Am J Epidemiol. Author manuscript; available in PMC 2008 Aug 26.
Published in final edited form as:
Am J Epidemiol. 2007 Oct; 166(8): 966–974.
Published online 2007 Jul 19.
doi: 10.1093/aje/kwm155: 10.1093/aje/kwm155
INSERM Subrepository

PMCID: PMC2491970
HALMS: HALMS165622
PMID: 17641151

Why do children from socioeconomically disadvantaged families suffer from poor health when they reach adulthood? A life-course study

Maria Melchior,[1,2,3,*] Terrie E. Moffitt,[1,2] Barry J. Milne,[1] Richie Poulton,[4] and Avshalom Caspi[1,2]

[1] MRC Social, Genetic and Developmental Psychiatry Centre King's College, University of London, Institute of psychiatry, London,GB

[2] Department of Psychology and Neuroscience, and Psychiatry and Behavioral Sciences Institute for Genome Sciences and Policy, Duke University, Durham, NC,US

[3] Santé publique et épidémiologie des déterminants professionnels et sociaux de la santé INSERM : U687, IFR69, Université Paris Sud - Paris XI, Université de Versailles-Saint Quentin en Yvelines, Hôpital Paul Brousse 16, av Paul Vaillant Couturier 94807 VILLEJUIF,FR

[4] Dunedin School of Medicine University of Otago, NZ

* Correspondence should be adressed to: Maria Melchior maria.melchior@st-maurice.inserm.fr

Abstract

This study investigates what risk factors contribute to an excess risk of poor adult health among children who experienced socioeconomic (SES) disadvantage. Data come from 1,037 children born in Dunedin, New Zealand, in 1972–1973, followed from birth up to age 32. Childhood SES was measured at multiple points between birth and age 15 years. Risk factors included a familial liability to poor health, childhood/adolescent health risks, low childhood IQ, exposure to childhood maltreatment, and adult socioeconomic status. Adult health outcomes at age 32 were major depressive disorder, anxiety disorders, tobacco dependence, alcohol or drug dependence, and cardiovascular risk status. Results showed that low childhood SES was associated with an increased risk of substance dependence and poor physical health in adulthood (sex-adjusted Risk Ratios: tobacco dependence: 2.27, 95% Confidence Interval: 1.41, 3.65; alcohol or drug dependence; 2.11, 95% Confidence Interval: 1.16, 3.84; cardiovascular risk status: 2.55, 95% Confidence Interval: 1.46, 4.46). Together the risk factors studied here accounted for 55–67 percent of poor health outcomes among adults exposed to low SES as children. No single risk factor emerged as the prime explanation, suggesting that the processes mediating the link between childhood low SES and adult poor health are multifactorial.

Keywords: Adolescent, Adolescent Development, Adult, Alcoholism, epidemiology, Cardiovascular Diseases, epidemiology, Child, Child Development, Child, Preschool, Cohort Studies, Confidence Intervals, Female, Health Status, Humans, Infant, Intelligence Tests, statistics & numerical data, Longitudinal Studies, Male, Mental Disorders, epidemiology, Mental Health, New Zealand, epidemiology, Poverty, Risk Assessment, Risk Factors, Socioeconomic Factors, Substance-Related Disorders, epidemiology, Tobacco Use Disorder, epidemiology

In industrialized countries, over 40 percent of the total burden of disease is related to mental disorders such as depression, anxiety and alcohol or drug-related disorders and cardiovascular disease (1). These disorders are especially frequent among adults who experienced socioeconomic disadvantage when they

were children (2–14). However, past studies linking childhood SES to adult health suffered from two important weaknesses.

First, with notable exceptions (2, 14–16), most prior studies examined one adult health outcome at a time: e.g. depression (17), a substance-related disorder (8), or cardiovascular health (18–20). These studies relied on different methods and it is difficult to combine their results to assess the overall burden of ill health associated with early-life disadvantage. One methodological difference has to do with sampling: some studies were based on high-risk samples (17), others on general population samples (3, 8, 15, 16, 19, 21) or on selected working populations (18). A second methodological difference has to do with the measurement of childhood socioeconomic disadvantage. Often, studies of different health outcomes used different measures of childhood socioeconomic status (3, 8, 17, 20). A third methodological difference has to do with birth cohort effects: the meaning of socioeconomic categories changes with secular evolutions in education and labour market characteristics and it is difficult to compare findings of studies carried out in different birth cohorts. Therefore, to ascertain the overall burden of ill adult health among children who experience socioeconomic disadvantage it is necessary to study multiple adult health outcomes in a single cohort.

