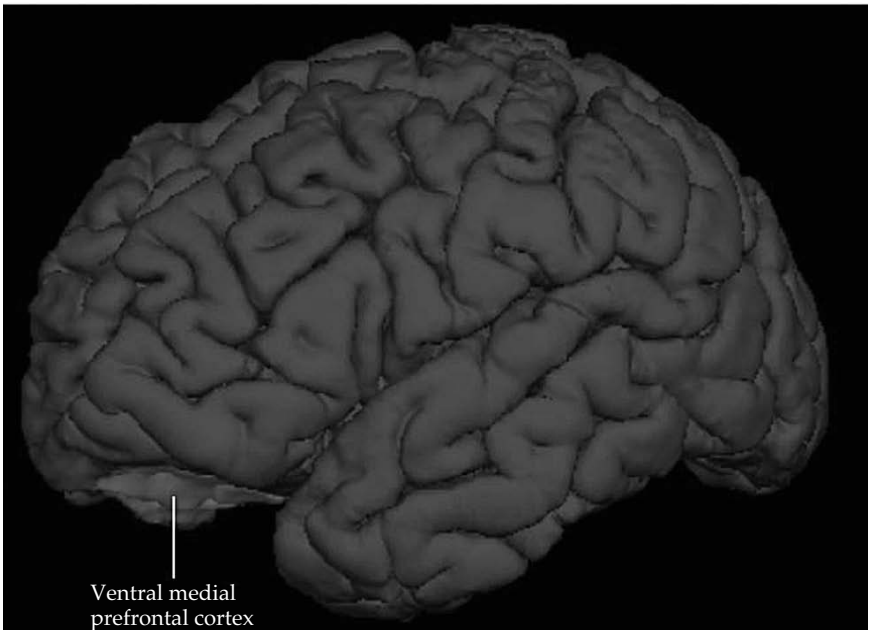
Figure 7.8 Association Between Occipital Gray Matter Volume and Family Income



Source: Authors' compilation based on NIH MRI Study of Normal Brain Development (National Institutes of Health 2012).

Note: Values adjusted for demographic variables. Unit of measure is number of gray matter voxels, a measure of regional volume commonly used in structural neuroimaging analyses. Error bars show the standard error for each group.

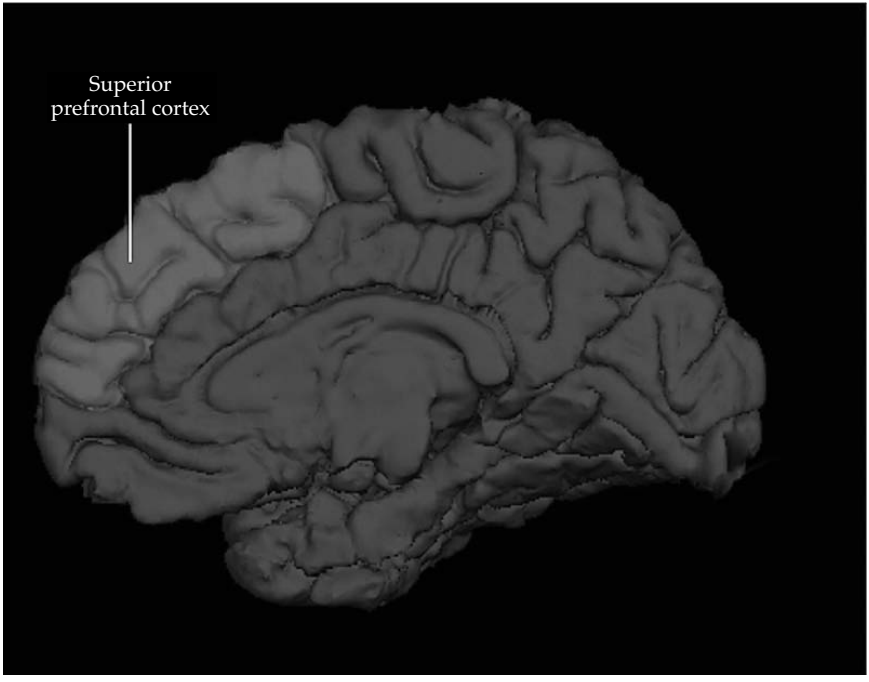
Figure 7.9 Ventral Medial Prefrontal Cortex



Source: Authors' figure.

Note: Ventral medial prefrontal cortex is central to cognitive control and regulation of emotions. Sensitivity analyses revealed differences in this part of the brain among children in low-, middle-, and high-income families. Analyses were conducted in Freesurfer, and all group differences were significant at $p < .05$.

Figure 7.10 Superior Prefrontal Cortex



Source: Authors' figure.

Note: The superior prefrontal cortex is crucial in attentional, working memory, and cognitive control processes. Sensitivity analyses revealed differences in this part of the brain among children in low-, middle-, and high-income families. These analyses were conducted in Freesurfer, and all group differences were significant at $p < .05$.

