Childhood Socioeconomic Position, Educational Attainment, and Adult Cardiovascular Risk Factors: The Aberdeen Children of the 1950s Cohort Study

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Objectives. We assessed the associations of childhood socioeconomic position with cardiovascular disease risk factors (smoking, binge alcohol drinking, and being overweight) and examined the roles of educational attainment and cognitive functioning in these associations.

Methods. Data were derived from a cohort study involving 7184 individuals who were born in Aberdeen, Scotland, between 1950 and 1956; had detailed records on perinatal characteristics, childhood anthropometry, and cognitive functioning; and responded to a mailed questionnaire when they were aged 45 to 52 years.

Results. Strong graded associations existed between social class at birth and smoking, binge drinking, and being overweight. Adjustment for educational attainment completely attenuated these associations. However, after control for adult social class, adult income and other potential confounding or mediating factors, some association remained.

Conclusions. Educational attainment is an important mediating factor in the relation between socioeconomic adversity in childhood and smoking, binge drinking, and being overweight in adulthood. (*Am J Public Health.* 2005;95:1245–1251. doi:10.2105/AJPH.2004.041129)

Studies have revealed associations between low childhood socioeconomic position or status (SEP) and cardiovascular disease (CVD) and CVD risk factors in later life that are independent of adult SEP.[1–15] However, most of these studies have involved the use of adults' reports of childhood SEP, which may be incomplete and inaccurate.[16] Before developing effective policy interventions to abolish the link between low childhood SEP and CVD, it is necessary to understand the causal pathways connecting them. Low childhood socioeconomic position is associated with low cognitive functioning and low educational attainment.[17] Thus, it is plausible that cognitive function and educational attainment are important intermediaries in the association between childhood SEP and adult risk factors, factors that may in turn lead to CVD. The aims of the present study were to assess the associations of childhood SEP with CVD risk factors (smoking, binge alcohol drinking, and being overweight) and to examine the role of educational attainment and cognitive function in these associations in a cohort born in the city of Aberdeen, Scotland, between 1950 and 1956.

METHODS

Study Participants

The Aberdeen Children of the 1950s Study involved a cohort of 12 150 children who were born in Aberdeen, Scotland, between 1950 and 1956 and who took part in a child development survey in the 1960s.[18–20] Comprehensive information was abstracted from the Aberdeen Maternity and Neonatal Databank regarding course of mother's pregnancy and children's physical characteristics at birth.[19] In 1999, this cohort study was reinitiated, and between 2000 and 2002 surviving cohort members were mailed a health questionnaire.[18]

Assessment of Childhood Socioeconomic Position

Childhood SEP was assessed at 2 time points. Social class at birth was based on the occupation of the study participant's father; these data were obtained from Aberdeen Maternity and Neonatal Databank obstetric records. Six categories were included: professional, managerial, skilled nonmanual, skilled manual, semiskilled, and unskilled manual. These categories can be collapsed into the 2 general categories of nonmanual (professional, managerial, and nonmanual/skilled nonmanual) and manual (manual/skilled manual, semiskilled, and unskilled manual). At the time of the childhood survey (1962), father's occupation was reported by each child and was similarly coded. All analyses were conducted with these 2 measures as exposure variables; however, none of the results differed substantively between the 2 measures, and thus we present results only for associations with social class at the time of birth.

Assessment of Cognitive Functioning and Educational Attainment

Throughout the 1950s in Aberdeen, cognitive function was routinely tested through the administration of IQ tests to children at the ages of 7, 9, and 11 years. These IQ scores were abstracted for the study participants, and results of tests taken after December 1962 and up until 1964 also were obtained as they became available. In this study, we used the results from the tests administered when the participants were aged 7 and 11 years. The tests conducted at 7 years provided an indication of the children's functioning before they had completed a significant amount of formal education, thus reflecting early postnatal exposures and family environment. Conversely, the tests conducted at age 11 reflected cognitive functioning at the end of the children's primary school education, and thus scores were influenced by the educational process and peer relationships as well as earlier exposures.

