Economics and the Fetal Origins Hypothesis

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Fetal Origins: Flashback to the 1950s

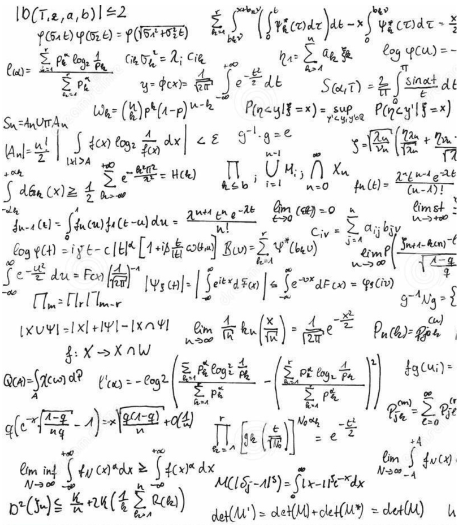
- Epidemiologists believed the fetus was a "perfect parasite"
- Fetus "afforded protection from nutritional damage that might be inflicted on the mother" (Susser & Stein, 1994)
- Placenta regarded as "perfect filter, protecting the fetus from harmful substances in the mother's body" (Landro, 2010)
- Half of US mothers reported smoking during pregnancy in 1960
- Women advised against gaining too much weight during pregnancy

Enter **DJ Barker**: Physician and epidemiologist

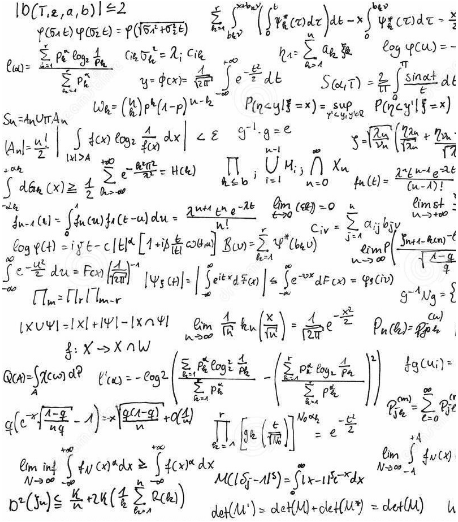
During the 1980s and 1990s, Barker argued that:

- 9 months *in utero* is perhaps the most critical period in life
- "Programs" the fetus to have certain chronic health conditions during adulthood
- These effects can remain latent for many years
  - Can make it tough for researchers to "connect the dots"
- Tahlidomide episode of late 1950s and early 1960s a watershed event against "perfect parasite" view
- Fetal Origins Hypothesis originally focused on prenatal nutrition

Contributions from economics

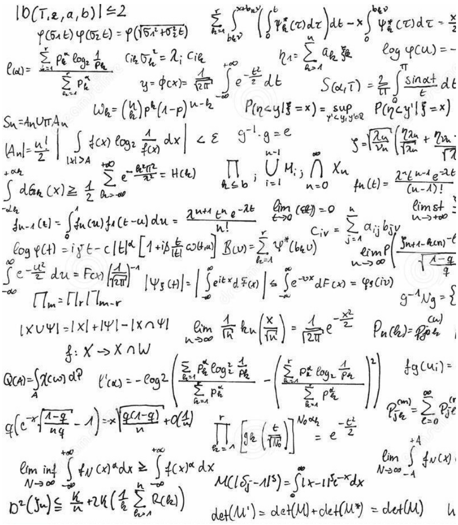


Contributions from economics



A. It's not just about famines

Contributions from economics



A. It's not just about famines

B. It's not just about health in adulthood being affected

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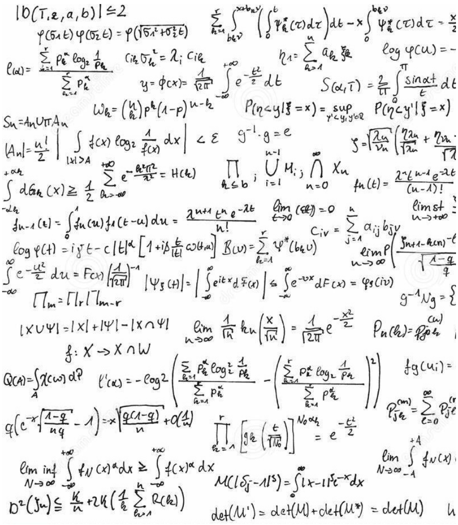


A. It's not just about famines

B. It's not just about health in adulthood being affected

C. More convincing empirical evidence

A) Not just about famine *in utero*

- Famine's long-term effects are plausible
  - If an experience is severe enough, there will be long-term effects
- Economists have considered non-nutritional experiences, including things like:
  1. disease environment (e.g. malaria and influenza)
  2. ionizing radiation
  3. temperature
  4. income
  5. air pollution
  6. etc.
- Multiple dimensions of prenatal environment matter

B) Not just about health outcomes

Endpoints including:

- Educational attainment
- Wages and incomes
- Kind of neighborhood you live in
- Whether you get married and whom you marry, etc.
- Lots of things beside health are affected

C) Why should you believe this?

