

- Consequences of Childhood Mental Health Disorders
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NATIONAL BUREAU OF ECONOMIC RESEARCH

## BULLETIN ON AGING AND HEALTH

### Consequences of Childhood Mental Health Disorders

In recent years, there has been increasing recognition of the prevalence of childhood mental health disorders. One well-regarded study found that one in five children and adolescents in the U.S. exhibit some functional impairment from a mental or behavioral disorder, with one in nine experiencing significant impairment and one in twenty experiencing extreme impairment.

Despite the fact that millions of children in the U.S. suffer from mental health problems, relatively little is known about the long-term effects of childhood mental disorders. In “**Mental Health in Childhood and Human Capital**” (NBER Working Paper 13217), researchers **Janet Currie** and **Mark Stabile** examine the relationship between several common mental health conditions and future educational outcomes.

The authors use data from two large data sets, the American National Longitudinal Survey of Youth and the Canadian National Longitudinal Survey of Children and Youth. The comparison between the U.S. and Canada is of interest since children from the two countries would be expected to have a similar underlying propensity for mental disorders, yet reported prevalence and treatment rates for mental disorders are much lower in Canada.

The authors focus on several of the most common mental disorders, including Attention Deficit Hyperactivity Disorder (ADHD), depression and anxiety, and aggression. They examine a set of outcomes designed to capture the child’s human capital accumulation, including grade repetition (a predictor of eventual school attainment), math and reading scores, enrollment in special education, and young adult delinquency.

This study offers several innovations relative to the existing literature. First, the authors

use “screener” questions asked of all children in the survey to identify mental disorders rather than relying on diagnosed cases. The latter approach is problematic because mental illness may be over-diagnosed or under-diagnosed relative to its true prevalence, creating the potential for bias in the estimation. Screener questionnaires are routinely administered to parents of troubled children as the first step in evaluating their child’s mental health, so a high score on a screener questionnaire is a good indication of the existence of a mental disorder. The authors use the screener questions to determine a hyperactivity score, an emotional behavior score, and an aggressive behavior score, as well as a measure of overall behavioral problems.

Second, while past studies have found that children who have mental disorders have worse outcomes, this association may reflect other problems suffered by these children. For example, prenatal exposure to alcohol, tobacco, or drugs is a known risk factor for childhood mental health disorders. Thus, the correlation between mental disorders and child outcomes could be capturing the long-term effects of prenatal factors rather than the effect of mental disorders per se. To address this, the authors focus on sibling comparisons, a strategy which allows them to control for omitted factors that are common to all children within a family.

Turning to the results, the authors find that children with higher hyperactivity scores have worse academic outcomes. A one-unit change in the hyperactivity score (where the average score is 5 and the maximum score is 16) increases the probability of grade repetition by about 1 percentage point, or roughly 10 percent relative to the mean. A one-unit change in the score also lowers math and reading scores by about 5 percent of a standard deviation and

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raises the probability of being enrolled in special education by about 1 percentage point or 15 percent. Interestingly, there is no significant effect of hyperactivity on delinquency.

Aggression and emotional problems have adverse effects on child outcomes as well, though they are not as large. A higher aggression score raises the probability of delinquency and grade repetition and lowers math and reading scores. A higher depression score raises the probability of grade repetition but has no significant effect on test scores, suggesting that cognitive impairment is not the primary mechanism for the grade repetition effect.

Where they can be compared, the results are quite similar in the U.S. and Canada. The effects of mental health problems are large relative to that of family income, which is known to be an important predictor of child outcomes. They are also large relative to the effect of chronic physical health problems.

The results raise an interesting question about why early childhood mental health problems affect educational outcomes—is it

simply because they predict later mental health problems, or do they have an independent effect? The authors find that for grade repetition and special education, early mental health problems matter mostly because they predict later mental health problems. However, in the case of test scores, these problems have an independent effect. This could be because even

temporary childhood mental health problems affect test scores, or alternatively, because earlier onset of a mental health problem is associated with a more adverse effect.

Perhaps surprisingly, the authors find little evidence that income protects against the negative effects of mental health problems. They suggest that this may be because treat-

ment for childhood mental health problem is still a relatively new phenomenon, making it difficult for even wealthy parents to identify and purchase effective care.