At 7 years of age the participants were administered the Moray House Picture Intelli-

gence Tests.[18] All participants were administered the test within 6 months of their 7th birthday. The tests given at age 11, also conducted within 6 months of participants' 11th birthday, included a battery of Moray House tests: 2 tests of verbal reasoning and 1 each of arithmetic and English. Because the mean verbal reasoning score was highly correlated with the arithmetic and English scores (Pearson correlation coefficients of 0.86 and 0.89, respectively, $P<.001$ for both) and all 3 showed similar associations with exposures and outcomes in this study, mean verbal reasoning scores at 11 years were used as the measure of cognitive functioning at that age.

In the mailed health questionnaire, participants were asked to report the age at which they left secondary education and to indicate their educational or vocational qualifications. A list was provided that included an option of "no formal qualification" and then a hierarchy of seven formal United Kingdom educational qualifications from leaving certificate (lower level of qualification by those leaving school at a minimum school-leaving age—aged 15 years for this cohort) through a university degree.

Assessment of Other Childhood Characteristics

Birthweight and gestational age data were abstracted from obstetric records at the time of the 1962 survey.[18] Participants' intrauterine growth rate was estimated by calculating standardized *z* (standard deviation) scores for sex and gestational age (in weeks). Height and weight at school entry were measured directly, and these data were linked to the childhood survey data participants in 1962. Age- and sex-standardized *z* scores based on 3-month age categories were derived for height and weight.

Adult Characteristics

At the time of the questionnaire mailing (2000), 291 (2.4%) of the 12 150 original cohort members had emigrated (outside the United Kingdom), 62 (0.5%) were in the armed forces or institutionalized, 479 (4.0%) had died, and 36 could not be reached for other reasons. The remaining 11 282 participants were mailed a follow-up health questionnaire, and 7183 (63.7%) responded. In comparison with nonresponders, responders were more likely to be female, to have been categorized as affluent in terms of childhood SEP, and to have had high cognitive function scores as children.[18,21]

Participants were asked about their most recent occupation. Occupations were categorized into the same 6 categories used for childhood social class. Also, participants were asked to indicate their personal gross annual income (no income, less than £2000, £2000–£5999, £6000–£9999, £10 000–£14 999, £15 000–£19 999, £20 000–£29 999, £30 000–£39 999, £40 000 or more); weekly equivalent amounts were provided for each category.

Respondents were asked about their own smoking behavior and whether their parents had smoked when they were children. Binge drinking was defined as consumption of 4 or more alcoholic drinks in 1 episode at least once a week.

In addition, participants were asked to record their weight and height. Of the 7007 respondents who provided an estimate of their weight, 6092 (87%) reported that they had used a scale. There was a tendency for those who had not used a scale to report weights lower than their weights (74.5 kg vs 75.5 kg; $P=.07$). Therefore, all analyses that included body mass index, obesity, or weight were adjusted by including a dummy variable for scale nonuse in the multivariate models. Overweight was defined as a body mass index of 25 kg/m^2 or more.[22]

Statistical Analysis

Means for continuous variables, and prevalences for dichotomous variables, are presented in regard to participant characteristics according to social class at birth. We fit regression models to assess linear trends across these categories by entering social class at birth as a score in these models and conducting an F test.

Relative indexes of inequality (RIIs)[23] were estimated for the associations of social class at birth, educational attainment, adult social class, and adult income with childhood and adult height. For each SEP exposure, a score was assigned to each category on the basis of the midpoint of the proportion of the population in that category. For example, if 10% of the respondents were assigned to the professional social class category and a score from 0 (highest SEP) to 1 (lowest SEP) represented the entire population, participants in this group would be allocated a score of 0.05 (0.1/2); if 20% of the respondents were in the managerial category, this group would be allocated a score of 0.20 (0.1 + 0.2/2); and so on. The index of inequality was then obtained by regressing the outcome on each of these SEP scores. The virtue of this technique is that it is directly interpretable as comparing, in each case, the highest (0) and lowest (1) SEP indicators assigned.[23]

A series of multiple logistic regression models was used to assess the associations of social class at birth with the risk factors examined. In these models, participants' age, cognitive functioning at ages 7 and 11, age at leaving secondary school, intrauterine growth *z* score, and childhood height and body mass index were all entered as continuous variables. Birth order, family size, adult social class, adult income, parental smoking, and educational qualifications were all entered as categorical variables. These analyses were repeated with the inclusion of RII scores (as just detailed) for social class at birth and each measure of adult SEP and education. Likelihood ratio tests were used to assess interactions. All analyses were conducted with Stata version 8.0 (Stata Corp, College Station, Tex).

