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BULLETIN ON AGING AND HEALTH

Technology Diffusion in Health Care

Health care spending in the U.S. accounts for 16 percent of GDP, a much larger share than in other developed countries. Is this money well spent? On the one hand, several studies have concluded that increases in health care spending over time have yielded dramatic increases in life expectancy. Yet other studies have found that there are marked differences in spending across hospitals and regions and that higher spending is not associated with better outcomes. These latter studies suggest that there are inefficiencies in the U.S. health care system and that the U.S. may be on the “flat of the curve” of the medical production function.

In “**Technology Diffusion and Productivity Growth in Health Care**” (NBER Working Paper 14865), researchers **Jonathan Skinner** and **Douglas Staiger** examine whether differential adoption of new technologies across hospitals can help to explain empirical patterns in health outcomes. The authors draw on macroeconomic models of technology diffusion and productivity, in which small differences in the propensity to adopt technology can lead to wide and persistent productivity differences across countries, or here, hospitals.

The authors focus on the treatment of heart attacks (acute myocardial infarction, or AMI). They examine three specific treatments: aspirin, beta blockers, and the restoration of blood flow to the heart muscles, which may be accomplished with “clot-busting” drugs or surgical angioplasty. All of these treatments are relatively inexpensive, have been shown to

be effective in saving lives, and are administered based on the decision of the physician rather than the patient.

A key variable of interest is the diffusion rate, which measures the rate at which a new technology is applied to eligible patients. In the authors’ model, the rate of diffusion of a given technology at a particular hospital will depend on the length of time the technology has been available and on a “common factor” capturing the hospital’s intensity of search for new innovations in general. The authors use Medicare data on 2.8 million patients who experienced heart attacks from 1986 to 2004 to test the theoretical implications of their model.

The authors’ first key finding is that the diffusion rate for each of the three technologies is strongly correlated with the common factor, suggesting that hospitals that adopt one innovation early are also more likely to adopt other innovations as well. Hospitals with quicker adoption tend to be major teaching hospitals, to have higher patient volume, and to be located in states with higher average income. These hospitals may find it easier to adopt new technologies and place more value on early adoption.

The authors also show that differences in the rate of technology adoption lead to meaningful differences in treatment patterns. The use of beta blockers varies from 65 percent among hospitals in the highest quintile of the common factor (fastest adopting hospitals) to only 31 percent among hospitals in the lowest quintile. Similarly, aspirin use varies from

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The NBER Bulletin on Aging and Health summarizes selected Working Papers recently produced as part of the Bureau’s program of research in aging and health economics. The Bulletin is intended to make preliminary research results available to economists and others for informational purposes and to stimulate discussion of Working Papers before their final publication. The Bulletin is produced by David Wise, Area Director of Health and Aging Programs, and Courtney Coile, Bulletin Editor. To subscribe to the Bulletin, please send a message to: abb@nber.org

90 percent in the highest quintile to 65 percent in the lowest quintile.

Critically, differences in technology adoption also lead to large differences in health outcomes. The authors project that survival rates in the fastest adopting hospitals are 3.3 percentage points higher than in the slowest adopting hospitals, an amount that is equivalent to one-third of the total improvement in survival rates over the past two decades. Interestingly, the authors’ model predicts that there will not be convergence in hospitals’ diffusion rates or survival rates over time, hypotheses that are supported by the data.

Finally, the authors compare the effectiveness of speeding the rate of technology adoption vs. adding more traditional health care inputs for improving survival. They find that a one-standard deviation increase in the diffusion rate

has the same effect as doubling traditional inputs. They also use this framework to reassess the cost-effectiveness of health care for heart attack patients. When they fail to control for technology adoption, the authors estimate that it takes \$355,000 of additional health care spending to generate one year of life saved, suggesting that the U.S. is on or near the "flat of the curve." However, when they include controls for each hospital's technology level, the cost per life-year saved falls to under \$100,000, a more favorable cost-effectiveness ratio. The authors also show that hospitals with faster technology adoption should and do choose lower levels of other health care inputs, because the returns to traditional inputs are lower once technologies like aspirin and beta

blockers have been adopted.