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## How Investment Options Affect Portfolio Choice in Individual Accounts

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More than two dozen countries around the world now have individual accounts as part of their public pension systems. While such accounts are not currently part of the U.S. Social Security system, many prominent policy makers and academics have proposed introducing an individual account component to the system. Moreover, millions of U.S. workers already have individual accounts in their employer-sponsored pension plans, as defined contribution or 401(k)-style plans have increasingly come to replace traditional defined benefit plans.

A key issue in designing individual accounts is determining what menu of investment choices to offer to participants. Standard portfolio theory suggests that it sufficient to offer just two options—the “market portfolio”, an asset that incorporates all available assets in proportion to their importance in the market, and a risk-free asset—and allow investors to select the combination of these that matches their risk preferences. In reality, participants face a more complex menu of options. Employer-sponsored pension plans in the U.S. typically offer options from several asset classes, such as domestic equity, international, bond, and balanced funds, and often offer multiple funds within each asset class. In other cases, the menu is even more complex—in the Swedish social security system, account holders can choose from over 650 funds.

In “**Individual Account Investment Options and Portfolio Choice: Behavioral Lessons from 401(k) Plans**,” (NBER Working Paper 13169) researchers **Jeffrey Brown, Nellie Liang, and Scott Weisbender** explore whether the mix of investment options available in an individual account plan affects participants’ portfolio choices.

One challenge in examining this question is that the investment preferences of workers may differ across firms. If preferences are correlated with fund options—for example, because workers with a high risk tolerance ask

their firm to offer more equity funds – this will introduce bias into the estimation. Previous studies have typically used data on a cross-section of firms in a single year, making it difficult to control for firm-specific differences in worker preferences.

The authors overcome this challenge by constructing a firm-level panel data set on pension fund options and contributions during the 1990s, using firms’ 11-k filings with the Securities and Exchange Commission. By having repeated observations on firms, the authors can control for differences in investment preferences of workers across firms and over time, essentially using within-firm changes over time to identify the effect of fund options on portfolio choice.

The authors first report on fund options and contributions in their sample. The typical firm offers 7 or 8 funds—one company stock (all firms who make 11-k filings offer company stock), three domestic equity, one international equity, two bond, and one balanced fund. Most firms offer between 4 and 12 funds. The allocation of fund offerings and contributions varies across firms. While the typical firm has 38 percent of its fund offerings and 45 percent of its contributions in domestic equity, these figures can be as low as 20 percent at the 10<sup>th</sup> percentile and as high as 56 percent (for offerings) or 68 percent (for contributions) at the 90<sup>th</sup> percentile.

The central question examined by the authors is how portfolio allocation changes as fund options change. If participants follow an optimal portfolio strategy or a fixed allocation rule such as a 60/40 stock/bond mix, then increasing fund options, for example by offering a new domestic equity fund, should not have much of an effect on portfolio allocation. If, by contrast, participants follow a “naïve” diversification strategy of allocating their assets evenly across all funds or randomly allocate all assets to a single fund, then increasing the share of equity funds among the firms’ offerings will

increase the share of the portfolio invested in equity.

The authors find that the mix of investment options has a strong effect on portfolio allocation. For example, suppose that a firm offering 3 stock and 2 bond funds adds a new stock fund, raising the share of its fund offerings in domestic equity by 6.7 percentage points (from 3/5 to 4/6). This change is estimated to raise the share of the participant’s portfolio that is invested in domestic equity by 3 percentage points. The response to an increase in bond or balanced funds is similar, while the response to an increase in international equity or company stock funds is smaller but also significant.

The magnitude of these effects is smaller than what would occur if all participants engaged in naïve diversification, but larger than what would occur if all participants followed an optimal strategy or fixed allocation rule. The authors also find that unobservable firm-specific factors are an important determinant of how assets are allocated, especially for company stock, since the results including these controls (discussed above) and excluding them differ substantially.

To explore the implications of these findings, the authors examine how fund offerings have changed in recent years. Between 1998 and 2002, the typical plan added four funds to its offerings, with two-thirds of the growth coming in actively-managed equity funds and only 8 percent in stock index funds like the S&P 500. As documented in other literature, actively managed funds charge substantially higher annual fees than do index funds, without earning higher after-expense returns on average (and perhaps perform no better before expenses). This raises the concern that an increase in fund offerings may result in more money being allocated to high-cost funds that will on average yield lower net returns. A simple calculation by the authors shows that a 0.35 percent difference in annual

returns can result in a non-trivial 7.5 percent difference in wealth at retirement, due to the power of compounding.

