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P A P E R



Power to the People

The Role of Consumer-Controlled
Personal Health Management
Systems in the Evolution of
Employer-Based Health Care Benefits

Spencer S. Jones, John P. Caloyeras, Soeren Mattke

Sponsored by The Dossia Consortium

The research described in this report was sponsored by The Dossia Consortium and was conducted in RAND Health, a division of the RAND Corporation.

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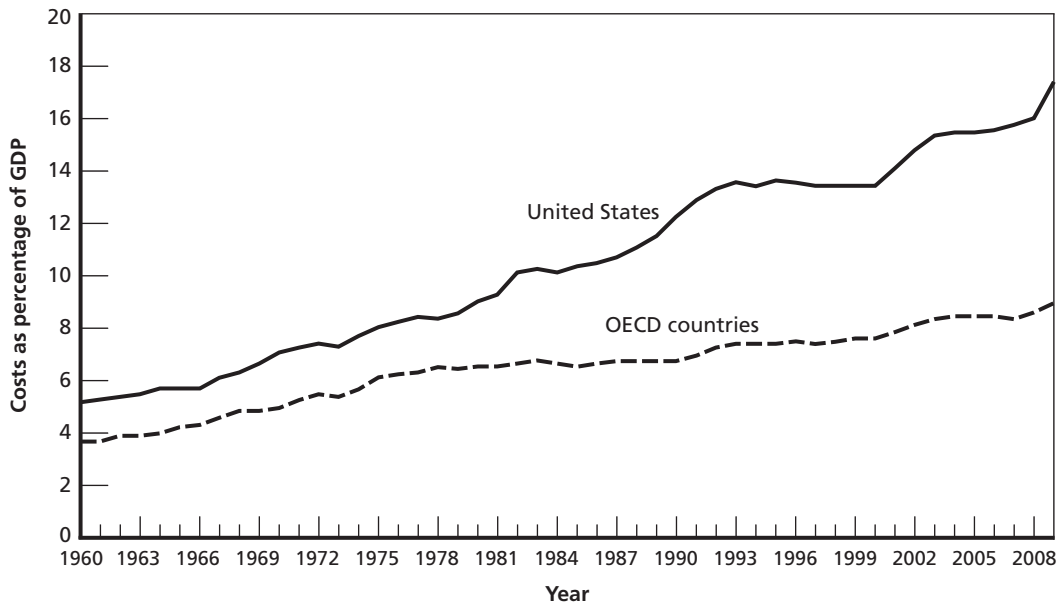
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Preface

Health insurance premium costs increased by 178 percent between 2001 and 2010, and, as Figure 1 illustrates, health care costs have increased much more quickly in the United States than they have in other industrialized countries, so health care costs pose a threat to the global competitiveness of U.S. companies. In response to increasing cost pressure, many U.S. companies are experimenting with new approaches to benefit design that aim at delivering higher-value health care services to their employees. The passage of the Patient Protection and Affordable Care Act (Pub. L. 111-148, 2010) has further piqued employers' interest in new benefit designs because it includes numerous provisions that favor cost-reducing strategies, such as workplace wellness programs, value-based insurance design (VBID), and consumer-directed health plans (CDHPs). For example, the excise tax imposed on high-cost plans favors lower-cost coverage options, such as CDHPs, and the implementation of wellness programs is being supported by several changes to the law that allow employers more discretion to reward employees for healthy lifestyles.

Figure 1
Health Care Costs in the United States and in Other Industrialized Countries



SOURCE: Organisation for Economic Co-operation and Development (OECD), 2010.
NOTE: GDP = gross domestic product.

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Approaches to benefit design, such as wellness programs, VBID, and CDHPs, fundamentally change the consumer's role in health care, in that they require consumers to become engaged and informed decisionmakers. Decisions about which coverage options to choose and where to seek care will become more complex and demanding, and the financial implications of those decisions will become more substantial under new benefit designs. If executed well, new benefit designs can support a partnership between employer and employee and help employees enjoy better health while spending less on health care.

In spite of increasing incentives and the promise of these approaches, uptake and implementation of wellness programs, CDHPs, and VBID is far from universal. Only 54 percent of large employers offered a CDHP option in 2010 (Towers Watson, 2010), despite evidence that these plans can result in significant reductions in health care spending (U.S. Government Accountability Office [GAO], 2010; Buntin, Haviland, et al., 2011; Buntin, Damberg, Haviland, Kapur, et al., 2006; Miller, 2005). Likewise, many employers are finding it difficult to realize the full benefits of VBID; in fact, a recent study indicates that less than 20 percent of employers regard their implementation of VBID as being "very successful" (see Figure 2).

