Estimation of Health Benefits From a Local Living Wage Ordinance

Rajiv Bhatia, MD, MPH, and Mitchell Katz, MD

Objectives. This study estimated the magnitude of health improvements resulting from a proposed living wage ordinance in San Francisco.

Methods. Published observational models of the relationship of income to health were applied to predict improvements in health outcomes associated with proposed wage increases in San Francisco.

Results. With adoption of a living wage of $11.00 per hour, we predict decreases in premature death from all causes for adults aged 24 to 44 years working full-time in families whose current annual income is $20 000 (for men, relative hazard [RH] = 0.94, 95% confidence interval [CI] = 0.92, 0.97; for women, RH = 0.96, 95% CI = 0.95, 0.98). Improvements in subjectively rated health and reductions in the number of days sick in bed, in limitations of work and activities of daily living, and in depressive symptoms were also predicted, as were increases in daily alcohol consumption. For the offspring of full-time workers currently earning $20 000, a living wage predicts an increase of 0.25 years (95% CI = 0.20, 0.30) of completed education, increased odds of completing high school (odds ratio = 1.34, 95% CI = 1.20, 1.49), and a reduced risk of early childbirth (RH = 0.78, 95% CI = 0.69, 0.86).

Conclusions. A living wage in San Francisco is associated with substantial health improvement. (*Am J Public Health.* 2001;91:1398–1402)

The inverse relationship between socioeconomic status (SES) and health, which has been extensively documented,[1–6] may be mediated by material, behavioral, psychosocial, or physiologic pathways.[2,7–9] Income is a widely used dimension of SES that at lower levels predicts poor health and premature death, whether measured at the individual or at the aggregate level.[10–13] Increasing the federal minimum wage is one means of limiting income poverty in the United States. Indeed, many municipalities in the United States have increased the minimum wage for certain sectors of the local labor force by establishing local "living wage" laws. In contrast to the national minimum wage, a living wage generates an income sufficient to meet subsistence needs such as food, shelter, clothing, transportation, and child care.[14,15]

San Francisco's legislative board recently considered adopting a living wage of $11 per hour for workers of the city's contractors and property leaseholders. We estimated the magnitude of the anticipated health improvement associated with this legislation.

METHODS

Data

In 1999, the city and county of San Francisco commissioned an economic analysis by San Francisco State University to examine the implications of a proposal to require that all workers of city contractors and property leaseholders receive a minimum hourly wage of $11.00. The analysis relied on 2 principal sources of information: (1) surveys mailed to city contractors and property leaseholders and (2) administrative data on contractor budgets provided by city departments.[16] The response rate to the 2 parts of the mailed survey was low (approximately 24% and 26%, respectively), and the administrative data from city departments was often of limited quality and completeness. The analysis assessed the number of part-time and full-time workers in designated wage ranges and their benefits and provided estimates of the aggregate income gains for these workers that the proposed minimum hourly wage of $11 would bring about. The average income benefit was calculated by dividing the aggregate gain by the number of affected workers separately for full-time and part-time workers in each of 4 sectors: city contractors, airport leaseholders, port leaseholders, and other leaseholders. Confidence intervals for the number of workers affected and the average wage gain were not provided.

Because the San Francisco State University analysis did not directly assess the social or economic characteristics of the affected workers, we used 3 years of Bureau of Labor Statistics data for the San Francisco Bay area (1997–1999 Annual March Current Population Survey) to characterize workers aged 18 to 64 years who earned $5.75 to $11 per hour and currently worked in occupational and industry categories likely to be affected by the city ordinance. We adjusted income data to current dollars by using the urban consumer price index. Estimated proportions were pooled across the 3 survey years, and standard errors were calculated by methods supplied by the Bureau of Labor Statistics.