The authors conclude that their study “strongly suggests that average participants are not optimally allocating their portfolios

according to standard finance theory predictions, but instead are following naive strategies that subject them to ‘manipulation’ by non-binding changes in the number and mix of investment options. A key policy implication is that the number and mix of investment

options will have an important effect on overall asset allocation in the individual accounts.”

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## Diabetes and Socioeconomic Status

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The prevalence of diagnosed diabetes has risen dramatically in the U.S. over the past several decades, from less than one percent of the population in 1958 to seven percent today. Diabetes can result in serious health problems, including heart and kidney disease, poor circulation requiring the amputation of limbs, vision problems including blindness, and premature death. According to one study, the health care costs associated with diabetes are \$92 million per year.

While the high costs of diabetes have led to more interest in the disease in recent years, many questions remain. Is the true incidence of diabetes rising rapidly, or is it simply that more cases are now being diagnosed? Since the landmark Whitehall Study of the late 1960s, researchers have been aware of disparities in health outcomes by socioeconomic status (SES). In the case of diabetes, are there significant differences in disease onset, diagnosis, and treatment by race or education group?

In “**Diabetes and the Rise of the SES Health Gradient**,” (NBER Working Paper 12905), researcher **James P. Smith** of the Rand Corporation examines trends in diagnosed and actual diabetes over a twenty-five year period.

The author uses several waves of the National Health and Nutrition Examination Survey (NHANES), covering the periods 1976–80, 1988–94, and 1999–2002. This data set combines information obtained through personal interviews, physical examinations, and lab tests. This information allows the author to identify both diagnosed and undiagnosed cases of diabetes and to determine whether the disease is being successfully managed. The analysis focuses on men, since gestational diabetes, which is an important component of diabetes for women, is not treated consistently over time in the data.

The author finds that the prevalence of diagnosed diabetes among adult men has more than doubled over the past twenty-five years, from 3 percent of the population in the late 1970s to 7 percent today. The prevalence

of actual diabetes (including both diagnosed and undiagnosed cases) has also risen, though less dramatically—from 6 percent of the population to 9 percent today, a fifty percent increase. The difference in these two trends is explained by improvements in diabetes detection over time—today, only one in five cases is undiagnosed, down from one in two in the late 1970s.

Compared to whites, African-American men and Hispanic men are about one-third more likely to have both diagnosed diabetes (8.4 and 8.5 percent of the population, respectively, versus 6.3 percent for whites) and actual diabetes (11.1 and 10.8 percent, versus 8.0 for whites), according to the most recent survey.

Comparing prevalence by education group, the author finds that high school dropouts are roughly sixty percent more likely to have diagnosed diabetes and twice as likely to have actual diabetes as men who have attended college. The improvement in diabetes detection over the past twenty-five years has been larger for college-educated men (from 50 percent of cases undiagnosed to 16 percent) than for high school dropouts (from 49 percent to 31 percent).

Do differences in diabetes rates by race and education reflect a causal effect of these factors on health, or are they picking up the effect of other variables that happen to be correlated with these factors? To explore this, the author estimates probit models of disease prevalence, which show the effect of each factor holding the others constant. He finds that being Hispanic or African-American raises the risk of diabetes. Higher education lowers the risk of diabetes, with a more consistent and larger impact on actual diabetes than on diagnosed diabetes.

This analysis yields some other interesting results. Having a diabetic parent raises the risk of diabetes, though it is indeterminate given the data whether this is due to genetic factors or a shared family social and environmental background. Being overweight raises the risk of diabetes, particularly for those who

are morbidly obese (body mass index in excess of 40). The risk of diabetes increases with age, declines with physical activity, and is not affected by smoking.

Smith also examined the determinants of diabetes detection and treatment. He finds that over time, race has become less important while education has become more important in both the detection and successful management of diabetes. He suggests that education may increase patients’ ability to adopt and adhere to complex new diabetes treatments. These treatments often require careful patient self-management on a daily basis—for example, patients must monitor their blood glucose levels, balance insulin injection doses with food intake and physical activity, and consult regularly with health care providers.