RESULTS

Table 1 presents the distributions of CVD risk factors among the participants and corresponding distributions for women and men aged 45 to 54 years who took part in the Scottish Health Survey of 1998.[24] Men were more likely than women to engage in binge drinking and to be overweight, but smoking prevalence rates were similar among men and women. Our study participants were less likely to be smokers and to be overweight than Scottish Health Survey respondents.

No evidence was found of any interactions between gender and social class at birth in any of the associations ($P>.4$ for all associations), and thus we present all results for women and men combined. The associations of adult income with both current smoking behavior and being overweight differed according to gender ($P<.01$ for both). The odds ratio (OR) for current smoking among

TABLE 1—Prevalence Rates of Adult Cardiovascular Risk Factors Among Aberdeen Children of the 1950s Study Participants Compared With Results From the Scottish Health Survey, 1998

	Women			Men				
	Aberdeen Study		Scottish Health Survey	Aberdeen Study		Scottish Health Survey	Total: Aberdeen Study	
Group	No.	% (95% CI)	% (95% CI)	No.	% (95% CI)	% (95% CI)	No.	% (95% CI)
Current smokers	3698	27.3 (25.9, 28.8)	34 (31, 37)	3393	27.2 (25.7, 28.7)	40 (37, 44)	7091	27.3 (26.2, 28.3)
Ever smokers	3698	50.0 (48.4, 51.6)	54 (50, 58)	3393	54.6 (52.9, 56.2)	60 (56, 63)	7091	52.2 (51.0, 53.3)
Binge drinkers	3419	18.3 (17.0, 19.6)	. . .[a]	3252	36.3 (34.7, 38.0)	. . .[a]	6671	27.1 (26.0, 28.1)
Overweight individuals	3625	50.3 (48.6, 51.9)	63 (59, 67)	3365	64.7 (63.0, 66.3)	75 (72, 78)	6990	57.2 (56.0, 58.4)

Note. CI = confidence interval.
[a]Not available.

low-income versus higher income women was 1.95 (95% confidence interval [CI]= 1.65, 2.31); the corresponding OR among men was 2.73 (95% CI=2.31, 3.23). Odds ratios for being overweight were 1.17 (95% CI=1.02, 1.35) among women and 0.73 (95% CI=0.61, 0.86) among men. An interaction term was incorporated into all of the logistic regression models that included both gender and income as covariates. No evidence of interactions between gender and income for other outcomes was found, nor was there evidence of interactions between gender and adult social class or educational attainment in any of the associations ($P>.2$ for all associations).

Table 2 presents the adult characteristics of the participants according to their social class at birth. The response proportion decreased linearly with decreasing SEP. All 3 CVD risk factors showed a graded association across the social class distribution, with the most unfavorable level of each seen in adults who were born in the lowest-status socioeconomic groups. Adult social class, income, and educational attainment also showed strong incremental associations with social class at birth. The prevalence and means of adult characteristics according to whether the participant's father was unemployed at the time of the participant's birth are also shown in Table 2. In general, results for this unemployed category were similar to those for the manual social class category. Because those who are unemployed are likely to be a heterogeneous group and cannot be grouped according to an occupational classification, all further results, including the trend tests presented in Table 2, exclude participants whose fathers were unemployed.

Table 3 shows the RII coefficients of childhood and adult height for all SEP indicators.

