



REPRODUCTIVE ROULETTE

Declining Reproductive Health, Dangerous Chemicals, and a New Way Forward

By Reece Rushing

July 2009

Contents

Introduction

Part I: Declining Reproductive Health

- I. Fertility problems on the rise
- II. More premature births and infants with low birth weight
- III. More birth defects and disabilities

Part II: Dangerous Chemicals

- I. Overview of chemical dangers
- II. Phthalates
- III. BPA (bisphenol A)
- IV. PBDEs (polybrominated diphenyl ethers)

Part III: A New Way Forward

- I. Stronger standards, safer chemicals
- II. Knowledge for action
- III. A new foundation
- IV. Conclusion



PART I

Declining reproductive health

Reproductive health has declined over the last several decades in the United States, according to recent studies. As shown in the following slides:

- Reported infertility and impaired fertility are up among both men and women, regardless of age.
- There are more premature births and more infants with low birth weight.
- There are more birth defects and disabilities.

Even seemingly small upticks can have large consequences. There were a total of 4.3 million births in the United States in 2006. A rise in birth defects of just 1 or 2 percent increases the total number of afflicted children by tens of thousands. This is a tragedy for families that must deal with these problems. It also puts additional strain on the health care system.

Part II of this presentation focuses on one possible reason for the decline in reproductive health—the increase in human exposure to chemicals found in consumer products and used for industrial activities. Other factors, such as inadequate health care, poor nutrition, and delayed childbirth, may also share blame for at least some problems. But new research reveals a chemical soup in the bodies of virtually all Americans that appears to be taking a toll.

I. Fertility problems on the rise

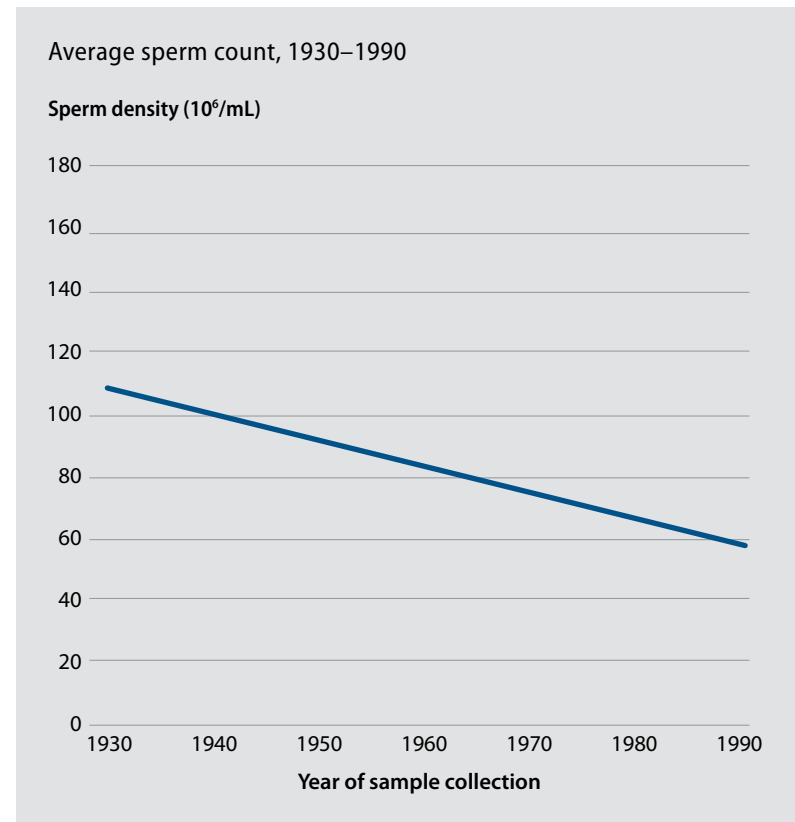
More men and women today experience difficulty having children, according to recent studies. The data in the following slides show:

- Sperm count appears to have steadily declined since the 1930s.
- Impaired fertility among women increased almost 2 percent from 1982–2002.
- Impaired fertility among women under 25 and women between 25 and 34 has increased significantly.
- An estimated 3 to 10 percent of women have endometriosis—a leading cause of infertility that has been linked to chemical exposures.
- The annual number of reported miscarriages and stillbirths are significantly higher than in the 1970s and '80s.