Finally, the author explores which factors are responsible for the rise in actual diabetes prevalence over time. The rise in obesity is the most important factor, accounting for an estimated 2.2 percentage point increase. An increase in the number of people with a diabetic parent led to an additional 1.4 point increase. Changing demographics, such as a rise in the Hispanic population, led to a 0.2 point increase. Rising education lowered diabetes prevalence by 1.2 percentage points. Altogether, changes in these factors are predicted to have caused a 2.5 point increase in diabetes prevalence, accounting for over 80 percent of the actual change in diabetes prevalence over the period.

Smith concludes: “Those in lower education groups face a triple threat with diabetes. First, at least in more recent years, they are of slightly higher risk in contracting the disease. Second, they remain at considerably greater risk of having their diabetes undiagnosed and presumably untreated. Third, even after diagnosis, they have considerably more difficulty in successful self-management of the disease using the complex but effective treatments necessary to diminish the negative health consequences associated with diabetes.”

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## NBER Profile: *Angus Deaton*

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Angus Deaton is a Research Associate at the NBER. He is affiliated with the NBER's programs on Aging, Health Care, Public Economics, Education, Children, and Economic Fluctuations and Growth.

Deaton is the Dwight D. Eisenhower Professor of International Affairs and Professor of Economics and International Affairs at the Woodrow Wilson School of Public and International Affairs and the Economics Department at Princeton University. He has previously taught at the University of Bristol and Cambridge University.

Deaton is a Fellow of the American Academy of Arts and Sciences, the British Academy, and the Econometric Society. He was the first recipient of the Econometric Society's Frisch Medal in 1978 and has served as Editor of *Econometrica*. He has served as Vice-President and an Executive Committee Member of the American Economic Association; he is currently

standing for election to President-Elect. He has been a member of several scientific panels for the National Academy of Sciences and a member of the Board of Overseers for the Panel Study of Income Dynamics.

Professor Deaton's current research focuses on the determinants of health in rich and poor countries, as well as on the measurement of poverty in India and around the world. He has a long-standing interest in the analysis of household surveys.

He received a B.A., M.A., and Ph.D. from Cambridge University and has received honorary degrees from the University of Rome, Tor Vergata, and from University College, London.

He is married to NBER research associate Anne Case, and they like to spend time together at the Metropolitan Opera in New York and on the trout rivers of Montana.



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## Economic Causes and Consequences of Population Aging: A Special Issue of Proceedings of the National Academy of Sciences

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The papers from the NBER conference "Economic Causes and Consequences of Population Aging" held November 17–18, 2006 in honor of Robert W. Fogel's 80<sup>th</sup> birthday have been published as a special issue in the *Proceedings of the National Academy of Sciences (PNAS)*. Robert W. Fogel is an NBER research associate and the Charles R. Walgreen Distinguished Service Professor of American Institutions at the University of Chicago Graduate School of Business. He received the Nobel Prize in economics in 1993 for his applications of economic theory and quantitative methods to explain economic and institutional change. As discussed in the introduction to the special issue, Robert Fogel's recent work has focused on understanding long-run changes in the physiology of aging in the United States.

The six PNAS papers examine the relationship between health and economic growth, the importance of early life fac-

tors to healthy aging, the impact of socioeconomic status on health, and how to finance retirement for a growing elderly population without imposing too many burdens on the young. James Poterba, Steven Venti, and David Wise investigate how the changes in types of pension plans in demographic structure will affect the wealth of future retirees, arguing that the continuation of pension plan shifts away from traditional defined benefit plans to 401(k) plans will lead to large increases in retirement wealth even if rates of return on financial assets are below their historical pattern. James Smith examines the relationship between socioeconomic status and health for the specific case of diabetes, showing that as treatments have become more complex, the more educated have become relatively more successful than the less educated in managing diabetes. James Heckman stresses that non-cognitive abilities such as persistence, motivation, self-control, risk aversion, and

willingness to delay gratification determine later educational outcomes because they make investments in education easier. While income by itself plays some role in explaining socioeconomic disparities the effects of income are often weak. Angus Deaton examines heights, childhood mortality, and income in 43 developing countries and argues that there is no clear cut relationship between height and income across countries. David Cutler, Grant Miller, and Douglas Norton's study of differential income declines across US states during the Great Depression and Dust Bowl experienced *in utero* on health at older ages finds no effects. Dora Costa, Lorens Helmchen, and Sven Wilson argue that public health may explain some of the trends in black-white health differentials. They find that older black men circa 1910 had very high rates of arteriosclerosis relative to whites and trace their poorer health status at ages 60–74 to their greater life-long incidence of infectious disease.

