Introduction

Type 2 diabetes is a metabolic health condition in which the pancreas makes insufficient insulin, a hormone that regulates blood sugar, or the body becomes resistant such that cells cannot properly utilize glucose. As a result, excess glucose circulates in the blood stream, which over time damages many structures including blood vessels and nerves.

In recent decades the prevalence of type 2 diabetes has surged in the southern United States and in many middle-income countries, and in particular among economies with a long history of poverty followed by rapid economic growth.

This project explores an explanation for the connection between rapid economic growth and type 2 diabetes.

Motivating Literature

The fetal origins hypothesis (Barker, 1990) suggests that the endocrine pancreas is a form of permanent biological human capital, which is shaped in utero and fixed thereafter to process the diet that the net nutrition of the mother and grandmother forecast it to encounter. Generations of poverty and poor nutrition create a thrifty phenotype that will struggle to process a rich diet. Therefore unbalanced physical growth—a mismatch between development in utero and adult lifestyle will make the individual prone to diabetes. The chart below illustrates that individuals most at risk have low birth weight followed by obesity in early adolescence.

Source: [Barker, Eriksson et al. 2002]

Accepting the above, the issue is how to operationalize these ideas, i.e. to test the claim using readily-available data on per capita income and diabetes prevalence.

Procedures

My hypothesis attributes high rates of diabetes prevalence, often discovered among middle-age adults, to newly-attained, rapid economic growth during the adulthoods of these birth cohorts.

My empirical work uses aggregate data at the level of states and countries. The analysis begins with a very simple model:

\[ P_i = \beta_0 + \beta_1 R_i + \beta_2 F_i + \epsilon_i \]

where \( P_i \) represents the current age-adjusted prevalence rate for state (or country) \( i \), \( R_i \) denotes the ratio of per capita income (or GDP) in period 2 relative to period 1, and \( F_i \) represents fixed effects. Periods 1 and 2 are designed to bracket the onset of rapid growth, which are taken as 1950 and 1980 for the U.S. and 1960 and 2000 for other countries.

Discussion

The most dramatic changes to occur in the post WWII South were agricultural mechanization, the diffusion of automobiles, and the rise of centers of industry, banking, and military operations, all of which began to employ more women. The diet, however, continued to favor energy-rich foods of pork and corn and recreational exercise was rare. A reduction in work effort accompanied technological change, children’s diets were increasingly unsupervised, and home-cooked meals came to be replaced by prepared foods. Obesity emerged as a health problem.

Summarizing the important changes in the rest of the world is a complex task. From the graph below, however, it seems that economic growth was accompanied by a shift to sugar consumption that may be a reasonable index of change toward a rich diet.

As in the South, the effects of technological change on work and leisure plausibly accompanied increased growth.

Conclusion

The fetal origins hypothesis indicates that the capacity of the endocrine pancreas is fixed in utero, and because diabetes usually appears in middle age one can link conditions of prenatal development to prevalence of the disease decades later in the same birth cohort. The former may create vulnerability and later conditions that stress endocrine function can trigger the disease.

One may criticize the empirical model on several grounds: aggregate data have well-known shortcomings, the cohort relationships are not well-matched, and GDP or income are taken as indexes of larger socioeconomic changes. It is notable, however, that despite these problems, statistically significant, powerful effects are found for income growth on the prevalence of type 2 diabetes. This discovery justifies investment of greater resources in understanding the broad socioeconomic causes of this debilitating disease.

References


Bureau of Economic Analysis, under the section on “Annual Personal State Income and Employment” Table S4A4 [http://www.bea.gov/iTable/iTable.cfm?ReqID=7&step=1&isuri=1&dirname=]