Average sperm count is falling

Average sperm count appears to have steadily declined since the 1930s. This graph shows a regression line of the mean sperm density in North America over a 50-year period based on the findings of multiple studies. Studies have also found falling average sperm count in Europe. A low sperm count can impair or inhibit a man's ability to reproduce.

Source: Shanna H. Swan, et al., "The Question of Declining Sperm Density Revisited: An Analysis of 101 Studies Published 1939–1996," *Environmental Health Perspectives* 108 (10) (Oct. 10, 2000); E. Carlsen et al., "Evidence for Decreasing Quality of Semen During Past 50 Years," *British Medical Journal* 305 (Sept. 12, 1992).

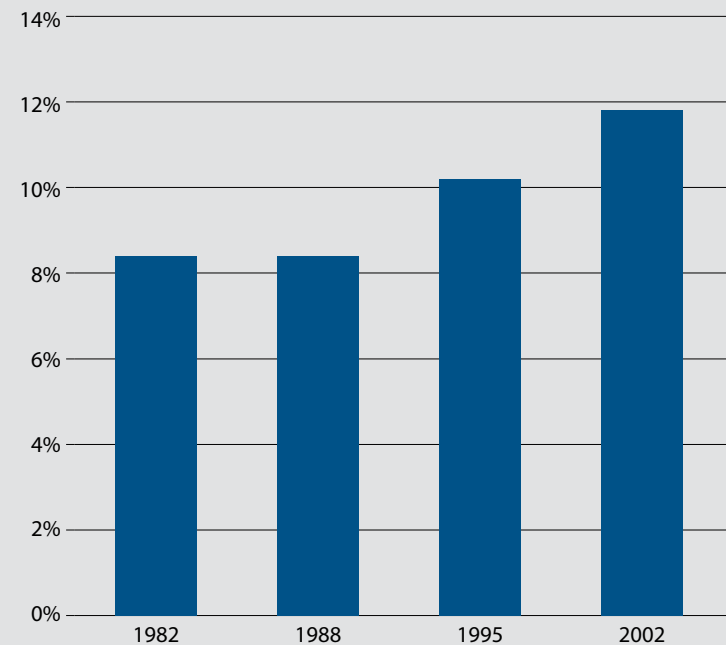


More women experience fertility problems

More women are experiencing impaired fecundity, defined as difficulty or inability to conceive. This graph demonstrates the trend over a 20-year period. A leading cause of female infertility is endometriosis, which has been linked to chemical exposures. An estimated 3 to 10 percent of women have endometriosis, a disease in which tissue that lines the uterus also grows outside the uterus. Of these women, 30 to 40 percent are infertile.

Source: Anjani Chandra and Elizabeth Hervey Stephen, "Impaired Fecundity in the United States: 1982–1995," *Family Planning Perspectives* 30 (1) (1998): 34–42; Chandra, et al., "Fertility, Family Planning, and Reproductive Health of U.S. Women: Data from the 2002 National Survey of Family Growth," *National Center for Health Statistics, Vital Health Stat* 23 (25) (2005).

Percentage of all women with impaired fecundity for selected years, 1982–2002

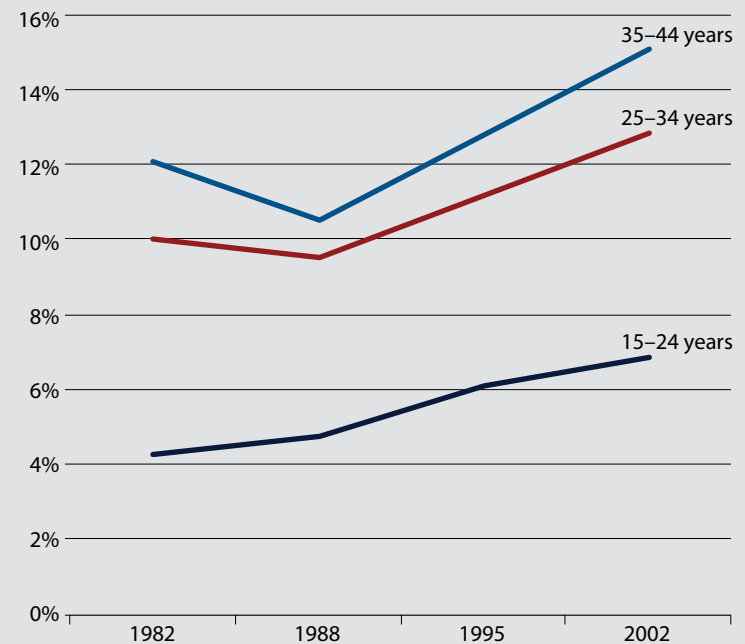


Fertility problems are rising across age groups

Women today are having children later in life; the mean age for childbirth increased from 25 in 1980 to 27 in 2006. This trend is often cited as the reason for declining female fertility. Yet more women report experiencing impaired fecundity regardless of age. From 1982–2002, women under 25 and women between 25 and 34 reported an increasing number of fertility problems.