A second shortcoming of previous research is that the mechanisms through which the experience of early disadvantage influences lifelong health have not been thoroughly investigated. Candidate mechanisms need (a) to be especially frequent among children who grow up disadvantaged and (b) to independently predict adult health. Several factors meet both criteria a) and b): 1) a familial liability to poor health (17, 22), 2) mental and physical health problems which onset during childhood or adolescence (16, 23–25), 3) low IQ (15, 26, 27), 4) the experience of childhood maltreatment (19, 28, 29) and 5) low socioeconomic attainment in adulthood (17, 18, 20). Importantly, children from low socioeconomic backgrounds simultaneously experience multiple adversities, suggesting that multiple mechanisms contribute to their excess risk of poor adult health. However, prior studies did not consider the role of a broad range of familial and individual adversities, leaving an incomplete picture of the processes that lead from childhood disadvantage to adult health.

We previously reported that children from the Dunedin birth cohort who experienced socioeconomic disadvantage were at increased risk of a range of poor mental and physical health outcomes at age 26 (2). However, at the time, study members had not reached their socioeconomic position of destination, and also we were not able to examine the mechanisms that explained disadvantaged children's excess risk of ill adult health. The present study extends past research in two ways. First, we test whether children who experience socioeconomic hardship disproportionately suffer from various mental disorders, substance dependence, and poor physical health at age 32. Second, we examine the extent to which disadvantaged children's excess risk of poor adult health reflects 1) a liability to mental and physical disorders also present among their parents, 2) health risks that appeared while they were growing up, 3) low childhood IQ, 4) the experience of maltreatment early in life, and 5) low adult socioeconomic attainment.

MATERIALS AND METHODS

Study population

Participants are members of the Dunedin Multidisciplinary Health and Development Study, a longitudinal investigation of health and behavior in a complete birth cohort (30). Study members (n=1,037; 91 percent of eligible births; 52 percent male) were born in Dunedin, New Zealand, between April 1972–March 1973 and participated in the first follow-up assessment at age 3. The cohort represents the full range of socioeconomic status in the general population of New Zealand's South Island and is primarily white. Follow-up examinations have been carried out at ages 3, 5, 7, 9, 11, 13, 15, 18, 21, 26 and most recently at 32, when 972 study members were assessed (96 percent of the 1,015 study members still alive in 2004–2005). Data are collected at the study Research Unit during a full day of individual data collection. Each phase of the study was approved by the Otago Ethics Committee and study members gave informed consent before participating.

Measures

Socioeconomic status (SES)

The SES of the study members' families was measured with a six-point scale assessing parents' self-reported occupational status (31). The scale places each occupation into one of 6 categories (1=unskilled laborer, 6=professional) based upon the educational levels and income associated with that occupation in data from the New Zealand census. The variable used in our analyses, childhood SES is the average of the highest SES level of either parent, assessed repeatedly at the study members' birth and ages 3, 5, 7, 9, 11, 13 and 15. As previously reported, we distinguished three socioeconomic groups: high (groups 1 and 2: e.g., manager, physician), intermediate (groups 3 and 4: e.g., secretary, electrician) and low (groups 5 and 6: e.g., cashier, textile machine operator) (2).

Adult SES was assessed at age 32 by study members' self-reported occupation and classified as high, intermediate or low following the same classification (32).

Adult health outcomes Psychiatric disorders in the 12 months preceding the age-32 assessment were ascertained in private interviews conducted by trained research interviewers who had a tertiary qualification in psychiatry, psychology or a related discipline using the Diagnostic Interview Schedule (DIS (33, 34)). Psychiatric disorders were diagnosed using the 4th version of the Diagnostic and Statistical Manual for Mental Disorders (DSM-IV) (35). Past-year prevalence rates in the Dunedin study are comparable to past-year prevalence rates in the U.S. National Comorbidity Study Replication (NCS-R) (36). In this report, we examine major depressive disorder, anxiety disorders (generalized anxiety disorder, obsessive-compulsive disorder, panic disorder, post-traumatic stress disorder, agoraphobia, social phobia and simple phobia), tobacco dependence, and alcohol or drug dependence.

Cardiovascular risk status at age 32 was ascertained during a physical examination by six biomarkers: overweight (body mass index of 30 kg/m^2 or more, or a large waist girth: 88 cm or more in women, 102 cm or more in men), high resting blood pressure (systolic reading of 130 mm Hg or higher or a diastolic reading of 85 mm Hg or higher), elevated non-fasting total cholesterol (240 mg/dL or higher), low non-fasting high-density lipoprotein cholesterol level (40 mg/dL or lower in men, 50 mg/dL or lower in women), high glycated hemoglobin concentration (in the top quartile of the cohort's distribution), and low cardiorespiratory fitness (lowest quartile of the gender-specific VO_2max distribution). 92 percent of the participants (N=892) provided blood samples (always between 4:15–4:45 pm). Pregnant women (N=26) were excluded from the reported analyses. As previously described, we assessed multiple risk-factor clustering by summing the number of biomarkers on which the study member was at risk. Study members with three or more risk factors were considered to present a cluster of cardiovascular risks (37).