Lack of employee engagement is commonly seen as a key obstacle to realizing the full benefit of workplace wellness programs. Although participation rates vary across organizations, they remain low overall. For example, more than half (52 percent) of companies that offer health risk assessments to their employees report participation rates of 50 percent or less (Baicker, Cutler, and Song, 2010). Participation rates in other programs, such as weight management, health coaching, and smoking cessation, are also typically quite low (Baicker, Cutler, and Song, 2010). A second important obstacle to realizing the full potential of these approaches to benefit design is lack of adequate decision-support tools, and comparing quality or value across different health care providers continues to be difficult for consumers. The U.S. Government Accountability Office has concluded that, in general, insurance carriers do not provide sufficient information for enrollees to identify high-quality care and that quality

Figure 2
Employers' Satisfaction with Value-Based Insurance Design, 2008



SOURCES: Mercer, 2009; Choudhry et al., 2010.

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metrics provided to assess individual physicians do not facilitate meaningful comparisons. Similarly, the same report found that comparative cost data about health care providers were not readily available for consumers (GAO, 2006).

To overcome the obstacles of health care benefit redesign, consumers will need appropriate decision-support tools and access to resources that can help them actively manage their health risks and health care utilization. And, given the structure of the U.S. health care system, there are compelling incentives for employers to provide such tools and resources. In order to support benefit options, such as wellness programs, VBID, and CDHPs, these tools should promote employee engagement and provide actionable information that supports more-informed health care consumerism.

Consumer-controlled personal health management systems (HMSs) are a class of tools that provide such encouragement, data, and decision support to individuals. There is no universally accepted term for such tools at the moment. Developers refer to them descriptively as *enhanced personal health records* or *personal health platforms* or by their respective product names. For the purposes of this paper, we use the term *health management system*. Broadly, an HMS is a person-centric repository for data from various sources combined with a suite of other features and functions that are designed to engage and assist individuals in the management of their own health and wellness. Its functionalities fall into the following three categories: health information management, promotion of wellness and healthy lifestyles, and decision support.

The concept of an HMS is relatively new and not widely used yet. Consequently, data on the potential impact of integrated solutions, such as the HMS, are limited. However, several of the functionalities that the HMS seeks to integrate have been evaluated in the research literature with largely positive results. In this paper, we review the evidence for many of the possible components of an HMS, including the following:

- personal health record
- web-based health risk assessment
- integrated remote monitoring data
- personalized health education and messaging
- nutrition solutions and physical activity monitoring
- diabetes-management solutions
- medication reminders
- vaccination and preventive-care applications
- integrated incentive programs
- social-networking tools
- comparative data on price and value of providers
- telehealth consultations
- virtual coaching
- integrated nurse hotline.

Many employers are now testing approaches to deliver such information and decision support. The most typical approach is a web portal that allows an employee to take a health risk assessment and then links him or her to programs and other resources that match his or her particular risk profile. In addition, those portals are used to communicate health-related content to all employees, irrespective of risk profiles. An HMS as sketched out in this paper is an evolutionary step beyond existing tools, in that it integrates data from a variety of sources

and customizes tools, resources, and information to a greater extent. In addition, the HMS can provide a platform for developers to build applications that will engage employees in their own health and health care and make more-informed choices about their health care consumption. The proliferation of Web 2.0 applications for wellness and health will drive innovation, but it will also make it increasingly difficult for employers to identify which applications are most appropriate for their employees. This dilemma might be most efficiently solved through establishing a “health application marketplace.” The marketplace model for applications is common and likely familiar to consumers (e.g., Apple’s App Stores). Integrating the marketplace into the HMS has the added advantage of leveraging the availability of an individual’s health data and social network, which should enable an employee to solicit feedback from his or her peers and identify products and applications that are most likely to fit his or her individual needs.

In principle, the HMS is an attractive idea; indeed, leveraging personalized health information and integrating the presently disparate features described in this paper into a “one-stop shop” could make the whole greater than the sum of its parts. However, this hypothesis remains untested, and the value of the HMS will be borne out as employers begin to adopt and implement these emerging technologies and further assess their effects on employee behavior, health care costs, and overall value.