Estimates were based on peer-reviewed published studies of income's effect on health. Health outcomes of interest were premature mortality, preventable hospitalizations, and emergency room visits. We identified relevant literature on health outcomes by using Melvyn Medline (available at: http://www.library.ucsf.edu/db/medline/medframe) and by searching for English language articles that matched the subject-heading search terms "income" and "United States" (and "mortality," "hospitalization," or "health status indicators") and that were published between 1990 and 1998. A priori, we developed the following 6 criteria for study inclusion: (1) subjects representative of the US general population; (2) income measured at the individual, family, or household level; (3) longitudinal design; (4) statistical adjustment for age and sex; (5) year of income ascertainment provided; and (6) income applied as a continuous variable. When several analytic models were used in a single study, we selected those models that assessed nonlinear effects of income and adjusted for other correlates of social position, such as education.

We identified 8 general-population studies of income's effects on all-cause mortality. All of these studies observed an inverse associa-

tion between income and premature mortality. Four of the prospective national studies categorized income.[17–20] Two analyses were cross-sectional,[21,22] and one used a ratio of income to the poverty level as the independent variable and limited the analyses to Whites and African Americans.[23] Only one study of income and mortality, a reanalysis of the Current Population Survey data, met all 6 of our criteria.[24] The investigators stratified the analysis by 3 age categories and by sex and additionally adjusted for age, household size, education, and marital status. The model that used a logarithmic transformation of income resulted in the best fit to the risk of mortality. One nationally representative study of income and hospital utilization was identified; however, income was assessed at the zip code level, and this predictor was not available in our analysis.

We identified 4 studies of the relationship between individual income and health status indicators in representative US populations.[13,25–27] All 4 studies were cross-sectional; however, one study, by Ettner,[27] used a 2-stage instrumental variable approach that allowed assessment of temporal relationships, so we included it in our analysis. The Ettner study assessed several health status indicators by using 3 data sets: the 1987 National Survey of Families and Households, the 1986–1987 panels of the Survey of Income and Program Participation, and the 1988 National Health Interview Survey. Outcomes were modeled as a function of log-transformed income, and the analyses were adjusted for sex, household size, marital status, race/ethnicity, age, education, and metropolitan area of residence. The analysis demonstrated a statistically significant exogenous relationship between income and 3 continuous health outcomes—the Center for Epidemiologic Studies scale of depressive symptoms, the number of days sick in bed in the past 4 months, and average daily alcohol consumption—as well as 3 discrete outcomes—self-rated health, work limitations, and limitations in activities of daily living.

We were also interested in the relationship between income and childhood development because of the importance of child development to lifelong social position and because of its potential intervening role in the relationship of income to health. We estimated the effect of increased wages on educational attainment and on early childbearing out of marriage by using an analysis from the Panel Study of Income Dynamics.[28] We selected this study because it illustrated the contribution of family income to childhood educational achievement and met all of our a priori inclusion criteria. For our analysis, we used the coefficients derived from models that used a log transformation of income and that adjusted for race/ethnicity, sex, number of siblings, family structure, and maternal age, schooling, and employment.

TABLE 1—Selected Characteristics of Workers: San Francisco Bay Region[a], California, 1997–1999

Characteristic	All Workers (n = 2667), % (90% CI)	Workers Targeted by Ordinance (n = 377), % (90% CI)
Female	43.3 (41.2, 45.3)	56.2 (50.8, 61.6)
Age, y		
18–23	8.3 (7.2, 9.4)	24.9 (20.2, 29.5)
24–44	58.0 (56.0, 60.0)	50.4 (44.9, 55.8)
45–64	33.7 (31.8, 35.6)	24.8 (20.1, 29.5)
Race/ethnicity		
White	74.7 (72.9, 76.4)	70.5 (65.5, 75.5)
Black	6.0 (5.1, 7.0)	5.9 (3.4, 8.4)
Asian/Pacific Islander	18.4 (16.8, 19.9)	23.0 (18.4, 27.6)
Native American	0.9 (0.6, 1.3)	0.6 (0, 1.3)
Marital status		
Married	56.7 (54.7, 58.7)	43.2 (37.8, 48.5)
Widowed, divorced, or separated	27.4 (25.8, 29.0)	9.9 (6.7, 13.1)
Unmarried	29.0 (27.2, 30.8)	46.9 (41.5, 52.3)
Family size		
1	26.5 (24.8, 28.3)	25.8 (21.1, 30.5)
2	23.9 (22.2, 25.6)	21.9 (17.4, 26.4)
3–4	38.0 (36.1, 40.0)	38.6 (33.4, 43.9)
>4	11.5 (10.3, 12.8)	13.6 (9.9, 17.3)
Any children <18 y	37.2 (35.2, 39.1)	28.2 (23.3, 33.1)
Any children <6 y	16.7 (15.2, 18.2)	12.7 (9.0, 16.3)
College graduate	41.8 (39.8, 43.7)	16.2 (12.3, 20.2)
Working full-time	86.3 (85.0, 87.7)	72.8 (68.0, 77.6)
Earning >50% of family income	60.4 (58.4, 62.3)	45.0 (39.6, 50.4)
Family annual income <$25 000	9.6 (8.4, 10.8)	32.1 (27.0, 37.1)