- Fetal origins sounds like astrology
- There's lots of astrology-caliber work out there on fetal origins that should not be believed
- Economics "identification revolution" applied to fetal origins
  - Fetal origins lends itself to "severe" hypothesis testing (Dinardo, 2007)
  - Clear, *a priori* definitions of treatment and control groups
  - Combines well with natural experiments

Randomized Control Trial

- Surefire way to causal inference
- Easy to analyze results: compare means
- Could also run a regression, e.g. ordinary least squares (OLS) regression
  - On data from a Randomized Control Trial
  - Could control for a host of potential confounders
  - You'd get same answer as comparing means
  - Why? Because potential confounders don't vary systematically by the treatment
- Can't always randomize (expense, feasibility, ethics)
  - Don't see many randomizations on human prenatal period

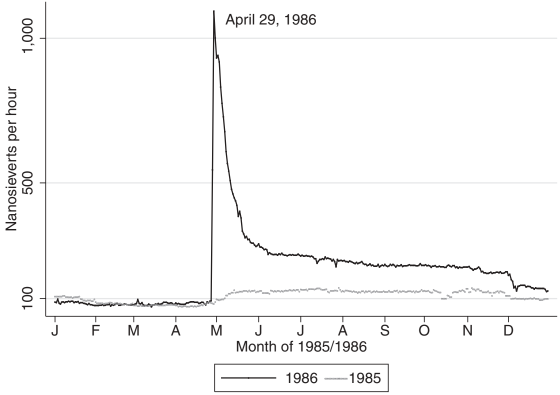
Natural Experiment Approach

- Over last 10-15 years, applied microeconomics has gone over to Natural Experiment approach
- AKA "quasi-experiment", "design-based", "identification strategy" and to a lesser extent "instrumental variables"
- Not as popular in sociology, demography, epidemiology
  - Remain more in regression analysis and statistical approaches
  - Interestingly, natural experiments were more popular in epidemiology 30+ years ago than now
- Fetal Origins studies by economists typically follow the natural experiment approach

Example: Chernobyl fallout in Sweden

Almond, Edlund, & Palme (2009)

- Core meltdown in spring 1986
- Damage to test scores for those exposed prenatally
- Comparable in magnitude to other major educational interventions



Policy Implications of Fetal Origins Evidence?

- Definitely uses lots of natural experiments, e.g. Chernobyl, 1918 Influenza Pandemic, and Famine episodes
- Causal inference supported by these analyses – a big success!
- Most economists now believe adult outcomes linked to prenatal environment
- Policy implications:
    - No influenza pandemics?
    - No famines?
    - No Chernobyls?
    - Merely making the "rubble bounce"
    - Fetal origins not pivotal to cost-benefit calculation of extreme/mortality events
- Limited policy implications of severe experiences/natural experiments

Downside of the natural experiment approach (as typically implemented)

Policy Implications of Fetal Origins Evidence?

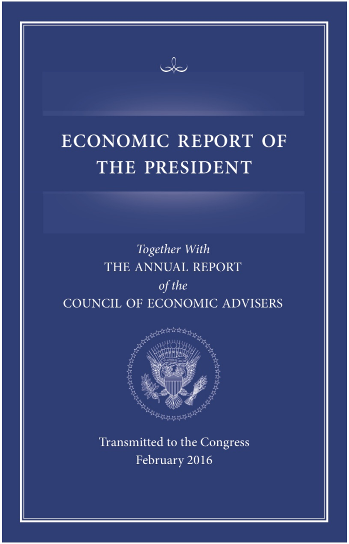
- Literature has matured to consider milder treatments

    i. "Fetal origins" effects can be pivotal in cost-ben calculations when treatments are mild
    ii. Mild events and circumstance are more commonly experienced than extreme ones

- Tension is to maintain quality of identification strategy
- Some examples:
    - Prenatal ramadan fasting, e.g. Almond & Mazumder (2011)
    - Maternal stress, e.g. Persson & Rossin-Slater (2018)
    - Seasonal influenza, e.g. Ward (2012), Schwandt (2017)
    - Low level radiation, e.g. Black et al. (2017)

Fetal Origins was shaping the policy discussion in US

Flashback to 2016!



Fetal Origins was shaping the policy discussion in US

Flashback to 2016!

Chapter 4 focuses on disparities in opportunity that appear at an early age and the long-run benefits of investment in the education, health, and well-being of children. Children's earliest years play a large role in determining later-in-life success through the health and human capital investments they receive during that time. Comparisons show persistent, large gaps in early health and cognitive skills of young children across household income, race/ethnicity, and family structure. This chapter explores how these early-life disadvantages contribute to later-in-life disparities in education, income, employment, health, and exposure to the criminal justice system. It reviews research demonstrating that direct investments in children—through programs such as nurse home visiting, early education, nutritional support, and health care coverage as well as indirect investments like income transfers to working families—can help to close gaps in these important outcomes and have lasting, positive effects. These long-run benefits help motivate the President's agenda in this area, including ensuring access to pre-school education for all, making the expanded Child Tax Credit permanent, and expanding Medicaid.

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Summary

- Fetal origins effects can be large
  - Can be substantially larger than effects of longer, more costly interventions occurring later in childhood (e.g. reducing class size)
  - Often authors left to defend large effects, but evidence all design-based at this point
- Constitute an opportunity to re-allocate existing resources and improve outcomes
- Economics $\equiv$ study of optimal allocation of scarce resources. Fetal origins offers an intriguing lifecycle perspective on this
- Behavior by parents is important
  - Neglected in fetal origins literature
  - Newer research is exploring
- Low cost because prenatal period is short...but its effects are life-long!