The authors' model of health care productivity can reconcile both the dramatic increases in life expectancy for AMI patients over time and the "flat of the curve" inefficiencies at a given point of time. The authors argue that the dramatic growth in survival over the past several decades was largely due to the diffusion of inexpensive and highly effective treatments, while the apparent point-in-time inefficiencies may result from a failure to control for hospital-specific rates of technology adoption. The authors caution, however, that their estimates are sensitive to the specification of the model and do not necessarily apply for the treatment of diseases other than heart attacks.

The authors conclude by considering

the puzzle of why hospitals and physicians don't adopt new technologies more quickly, particularly a technology like aspirin that is so inexpensive and would appear to require little physician training to implement. They suggest that physicians historically have faced little pressure to change old habits due to the notoriously imperfect nature of health care markets. However, public reporting of technology use by hospitals, as was recently instituted in the case of beta blockers, may help to speed the pace of technology adoption and reduce inefficiencies in the provision of health care.

The authors thank the National Institute on Aging (P01-AG19783) and the Robert Wood Johnson foundation for financial support.

Employer-Sponsored Health Insurance and Health Reform

Employer-sponsored insurance (ESI) plays a central role in the financing of health care in the U.S. Currently, 162 million Americans have ESI, representing over 60 percent of the non-elderly population. ESI dominates the private insurance market, accounting for 90 percent of the market. ESI not only is an important source of insurance coverage for workers and their families, but also affects individuals' employment decisions, including the choice of whether to work, how many hours to work, and what type of job to hold.

In light of the current focus on health reform in the U.S., it is worth examining the "goodness of fit" of ESI in the current economic and health insurance environments and how that might change under various health reforms. This is the subject of a new working paper by researchers **Thomas Buchmueller** and **Alan Monheit**, "**Employer-Sponsored Health Insurance and the Promise of Health Insurance Reform**" (NBER Working Paper 14839).

The authors begin by discussing the history of ESI. While its origins can be traced back to 1929, when a group of Dallas teachers contracted with a hospital to cover inpatient services for a fixed annual premium, the link between employment and private health insurance

was strengthened by three key government decisions in the 1940s and 1950s. First, during World War II the War Labor Board ruled that wage and price controls did not apply to fringe benefits such as health insurance, leading many employers to institute ESI. Second, in the late 1940s the National Labor Relations Board ruled that health insurance and other employee benefit plans were subject to collective bargaining. Third, in 1954 the Internal Revenue Service decreed that health insurance premiums paid by employers were exempt from income taxation.

The authors next discuss salient facts and trends in ESI coverage. ESI coverage is strongly correlated with firm size, with 97 percent of firms with over 100 employees offering coverage vs. 40 percent of firms with fewer than 25 employees. Offer rates have remained fairly steady over the past ten years, increasing in small firms in the late 1990s during a period of robust economic growth before slipping back to 1996 levels. The share of premiums paid by employers has remained constant over time, averaging 85 percent for individual coverage and 75 percent for family coverage. However, due to the rising cost of health care, employee premiums more than doubled in dollar terms over the past decade, from \$1,300 to \$2,900 for family coverage.

The likelihood of being a full-year policyholder of ESI is strongly correlated with demographic characteristics. In 2005, the likelihood of holding ESI coverage was 47 percent for individuals age 44 to 54, vs. 39 percent for individuals age 25 to 34. Individuals with low income or education and Hispanics are much less likely to hold ESI. Thus while there is little evidence that ESI is disappearing, rising health costs are a concern, as are disparities in ESI offer and coverage rates by firm size, age, race and ethnicity, and socioeconomic status.

Next, the authors review the advantages and disadvantages of ESI. Since economists typically assume that workers pay for health benefits through reductions in wages, why do workers choose to purchase insurance through their employers rather than on the individual market? The answer is that there are significant savings associated with ESI. First, there are substantial economies of scale when purchasing insurance through a group. Second, the problem of adverse selection (sicker individuals being more likely to sign up for coverage) is reduced in an employer-sponsored group, since a large group is likely to have something approaching the population average level of risk. Third, the fact that health insurance premiums are not subject to income taxation effec-

tively reduces the price of insurance purchased through the employer.

The authors note that these advantages are bigger at large firms, who experience greater economies of scale, more efficient risk pooling, and tend to have higher-paid employees. These factors may help to explain the higher ESI offer rates at large firms. Large firms also are able to self-insure rather than purchase insurance coverage directly, giving them the opportunity to shape the benefit package to suit their employees' needs and to actively manage costs.