Note. CI = confidence interval.
[a]These estimates were derived from Bureau of Labor Statistics Annual March Current Population Survey data for the San Francisco Bay area (1997–1999). "Current workers" indicates currently employed workers aged 18 to 64 years who were working at least 26 weeks per year. "Workers targeted by ordinance" refers to the subset of current workers earning $5.75 to $11 per hour in occupational and industry categories who would probably be affected by adoption of a proposed living wage of $11 per hour for workers of the city's contractors and property leaseholders.

Analytic Approach

Effect measures and their standard errors were abstracted from the selected studies or were obtained from the study authors. The urban consumer price index was used to adjust the expected gain in income due to the proposed wage increase and the current income of earners to the year of income valuation reported in the studies. We estimated expected changes in health outcomes for full-time and part-time workers by applying the current estimated family income and the expected income gain to the study model. Given a specified annual income gain, this approach produced a value for each point on the current income distribution of the target

population of workers. Depending on the study outcome and model used, the benefit of the living wage was expressed as either a difference, a ratio, or a percentage change.

RESULTS

The San Francisco State University economic analysis estimated that 42 118 full-time and part-time earners working in 4 economic sectors would be affected by the proposed $11-per-hour living wage.[16] Estimated annual income gains varied by sector but averaged (in current dollars) $2668 for affected part-time workers and $4822 for full-time workers.

Table 1 describes selected characteristics of currently employed workers in the San Francisco Bay area aged 18 to 64 who worked at least 26 weeks a year as well as characteristics of those whose wages, industries, and occupations were most similar to those affected by the living wage. Of those affected by the living wage, 32.1% (90% confidence interval [CI]=27.0, 37.1) were members of families with annual incomes less than $25 000. Compared with all current workers, workers targeted by the ordinance were more likely to be female, young, less educated, unmarried, without children, and working part-time.

Wage gains predicted mortality risk reductions and improvements in health status for both men and women and for both part-time and full-time workers. The average magnitudes of these benefits for adult workers aged 24 to 44 with a current family income of $20 000 are presented in Table 2.

The estimated reduction in mortality risk (relative hazard) for a full-time worker decreases with increasing current income, from 0.93 (95% CI=0.90, 0.96) for men and 0.95 (95% CI=0.93, 0.97) for women with a family annual income of $15 000 to 0.98 (95% CI=0.977, 0.990) for men and 0.99 (95% CI=0.985, 0.994) for women with a family income of $75 000 (Figure 1).

The number of days sick in bed, depressive symptoms, the risks of limitations in work or activities of daily living, and being in the poorest subjective health would all be expected to be modestly reduced for full-time workers with current family incomes of $20 000; however, daily alcohol consumption would modestly increase (Table 2).

For the children of workers benefiting from a living wage, the chances of completing high school would increase (Figure 2), as would the number of years of completed education. For girls, the risk of childbirth outside of marriage would be expected to fall.