Familial liability to poor health When study members were aged 32 years, their biological parents were contacted and asked to report their own and the other parent's history of mental and physical health using well-established instruments: the Family History Screen (38); parental history of physical disorders was assessed following the Health Family Tree Study (39) and the National Heart, Lung, and Blood Institute (NHLBI) Family Heart Study (40). This yielded valid information on parental health history for 96 percent of study members (n=976). A parent was considered to have a positive history of a disorder if any informant reported it. In this study, we use either parent's history of depression, anxiety, tobacco smoking, alcohol problems, and heart disease (defined as a history of heart attack, balloon angioplasty, coronary bypass, or angina).

Childhood/adolescent health risks Adolescent depression and anxiety disorders were assessed at ages 11, 13, 15, and 18 in a psychiatric interview. Variable construction details, reliability, validity, and evidence of impairment for diagnostic groups have been described elsewhere (30, 41). Adolescent tobacco, alcohol, and drug use were assessed at age 15. Adolescent tobacco smoking was defined as self-reported daily smoking in the 12 months preceding the assessment. Adolescent alcohol and drug use was defined as the self-reported use of alcohol or marijuana more than twice or any hard drug at least once in the 12 months preceding the assessment. Childhood Body Mass Index (BMI) was defined as the average of sex and age-standardized body mass at ages 5, 7, 9, and 11 years calculated from physical measurements.

Childhood IQ At ages 7, 9, 11 and 13 study members were assessed with the Wechsler Intelligence Scale for Children (42) by trained psychometrists. As previously described, scores from the 4 age periods were averaged into an overall score, which was standardized and reverse coded to create a measure of low childhood IQ (37).

Childhood maltreatment As previously described, adverse childhood experiences during the first decade of life (ages 3–11) were ascertained using behavioral observations, parental reports, and retrospective reports by study members once they reached adulthood (43). First, exposure to maternal rejection (reported for 14% of participants) was assessed at age 3 by observational ratings of mothers' interaction with the Study children. Second, exposure to harsh discipline was assessed at ages 7 and 9 according to parental reports of disciplinary behaviors. Parents scoring in the top decile of the sample-wide distribution were classified as unusually harsh. Third, exposure to disruptive caregiver changes was assessed through age 11 and defined by two or more changes of the child's primary caregiver (6% of participants). Fourth, exposure to physical abuse (4% of participants) was assessed retrospectively at age 26 on the basis of reports of multiple episodes of severe physical punishment resulting in lasting bruising or injury through age 11. Fifth, exposure to sexual abuse (12% of participants) was assessed retrospectively at age 26 on the basis of reports of unwanted sexual contacts before age 11. The health effects of childhood maltreatment appear to be cumulative and we derived a cumulative exposure index for each child by counting the number of maltreatment experiences during the first decade of life (43, 44); 64% of children experienced no maltreatment, 27% experienced 1 indicator of maltreatment (hereafter "probable maltreatment"), and 9% experienced 2 or more indicators of maltreatment ("definite maltreatment").

Statistical analysis

We studied the association between childhood SES and adult health using Cox regression models with robust variance in which the time of follow-up was held constant (45). We chose this statistical method over logistic regression because the health outcomes we studied are frequent, causing odds ratios to overestimate relative risks (RR) by more than 10 percent.

First, we calculated sex-adjusted RRs of major depression, anxiety disorders, tobacco dependence, alcohol or drug dependence and cardiovascular risk in the low and intermediate childhood SES groups compared to the high SES group (Models A). Next, we successively adjusted for a familial liability to poor health (Models B), childhood/adolescent health risks (Models C), low childhood IQ (Models D), childhood maltreatment (Models E), and adult SES (Models F). Our final models (Models G) included childhood SES, sex, a familial liability to poor health, childhood/adolescent health risks, low childhood IQ, childhood maltreatment, and adult SES.

We compared fully-adjusted RRs (Models F) to the unadjusted (Models A) by calculating the percent change in the excess risk in the low SES group (percent Change= $(RR_{nonadjusted} - RR_{adjusted})/(RR_{nonadjusted} - 1)$

Additionally, we studied the overall number of health problems using Poisson regression models.

Data were analyzed using the SAS statistical package (version 9.1; SAS Institute, Cary, NC).

RESULTS

Of Dunedin study members, 20.5 percent belonged to a low SES group when they were growing up, 63.4 percent belonged to an intermediate SES group, and 16.1 percent belonged to a high SES group. At age 32, 16.4 percent had suffered from a major depression episode in the past year, 22.2 percent had any anxiety disorder, 19.2 percent were tobacco-dependent, 14.4 percent were alcohol or drug-dependent, and 16.3 percent presented a cluster of cardiovascular risks at the physical examination.