TABLE 2—Adult Cardiovascular Disease Risk Factors and Other Adult Characteristics of Participants, by Social Class at Time of Birth: Aberdeen Children of the 1950s Study

	Social Class at Birth						
Characteristic	Professional/Managerial (n = 789)	Skilled Nonmanual (n = 870)	Skilled Manual (n = 3154)	Semiskilled (n = 975)	Unskilled Manual (n = 1048)	Unemployed (n = 348)	*P* for Trend[a]
Questionnaire response rate, %	73.3	69.8	64.0	61.9	57.7	55.0	<.001
Current smoking, % (95% CI)	19.8 (17.1, 22.7)	20.2 (17.6, 23.0)	26.6 (25.1, 28.2)	33.6 (30.7, 36.7)	33.4 (30.6, 36.4)	31.5 (26.8, 36.6)	<.001
History of smoking, % (95% CI)	45.1 (41.6, 48.6)	44.2 (40.9, 47.6)	51.5 (49.8, 53.3)	58.5 (55.3, 61.6)	60.0 (57.0, 62.9)	53.5 (48.2, 58.8)	<.001
Binge drinking, % (95% CI)	23.3 (20.4, 26.5)	24.2 (21.4, 27.3)	26.9 (25.3, 28.5)	32.0 (29.0, 35.2)	28.8 (26.0, 31.7)	25.1 (20.6, 30.2)	<.001
Overweight or obese (BMI ≥ 25 kg/m^2), % (95% CI)	48.5 (45.0, 52.0)	54.9 (51.5, 58.2)	58.1 (56.4, 59.9)	58.1 (54.9, 61.2)	60.2 (57.1, 63.2)	62.0 (56.7, 67.1)	<.001
BMI, kg/m^2, mean ±SD	25.4 ±4.1	26.2 ±4.7	26.6 ±4.7	26.9 ±5.0	27.1 ±5.4	27.4 ±5.4	<.001
Age at leaving secondary school, y, mean ±SD	16.9 ±1.08	16.4 ±1.16	15.9 ±1.12	15.6 ±0.96	15.5 ±0.86	15.9 ±1.12	<.001
University education, % (95% CI)	49.2 (45.7, 52.7)	28.9 (25.9, 32.1)	17.2 (15.9, 18.6)	9.8 (8.0, 11.9)	7.7 (6.2, 9.6)	19.2 (15.3, 24.0)	<.001
No formal qualifications or education only up to grades 2–5, % (95% CI)	5.4 (4.0, 7.3)	14.5 (12.3, 17.1)	23.6 (22.1, 25.2)	36.1 (33.0, 39.3)	40.0 (37.0, 43.1)	28.7 (24.0, 33.9)	<.001
Manual social class as adult, % (95% CI)	12.7 (10.5, 15.2)	21.7 (19.1, 24.6)	32.3 (30.7, 34.0)	42.8 (39.7, 46.0)	48.6 (45.5, 51.7)	34.1 (29.3, 39.4)	<.001
Low income as adult, % (95% CI)	31.1 (28.7, 35.2)	37.0 (33.8, 40.4)	45.6 (43.8, 47.4)	53.8 (50.6, 57.0)	56.8 (53.7, 59.8)	51.4 (46.0, 56.7)	<.001

Note. CI = confidence interval; BMI = body mass index.
[a]Trend tests across occupational social class categories not including unemployed individuals.

TABLE 3—Relative Index of Inequality (RII) in Childhood and Adult Height, by Social Class at Birth and Adult Indicators of Socioeconomic Position: Aberdeen Children of the 1950s Study

	Childhood Height for Age and Gender *z* Score		Childhood Height		Adult Height	
	RII Coefficient[a] (95% CI)	*P* for Linear Trend	RII Coefficient[a] (95% CI)	*P* for Linear Trend	RII Coefficient[a] (95% CI)	*P* for Linear Trend
Social class at birth	−0.64 (−0.72, −0.59)	<.001	−0.08 (−0.09, −0.07)	<.001	−0.06 (−0.07, −0.05)	<.001
Educational attainment	−0.47 (−0.55, −0.36)	<.001	−0.04 (−0.05, −0.03)	<.001	−0.03 (−0.04, −0.02)	<.001
Social class in adulthood	−0.54 (−0.63, −0.46)	<.001	−0.05 (−0.06, −0.04)	<.001	−0.05 (−0.06, −0.04)	<.001
Adult income	−0.45 (−0.54, −0.37)	<.001	−0.04 (−0.05, −0.03)	<.001	−0.15 (−0.16, −0.14)	<.001

Note. CI = confidence interval.
[a] The RII is the gradient of the slope in height between the most and least affluent for each measure in the study population, based on an allocated score ranging from 0 (most affluent) to 1 (least affluent) that takes into account the fact that each measure has different categories with different proportions of the population in each category.