This research was sponsored by Dossia, an employer-led group comprised of Fortune 500 companies dedicated to empowering people and their doctors to be active partners for health by providing secure, convenient access to lifelong health information, and conducted by RAND Health. RAND Health is a major research division within the RAND Corporation, a non-profit institution headquartered in Santa Monica, California. For more than 60 years, RAND has worked to improve policy and decisionmaking through research and analysis. RAND Health continues that tradition, advancing understanding of health behaviors and examining how the organization and financing of care affect costs, quality, and outcomes. RAND Health research addresses policy concerns in several areas, as well as the scientific basis for improving service delivery, system performance, and organizational effectiveness. Studies are coordinated through three programs—Economics, Finance, and Organization; Health Promotion and Disease Prevention; and Quality Assessment and Improvement—and three strategic initiatives—Global Health, Military Health, and Public Health Systems and Preparedness.

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Acknowledgments

The authors would like to acknowledge the helpful feedback received from our peer reviewers, David Lowsky and Kimberly Jinnett.

Abbreviations

AHRQ	Agency for Healthcare Research and Quality
AMA	American Medical Association
CCD	Continuity of Care Document
CDC	Centers for Disease Control and Prevention
CDHP	consumer-directed health plan
CDPH	California Department of Public Health
CFO	chief financial officer
CMS	Centers for Medicare and Medicaid Services
CVD	cardiovascular disease
EHR	electronic health record
ERISA	Employee Retirement Income Security Act
GAO	U.S. Government Accountability Office
GDP	gross domestic product
HbA1c	glycated hemoglobin
HHS	U.S. Department of Health and Human Services
HIPAA	Health Insurance Portability and Accountability Act
HL7	Health Level Seven International
HMO	health maintenance organization
HMS	health management system
HRA	health reimbursement account
HRET	Health Research and Educational Trust
HSA	health savings account
KFF	Henry J. Kaiser Family Foundation

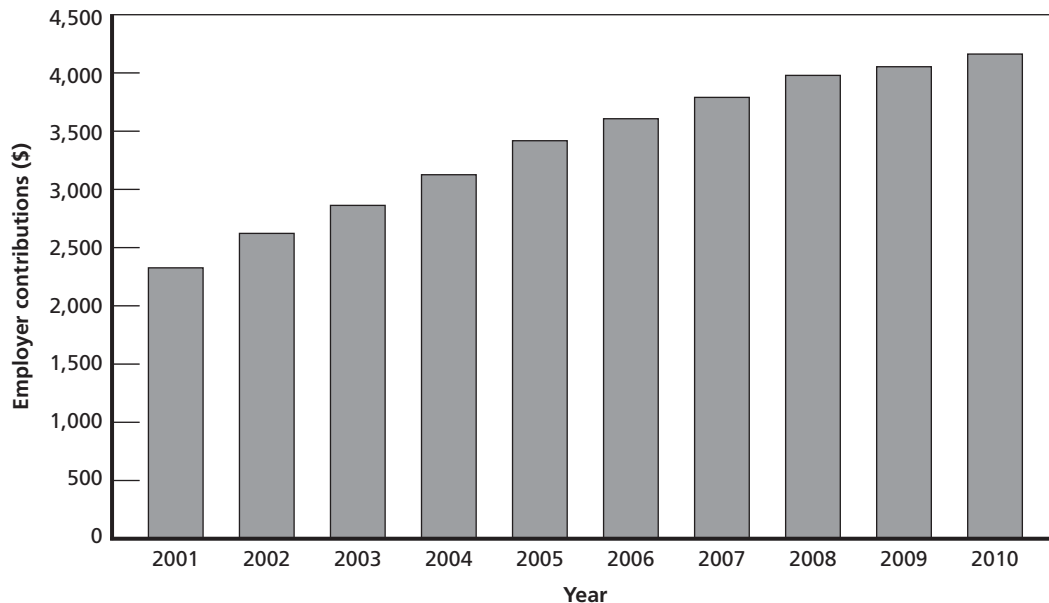
NCVHS	National Committee on Vital and Health Statistics
NFID	National Foundation for Infectious Diseases
NWHPS	National Worksite Health Promotion Survey
OECD	Organisation for Economic Co-operation and Development
PHR	personal health record
PPO	preferred provider organization
RFI	request for information
ROI	return on investment
SEER	Surveillance Epidemiology and End Results
USPSTF	U.S. Preventive Services Task Force
VBID	value-based insurance design
WHO	World Health Organization
WVU	West Virginia University

Introduction

U.S. employers are increasingly concerned about the cost of providing health care coverage. Over the course of the past decade, employer outlays for the average employee's annual health insurance premiums have increased by 178 percent (see Figure 3). The economic crisis has accentuated this challenge, as evidenced by two recent surveys that found that, between March 2010 and December 2010, the percentage of chief financial officers (CFOs) who listed health care costs as their top concern jumped from an already high 68 percent to 84 percent (Grant Thornton, 2010).