Overall, at age 32, 28.8 percent of study members suffered from one health problem, 15.9 percent from two, 5.6 percent from three, and 2.2 percent from four. Study members who had experienced childhood disadvantage were especially likely to experience multiple health problems by the time they reached adulthood (compared to high childhood SES group, sex-adjusted RRs: intermediate childhood SES group: 1.15, 95 percent CI 0.90;1.49; low childhood SES group: 1.52,95 percent CI 1.15;2.02).

By age 32, children who belonged to a low SES group were at higher risk than those who belonged to a high SES group of suffering from tobacco-dependence (sex-adjusted Relative Risk (RR): 2.27, 95 percent Confidence Interval (CI): 1.41, 3.65), alcohol or drug-dependence (sex-adjusted RR: 2.11, 95 percent CI: 1.16, 3.84), and of presenting clustered cardiovascular risks (sex-adjusted RR: 2.55, 95 percent CI: 1.46,

4.46) (Table 1). Children from socioeconomically-disadvantaged families were not, however, at elevated risk of adult depression or anxiety disorders and we did not include these two outcomes in subsequent analyses.

As shown in Table 2, low SES children were more likely than high SES children to carry a familial liability to poor health, to exhibit childhood/adolescent health risks (except for adolescent alcohol or drug use), to have had low childhood IQ, to have experienced childhood maltreatment, and to reach a lower adult socioeconomic level. As expected, these risk factors predicted an increased risk of poor adult health (although the association between childhood IQ and adult drug or alcohol dependence fell just short of statistical significance).

As shown in Table 3, no single factor emerged as the prime explanation of disadvantaged children's excess risk of poor adult health: a familial liability to poor health, childhood/adolescent health risks, low childhood IQ, childhood maltreatment and adult SES all contributed. Studied simultaneously, these factors accounted for 67 percent of the excess risk of adult tobacco dependence, 55 percent of the excess risk of adult alcohol or drug dependence and 64 percent of the excess risk of clustered cardiovascular risks among adults who had been exposed to socioeconomic disadvantage as children.

DISCUSSION

We found that children who experience socioeconomic disadvantage are at high risk of suffering from tobacco, alcohol, or drug dependence and of having an unfavorable cardiovascular risk profile by the time they reach young adulthood. To our knowledge, this is one of few studies to compare and contrast different disorders that contribute to the overall burden of ill adult health among children from socioeconomically-disadvantaged families (2, 15, 16). This excess risk of poor health appears to be due to disadvantaged children's high levels of exposure to multiple adversities, including a familial liability to mental and physical disorders, childhood/adolescent health risks, low childhood IQ, exposure to childhood maltreatment and low adult socioeconomic status. No single factor emerges as a leading explanation, pointing to the multifactorial nature of the effects of childhood disadvantage on later health.

Several methodological strengths contribute to the validity of our findings. First, we studied a birth cohort with excellent follow-up at age 32 and our results are not affected by sample attrition. Second, study members' childhood socioeconomic position was measured prospectively and is not influenced by recall bias. Third, risk factors for poor adult health were assessed prospectively, using validated measures obtained from multiple informants.

Our study also has limitations. Most importantly, study participants were aged 32 years at the time of the latest study assessment and we were not able to study clinical outcomes of cardiovascular disease. Instead, we focused on clustered risk factors, which have been shown to predict cardiovascular morbidity later in life (46). Furthermore, our data are right-censored, and study members will present with new health problems as they age. The onset of mental disorders peaks in adolescence and young adulthood, so the number of new cases that will occur after age 32 is likely to be small (36). However, new physical health problems will emerge over time, and we will continue to assess these in the future.

In our study, children who grew up disadvantaged were not at higher risk of major depression or anxiety disorders than those who came from more privileged families. While there is evidence that children and adults who experience socioeconomic disadvantage are at high risk of experiencing depression or anxiety concomitantly (24, 47–49), research on the long-term association between early-life socioeconomic position and the risk of such common mental disorders has yielded inconsistent results. Overall, studies that found that children from disadvantaged families experience poor mental health in adulthood examined high-risk samples (17, 50) or focused on symptoms of psychological distress rather than clinically-significant disorders (3, 4, 6, 7). Studies based on population samples have not confirmed that children from disadvantaged backgrounds are especially prone to depression or anxiety by the time they reach adulthood (51, 52). Overall, these results are in line with our previous research which highlights that adult experiences are key in determining individuals' risk of adult depression and anxiety, although a small proportion of depressed and anxious individuals have childhood risk (53, 54).

Several studies have indicated that adults' risk of substance-related disorders and poor cardiovascular health starts early in life (8–12, 19, 20, 55). Our study adds to this research by showing that these lifecourse health disparities reflect multiple risk factors. The Dunedin cohort is based in New Zealand, and it is important to consider whether our findings apply to other populations. Because New Zealand is similar to other industrialized countries in terms of labor market characteristics (56), health patterns (57) and socioeconomic health gradients (2, 58), our conclusion about the multifactorial nature of the association between childhood socioeconomic status and adult health is likely to hold in other populations. However, prevalence rates of mental and physical disorders, distributions of specific risk factors, and associations between socioeconomic circumstances and health may vary across populations. Therefore the mechanisms that mediate low SES children's risk of poor adult health may be context-specific and should be investigated in different populations.