There are also notable disadvantages of ESI. The exemption of insurance premiums from taxation may lead to higher health spending. The benefits from the tax exemption flow disproportionately to high-income workers, who have higher marginal tax rates and more generous plans. The link between employment and insurance coverage may distort employment decisions, such as whether to switch jobs or retire, and does not work well for people who have high rates of job turnover.

The authors focus their discussion

of health reform on strategies in which private insurance remains the dominant mechanism for financing health care. Approaches that include mandates generally do not aim to reduce the role of ESI. Indeed, ESI may play a bigger role under reforms that involve either an employer mandate, such as in Hawaii, or a "pay or play" requirement for employers, such as in the recent Massachusetts reform. As the authors note, the Massachusetts reform "can be seen as a pragmatic response to the strengths and weaknesses of the ESI system," in that it does not alter the incentives leading to the dominance of an ESI system that works fairly well for many families, but includes an individual mandate, which may be more effective at increasing coverage and less likely to create labor market distortions.

Voluntary approaches to health reform often focus on reducing the cost of health insurance directly or indirectly. For example, one recent proposal would replace the tax subsidy currently given to ESI with a refundable tax credit that could be used when purchasing insurance on the individual market. This reform

would ensure that the benefits of the tax subsidy are the same regardless of an individual's income or whether his employer offers ESI (unlike in the current system), but might also lead to an unraveling of the ESI market, creating other inequities such as higher premiums for sicker workers due to adverse selection. Voluntary approaches that promote ESI would not be subject to this concern.

The authors suggest that it is unlikely that health reform will lead to the end of ESI. However, there are four longstanding areas of concern with ESI that warrant further consideration, including its lack of portability, tendency to promote over-consumption of health care, lesser appeal for small firms, and lack of ability to control cost growth. As the authors conclude, "achieving workable solutions to these problems is the key challenge that will confront the ESI system as it strives to maintain its relevance during the likely contentious debate over the nature of health insurance reform."

The authors acknowledge funding from the Robert Wood Johnson Foundation's Economic Research Initiative on the Uninsured.

Social Security and Redistribution

With annual expenditures of over \$600 Billion, Social Security is the largest government program in the U.S. Social Security is also the single largest source of income for the elderly, accounting for 40 percent of all income going to individuals age 65 and above and over 80 percent of income for the poorest quintile of families.

While Social Security is clearly an important source of income for poor families, it is less clear whether the program redistributes income from more well-off to poorer families. Although Social Security has a progressive benefit formula, various features of the program reduce the extent of redistribution in the system.

This question is relevant for the debate over Social Security reform, since most reform proposals intend to maintain Social Security as a progressive program and yet have the potential to alter the extent of redistribution. Knowing

how much redistribution exists in the current system, and which aspects of the program's design influence this, is useful in order for policy makers to assess the distributional effects of any program change.

In "Is Social Security Part of the Social Safety Net?" (NBER Working Paper 15070), researchers **Jeffrey Brown**, **Julia Coronado**, and **Don Fullerton** examine the extent of redistribution in the Social Security system. To do so, the authors build a model that categorizes individuals by their lifetime resources and calculates the taxes they pay and benefits they receive from Social Security. Importantly, the authors use a number of different definitions of income and of redistribution, in order to obtain a more complete understanding of the issue.

The authors use 26 years of data from the Panel Study of Income Dynamics (PSID) to construct complete lifetime earning histories for individuals in their

sample. The use of actual (rather than simulated) data allows the authors to incorporate real events and phenomena, such as spells of unemployment or a correlation between earnings and marital status, which may be important for the analysis.

The authors begin by calculating the lifetime net Social Security tax rate for each individual in their sample. This is the present value of Social Security tax payments minus the present value of Social Security benefits divided by the present value of the individual's lifetime income. They then use this tax rate to calculate three different measures of redistribution. The first is a measure of how the Gini coefficient (a well-known gauge of income inequality) changes when Social Security is included. This is useful for understanding the overall impact of Social Security on inequality. The other measures are the average net tax rate in each quintile of the income distribution

and the fraction of individuals in each quintile that receive positive net transfers from Social Security. The latter two measures are useful for assessing whether the program does indeed benefit those at the bottom of the income distribution.