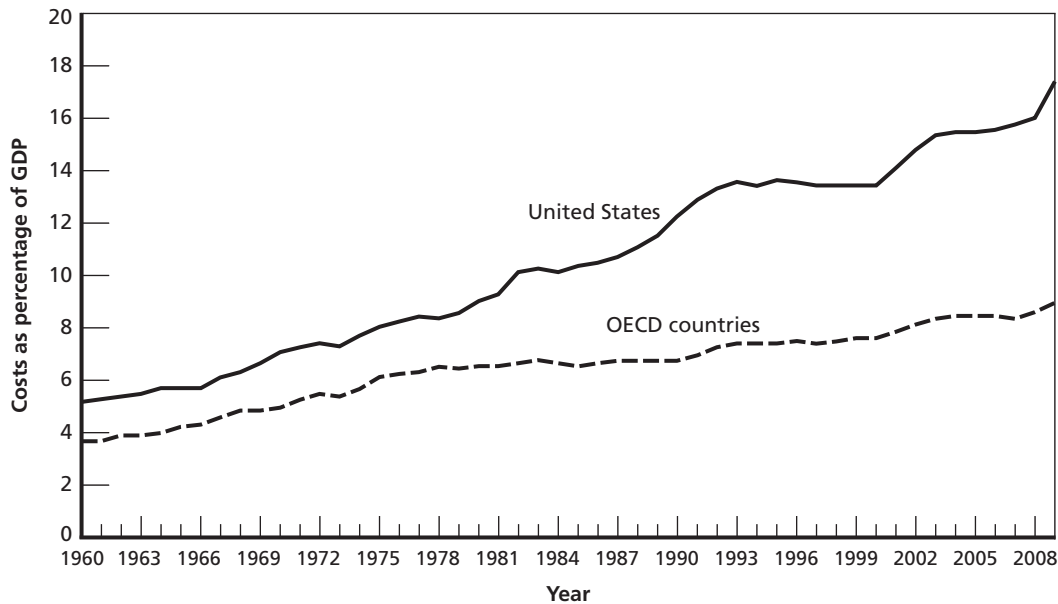
As Figure 4 illustrates, health care costs have increased much more quickly in the United States than they have in other industrialized countries. These rising costs thus pose a threat to the global competitiveness of U.S. companies. The disparity in the rates of spending growth in the United States and in other nations is a product of both structural differences and differences in the adoption of specific cost-control policies. Examples of structural differences include the following:

Figure 3
Average Annual Employer Contributions to Health Insurance Premiums for Individual Coverage, 2001–2010



SOURCE: Henry J. Kaiser Family Foundation (KFF) and Health Research and Educational Trust (HRET), 2010.
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Figure 4
Health Care Costs in the United States and in Other Industrialized Countries



SOURCE: Organisation for Economic Co-operation and Development (OECD), 2010.

NOTE: GDP = gross domestic product.

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- In Israel, decisions about the addition of drugs and procedures to the service offerings of its four private, nonprofit insurance funds are made by a centralized advisory council, and no new drug or procedure can be added unless there are adequate funds (raised from tax revenues) already available (Saltman, 2009).
- In the United Kingdom, the lion's share of health care funds comes from general revenues, and, traditionally, the health sector has had to compete with other sectors of the national government (Saltman, 2009).

Examples of specific cost-control measures that have been implemented elsewhere include the following:

- In Germany, insurance premiums cannot increase more quickly than the average worker's wages do.
- In the United Kingdom, the elderly have no copayments for outpatient pharmaceuticals—a policy aimed at encouraging medication adherence and reducing expensive hospital admissions.
- In Finland, general practitioners are paid up to twice as much as specialists.
- In Sweden, Denmark, and Norway, accelerated accrual of pensions is offered to individuals who choose to stay home to care for a family member (rather than putting that family member in a nursing home) (Saltman, 2009).

The structural and political barriers that exist in the fragmented U.S. health system make many of the policies identified in these examples practically infeasible or politically untenable in the United States.