Table 7.1 Demographic Summary

Age (average age in months for wave 1)	126.13 ± 46.59 months	
Gender (male)	207	
Total N	431	
Education	**Father**	**Mother**
Less than high school	10	4
High school	86	55
Some college	116	131
College	115	144
Some graduate level	19	22
Graduate level	83	73
Income at wave 1		
Less than $5,000	1	
5,001–10,000	2	
10,001–15,000	4	
15,001–25,000	10	
25,001–35,000	21	
35,001–50,000	82	
50,001–75,000	104	
75,001–100,000	102	
More than 100,001	94	
Race	**Father**	**Mother**
African American	41	40
American Indian/Alaskan Native	2	1
Multiracial	5	3
Asian	9	8
Native Hawaiian/Other Pacific Islander	2	0
Not provided	33	27
White	337	347
Ethnicity	**Father**	**Mother**
Hispanic or Latino	39	30
Not Hispanic or Latino	390	399

Source: Authors'compilation based on NIH MRI Study of Normal Brain Development (National Institutes of Health 2012).

Note: Based on wave 1 data.

Table 7.2 Attrition by Income

Income	Wave 2 (Change from wave 1)
Less than $5000	+1
5,001–10,000	0
10,001–15,000	–3
15,001–25,000	+1
25,001–35,000	–1
35,001–50,000	–33
50,001–75,000	–22
75,001–100,000	–14
More than 100,001	–22

Source: Authors' compilation based on NIH MRI Study of Normal Brain Development (National Institutes of Health 2012).

Note: Negative numbers reflect loss of total number of participants in income bracket; positive numbers indicate gain of total number of participants in income bracket. Increase in total number did occur in sample because participants may have changed income bracket, and so on. Large overall attrition (in terms of absolute change) was seen in the higher-SES groups; however, the attrition in the lower-SES portions of the sample was of a much greater percentage (as in wave 1, the range of individuals from low-SES backgrounds ranged from one to twenty-one depending on the income bracket). SES = socioeconomic status.

Table 7.3 Summary Statistics for Brain Regions of Interest

Region	Mean (±Standard Deviation)
Whole brain volume	1431.94 (±146.26) mm^3
Superior prefrontal cortex*	22.31 (±3.42) mm^3
Ventral medial prefrontal cortex*	77.27 (±9.72) mm^3
Hippocampus*	7.94 (±0.788) mm^3
Cerebellum*	109.35 (±10.46) mm^3
Occipital lobe*	82.072 (±10.69) mm^3

Source: Authors' compilation based on NIH MRI Study of Normal Brain Development (National Institutes of Health 2012).

*Statistics for brain regions of interest are expressed in number of gray matter voxels (a measure of regional volume commonly used in structural neuroimaging analyses).

Table 7.4 Model Estimates for Association Between SES Measures and Brain Regions of Interest

	Right Ventral Medial PFC		Left Ventral Medial PFC		Left Superior PFC		Right Superior PFC	
HS education or less	5.16	(177.6)	–82.25	(195.6)	–235.3	(417.1)	–264.7	(418.7)
Some college	–18.79	(142.4)	–45.10	(157.5)	–75.17	(328.3)	–121.5	(331.4)
College	105.3	(136.2)	–87.74	(151.0)	–134.3	(310.3)	76.22	(314.4)
Low SES	–69.72	(237.1)	29.91	(260.0)	–310.7	(581.1)	–868	(573.0)
Middle SES	16.92	(123.8)	78.48	(135.5)	70.59	(305.8)	–140.4	(300.9)
Income (continuous)	57.67	(109.0)	18.71	(119.6)	254	(267.9)	523.6**	(263.7)**
	Occipital Lobe		Cerebellar Gray Matter		Cerebellum Total Volume		Hippocampus Total Volume	
HS education or less	479.0	(931.4)	–1668.6	(1002.7)	–2415.1	(1166.9)	–125.3	(82.21)
Some college	–17.67	(717.1)	–682.2	(748.8)*	–874.2	(869.7)**	–95.12	(62.79)
College	713.9	(667.9)	–187.1	(681.0)	–434.2	(789.8)	–9.969	(58.14)
Low SES	–3090.3	(1367.0)**	–5101.3	(1652.9)**	–5731.8	(1945.2)**	–297.7	(124.5)**
Middle SES	–712.9	(723.0)	–1601.1	(879.2)*	–1716.6	(1034.9)*	–127.2	(65.96)*
Income (continuous)	1878.6**	(629.5)**	3183.6	(758.4)**	3608.8	(892.6)**	180.9	(57.40)**

Source: Authors' compilation based on NIH MRI Study of Normal Brain Development (National Institutes of Health 2012).

Note: Beta and standard errors (in parentheses) shown for each brain region of interest. Estimate for education (for example, HS education or less, some college, college) are differences compared to graduate school. Estimate for SES group compare to high-SES group. Estimates from random-effects model with conventional standard. SES = socioeconomic status; PFC = prefrontal cortex; HS = high school.

*$p < .10$; **$p < .05$