

What is causal inference?

Causal inference is the scientific process of identifying and quantifying cause-and-effect relationships between variables—determining not just whether two factors are associated but whether changing one directly leads to a change in the other. Unlike traditional statistical analysis, which focuses on correlations, causal inference aims to answer interventional questions such as “What will happen if we increase the dosage of a drug?” or “How would test scores change if class sizes were reduced?” To achieve this, researchers use approaches like randomized controlled trials, natural experiments, propensity-score matching, instrumental variables, and structural causal models (e.g., Judea Pearl’s do-operator) to control confounders and isolate the effect of the treatment or intervention. This framework is crucial in fields ranging from epidemiology and economics to policy evaluation and artificial intelligence because it enables evidence-based decisions that rely on genuine causal mechanisms rather than coincidental correlations.

Prepare a chart of causal structure from existing research or your own project

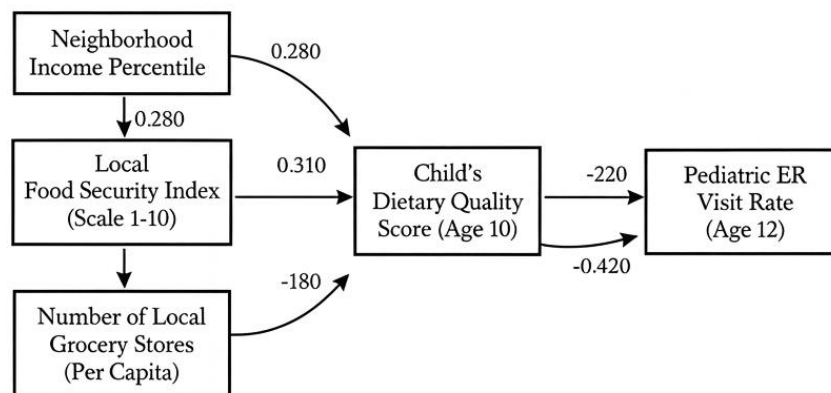


Figure Observational causal model of childhood health attainment from administrative

This diagram presents an observational causal model of childhood health attainment that links community-level socioeconomic factors to a child's later health outcome. It shows that a higher neighborhood income percentile improves the local food security index, which then contributes to better child dietary quality scores at age 10; meanwhile, access to more local grocery stores per capita also positively influences dietary quality. Both neighborhood income and food security shape the quality of a child's diet, and the dietary quality at age 10 in turn has a strong inverse relationship with the pediatric ER visit rate at age 12, indicating that healthier diets reduce ER visits. The arrows represent the causal directions, and the numbers on the arrows show the strength and sign (positive or negative) of each relationship, highlighting the pathways through which socioeconomic and environmental factors influence childhood health outcomes.