TABLE 4—Associations Between Social Class at Birth and Adult Behavioral Risk Factors for Cardiovascular Disease After Adjustment for Potential Confounding and Mediating Variables: Aberdeen Children of the 1950s Study

		OR (95% CI) for Manual vs Nonmanual Social Class at Birth, by Risk Factor			
Model	Variable(s)	Current Smoking	Ever Smoking	Binge Drinking	Overweight
1	Age and gender only	1.65 (1.43, 1.89)	1.49 (1.33, 1.67)	1.27 (1.11, 1.45)	1.33 (1.17, 1.49)
2	Adult social class	1.30 (1.13, 1.50)	1.26 (1.12, 1.42)	1.17 (1.01, 1.34)	1.27 (1.12, 1.43)
3	Adult income	1.43 (1.24, 1.65)	1.38 (1.23, 1.55)	1.21 (1.05, 1.39)	1.36 (1.21, 1.52)
4	Family size	1.46 (1.27, 1.68)	1.35 (1.20, 1.51)	1.23 (1.07, 1.40)	1.32 (1.17, 1.48)
5	Birth order	1.48 (1.28, 1.70)	1.30 (1.14, 1.47)	1.20 (1.05, 1.39)	1.30 (1.16, 1.46)
6	Birthweight *z* score	1.62 (1.40, 1.87)	1.48 (1.32, 1.66)	1.32 (1.15, 1.52)	1.36 (1.20, 1.53)
7	Childhood height *z* score	1.56 (1.35, 1.79)	1.46 (1.30, 1.64)	1.28 (1.11, 1.48)	1.36 (1.21, 1.54)
8	Childhood body mass index *z* score	1.63 (1.42, 1.87)	1.49 (1.33, 1.67)	1.29 (1.12, 1.48)	1.33 (1.18, 1.50)
9	Cognitive function at 7 y	1.38 (1.19, 1.60)	1.34 (1.19, 1.51)	1.20 (1.04, 1.39)	1.23 (1.08, 1.39)
10	Cognitive function at 11 y	1.28 (1.10, 1.48)	1.24 (1.10, 1.41)	1.14 (0.98, 1.32)	1.17 (1.03, 1.32)
11	Parental smoking	1.54 (1.34, 1.76)	1.42 (1.26, 1.59)	1.22 (1.06, 1.40)	1.29 (1.15, 1.45)
12	Educational attainment	1.05 (0.90, 1.22)	1.02 (0.90, 1.15)	1.03 (0.89, 1.20)	1.15 (1.02, 1.31)
13	All except educational attainment	1.20 (1.03, 1.40)	1.17 (1.02, 1.34)	1.17 (1.01, 1.38)	1.20 (1.05, 1.38)
14	All	1.01 (0.85, 1.20)	1.01 (0.88, 1.17)	1.05 (0.89, 1.24)	1.15 (1.00, 1.33)

Note. OR = odds ratio; CI = confidence interval. All models were adjusted for age and gender. An interaction term between income and gender was included for the current smoking and overweight variables.

In the case of each of these indicators, there was a linear incremental decrease in height in childhood and adulthood with decreasing SEP. Social class at birth was more strongly related to childhood growth and height than education or adult income (both *P* values for differences in regression coefficients, estimated with *z* scores, were less than .01). Adult income exhibited the strongest inverse association with adult height (all *P* values for the difference between this regression coefficient and the other 3 coefficients were less than .001).

Table 4 shows the association of social class at birth with adult behavioral risk factors after adjustment for potential confounding and mediating variables. After adjustment for gender and age, manual (vs nonmanual) social class status at birth was associated with increased odds of current or ever smoking in adulthood, binge drinking, and being overweight. Of the potential mediating factors, adjustment for educational attainment had the most profound effect, completely eliminating the association between childhood manual social class status and smoking and binge drinking and attenuating the association between manual social class status and being overweight (model 12). Adult social class (model 2) and income (model 3) lowered the magnitude of the associations to a smaller degree than did the effect of educational attainment and did not remove the independent effects of childhood social class on these outcomes. Cognitive function at both ages 7 (model 9) and 11 (model 10) years attenuated the associations, although some effects remained. Family size, birth order, birthweight for gestational age, childhood height and body mass index, and parental smoking had little effect on the associations between childhood social class and adult behavioral risk factors.