Children who experience socioeconomic disadvantage are at high risk of suffering from multiple disorders by the time they reach adulthood. This reflects their experience of a broad range of adversities. Recent evidence showing that early interventions in high-risk children bear long-term cognitive, health, and social benefits imply that it is possible to counteract the effects of early disadvantage and help children from deprived backgrounds beat the odds (59).

Acknowledgments

Supported by the U.S. National Institute of Mental Health, the U.K. Medical Research Council and the U.K. Economic and Social Research Council, the William T. Grant Foundation, the Health Research Council of New Zealand, and the Statistics and Research Division of France's Ministry of Health and Social Affairs. T.E.M. and A.C. are Royal Society Wolfson Research Merit Award holders. We thank the Dunedin study members, Unit research staff, study founder Phil Silva, Ph.D, and Alan Taylor.

Approved abbreviations

CI Confidence Interval
RR Relative Risk
DSM Diagnostic and Statistical Manual of Mental Disorders
NHLBI National Heart, Lung and Blood Institute
SES Socioeconomic status

Footnotes

CONFLICT OF INTEREST: We declare no conflict of interest.

References

1. The World Health Report 2004: Changing history. The World Health Organization; Geneva, Switzerland: 2004. http://www.who.int/whr/2004/en/index.html.

2. Poulton R, Caspi A, Milne B, et al. Association between children's experience of socioeconomic disadvantage and adult health: a life-course study. Lancet. 2002;360:1640–5. [PMCID: PMC3752775] [PubMed: 12457787]

3. Power C, Stansfeld SA, Matthews S, et al. Childhood and adulthood risk factors for socio-economic differentials in psychological distress: evidence from the 1958 British birth cohort. Soc Sci Med. 2002;55(11):1989–2004. [PubMed: 12406466]

4. Cheung YB, Khoo KS, Karlberg J, et al. Association between psychological symptoms in adults and growth in early life: longitudinal follow up study. Br Med J. 2002;325(7367):749. [PMCID: PMC128376] [PubMed: 12364303]

5. Gilman SE, Kawachi I, Fitzmaurice GM, et al. Socio-economic status, family disruption and residential stability in childhood: relation to onset, recurrence and remission of major depression. Psychol Med. 2003;33(8):1341–55. [PubMed: 14672243]

6. Wiles NJ, Peters TJ, Leon DA, et al. Birth weight and psychological distress at age 45–51 years: results from the Aberdeen Children of the 1950s cohort study. Br J Psychiatry. 2005;187:21–8. [PubMed: 15994567]

7. Gale CR, Martyn CN. Birth weight and later risk of depression in a national birth cohort. Br J Psychiatry. 2004;184:28–33. [PubMed: 14702224]

8. Osler M, Nordentoft M, Andersen AM. Childhood social environment and risk of drug and alcohol abuse in a cohort of Danish men born in 1953. Am J Epidemiol. 2006;163(7):654–61. [PubMed: 16443802]

9. Claussen B, Davey SG, Thelle D. Impact of childhood and adulthood socioeconomic position on cause specific mortality: the Oslo Mortality Study. J Epidemiol Community Health. 2003;57(1):40–5. [PMCID: PMC1732268] [PubMed: 12490647]

10. Galobardes B, Lynch JW, Davey SG. Childhood socioeconomic circumstances and cause-specific mortality in adulthood: systematic review and interpretation. Epidemiol Rev. 2004;26:7–21. 7–21. [PubMed: 15234944]

11. Galobardes B, Smith GD, Lynch JW. Systematic review of the influence of childhood socioeconomic circumstances on risk for cardiovascular disease in adulthood. Ann Epidemiol. 2006;16(2):91–104. [PubMed: 16257232]

12. Langenberg C, Kuh D, Wadsworth ME, et al. Social circumstances and education: life course origins of social inequalities in metabolic risk in a prospective national birth cohort. Am J Public Health. 2006;96(12):2216–21. [PMCID: PMC1698170] [PubMed: 17077402]

13. Strand BH, Kunst A. Childhood Socioeconomic Position and Cause-specific Mortality in Early Adulthood. Am J Epidemiol. 2006 [PubMed: 17041134]

14. Power C. Social and economic background and class inequalities in health among young adults. Soc Sci Med. 1991;32(4):411–7. [PubMed: 2024156]

15. Hart CL, Taylor MD, Davey SG, et al. Childhood IQ, social class, deprivation, and their relationships with mortality and morbidity risk in later life: prospective observational study linking the Scottish Mental Survey 1932 and the Midspan studies. Psychosom Med. 2003;65(5):877–83. [PubMed: 14508035]

