

# Cystic Fibrosis Research News

## Title:

Tobacco smoke exposure and socioeconomic factors are independent predictors of pulmonary decline in pediatric cystic fibrosis

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## What was your research question?

We wanted to find out whether exposure to tobacco smoke and socioeconomic factors such as household income, parental education, and type of health insurance play a role for lung function decline over time in children with CF from 6 to 18 years of age.

## Why is this important?

CF lung disease progresses differently even among people with identical CFTR mutations. Half of this variation is due to socioeconomic factors and environmental exposures. Previous research has found that both income and second-hand smoke play a role in CF lung health. However, studies have reached separate conclusions when trying to understand to what extent such factors affect the lungs of children with CF, and if they are truly independent of each other. For example, smoking in the U.S. is more prevalent among disadvantaged people, therefore some believe it is the main reason why disadvantaged people with CF have worse health. But is that so?

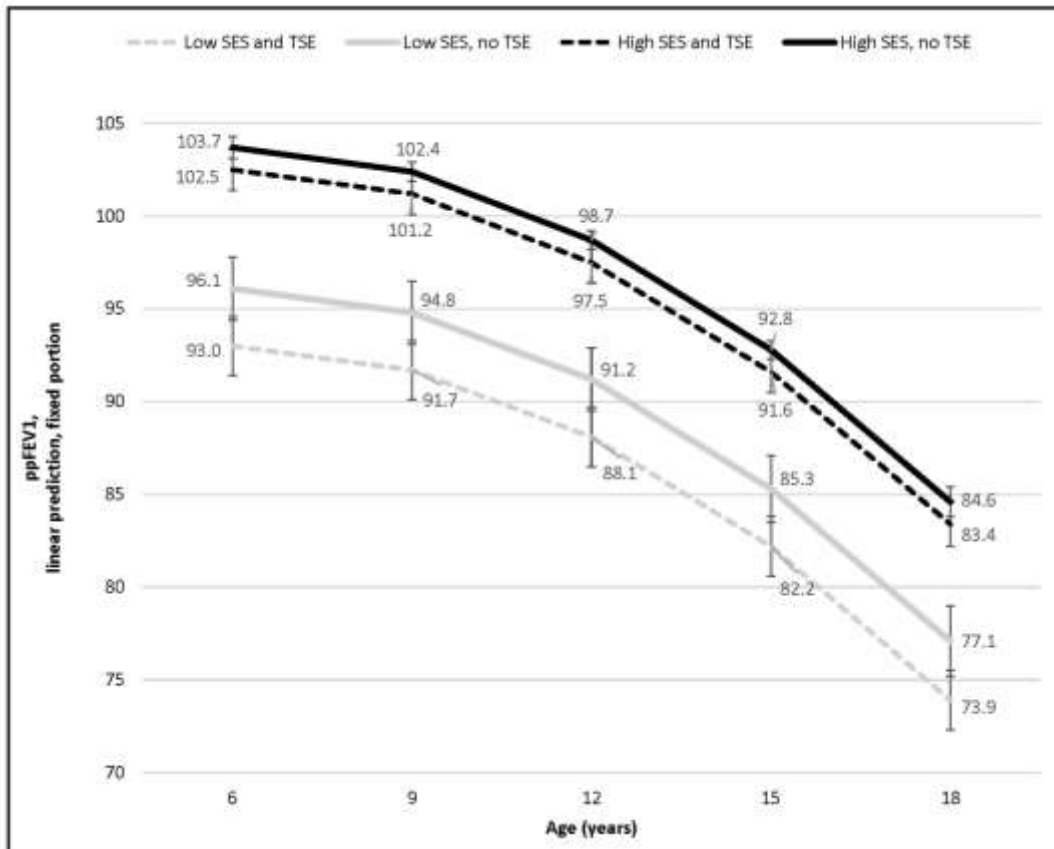
## What did you do?

From the CF Foundation Patient Registry, we obtained data on all U.S. children with CF from 2006 to 2016. We calculated their lung function at each age and conducted analyses to see if, over time, lung function declined differently by exposure to tobacco smoke as reported by parents, and by household income, parent education, and health insurance. We considered children smoke-exposed if someone in the family was a smoker or children were around a smoker at least several times weekly. Analyses controlled for age, race, ethnicity, household size, BMI, genotype, CF newborn screening diagnosis, hospitalizations, exacerbations, CFTR modulator use, and bacterial infections.

## What did you find?

Our analyses included 10,895 children with CF. More than a quarter of them were smoke-exposed. The risk of exposure was doubled in families with lower income and education. By age 6, smoke-exposed children had lower lung function than unexposed children, and this shortfall persisted through to age 18. Lower income, education, and public health insurance were also associated with pulmonary decline. Socioeconomic factors and smoke exposure each made independent, additive contributions to diminished lung function: for example, smoke exposure explained only 12% of the negative effect of low income. Further, smoke exposure was more damaging to disadvantaged children than to privileged counterparts.

**Lung function decline by socioeconomic status (SES) and tobacco smoke exposure (TSE)**



ppFEV<sub>1</sub>: Forced expiratory volume in 1 second, percent predicted. Mean=95.4 (standard deviation=0.19).

Low SES: annual household income ≤\$20,000, paternal education high school, public health insurance.

High SES: annual household income ≥\$100,000, paternal education college, private health insurance.

Adjusted for household income, paternal education, health insurance, household size, sex, race/ethnicity, Body Mass Index, newborn screening, genotype, hospitalizations, pulmonary exacerbations, CFTR modulator use, *P.aeruginosa*, and *B.cepacia*.

### What does this mean and reasons for caution?

This is the first such study with data of all U.S. children with CF. Results show that the damage of smoke exposure is fully displayed by age 6, therefore smoking cessation should be emphasized at CF diagnosis and restated during infancy and early childhood. Although smoking is more prevalent in disadvantaged families, unfavorable socioeconomic factors have an additional negative effect on lung function, independent of smoke exposure. The study was limited in that smoke exposure was based on parent self-report, which may have



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underestimated its actual effect. Future studies may screen for smoke exposure by testing saliva or urine for cotinine, produced when the body breaks down the nicotine in tobacco smoke.

## **What's next?**

Quitting smoking should be emphasized in CF care, and best practices to limit exposure should be developed. Patient registries should consider collecting smoke exposure data. To address disparities in CF lung health, interventions should prioritize smoke-exposed low-income children, among whom the adverse effects of smoke exposure are disproportionately large.

## **Original manuscript citation in PubMed**

<https://www.ncbi.nlm.nih.gov/pubmed/?term=Tobacco+smoke+exposure+and+socioeconomic+factors+are+independent+predictors+of+pulmonary+decline+in+pediatric+cystic+fibrosis>