To further illustrate the impact of education, we compared (1) the OR for manual (vs nonmanual) social class at birth for each risk

factor after adjusting for all of the remaining potential confounding and mediating factors (model 13) and (2) the ORs obtained when educational attainment was subsequently added to the models (model 14). In the case of all outcomes, there was evidence that some association remained when all of the covariates other than education were included. With the additional inclusion of education, some of the association with being overweight remained, but the associations with all other outcomes were eliminated.

When RII scores were estimated for childhood SEP, education, adult income, and social class in these models, the patterns of the associations and effects of potential mediating factors were similar to those shown in Table 4. For example, after adjustment for all covariates other than education (equivalent to model 13 in Table 4), the RII for current smoking associated with social class at birth was 1.35 (95% CI=1.03, 1.72); after additional adjustment for educational attainment (equivalent to model 14), this RII decreased to 1.19 (95% CI=0.92, 1.54). Results were similar for binge drinking (corresponding RIIs of 1.23 [95% CI=1.01, 1.55] and 1.04 [95% CI=0.79, 1.35]) and being overweight (corresponding RIIs of 1.37 [95% CI=1.08, 1.72] and 1.19 [95% CI=0.93, 1.49]).

DISCUSSION

Consistent with previous work,[4,5,9,12,13] the results of this study show that low SEP at birth is associated with adverse behavioral CVD risk factors (smoking, binge drinking, and being overweight) independent of adult social class and income. These associations are sometimes regarded as commonplace, but they are in fact remarkable. Simply on the basis of knowledge of the occupation of a participant's father at the time of the participant's birth, one could have predicted whether this individual would be likely to smoke, engage in binge drinking, and be overweight 40 years after he or she took part in the initial survey in 1962.

The present associations between SEP at birth and smoking and binge drinking were largely explained by educational attainment. Adjustment for educational attainment also importantly attenuated the association between childhood SEP and being overweight in adulthood.

Study Limitations

Although the majority of eligible survivors (64%) responded to the questionnaire mailed in 2000, important differences were found between responders and nonresponders. Prevalence rates of smoking and overweight were higher among Scottish Health Survey respondents aged 45 to 54 years than among respondents in our cohort (Table 1).[24] These differences may reflect socioeconomic differentials between the 2 groups of respondents, real differences in smoking and overweight rates between Aberdeen and the rest of Scotland, or both.[24] Differences between responders and nonresponders in our study would have resulted in exaggerated associations being observed between SEP at birth and adult behaviors only if there were no associations among nonresponders or these associations were in the opposite direction (i.e., nonresponders in more affluent family circumstances at the time of their birth were more likely to smoke, binge drink, and be overweight later in life) from those among responders.

Similarly, for the role of education in this association to be exaggerated by response bias, one would have to assume that among nonresponders the association between low SEP at birth and low educational attainment or the association between low educational attainment and adult risk behaviors was nonexistent or in the opposite direction from that among responders. While we cannot rule out these possibilities, they seem unlikely.

A strength of this study is the use of a measure of childhood SEP assessed at study initiation rather than one retrospectively reported in adulthood. However, a weakness is that we included only 1 measure of childhood SEP: father's social class. Such a single measure is unlikely to encompass the entire spectrum of childhood social circumstances, and its effect on adult risk factors—and, therefore, our results—may have led to underestimations of the true magnitude of this association.

Our measure of adult income was based on individuals rather than households. Among women in particular, this may not reflect true disposable income, because individuals with spouses will vary widely in regard to household income. This may explain the interactions between gender and income that we observed in the case of some of the outcomes. To address this issue, we included an interaction term between gender and income in the multivariate models.