16. Wickrama KA, Conger RD, Abraham WT. Early adversity and later health: the intergenerational transmission of adversity through mental disorder and physical illness. J Gerontol: Series B Psychol Sci Soc Sci. 2005;60(Spec No 2):125–9. [PubMed: 16251583]

17. Gilman SE, Kawachi I, Fitzmaurice GM, et al. Socioeconomic status in childhood and the lifetime risk of major depression. Int J Epidemiol. 2002;31(2):359–67. [PubMed: 11980797]

18. Brunner E, Shipley MJ, Blane D, et al. When does cardiovascular risk start? Past and present socioeconomic circumstances and risk factors in adulthood. J Epidemiol Community Health. 1999;53(12):757–64. [PMCID: PMC1756821] [PubMed: 10656084]

19. Lehman BJ, Taylor SE, Kiefe CI, et al. Relation of childhood socioeconomic status and family environment to adult metabolic functioning in the CARDIA study. Psychosom Med. 2005;67(6):846–54. [PubMed: 16314588]

20. Kivimaki M, Smith GD, Elovainio M, et al. Socioeconomic circumstances in childhood and blood pressure in adulthood: the cardiovascular risk in young Finns study. Ann Epidemiol. 2006;16(10):737–42. [PubMed: 16843680]

21. Elovainio M, Kivimaki M, Vahtera J. Organizational justice: evidence of a new psychosocial predictor of health. Am J Public Health. 2002;92:105–8. [PMCID: PMC1447369] [PubMed: 11772771]

22. Osler M, Petersen L, Prescott E, et al. Genetic and environmental influences on the relation between parental social class and mortality. Int J Epidemiol. 2006;35(5):1272–7. [PubMed: 16551770]

23. Chen E, Matthews KA, Boyce WT. Socioeconomic differences in children's health: how and why do these relationships change with age? Psychol Bull. 2002;128(2):295–329. [PubMed: 11931521]

24. Merikangas KR. Vulnerability factors for anxiety disorders in children and adolescents. Child Adolescent Psychiatr Clin N America. 2005;14(4):649–79. vii. [PubMed: 16171697]

25. Miech RA, Kumanyika SK, Stettler N, et al. Trends in the association of poverty with overweight among US adolescents, 1971–2004. J Am Med Assoc. 2006;295(20):2385–93. [PubMed: 16720824]

26. Martin LT, Fitzmaurice GM, Kindlon DJ, et al. Cognitive performance in childhood and early adult illness: a prospective cohort study. J Epidemiol Community Health. 2004;58(8):674–9. [PMCID: PMC1732844] [PubMed: 15252070]

27. Lawlor DA, Batty GD, Morton SM, et al. Early life predictors of childhood intelligence: evidence from the Aberdeen children of the 1950s study. J Epidemiol Community Health. 2005;59(8):656–63. [PMCID: PMC1733112] [PubMed: 16020642]

28. Anda RF, Whitfield CL, Felitti VJ, et al. Adverse childhood experiences, alcoholic parents, and later risk of alcoholism and depression. Psychiatr Serv. 2002;53(8):1001–9. [PubMed: 12161676]

29. Dong M, Giles WH, Felitti VJ, et al. Insights into causal pathways for ischemic heart disease: adverse childhood experiences study. Circulation. 2004;110(13):1761–6. [PubMed: 15381652]

30. Moffitt TE, Caspi A, Rutter M, et al. Sex differences in antisocial behaviour: Conduct disorder, delinquency, and violence in the Dunedin longitudinal study. Cambridge, UK: Cambridge University Press; 2001.

31. Elley WB, Irving JC. Revised socio-economic index for New Zealand. NZ J Educ Studies. 1976;11:25–36.

32. Statistics New Zealand. New Zealand standard classification of occupations. Wellington, New Zealand: Statistics New Zealand; 1999.

33. Robins L, Helzer J, Cottler L, et al. Diagnostic Interview Schedule, version III-R. St. Louis, MO: Washington University School of Medicine; 1989.

34. Robins L, Cottler L, Bucholz K, et al. Diagnostic Interview Schedule for DSM-IV. St Louis, MO: Washington University School of Medicine; 1995.

35. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4. Washington, DC: American Psychological Association; 1994.