Because similar cost-control measures have not been and are not likely to be implemented in the United States, private purchasers (e.g., employers) are left to identify ways in which they can curb the growth of their health care costs. In response to these disproportionately rising costs, U.S. companies are increasingly experimenting with new approaches to benefit design that aim at providing higher-value care within the constraints of the existing system. Three of the leading approaches are workplace wellness programs, consumer-directed health plans (CDHPs), and value-based insurance design (VBID). Despite increasing evidence that these approaches can be effective in holding down health care costs while improving employee health and wellness, challenges still remain because many employers have found it difficult to successfully implement these new designs. In this paper, we describe these three approaches to health benefit design, explain the principal challenges to their implementation, and discuss how new tools—specifically, person-centric health management systems—can help employers address and overcome barriers to the successful implementation of these approaches. This paper is based on a review of the scientific and trade literature, as well as data from surveys on benefit design.

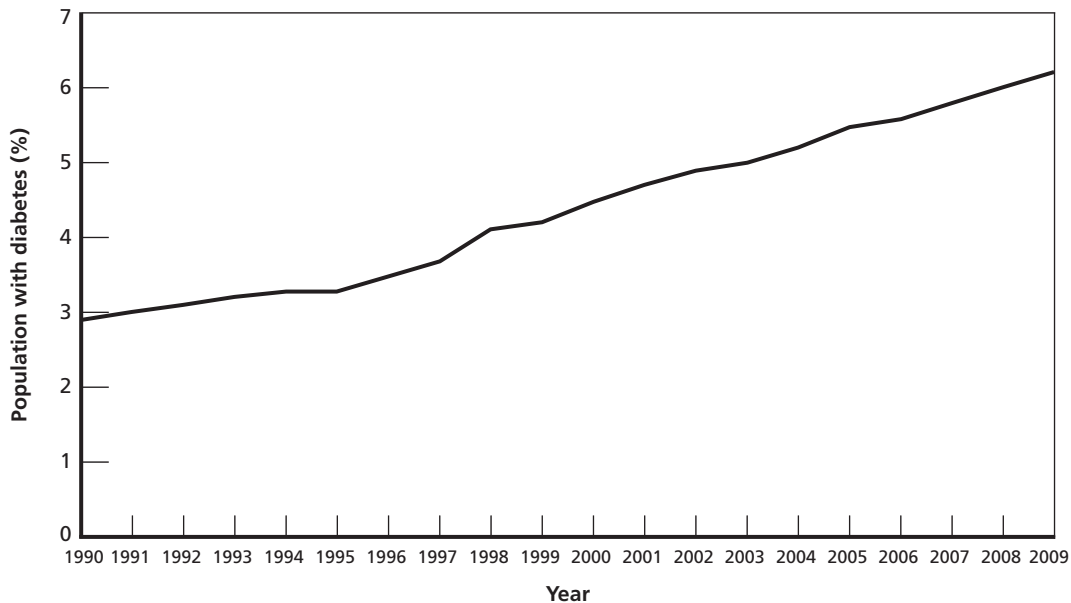
Findings

Health Care Cost Drivers

Fueled by population aging and lifestyle-related risk factors, such as obesity, the increasing prevalence of chronic diseases is one of the leading drivers of health care spending and, thus, the cost of health care coverage. Data from the Centers for Disease Control and Prevention (CDC) show that the prevalence of diabetes mellitus in the United States more than doubled (from 2.9 percent to 6.2 percent) over the course of the past two decades (Figure 5).

At the same time, improved medical technology has dramatically increased the survivability of many conditions, even at advanced stages. For instance, many cancers that cannot be cured with surgery or radiation because they have spread beyond organ boundaries can be controlled for many years with chemotherapy. Figure 6 displays data from the National Cancer Institute's Surveillance Epidemiology and End Results (SEER) program that show increasing survival rates for breast and colorectal cancer.