DISCUSSION

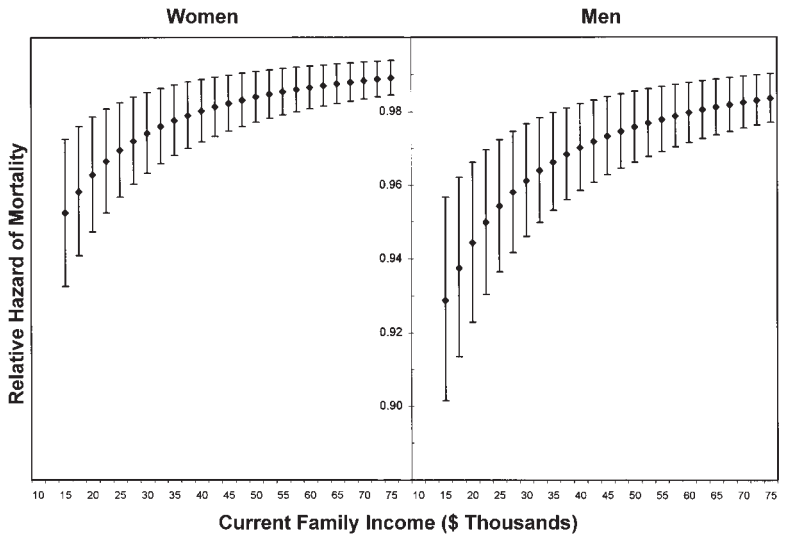
Estimating the magnitude of societal benefits resulting from a living wage is crucial because of the sizable costs of implementing this policy. Policymakers must be able to weigh the relative benefits and costs of a living wage compared with alternative means of achieving similar benefits.

Our analysis demonstrates that a modest gain in income resulting from a living wage would be associated with substantial health benefits. In addition, the educational attainment of workers' children would be improved and the risk of premarital childbirth among offspring would be lower with these modest income gains. Although our analysis predicted

TABLE 2—Estimated Health and Educational Effects on Workers and Their Children Resulting From Adoption of a Living Wage for Families With Incomes of $20 000: San Francisco Bay Region, California, 1997–1999

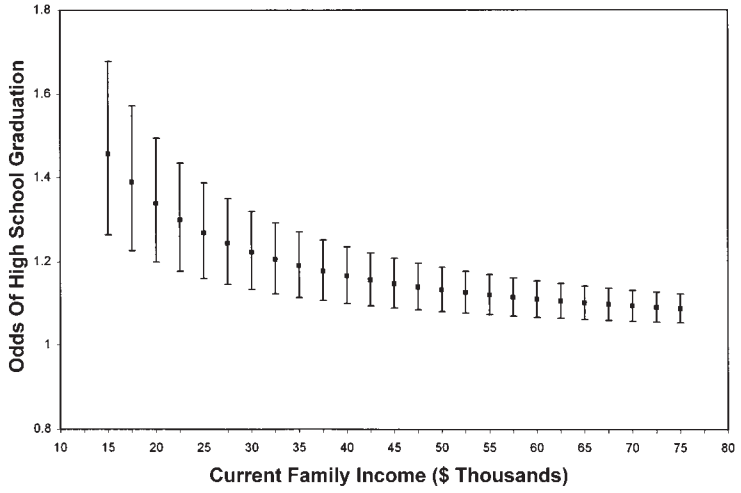
Study/Outcome	Model	Effect Measure	Estimate for Full-Time Workers (95% CI)	Estimate for Part-Time Workers (95% CI)
Backlund et al.[24]				
Mortality—male	Proportional hazards[a]	Hazard ratio	0.94 (0.92, 0.97)	0.97 (0.96, 0.98)
Mortality—female	Proportional hazards	Hazard ratio	0.96 (0.95, 0.98)	0.98 (0.97, 0.99)
Ettner[27]				
Health status	Ordered probit[b]	Relative risk	0.94 (0.93, 0.96)	0.97 (0.96, 0.98)
ADL limitations	Probit	Relative risk	0.96 (0.95, 0.98)	0.98 (0.97, 0.99)
Work limitations	Probit	Relative risk	0.94 (0.92, 0.96)	0.97 (0.95, 0.98)
CES–Depression scale	2-part[c]	Elasticity	−1.9%	−1.1%
No. of sick days	2-part	Elasticity	−5.8%	−3.2%
Alcohol consumption	2-part	Elasticity	+2.4%	+1.3%
Duncan et al.[28]				
Completed schooling	OLS regression	Years of schooling	0.25 (0.20, 0.30)	0.15 (0.12, 0.17)
Completed high school	Logistic regression	Odds ratio	1.34 (1.20, 1.49)	1.18 (1.11, 1.26)
Nonmarital childbirth	Proportional hazards	Hazard ratio	0.78 (0.69, 0.86)	0.86 (0.81, 0.92)