36. Kessler RC, Berglund P, Demler O, et al. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry. 2005;62(6):593–602. [PubMed: 15939837]

37. Caspi A, Harrington H, Moffitt TE, et al. Socially isolated children 20 years later: risk of cardiovascular disease. Arch Pediatr Adolesc Med. 2006;160(8):805–11. [PubMed: 16894079]

38. Weissman MM, Wickramaratne PJ, Adams P, et al. Brief screening for family psychiatric history. Arch Gen Psychiatry. 2001;57:675–82. [PubMed: 10891038]

39. Williams RR, Hunt SC, Barlow GK, et al. Health family trees: a tool for finding and helping young family members of coronary and cancer prone pedigrees in Texas and Utah. Am J Public Health. 1988;78(10):1283–6. [PMCID: PMC1349422] [PubMed: 3421383]

40. Higgins M, Province M, Heiss G, et al. NHLBI Family Heart Study: objectives and design. Am J Epidemiol. 1996;143(12):1219–28. [PubMed: 8651220]

41. Kim-Cohen J, Caspi A, Moffitt TE, et al. Prior juvenile diagnoses in adults with mental disorder: developmental follow-back of a prospective longitudinal cohort. Arch Gen Psychiatry. 2003;60(7):709–11. [PubMed: 12860775]

42. Wechsler D. Manual for the Wechsler Intelligence Scale for Children -Revised. New York, NY: Psychological Corporation; 1974.

43. Caspi A, McClay J, Moffitt TE, et al. Role of genotype in the cycle of violence in maltreated children. Science. 2002;297(5582):851–4. [PubMed: 12161658]

44. Danese A, Pariante CM, Caspi A, et al. Childhood maltreatment predicts adult inflammation in a life-course study. Proc Natl Acad Sci. 2007;104(4):1319–24. [PMCID: PMC1783123] [PubMed: 17229839]

45. Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. BMC Med Res Methodol. 2003;3(21):1–13. [PMCID: PMC521200] [PubMed: 14567763]

46. Grundy SM, Pasternak R, Greenland P, et al. AHA/ACC scientific statement: Assessment of cardiovascular risk by use of multiple-risk-factor assessment equations: a statement for healthcare professionals from the American Heart Association and the American College of Cardiology. J Am Coll Cardiol. 1999;34(4):1348–59. [PubMed: 10520820]

47. Fombonne E. Depressive disorders: time trends and possible explanatory mechanisms. In: Rutter M, Smith DJ, editors. Psychosocial disorders in young people. Chichester: UK: John Wiley & Sons; 1995.

48. Lorant V, Deliege D, Eaton W, et al. Socioeconomic inequalities in depression: a meta-analysis. Am J Epidemiol. 2003;157(2):98–112. [PubMed: 12522017]

49. Muntaner C, Eaton WW, Miech R, et al. Socioeconomic position and major mental disorders. Epidemiol Rev. 2004;26:53–62. 53–62. [PubMed: 15234947]

50. Ritsher JE, Warner V, Johnson JG, et al. Inter-generational longitudinal study of social class and depression: a test of social causation and social selection models. Br J Psychiatry Suppl. 2001;40:s84–90. s84–s90. [PubMed: 11315232]

51. Kessler RC, Magee WJ. Childhood family violence and adult recurrent depression. J Health Soc Beh. 1994;35(1):13–27. [PubMed: 8014427]

52. Eaton WW, Muntaner C, Bovasso G, et al. Socioeconomic status and depressive syndrome: the role of inter- and intra-generational mobility, government assistance, and work environment. J Health Soc Beh. 2001;42(3):277–94. [PMCID: PMC2802838] [PubMed: 11668774]

53. Jaffee SR, Moffitt TE, Caspi A, et al. Differences in early childhood risk factors for juvenile-onset and adult-onset depression. Arch Gen Psychiatry. 2002;58:215–22. [PubMed: 11879158]

54. Moffitt TE, Caspi A, Harrington HL, et al. Generalized anxiety disorder and depression: childhood risk factors in a birth cohort followed to age 32. Psychol Med. In Press. [PubMed: 17201999]

55. Strand BH, Kunst A. Childhood Socioeconomic Position and Cause-specific Mortality in Early Adulthood. Am J Epidemiol. 2007;165(1):85–93. [PubMed: 17041134]

56. Statistics New Zealand. Wellington, New Zealand: 2004. Labour market statistics. http://www.stats.gov.nz.

57. OECD. Health at a glance. Paris: OECD; 2001.

58. Wamala S, Blakely T, Atkinson J. Trends in absolute socioeconomic inequalities in mortality in Sweden and New Zealand. A 20-year gender perspective. BMC Public Health. 2006;6:164. [PMCID: PMC1526425] [PubMed: 16790061]

59. McCormick MC, Brooks-Gunn J, Buka SL, et al. Early intervention in low birth weight premature infants: results at 18 years of age for the Infant Health and Development Program. Pediatrics. 2006;117(3):771–80. [PubMed: 16510657]

Figures and Tables

Table 1

Childhood SES and adult mental and physical health in the Dunedin study (sex-adjusted Relative Risks (RRs), 95 percent Confidence Interval (CI)).