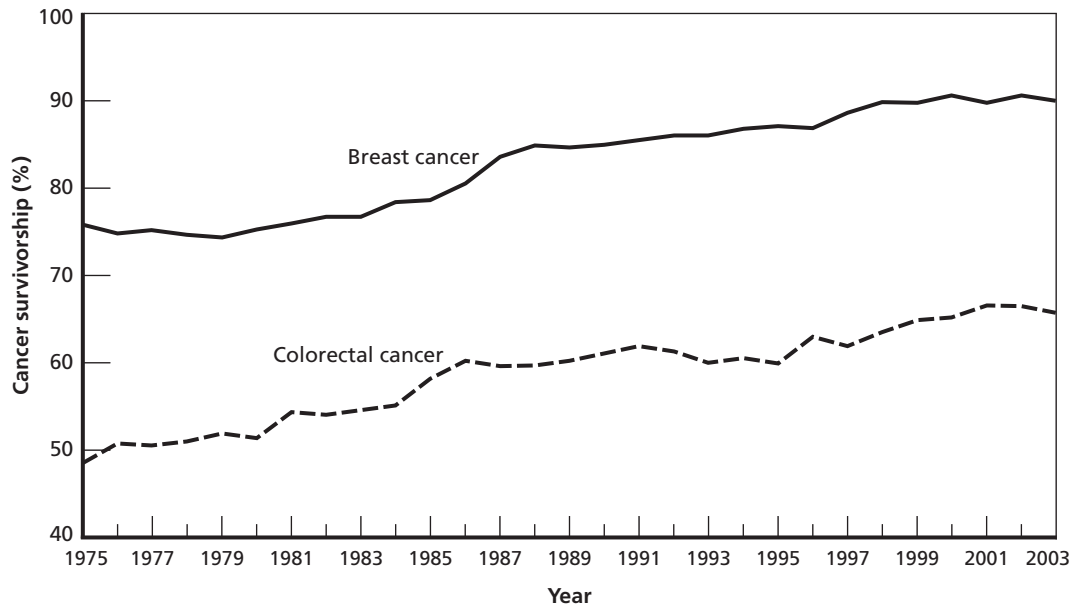
Figure 5
Prevalence of Diabetes in the United States, 1990–2009



SOURCE: CDC, 2011b.

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Figure 6
Five-Year Cancer Survivorship in the United States, 1975–2003



SOURCE: SEER, undated.

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The combination of increasing prevalence and improved survivability means that the population of Americans with chronic disease will grow to an estimated 170 million by the year 2030 and make up half of the U.S. population (Wu and Green, 2001). The costs associated with managing and treating chronic-disease patients are substantial. The attributable cost of managing diabetes in a privately insured employed population was recently estimated to exceed \$7,000 per patient annually (Durden et al., 2009). In a recent study examining the economic impact of metabolic risk factors for cardiac disease, the authors attributed nearly \$2,500 per patient annually to the presence of those risk factors (Sullivan et al., 2007); and a recent analysis of Medicare data found that the majority of changes in Medicare spending between 1987 and 2006 was driven by chronic diseases—in particular, diabetes, kidney disease, hyperlipidemia, hypertension, mental disorders, and arthritis (Thorpe, Ogden, and Galactionova, 2010).

Projections of the impact that changes in the prevalence of chronic diseases have had on total health care spending in the United States tell a grim story. Overall spending on the seven most common chronic diseases, estimated to be \$1.3 trillion in 2003, will grow to \$4.2 trillion by 2023. Key drivers in this growth in costs between 2003 and 2023 include cancers (\$319 billion to \$1.11 trillion, respectively), diabetes (\$132 billion to \$430 billion, respectively), and hypertension (\$312 billion to \$927 billion, respectively). Collectively, these data underscore the rising economic burden of chronic diseases in the United States and the need for effective mechanisms to decrease both the prevalence of chronic diseases and the costs of their treatment (DeVol and Bedroussian, 2007).

The incentives embedded in the current U.S. health care system also contribute to rapidly rising costs. Much of health care is paid for by insurance, isolating individuals from concerns about cost, and providers are typically compensated on a fee-for-service basis, which rewards

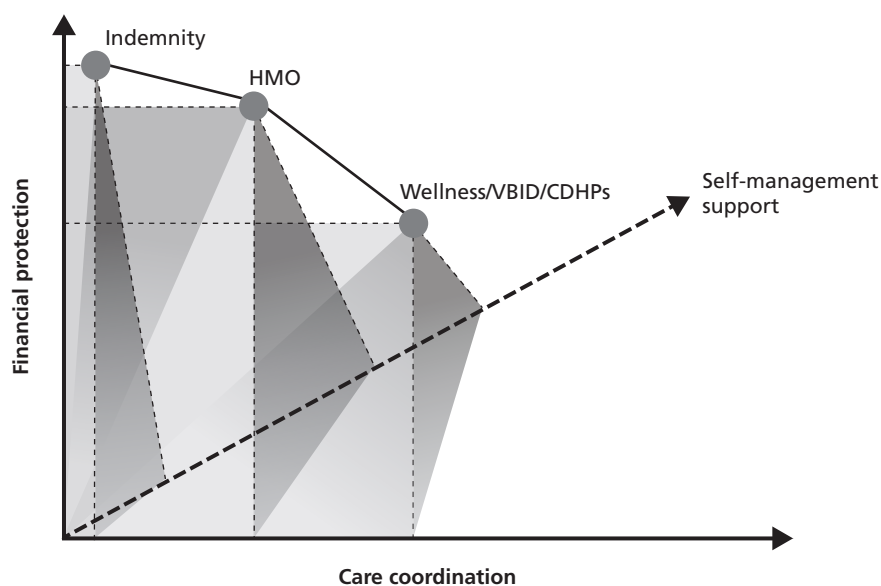
treatment volume rather than treatment value and can even penalize providers that adopt cost-saving innovations (Fisher, Bynum, and Skinner, 2009). High-tech procedures tend to be much better paid than providing primary care and ongoing management, and counseling of patients about lifestyle choices is often not covered by health insurance. Thus, the underlying incentive structure for providers promotes increasing the volume of care, especially of procedures, and consumers have neither the ability nor the incentive to counterbalance this trend.