In addition to the multiple definitions of redistribution, the authors also employ multiple definitions of income. The first is an individual's actual lifetime earnings. The second is an individual's potential lifetime earnings (their earnings if they had worked full-time throughout their adult lives, minus any periods of unemployment). Potential earnings measures the individual's ability to earn, regardless of what he or she actually chooses to do. The third pools the earnings of married couples, since their economic well-being depends on total household resources rather than individual earnings.

The authors have several major findings. First, when a more comprehensive income definition is used (potential or household income), Social Security has

virtually no impact on the overall distribution of lifetime economic resources, as measured by the Gini coefficient. Second, however, as the authors note, "while Social Security is not particularly good at flattening the overall income distribution, it nonetheless is at least mildly successful at transferring resources, on average, to the lifetime poor." Over 85 percent of individuals in the lowest quintile receive positive net transfers from Social Security when the narrowest definition of income is used (individual actual earnings). As the income definition is broadened, this share falls, but some individuals still receive positive transfers.

Third, transfers through the Social Security system are imperfectly targeted; some high-income individuals receive positive net transfers, particularly when income is defined at the household level, and some low-income individuals do not. One reason, for example, is that spousal benefits provide more generous payouts to the spouses of high earners. Finally, the authors examine whether the extent of

redistribution has changed over time and find that the program has become somewhat more progressive on balance, but the direction and extent of the changes depend on the income definition used.

As the authors note, their research suggests several avenues for future work. Their analysis explicitly ignores behavioral responses to Social Security, such as changes in labor supply or savings, which might have an impact on inequality. Second, their analysis does not incorporate the value of Social Security as an insurance program, for example in providing protection against the risk of disability or unexpectedly long life. Despite these limitations, the framework the authors develop could be used to explore the distributional consequences of Social Security reform.

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NBER Profile: John Shoven

John Shoven is a Research Associate of the NBER's programs in aging, public economics, and economic fluctuations and growth. He is the Director of the NBER's West Coast office.

Shoven is the Charles R. Schwab Professor of Economics at Stanford University and the Wallace R. Hawley Director of the Stanford Institute for Economic Policy Research. He is also a Senior Fellow of the Hoover Institution at Stanford. From 1993 until 1998, he served as Dean of Humanities and Sciences at Stanford.

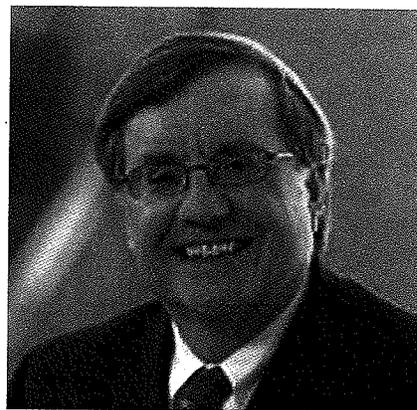
Shoven is a Fellow of the American Academy of Arts and Sciences. He is the author of more than one hundred published articles and the author or editor of more than twenty books, as well as a recipient of the Paul A. Samuelson Certificate for Excellence for Outstanding Scholarly Writing on Lifelong Financial Security. He has testified before Congress numerous times, including appearances before the House Ways and Means Committee, the Senate Finance Committee, and the House Committee on Education and the Workforce. In 1994-96, he was a mem-

ber of the Technical Panel on Trends and Issues in Retirement for the Advisory Council on Social Security. He regularly writes a column in *On Investing*, a Bloomberg magazine.

Shoven is a member of the board of directors of American Century Funds and Exponent, Inc. and is Chairman of the Board of Cadence Design Systems. Each summer for the past twenty-two years, Professor Shoven has run a week-long workshop for high school teachers of economics.

Professor Shoven holds a Ph.D. in Economics from Yale University and a B.A. in physics from the University of California at San Diego.

Professor Shoven's research is in the fields of public finance, corporate finance, and investments, often focusing on private and public sector policy issues within these areas. For example, in the 1990s his work highlighted the need for tax-efficient mutual funds and for reductions in taxes on large pension accumulations and distributions. In 2008, he co-authored a book with former Secretary of Treasury and State George Shultz dealing with



Social Security and health care reform. Professor Shoven's current research interests include economic demography (he is editing an NBER book-in-progress on the subject), the accuracy of the inflation adjustment of Social Security benefits, and the impact of financial market volatility on retirement intentions.