Source: Anjani Chandra and Elizabeth Hervey Stephen, "Impaired Fecundity in the United States: 1982–1995," *Family Planning Perspectives*, 30 (1) (1998): 34–42; Chandra, et al., "Fertility, Family planning, and Reproductive Health of U.S. women: Data from the 2002 National Survey of Family Growth," National Center for Health Statistics, *Vital Health Stat* 23(25) (2005).

Trends in the percentage of women (15–44 years) with impaired fecundity by age group, 1982–2002



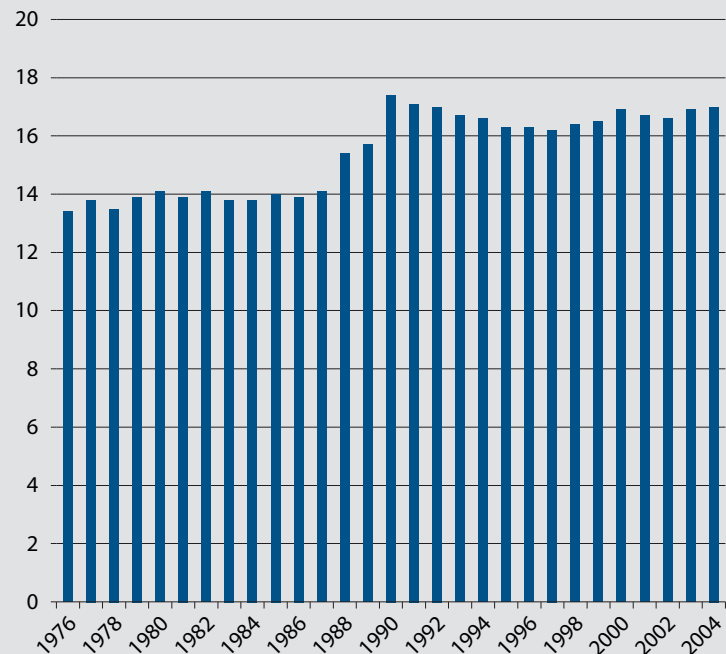
Miscarriages and stillbirths are up

The number of miscarriages and stillbirths have increased notably since the 1970s and 80s, according to [survey data collected by the National Center for Health Statistics](#). This chart shows the rate per 1,000 women aged 15–44 years who experienced spontaneous fetal losses from recognized pregnancies of all gestational periods. Miscarriages and stillbirths jumped above 16 per 1,000 pregnancies in the 1990s and 2000s, compared to 14 per 1,000 during the 1980s.

Source: Stephanie J. Ventura et al., "Estimated Pregnancy Rates by Outcome for the United States, 1990–2004," National Center for Health Statistics, *National Vital Statistics Reports* 56 (15) (April 14, 2008); Stephanie J. Ventura et al., "Trends in Pregnancies and Pregnancy Rates by Outcome: Estimates for the United States, 1976–96," National Center for Health Statistics, *Vital and Health Statistics* 21 (56) (January 2000).

Trends in the fetal loss rate, 1976–2004

Rate per 1,000



II. More premature births and infants with low birth weight

More infants are born prematurely and with low birth weights than ever before. The data in the following slides show:

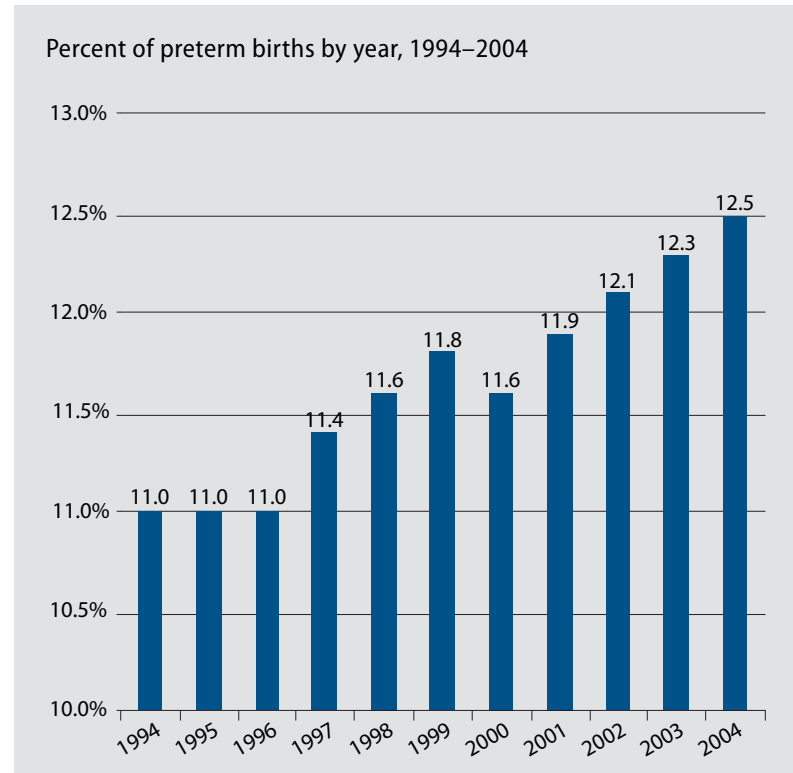
- Premature births have increased significantly since the mid-1990s.
- Premature births are rising among whites and Hispanics but remain highest among African Americans.
- The number of infants born with low birth weight increased almost 1 percent in just 10 years from 1994 to 2004.
- Low and very low birth weights are rising among all racial and ethnic groups, but are rising faster and remain significantly higher among African Americans.

It is still unclear whether chemical exposures are contributing to this rise in premature births and infants born with low birth weight, but recent research suggests this is a possibility.

Premature births are up significantly

This chart shows a significant increase in the percentage of births that are premature, from 11 percent in 1994 to 12.5 percent in 2004.

Source: National Center for Health Statistics, final natality data, 1990–1994, and period-linked birth/infant death data, 1995–present; March of Dimes, Peristats, “Perinatal Data Snapshots: United States Maternal and Infant Health Overview” (April 2007).

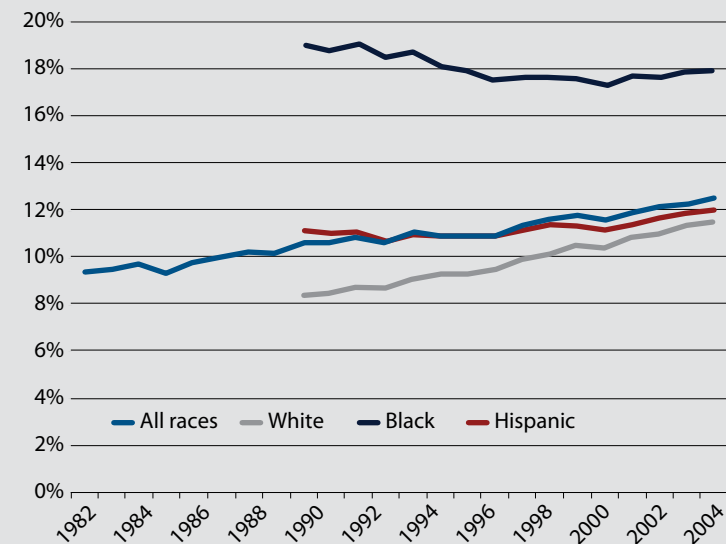


Premature births are rising for whites and Hispanics, but are more common for African Americans

Black communities are more commonly urban and lower income, and thus generally have higher exposure rates to dangerous chemicals. It is unclear whether this contributes to the discrepancy shown here. Other factors, such as differences in nutrition and health care, may also be part of the story.

Source: T.J. Mathews and Marian F. MacDorman, "Infant Mortality Statistics from the 2003 Period Linked Birth/Infant Death Data Set," *National Vital Statistics Reports* 54 (16) (May 2006); Robert L. Goldenberg and Dwight J. Rouse, "Prevention of Premature Birth," *New England Journal of Medicine* 339 (5) (1998): 313–20; Bernard Weiss and David C. Bellinger, "Social Ecology of Children's Vulnerability to Environmental Pollutants," *Environmental Health Perspectives* 114 (10) (2006):1479–85.