Evolution of Benefit Design to Contain Health Care Costs

In response to this increasing cost pressure, employers' approach to providing health care benefits has continued to evolve. Figure 7 conceptualizes this evolution along three key dimensions. The y-axis represents the degree of financial protection that employers offer their employees, the x-axis represents the degree to which coordination of care is emphasized or rewarded, and the z-axis represents the degree to which employees are supported in managing their own health. Under traditional indemnity health insurance models, employers assumed most of the financial risk, with little emphasis on care coordination or patient self-management. The approach was replaced by the health maintenance organization (HMO) model in the 1990s. An employee was still financially protected within the limits of HMO coverage but exposed to costs for care outside of his or her plan. HMOs placed greater emphasis on primary care, offering preventive services and self-management support to avoid major medical events. In addition, HMO models emphasized care coordination, typically requiring a patient to seek referrals from his or her primary care physicians prior to seeking specialist care.

Finally, as we move down the y-axis and further out along the x- and z-axes, we arrive at some of the strategies that employers are using today to contain health care costs—strategies

Figure 7
The Evolving Nature of Health Care Coverage



that place greater emphasis on risk- and cost-sharing, employee self-management, and care coordination. Three of these strategies are workplace wellness programs, VBID, and CDHPs.

The passage of the Patient Protection and Affordable Care Act (Pub. L. 111-148, 2010) has raised employers' interest in alternative approaches to benefit design. Recent evidence suggests that the majority of employers, particularly large employers, will continue to provide employer-sponsored health care coverage, instead of moving employees to individual coverage (Auerbach et al., 2011; Garrett and Buettgens, 2011; Mercer, 2010). But the Affordable Care Act also has numerous provisions that favor the cost-containment strategies mentioned in the previous section. For example, the excise tax imposed on high-cost plans favors lower-cost coverage options, such as CDHPs, and several provisions support the implementation of wellness programs by providing employers with more discretion to reward employees for healthy lifestyles.

Workplace Wellness Programs

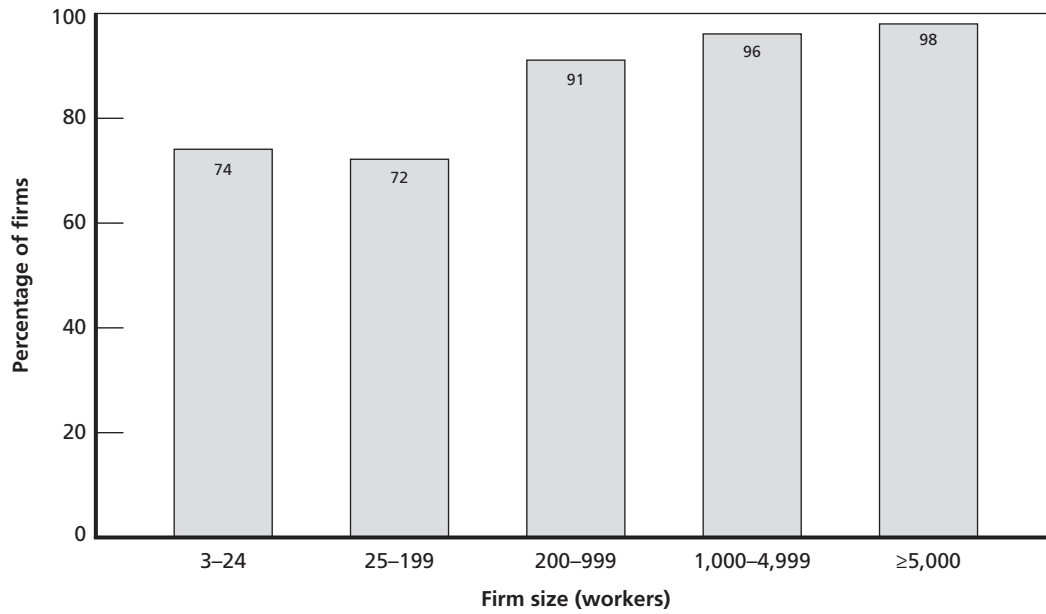
Description of the Approach. The Affordable Care Act defines a workplace wellness program as a program offered by an employer that is designed to promote health or prevent disease. These programs are often classified as primary or secondary prevention. Activities intended to prevent the onset of disease by identifying and controlling risk factors and promoting healthy behaviors are considered primary prevention. For example, a smoking-cessation program can prevent the development of cardiovascular disease and several types of cancer. Secondary prevention practices find and treat disease early, before symptoms or complications occur and when many chronic illnesses are more receptive to treatment. For example, diet and exercise programs can help diabetics control their disease and reduce the risk of complications, such as cardiovascular disease.