Adult body mass index was determined from self-reported weight and height, which have been shown to be strongly correlated with direct measurements.[25–27] However, despite these strong correlations, indicative that self-reports and direct measurements result in similar height and weight values, individuals who are obese tend to underestimate their body mass index.[25–27] If this systematic misreporting of weight was similar across social class groups in our study, it would have tended to dilute rather than exaggerate the magnitude of the associations observed. Any variations in misreporting according to social class could have biased our results in either direction. We found that participants who indicated not using scales to estimate their weight reported slightly lower weights on average, and this difference did not vary according to childhood or adult social class. This result provided some evidence that misreporting of weight did not differ according to social class.

Data on parental smoking were not collected during the original survey, so we relied on information obtained from the 2000–2002 questionnaire. If there were no differences in misreporting with respect to social class at birth, our results may have underestimated the effects of parental smoking on the association between social class at birth and adult CVD risk factors. This may in part explain why adjustment for adult smoking had very little effect on the association between social class at birth and smoking in adulthood.

The participants in this cohort are too young to have experienced a sufficient number of CVD events to allow determination of the pathways between childhood SEP and adult disease events. However, by continuing to conduct follow-ups with these individuals, we will be able to obtain important information on the roles of cognitive functioning, educational attainment, and CVD risk factors in

the associations between childhood SEP and risk of CVD in adulthood.

Public Health Implications

Our results concerning CVD risk factors are consistent with a systematic review of previous studies indicating that childhood socioeconomic adversity is associated with adverse behavioral risk factors both at young ages[28] and with other studies showing similar associations with adverse risk factors in adulthood.[4,5,7,9,11,12] Previous studies also have demonstrated associations of educational attainment with CVD risk factors.[29–31] The importance of our results resides in demonstrating the role of educational attainment as a mediator in the association between childhood SEP and adult behavioral risk factors. Given that cigarette smoking, binge drinking, and being overweight are known to increase CVD risk, our results suggest that a pathway leading from childhood socioeconomic adversity to low educational attainment and adverse CVD risk factors may explain in part the association between childhood SEP and CVD.

The role of educational attainment in the association between childhood SEP and adult behaviors could be explained via a number of pathways. Educational attainment will itself be influenced by childhood SEP, and its effect on the association between social class at birth and adult behaviors may indicate its value as a measure of childhood SEP. The association between social class at birth and childhood growth and height was stronger than that between education and childhood growth, suggesting that our measure of social class at birth was a better indicator of childhood socioeconomic circumstances than educational attainment. Educational attainment is associated with adult occupation and income, and thus it may reflect the availability of material resources, which are thought to be important determinants of health outcomes.[32]

We found that neither adult social class nor income fully explained the associations between childhood social class and adult risk factors, whereas education did explain these associations. Income is arguably the best single indicator of material living standards, but there is some evidence in the United Kingdom that survey participants may be reluctant to provide information on income and that, when they do, the information is inaccurate[33]; however, this observation has been disputed.[34]

Our results suggest that, rather than material resources, other factors related to higher educational achievement most likely explain the association between childhood SEP and behavioral risk factors in adulthood. The sociocultural characteristics of those at higher educational levels, for example self-confidence and ability to access and understand health promotional materials, may be relevant. Moreover, people's behaviors with respect to tobacco and alcohol consumption, diet, and physical activity, which will affect their body mass index, are likely to be influenced by their peers. Educational experiences will determine one's peers at the sensitive life course periods (late adolescence and early adulthood) during which these behaviors tend to be adopted.

In conclusion, we have shown that childhood SEP is associated with adult CVD risk factors. It is notable that the father's occupation when participants were born could have predicted which participants were most likely to be smokers and indulge in other risky behaviors in adulthood. Educational attainment appears to largely explain these associations. Our findings suggest that programs aimed at improving educational attainment may be important in enhancing health behaviors and therefore reducing CVD risk. ■

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Contributors

D.A. Lawlor and D.A. Leon developed the idea for this article. D.A. Lawlor undertook the statistical analysis, wrote the first draft of the article, and coordinated the writing of the article. H. Clark managed the study. All of the authors were involved in the writing of the article.

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Human Participant Protection

The revitalization of the Aberdeen Children of the 1950s Study cohort was approved by the Scottish multicenter research ethics committee and local research ethics committees, along with the Scottish Privacy Advisory Committee. Participants responding to the questionnaire provided informed consent to be involved in the study.

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