Trends in preterm birth percentage by race/ethnicity, 1981–2004



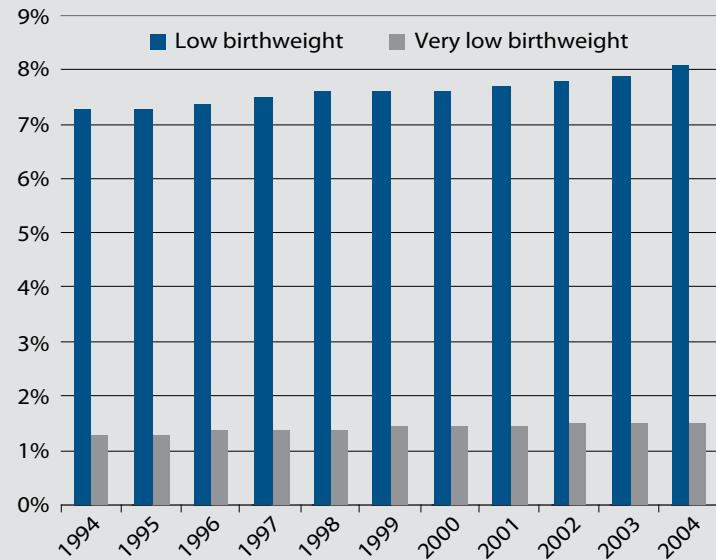
More infants are born with low birth weight

The number of infants born with low birth weight (under 6.6 lbs) increased almost 1 percent in just 10 years from 1994 to 2004. Very low birth weights (under 3 lbs, 4 oz) also increased.

Source: National Center for Health Statistics, final natality data; National Center for Health Statistics, final mortality data, 1990–1994, and period-linked birth/infant death data, 1995–present; March of Dimes, Peristats, “Perinatal Data Snapshots: United States Maternal and Infant Health Overview” (April 2007).

Percentage of infants born with low or very low birth weight from 1994–2004 in the United States

Percentage of births



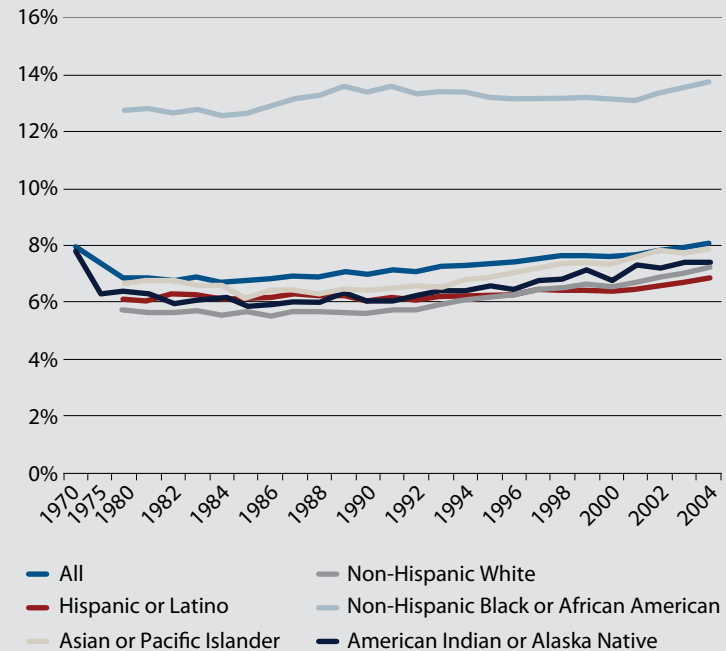
Black infants are more commonly born with low birth weight

Low birth weight (under 6.6 lbs) is rising among all groups, but is still significantly higher for African Americans.

Source: National Center for Health Statistics, National Vital Statistics System, Birth File; Centers for Disease Control and Prevention, Pediatric and Pregnancy Nutrition Surveillance System.