Note. CI = confidence interval; ADL = activities of daily living; CES = Center for Epidemiologic Studies; OLS = ordinary least squares.
[a]Effect measures for the 24- to 44-year age groups were used.
[b]The probit models required specifying the values of all the model covariates; the values given above were calculated for a married 30-year-old White female with 2 children living in a metropolitan area.
[c]The 2-part model used least squares regression on a log transformation of the dependent variable, with a conditional sample of subjects with positive values used for the outcome. The effect measure, elasticity, did not enable us to calculate confidence intervals.



Note. Bars represent 95% confidence intervals.

FIGURE 1—Estimated mortality risk reduction among full-time workers aged 24 to 44 years benefiting from the proposed San Francisco, Calif, living wage ordinance.



Note. Bars represent 95% confidence intervals.

FIGURE 2—Estimated change in the likelihood of high school graduation among children from birth to 15 years of age in families with full-time workers benefiting from the proposed San Francisco, Calif, living wage ordinance.

an increase in alcohol consumption, which may negatively affect health, the higher consumption of alcohol predicted by the applied study was attributed to a greater prevalence of drinking among wealthier persons.[27]

The major limitation of our analysis is the assumption of both a causal and a dynamic relationship between income and health. Since all available studies of the influence of income on health are observational, the apparent association could be due to confounding. Although all of the studies we applied adjusted for age, sex, race/ethnicity, education, and marital status, other unmeasured individual factors may explain the relationship between income and health. We were not able to account for neighborhood poverty, institutional racism, and inequalities in regional income distributions, which may also influence health outcomes independently of individual income.[8,11,29–33]

Reverse causality (i.e., poor health leads to poverty) is commonly raised as an alternative explanation of the association between SES and health. However, the evidence from prospective studies and the evidence for relationships between education and health and between spousal SES and health refute this hypothesis.[6] As childhood development is unlikely to influence parental income, reverse causality should not be an issue for these outcomes. Recent experience with welfare reform also provides compelling experimental evidence for the causal effect of income supplementation on childhood educational performance.[34]

Even if a causal relationship between income and health exists, we cannot be certain that an increase in income during adulthood will result in a prospective change in adult health. SES in childhood has been shown to predict health status in adult life, indicating that socioeconomic influences may be cumulative, have latent effects, or set an individual on a particular health trajectory.[9,35–38] However, longitudinal studies have demonstrated higher mortality rates among individuals in the middle income range whose incomes drop by more than 50%.[19] Also, significant effects of changes in family income on early childhood IQ and young adult achievement within families have been demonstrated.[28,39]

The application of observational studies in this policy analysis was constrained by the way the study data were reported and analyzed. While many of the reviewed mortality studies were prospective and statistically adjusted for potential confounders, few used continuous measures of income. For studies to be useful for estimating the health benefits accruing from modest income gains, researchers should retain income as a continuous measure and model nonlinear effects.

Our analysis was not intended to capture all of the possible economic effects, and their implications for health, of a living wage ordinance. Secondary economic benefits of a living wage would be "wage push" (resulting in

increasing wages for persons just above a living wage), "wage ripples" (increases in prevailing wages for persons doing similar work on noncity contracts), and local "multiplier" effects (due to the workforce spending additional income in the local economy). A potential negative effect of the living wage would be displacement of workers on city contracts due to competition from higher-paid or higher-skilled workers. Over the short term, the program would not be expected to result in displacement. However, even if displacements occurred, the ordinance would still increase the number of jobs in the community that paid a living wage.

