

# Sins of the Past

## Childhood risk factors contribute to later heart disease

*Living a healthy lifestyle is important at every age, but new research suggests that making changes earlier in life, even during childhood will be beneficial for the number one killer in the world, cardiovascular disease. As parents, what risk factors should we focus on? What behaviors should we change as we become young adults to lower our risk? Will modifying these risk factors help even if I am no longer a kid?*



### Abstract

**BACKGROUND:** Childhood cardiovascular risk factors predict subclinical adult cardiovascular disease, but links to clinical events are unclear.

**METHODS:** In a prospective cohort study involving participants in the International Childhood Cardiovascular Cohorts (i3C) Consortium, we evaluated whether childhood risk factors (at the ages of 3 to 19 years) were associated with cardiovascular events in adulthood after a mean follow-up of 35 years. Body-mass index, systolic blood pressure, total cholesterol level, triglyceride level, and youth smoking were analyzed with the use of i3C-derived age- and sex-specific z scores and with a combined-risk z score that was calculated as the unweighted mean of the five risk z scores. An algebraically comparable adult combined-risk z score (before any cardiovascular event) was analyzed jointly with the childhood risk factors. Study outcomes were fatal cardiovascular events and fatal or nonfatal cardiovascular events, and analyses were performed after multiple imputation with the use of proportional-hazards regression.

**RESULTS:** In the analysis of 319 fatal cardiovascular events that occurred among 38,589 participants (49.7% male and 15.0% Black; mean [ $\pm$ SD] age at childhood visits,  $11.8 \pm 3.1$  years), the hazard ratios for a fatal cardiovascular event in adulthood ranged from 1.30 (95% confidence interval [CI], 1.14 to 1.47) per unit increase in the z score for total cholesterol level to 1.61 (95% CI, 1.21 to 2.13) for youth smoking (yes vs. no). The hazard ratio for a fatal cardiovascular event with respect to the combined-risk z score was 2.71 (95% CI, 2.23 to 3.29) per unit increase. The hazard ratios and their 95% confidence intervals in the analyses of fatal cardiovascular events were similar to those in the analyses of 779 fatal or nonfatal cardiovascular events that occurred among 20,656 participants who could be evaluated for this outcome. In the analysis of 115 fatal cardiovascular events that occurred in a subgroup of 13,401 participants ( $31.0 \pm 5.6$  years of age at the adult measurement) who had data on adult risk factors, the adjusted hazard ratio with respect to the childhood combined-risk z score was 3.54 (95% CI, 2.57 to 4.87) per unit increase, and the mutually adjusted hazard ratio with respect to the change in the combined-risk z score from childhood to adulthood was 2.88 (95% CI, 2.06 to 4.05) per unit increase. The results were similar in the analysis of 524 fatal or nonfatal cardiovascular events.

**CONCLUSIONS:** In this prospective cohort study, childhood risk factors and the change in the combined-risk z score between childhood and adulthood were associated with cardiovascular events in midlife. (Funded by the National Institutes of Health.)

*This study followed 38,589 subjects aged 3-19 years for 35-50 years to look at the risk of cardiovascular events in midlife and correlated these findings with childhood risk factors. Five childhood risk factors, obesity, blood pressure, cholesterol, triglycerides, and youth smoking individually or in combination were shown to predict stroke and heart attacks in adulthood. Over half of the children studied exhibited risk factors for cardiovascular disease. This backs up previous research which has shown that children as young as 5 years of age had signs of early fatty deposits in arteries and 70% of 22-year-old soldiers had evidence of atherosclerosis in their coronary arteries.*

*Interventions in adulthood such as improving nutrition, quitting smoking, increasing exercise, and medications are helpful. But much more could be accomplished if we intervene at younger ages. We can then truly prevent the development of our top killer disease.*

*Cardiovascular disease risk is cumulative. Early childhood development of CV risk factors is associated with CV events in adulthood. While we have made great strides in the medical and surgical treatment of cardiovascular disease, the biggest impact will be from prevention. This study shows that the prevention of cardiovascular disease needs to begin in childhood and should be a focus through young adulthood.*

Childhood Cardiovascular Risk Factors and Adult Cardiovascular Events. N. Engl. J. Med 2022 Apr 04;[EPub Ahead of Print].