Trends in low birth weight by race/ethnicity, 1970–2004

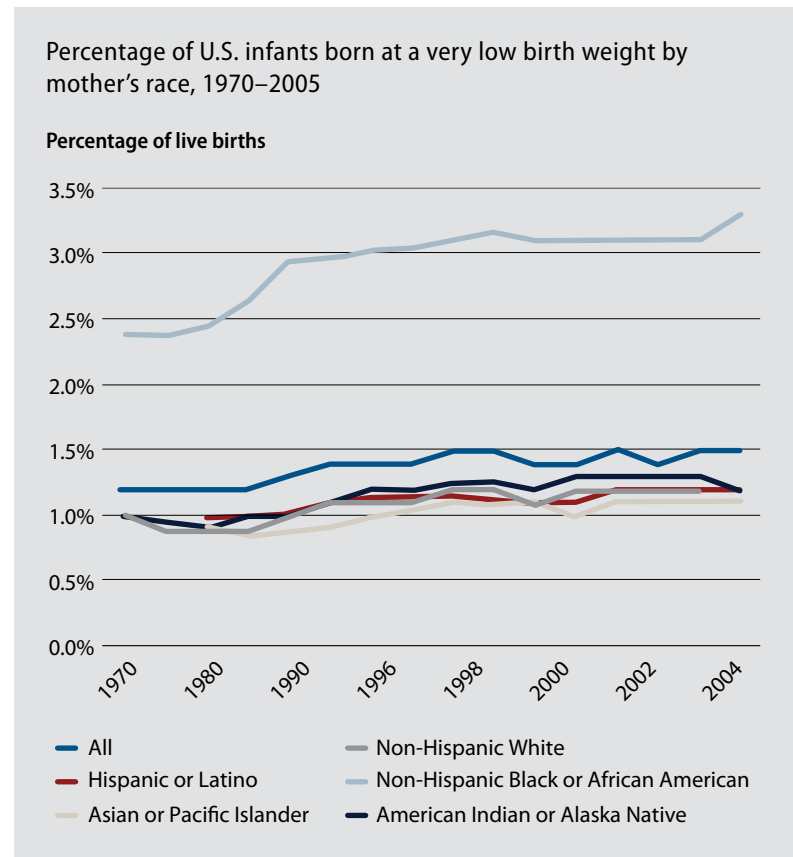
Percentage of births



More black infants are born with very low birth weight

African Americans have also seen a far steeper rise in very low birth weight (under 3 lbs, 4 oz) than other groups.

Source: National Center for Health Statistics, National Vital Statistics Reports, "Births: Preliminary data for 2005" Vol. 55, Table 4.



III. More birth defects and disabilities

Birth defects and disabilities are on the rise. The data in the following slides show:

- Cases of hypospadias, in which the male urethra does not develop properly, have doubled since the 1970s.
- Gastroschisis, a rare malformation in which the fetal intestines protrude through the stomach wall, has steadily increased over the last two decades.
- The percentage of U.S. students treated for a learning disability has increased from 8.3 percent in 1976 to 13.8 percent in 2005.
- Reported cases of autism have increased 10-fold since the early 1990s.

Chemical exposures have been linked to birth defects, including hypospadias and gastroschisis, as well as learning disabilities. A recent study also found a higher incidence of autism among children who live in homes with vinyl floors, which contain phthalates, one of the chemical groups profiled in Part II of this presentation. Research in this area is limited, however, and the connection between chemical exposures and autism remains unclear.

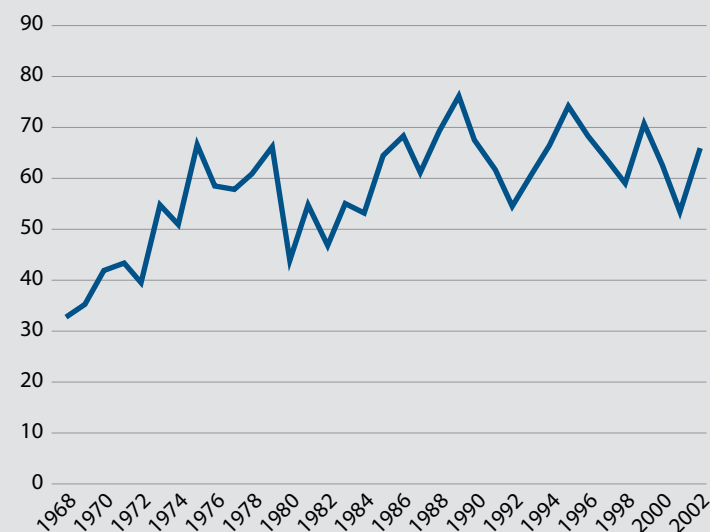
More cases of hypospadias

Birth defects are on the rise. One example is hypospadias, a condition in which the male urethra does not develop properly in the womb, resulting in the opening being located on the underside of the penis or occasionally in the perineum. Hypospadias is estimated to have doubled since the 1970s, and now occurs in 1 of every 125 live male births in the United States. This chart shows rising levels of hypospadias in Atlanta.