In his spare time, he enjoys gardening, traveling, and getting together with family and friends. He is an avid supporter of Stanford athletics and predicts that the Stanford Cardinal will be going to a football bowl game this fall for the first time in several years.

Abstracts of Selected Recent NBER Working Papers

14759

Jason Abaluck, Jonathan Gruber
Choice Inconsistencies Among the Elderly: Evidence from Plan Choice in the Medicare Part D Program

The Medicare Part D Prescription Drug Plan represents the most significant privatization of the delivery of a public insurance benefit in recent history, with dozens of private insurers offering a wide range of products with varying prices and product features; the typical elder had a choice of roughly 40 stand-alone drug plans. In this paper we evaluate the choices of elders across this wide array of Part D options using a unique data set of prescription drug claims matched to information on the characteristics of choice sets. We first document that the vast majority of elders are choosing plans that are not on the "efficient portfolio" of plan choice in the sense that an alternative plan offers better risk protection at a lower cost. We then estimate several discrete choice models to document three dimensions along which elders are making choices which are inconsistent with optimization under full information: elders place much more weight on plan premiums than they do on expected out of pocket costs; they place almost no value on variance reducing aspects of plans; and they value plan financial characteristics beyond any impacts on their own financial expenses or risk. These findings are robust to a variety of specifications and econometric approaches. We develop an "adjusted" revealed preference approach that combines data from consumer choices with ex ante restrictions on preferences, and find that in a partial equilibrium setting, restricting the choice set to the three lowest average cost options would have likely raised welfare for elders under the program.

14790

Kanaka Shetty, Thomas DeLeire, Chapin White, Jayanta Bhattacharya

Changes in U.S. Hospitalization and Mortality Rates Following Smoking Bans

U.S. state and local governments are increasingly restricting smoking in public places. This paper analyzes nationally representative databases, including the Nationwide Inpatient Sample, to compare short-term changes in mortality and hospitalization rates in smoking-restricted regions with control regions. In contrast with smaller regional studies, we find that workplace bans are not associated with statistically significant short-term declines in mortality or hospital admissions for myocardial infarction or other diseases. An analysis simulating smaller studies using subsamples reveals that large short-term increases in myocardial infarction incidence following a workplace ban are as common as the large decreases reported in the published literature.

14800

Chulhee Lee
Labor Force Participation of Older Males in Korea: 1955–2005

This study estimates the labor force participation rate (LFPR) of older males in Korea from 1955 to 2005, and analyzes the effects of several determining factors on labor force participation decisions at older ages. The LFPR of older men increased substantially from the mid-1960s to the late-1990s. This pattern is in sharp contrast to the historical experiences of most OECD countries, where the LFPR of older males declined rapidly over the last century. The rise in the LFPR of older males in Korea between 1965 and 1995 is largely explained by the dramatic increase in the labor-market activity of the rural elderly population. The results of regression analyses suggest that the acceleration of population aging in rural areas due to the selective out-migration of younger persons was the major cause of the sharp increase in the LFPR of older males. It is likely that the relative decline of the rural economy in the course of

industrialization made it increasingly difficult for the rural elderly population to save for retirement.

14811

Gabriel Aranovich, Jay Bhattacharya, Alan Garber, Thomas MaCurdy
Coping with Chronic Disease? Chronic Disease and Disability in Elderly American Population 1982–1999

It is well known that disability rates among the American elderly have declined over the past decades. The cause of this decline is less well established. In this paper, we test one important possible explanation—that the decline in disability occurred because of chronic disease prevention efforts among the elderly. For this purpose we analyze data from the National Long Term Care Survey and from the National Health and Interview Survey. Our findings suggest that primary prevention, as reflected in decreased disease prevalence, was not responsible for advances made in elderly functioning between 1980 and 2000. We found a broad decline in less severe forms of disability that is unlikely to have resulted from improved disease management. Instead, these measured improvements in functioning may reflect environmental, technological, and/or socioeconomic changes. Improvements in the more severe forms of disability were modest and were restricted to those suffering from particular illnesses, which make improved and/or more aggressive management a plausible explanation and one that might increase costs should the trend persist.