Our study demonstrates that a more egalitarian distribution of income may have long-term positive effects on individual and community health. However, attempts to modify the distribution of wealth are likely to face significant social, scientific, and economic challenges.[7,40–43] ■

About the Authors

The authors are with the San Francisco Department of Public Health and the Department of Medicine, University of California, San Francisco.

Requests for reprints should be sent to Rajiv Bhatia, MD, MPH, San Francisco Department of Public Health, 1390 Market St, Suite 822, San Francisco, CA 94102 (e-mail: rajiv_bhatia@dph.sf.ca.us).

This article was accepted May 1, 2001.

Contributors

R. Bhatia designed the study, collected the data, and performed the analysis. Both authors wrote the manuscript.

Acknowledgments

Jennifer Mann and Randy Reiter shared in developing the original concept for this project. Susan Ettner provided invaluable assistance in applying the data from her original research.

References

1. Marmot MG, Kogevinas M, Elston MA. Social/economic status and disease. *Annu Rev Public Health.* 1987;8:111–135.

2. Feinstein JS. The relationship between socioeconomic status and health: a review of the literature. *Milbank Q.* 1993;71:279–322.

3. Krieger N, Fee E. Measuring social inequalities in health in the United States: a historical review, 1900–1950. *Int J Health Serv.* 1996;26:391–418.

4. Macintyre S. The Black report and beyond: what are the issues? *Soc Sci Med.* 1997;44:723–745.

5. Marmot M, Wilkinson RG, eds. *Social Determinants of Health.* New York, NY: Oxford University Press; 1999.

6. Yen IH, Syme SL. The social environment and health: a discussion of the epidemiologic literature. *Annu Rev Public Health.* 1999;20:287–308.

7. Evans RG, Stoddart GL. Producing health, consuming health care. *Soc Sci Med.* 1990;31:1347–1363.

8. Williams DR. Race and health: basic questions, emerging directions. *Ann Epidemiol.* 1997;7:322–333.

9. Keating DP, Hertzman C, eds. *Developmental Health and the Wealth of Nations.* New York, NY: Guilford Press; 1999.

10. Kitagawa EM, Hauser PM. *Differential Mortality in the United States: A Study in Socioeconomic Epidemiology.* Cambridge, Mass: Harvard University Press; 1973.

11. Haan M, Kaplan GA, Camacho T. Poverty and health. Prospective evidence from the Alameda County study. *Am J Epidemiol.* 1987;125:989–998.

12. Waitzman NJ, Smith KR. Phantom of the area: poverty-area residence and mortality in the United States. *Am J Public Health.* 1998;88:973–976.

13. Geronimus AT, Bound J. Use of census-based aggregate variables to proxy for socioeconomic group: evidence from national samples. *Am J Epidemiol.* 1998; 148:475–486.

14. *Making Ends Meet: How Much Does It Cost to Raise a Family in California?* Sacramento: California Budget Project; 1999.

15. Morris J, Donkin A, Wonderling D, Wilkinson P, Dowler E. A minimum income for healthy living. *J Epidemiol Community Health.* 2000;54:885–889.

16. Alunan S, Blash L, Murphy B, Poetepan M, Roff H, Sidime-Brazier O. *The Living Wage in San Francisco: Analysis of Economic Impact, Administrative, and Policy Issues.* San Francisco, Calif: San Francisco Urban Institute; 1999.

17. Fiscella K, Franks P. Poverty or income inequality as predictor of mortality: longitudinal cohort study. *BMJ.* 1997;314:1724–1727.

18. Sorlie PD, Backlund E, Keller JB. US mortality by economic, demographic, and social characteristics: the National Longitudinal Mortality Study. *Am J Public Health.* 1995;85:949–956.

19. McDonough P, Duncan GJ, Williams D, House J. Income dynamics and adult mortality in the United States, 1972 through 1989. *Am J Public Health.* 1997; 87:1476–1483.

20. Lantz PM, House JS, Lepkowski JM, Williams DR, Mero RP, Chen J. Socioeconomic factors, health behaviors, and mortality: results from a nationally representative prospective study of US adults. *JAMA.* 1998;279: 1703–1708.