## Abstracts of Selected Recent NBER Working Papers

### WP 12954

**Sara Bleich, David Cutler, Christopher Murray, Alyce Adams**

#### **Why Is the Developed World Obese?**

Obesity has risen dramatically in the past few decades. However, the relative contribution of energy intake and energy expenditure to rising obesity is not known. Moreover, the extent to which social and economic factors tip the energy balance is not well understood. In this longitudinal analysis of developed countries, we estimate the relative contribution of increased caloric intake and reduced physical activity to obesity using two methods of energy accounting. Results show that rising obesity is primarily the result of consuming more calories. We estimate multivariate regression models and use simulation analysis to explore technological and sociodemographic determinants of this dietary excess. Results indicate that the increase in caloric intake is associated with technological innovations such as reduced food prices as well as changing sociodemographic factors such as increased urbanization and increased female labor force participation. The study findings offer useful insights to future research concerned with the etiology of obesity and may help inform the development of obesity-related policy. In particular, our results suggest that policies to encourage less caloric intake may help reverse past trends in increased consumption.

### WP 12958

**Alan Gustman, Thomas Steinmeier**  
**Projecting Behavioral Responses to the Next Generation of Retirement Policies**

This paper examines retirement and related behavioral responses to policies that on average are actuarially neutral. Many conventional models predict that actuarially neutral policies will not affect retirement behavior. In contrast, our model allows those with high time preference rates to find that the promise of an actuarially fair increase in future rewards does not

balance the loss from foregone current benefits. Using data from the Health and Retirement Study, we find that from age 62 through full retirement age, the earnings test reduces full-time work by married men by about four percentage points, or by about ten percent of married men at full-time work. Abolishing the requirements on many jobs that an individual work full-time or not at all, what we term a minimum hours constraint on employment, would induce more than twice as many people to enter partial retirement as would leave full-time work, so that total full-time equivalent (FTE) employment would increase, although by a modest amount. If all benefits from personal accounts could be taken as a lump sum, the fraction not retired at age 62 would fall by about 5 percentage points compared to a system where there is mandatory annuitization of benefits.

### WP 12981

**Jonathan Skinner**  
**Are You Sure You're Saving Enough for Retirement?**

Many observers believe current aging baby boomers are woefully unprepared for retirement. Others raise the prospect that Americans are saving too much for retirement. This paper attempts to reconcile these contrasting views using a simple life cycle model and a more sophisticated retirement program, ESPlanner, with special reference to retirement prospects for economists. I find most households with postgraduate degrees fall short of the wealth needed to smooth spending through retirement. Of course, there are ways to economize during retirement: stepping up household production (cooking at home rather than eating out), selling one's house, or maintaining the modest individual consumption levels from when children still roamed the house. But ultimately, I argue these laudable strategies to reduce retirement expenses will be dwarfed by rapidly growing out-of-pocket medical expenses. The combina-

tion of eroding retiree health benefits and the risk of catastrophic future out-of-pocket health spending suggests that even conventional retirement planning recommendations could be too low.

### WP 12987

**Alix Peterson Zwane, Michael Kremer**  
**What Works in Fighting Diarrheal Diseases in Developing Countries? A Critical Review**

The Millennium Development Goals call for reducing by half the proportion of people without sustainable access to safe drinking water. This goal was adopted in large part because clean water was seen as critical to fighting diarrheal disease, which kills 2 million children annually. There is compelling evidence that provision of piped water and sanitation can substantially reduce child mortality. However, in dispersed rural settlements, providing complete piped water and sanitation infrastructure to households is expensive. Many poor countries have therefore focused instead on providing community-level water infrastructure, such as wells. Various traditional child health interventions have been shown to be effective in fighting diarrhea. Among environmental interventions, handwashing and point-of-use water treatment both reduce diarrhea, although more needs to be learned about ways to encourage households to take up these behavior changes. In contrast, there is little evidence that providing community-level rural water infrastructure substantially reduces diarrheal disease or that this infrastructure can be effectively maintained. Investments in communal water infrastructure short of piped water may serve other needs and may reduce diarrhea in particular circumstances, but the case for prioritizing communal infrastructure provision needs to be made rather than assumed.