14820

David Bloom, David Canning, Gunther Fink, Jocelyn Finlay
The Cost of Low Fertility in Europe

We analyze the effect of fertility on income per capita with a particular focus on the experience of Europe. For European countries with

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below-replacement fertility, the cost of continued low fertility will only be observed in the long run. We show that in the short run, a fall in the fertility rate will lower the youth dependency ratio and increase the working-age share, thus raising income per capita. In the long run, however, the burden of old-age dependency dominates the youth dependency decline, and continued low fertility will lead to small working-age shares in the absence of large migration inflows. We show that the currently very high working-age shares generated by the recent declines in fertility and migration inflows are not sustainable, and that significant drops in the relative size of the working-age population should be expected. Without substantial adjustments in labor force participation or migration policies, the potential negative repercussions on the European economy are large.

14886

**Kathleen Mullen, Richard Frank,
Meredith Rosenthal**

Can You Get What You Pay For? Pay-For-Performance and the Quality of Health-care Providers

Despite the popularity of pay-for-performance (P4P) among health policymakers and private insurers as a tool for improving quality of care, there is little empirical basis for its effectiveness. We use data from published performance reports of physician medical groups contracting with a large network HMO to compare clinical quality before and after the implementation of P4P, relative to a control group. We consider the effect of P4P on both rewarded and unrewarded dimensions of quality. In the end, we fail to find evidence that a large P4P initiative either resulted in major improvement in quality or notable disruption in care.

14987

John Cawley, Joshua Price Outcomes in a Program that Offers Financial Rewards for Weight Loss

Obesity rates in the U.S. have doubled since 1980. Given the medical, social, and financial costs of obesity, a large percentage of Americans are attempting to lose weight at any given time but the vast majority of weight loss attempts fail. Researchers continue to search for safe and effective methods of weight loss, and this paper examines one promising method - offering financial rewards for weight loss. This paper studies data on 2,407 employees in 17 worksites who participated in a year-long worksite health promotion program that offered financial rewards for weight loss. The intervention varied by employer, in some cases offering steady quarterly rewards for weight loss and in other cases requiring participants to post a bond that would be refunded at year's end conditional on achieving certain weight loss goals. Still others received no financial incentives at all and serve as a control group. We examine the basic patterns of enrollment, attrition, and weight loss in these three groups. Weight loss is modest. After one year, it averages 1.4 pounds for those paid steady quarterly rewards and 3.6 pounds for those who posted a refundable bond, under the assumption that dropouts experienced no weight loss. Year-end attrition is as high as 76.4%, far higher than that for interventions designed and implemented by researchers.

15000

Anne Case, Christina Paxson The Impact of the AIDS Pandemic on Health Services in Africa: Evidence from Demographic and Health Surveys

We analyze the effect of fertility on income per capita with a particular focus on the experience of Europe. For European countries with

below-replacement fertility, the cost of continued low fertility will only be observed in the long run. We show that in the short run, a fall in the fertility rate will lower the youth dependency ratio and increase the working-age share, thus raising income per capita. In the long run, however, the burden of old-age dependency dominates the youth dependency decline, and continued low fertility will lead to small working-age shares in the absence of large migration inflows. We show that the currently very high working-age shares generated by the recent declines in fertility and migration inflows are not sustainable, and that significant drops in the relative size of the working-age population should be expected. Without substantial adjustments in labor force participation or migration policies, the potential negative repercussions on the European economy are large.

15005

Richard Burkhauser, John Cawley, Maximilian Schmeiser Differences in the U.S. Trends in the Prevalence of Obesity Based on Body Mass Index and Skinfold Thickness

There are several ways to measure fatness and obesity, each with its own strengths and weaknesses. The primary measure for tracking the prevalence of obesity has historically been body mass index (BMI). This paper compares long-run trends in the prevalence of obesity when obesity is defined using skinfold thickness instead of body mass index (BMI), using data from the full series of U.S. National Health Examination Surveys. The results indicate that when one uses skinfold thicknesses rather than BMI to define obesity, the rise in the prevalence of obesity is detectable ten to twenty years earlier. This underscores the importance of examining multiple measures of fatness when monitoring or otherwise studying obesity.

NBER

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