	Major depressive disorder n=958/157 cases		**Anxiety disorders n=958/213cases**		**Tobacco dependence n=965/185 cases**		**Alcohol or drug dependence n=954/137 cases**		**Cardiovascular risk n=860/140 cases**	
	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
Childhood SES:										
high	1.00		1.00		1.00		1.00		1.00	
intermediate	0.79	0.54, 1.17	1.08	0.77, 1.51	1.48	0.94, 2.33	1.74	1.00,3.02	1.51	0.89, 2.57
low	1.21	0.79,1.85	1.16	0.79, 1.72	2.27	1.41, 3.65	2.11	1.16, 3.84	2.55	1.46, 4.46
Sex:										
woman	1.00		1.00		1.00		1.00		1.00	
man	0.59	0.44, 0.79	0.72	0.57, 0.91	0.96	0.74–1.24	2.18	1.55, 3.06	1.25	0.92, 1.69

Table 2

Associations between childhood SES and adult health with a familial liability to poor health, childhood/adolescent health risks, childhood IQ, childhood maltreatment and adult SES in the Dunedin study (n, %, Relative Risk (RR), 95% Confidence Interval (CI)).

			Childhood SES	**Tobacco dependence n=965/185 cases**		**Alcohol or drug dependence n=954/137 cases**		**Cardiovascular risk n=860/140 cases**	
	n	%	Pearson's correlation coefficient (p-value)	sex-adjusted RR	95% CI	sex-adjusted RR	95% CI	sex-adjusted RR	95%CI
Familial liability to poor health									
Either parent was a smoker: no	976	20.3	−0.19(<0.0001)	1.00		-	-	-	-
yes		79.7		1.51	1.04, 2.21				
Either parent had an alcohol problem: no	976	76.7	−0.14(<0.0001)	-	-	1.00		-	-
yes		23.3				1.91	1.40, 2.61		
Either parent had heart disease: no	948	75.7	−0.07 (0.014)	-	-	-	-	1.00	
yes		24.3						1.63	1.19, 2.24
Childhood/adolescent health risks									
Adolescent tobacco smoking: no	963	85.1	−0.14(<0.0001)	1.00		-	-	-	-
yes		14.9		2.81	2.17, 3.66				
Adolescent alcohol/drug use: no	959	81.2	−0.03 (0.28)	-	-	1.00		-	-
yes		18.8				2.03	1.46, 2.82		
Childhood BMI: per sd	960	-	−0.08 (0.005)	-	-		-	1.00	
								1.60	1.42, 1.80
Low childhood IQ:	987	-	0.41 (<0.0001)	1.23	1.09,	1.11	0.95,	1.31	1.12,

Open in a separate window

Table 3

Associations between childhood SES and adult health, adjusting for A) sex, B) a familial liability to poor health, C) childhood/adolescent health risks, D) childhood IQ, E) childhood maltreatment, and F) adult SES in the Dunedin study (Relative Risk (RR), 95% Confidence Interval (CI)).

	Tobacco dependence		Alcohol or drug dependence		Cardiovascular risk	
	RR	**95% CI**	**RR**	**95% CI**	**RR**	**95% CI**
A. Models adjusted for sex						
Childhood SES: high	1.00		1.00		1.00	
intermediate	1.48	0.94, 2.33	1.74	1.00, 3.02	1.51	0.89, 2.57
low	2.27	1.41–3.65	2.11	1.16, 3.84	2.55	1.46, 4.46
B. Models adjusted for sex and a familial liability to poor health						
Childhood SES: high	1.00		1.00		1.00	
intermediate	1.40	0.89, 2.22	1.69	0.98, 2.91	1.43	0.84, 2.44
low	2.11	1.30, 3.42	1.83	1.00, 3.35	2.34	1.33, 4.11
Either parental was a smoker no	1.00		-	-	-	-
yes	1.39	0.95, 2.03				
Either parent had an alcohol problem: no	-	-	1.00		-	-
yes			1.84	1.33, 2.53		
Either parent had heart disease: no	-	-	-	-	1.00	
yes					1.55	1.13, 2.14
C. Models adjusted for sex and childhood/adolescent health risks						
Childhood SES: high	1.00		1.00		1.00	
intermediate	1.40	0.89, 2.20	1.65	0.95, 2.88	1.47	0.86, 2.49
low	1.80	1.09, 2.96	1.98	1.08, 3.62	2.14	1.22, 3.75
Adolescent tobacco smoking: no	1.00		-	-	-	-
yes	2.64	2.00, 3.49				
Adolescent alcohol/drug use: no	-	-	1.00		-	-
yes			2.01	1.45, 2.79		
Childhood BMI: per sd:	-	-	-	-	1.55	1.38, 1.75
D. Models adjusted for sex and childhood IQ						
Childhood SES: high	1.00		1.00		1.00	
intermediate	1.35	0.84, 2.17	1.61	0.91, 2.85	1.35	0.75, 2.40
low	2.02	1.21, 3.38	2.05	1.08, 3.11	2.11	1.10, 4.04
Low childhood IQ: per sd:	1.14	1.00, 1.30	1.03	0.86, 1.22	1.20	1.00, 1.43
E. Models adjusted for sex and childhood maltreatment						

Open in a separate window