Source: Centers for Disease Control and Prevention, National Center on Birth Defects and Developmental Disabilities, "Temporal and Spatial Variations in Birth Defects in Atlanta" (March, 2004); Laurence S. Baskin, et al., "Hypospadias and Endocrine Disruption: Is There a Connection?" *Environmental Health Perspectives* 109 (11) (November 2001): A542–A543.

Prevalence of hypospadias in Atlanta

Prevalence per 10,000 births



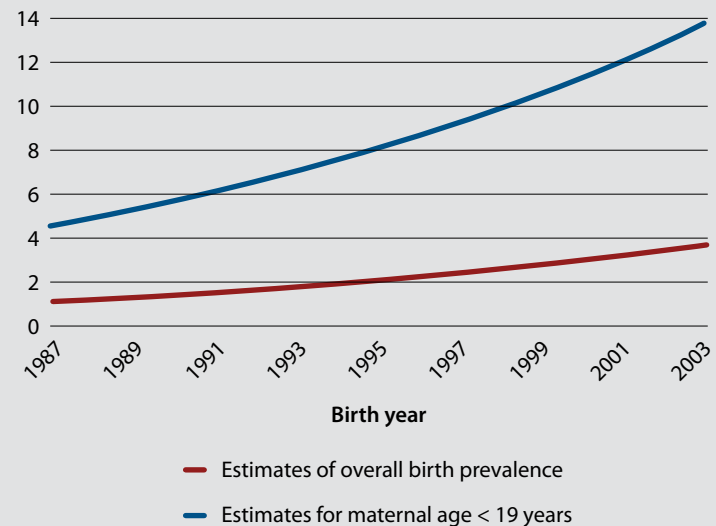
More cases of gastroschisis

Another birth defect on the rise is gastroschisis, a rare malformation in which the fetal intestines protrude through the stomach wall and are externally visible. This graph shows a significant rise of gastroschisis in California over a 16-year period. The estimates are based on a regression model that controlled birth prevalence in California for maternal age and ethnicity, as well as paternal age. Mothers younger than 19 are at greater risk of having babies with gastroschisis.

Source: Lan T. Vu, Kerilyn K. Nobuhara, Cecile Laurent, and Gary M. Shaw, "Increasing Prevalence of Gastroschisis: Population-Based Study in California," *The Journal of Pediatrics* (February 2008).

Prevalence of gastroschisis in California, 1987–2003

Number of cases per 10,000 births



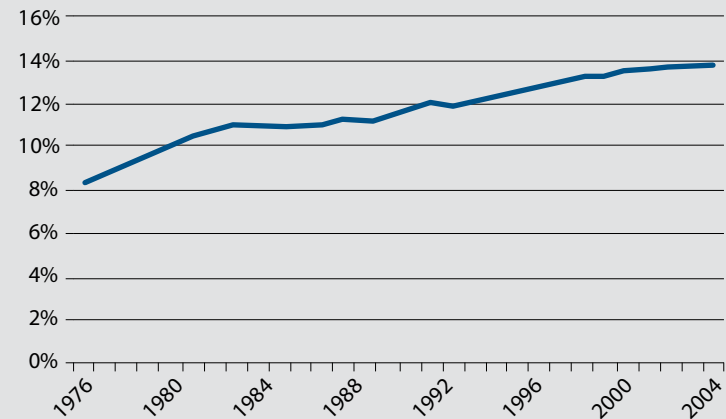
More children are treated for learning disabilities

The percent of U.S. students treated for a learning disability increased from 8.3 percent in 1976 to 13.8 percent in 2005. Improved and more uniform diagnostic criteria are thought to account for some, but not all, of the difference.

Source: Office of Special Education and Rehabilitative Services, Office of Special Education Programs, [Data Analysis System](#) (U.S. Department of Education, 1976–2005); Greater Boston Physicians for Social Responsibility, “[In Harm’s Way](#)” (2001).

Total school enrollment treated under the Individuals with Disabilities Education Act, 1976–2004

Percent of students



More cases of autism

Reported cases of autism spectrum disorders have increased 10-fold since the early 1990s.

Source: Michael Szpir, "Tracing the Origins of Autism", *Environmental Health Perspectives* 114 (7) (July 2006): A412–A419.

Reported cases of autism spectrum disorders in the United States and outlying areas, 1992–2003

Cases