21. Pappas G, Queen S, Hadden W, Fisher G. The increasing disparity in mortality between socioeconomic groups in the United States, 1960 and 1986. *N Engl J Med.* 1993;329:103–109.

22. Rogers RG. Living and dying in the USA: sociodemographic determinants of death among blacks and whites. *Demography.* 1992;29:287–303.

23. Kaufman JS, Long AE, Liao Y, Cooper RS, McGee DL. The relation between income and mortality in US blacks and whites. *Epidemiology.* 1998;9: 147–155.

24. Backlund E, Sorlie P, Johnson N. The shape of the relationship between income and mortality in the United States. Evidence from the National Longitudinal Mortality Study. *Ann Epidemiol.* 1996;6:12–20.

25. Marmot MG, Fuhrer R, Ettner SL, Marks NF, Bumpass LL, Ryff CD. Contribution of psychosocial factors to socioeconomic differences in health. *Milbank Q.* 1998;76:403–448, 305.

26. Kennedy BP, Kawachi I, Glass R, Prothrow-Stith D. Income distribution, socioeconomic status, and self rated health in the United States: multilevel analysis. *BMJ.* 1998;317:917–921.

27. Ettner SL. New evidence on the relationship between income and health. *J Health Econ.* 1996;15: 67–85.

28. Duncan GJ, Yeung W, Brooks-Gunn J, Smith JR. How much does childhood poverty affect the life chances of children? *Am Sociol Rev.* 1998;63:406–424.

29. Krieger N, Sidney S. Racial discrimination and blood pressure: the CARDIA study of young black and white adults. *Am J Public Health.* 1996;86:1370–1378.

30. Kaplan GA, Pamuk ER, Lynch JW, Cohen RD, Balfour JL. Inequality in income and mortality in the United States: analysis of mortality and potential pathways. *BMJ.* 1996;312:999–1003.

31. Kawachi I, Kennedy BP. Income inequality and health: pathways and mechanisms. *Health Serv Res.* 1999;34:215–227.

32. Wilkinson RG. Health, hierarchy, and social anxiety. *Ann N Y Acad Sci.* 1999;896:48–63.

33. Lynch JW, Smith GD, Kaplan GA, House JA. Income inequality and mortality: importance to health of individual income, psychosocial environment, or material conditions. *BMJ.* 2000;320:1200–1204.

34. Morris PA, Huston AC, Duncan GJ, Crosby DA, Bos JM. *How Welfare and Work Policies Affect Children: A Synthesis of Research.* New York, NY: Manpower Research Development Corporation; 2001.

35. Kuh DJ, Wadsworth ME. Physical health status at 36 years in a British national birth cohort. *Soc Sci Med.* 1993;37:905–916.

36. Smith GD, Hart C, Blane D, Hole D. Adverse socioeconomic conditions in childhood and cause specific adult mortality: prospective observational study. *BMJ.* 1998;316:1631–1635.

37. Holland P, Berney L, Blane D, Smith GD, Gunnell DJ, Montgomery SM. Life course accumulation of disadvantage: childhood health and hazard exposure during adulthood. *Soc Sci Med.* 2000;50:1285–1295.

38. Duncan G, Brooks-Gunn J, eds. *Consequences of Growing Up Poor.* New York, NY: Russell Sage Foundation; 1997.

39. Duncan GJ, Brooks-Gunn J, Klebanov PK. Economic deprivation and early childhood development. *Child Dev.* 1994;65:296–318.

40. Wilensky HL. Social science and the public agenda: reflections on the relation of knowledge to policy in the United States and abroad. *J Health Polit Policy Law.* 1997;22:1241–1265.

41. Tesh SN. *Hidden Arguments.* New Brunswick, NJ: Rutgers University Press; 1990.

42. McKinlay JB, Marceau LD. To boldly go . . . *Am J Public Health.* 2000;90:25–33.

43. Geronimus AT. To mitigate, resist, or undo: addressing structural influences on the health of urban populations. *Am J Public Health.* 2000;90:867–872.