### WP 13045

**Melissa Kearney, Phillip Levine**

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## Subsidized Contraception, Fertility, and Sexual Behavior

This paper examines the impact of recent state-level Medicaid policy changes that expanded eligibility for family planning services to higher income women and to Medicaid clients whose benefits would expire otherwise. We begin by establishing that the income-based policy change led to a substantial increase in the number of program recipients. We then examine Vital Statistics birth data from 1990 to 2003 and determine that it also reduced overall births to non-teens by about two percent and to teens by over four percent. Our estimates suggest a nearly nine percent reduction in births to women age 20–44 made eligible by the policy change. We supplement our state-level analysis with an investigation of individual-level data from the 1988, 1995, and 2002 National Surveys of Family Growth (NSFG) to examine the impact of these policies on sexual behavior and contraceptive use. Evidence from this analysis suggests that the reduction in fertility associated with raising income thresholds for eligibility was accomplished via greater use of contraception. Our calculations indicate that allowing higher income women to receive federally-funded family planning cost on the order of \$6,800 for each averted birth.

### WP 13083

**James Poterba, Steven Venti, and David Wise**

#### New Estimates of the Future Path of 401(k) Assets

Over the past two and a half decades there has been a fundamental change in saving for retirement in the United States, with a rapid shift from employer-managed defined benefit pen-

sions to defined contribution saving plans that are largely controlled by employees. To understand how this change will affect the well-being of future retirees, we project the future growth of assets in self-directed personal retirement plans. We project the 401(k) assets at age 65 for cohorts attaining age 65 between 2000 and 2040. We also project the total value of assets in 401(k) accounts in each year through 2040 and we project the value of 401(k) assets as a percent of GDP over this period. We conclude that cohorts that attain age 65 in future decades will have accumulated much greater retirement saving (in real dollars) than the retirement saving of current retirees.

### WP 13133

#### Christopher Carpenter How Do Workplace Smoking Laws Work? Quasi-Experimental Evidence from Local Laws in Ontario, Canada

There are very large literatures in public health and economics on the effects of workplace smoking bans, with most studies relying on cross-sectional variation. We provide new quasi-experimental evidence on the effects of workplace bans by using the differential timing of adoption of over 100 very strong local smoking by-laws in Ontario, Canada over the period 1997–2004. We employ restricted-use repeated cross section geocoded outcome data to estimate reduced form models that control for demographic characteristics, year fixed effects, and county fixed effects. We first show that the effects of the local laws on actual workplace smoking policy (i.e. the “first stage”) were not uniform; specifically, local laws were only effective at increasing ban presence among blue collar workers. Among blue collar workers,

adoption of a local by-law significantly reduced the fraction of worksites without any smoking restrictions (i.e. where smoking is allowed anywhere at work) by over half. The differential effect of local policies also improved health outcomes: we find that adoption of a local by-law significantly reduced SHS exposure among blue collar workers by 25–30 percent, and we confirm that workplace smoking laws reduce smoking. We find plausibly smaller and insignificant estimates for white collar and sales/service workers—the vast majority of whom worked in workplaces with privately initiated smoking bans well before local by-laws were adopted. Overall our findings advance the literature by confirming that workplace smoking bans reduce smoking, documenting the underlying mechanisms through which local smoking by-laws improve health outcomes, and showing that the effects of these laws are strongly heterogeneous with respect to occupation.

### WP 13188

#### Michael Baker, Kevin Milligan Maternal Employment, Breastfeeding, and Health: Evidence from Maternity Leave Mandates

Public health agencies around the world have renewed efforts to increase the incidence and duration of breastfeeding. Maternity leave mandates present an economic policy that could help achieve these goals. We study their efficacy focusing on a significant increase in maternity leave mandates in Canada. We find very large increases in mothers’ time away from work post-birth and in the attainment of critical breastfeeding duration thresholds. However, we find little impact on the self-reported indicators of maternal and child health captured in our data.

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