Wellness programs can address both primary and secondary prevention and can take the form of either population-based or individualized interventions. Population-based activities are intended to promote awareness and encourage behaviors that are proven to be associated with improved health, regardless of demographic factors or baseline health status, such as improved nutrition or regular exercise. Individualized interventions are tailored to the specific circumstances and health needs of individual workers, such as lifestyle coaching or personal training. Many employers use population-based initiatives as a gateway for workers to learn about and gain access to more-personalized interventions.

Current Uptake. Nearly all large firms (98 percent) and the majority of smaller firms offer at least one specified wellness program (Figure 8) (KFF/HRET, 2010). Some of the most-popular primary prevention activities among large firms (200 or more workers) are web-based resources for healthy living (80 percent), gym-membership discounts or on-site exercise facilities (63 percent), smoking-cessation programs (60 percent), wellness newsletters (60 percent), and weight-loss programs (53 percent). Wellness programs addressing secondary prevention are also common. Nearly 70 percent of large firms with a wellness program offered a disease-management program in 2010. Shown in Figure 9 is the prevalence of some frequent disease-management programs, which include programs targeting diabetes, hypertension, and depression.

Firms are also trying new programs, or designing old programs in new ways to promote health or prevent disease. For example, West Virginia University (WVU) Healthcare employees are now being offered a social-networking fitness program in which employees are matched with others via social media by their demographics, fitness level, and lifestyle (WVU

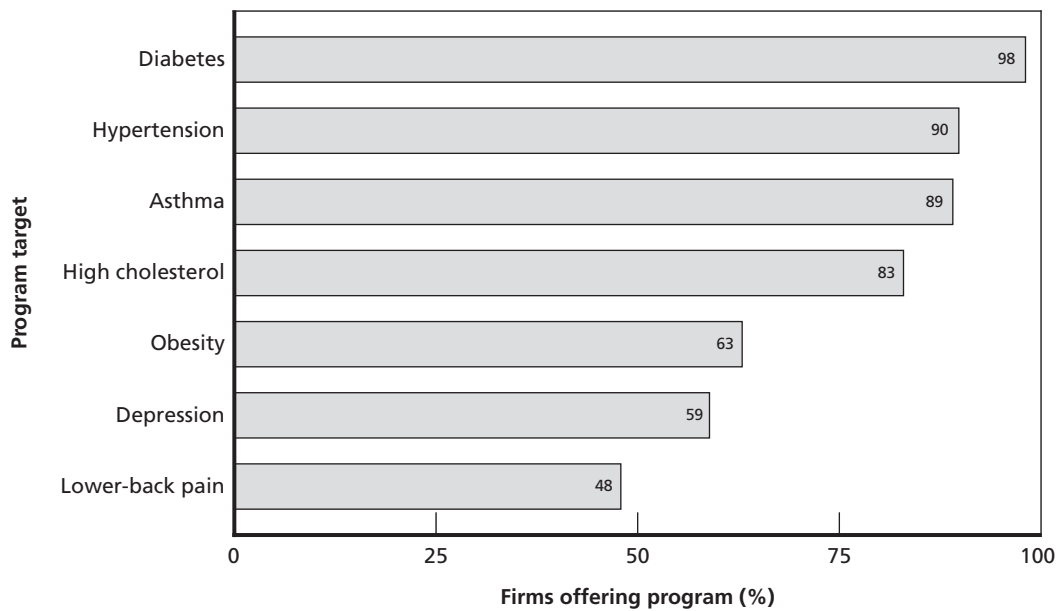
Figure 8
Proportion of Firms Offering at Least One Specified Wellness Program, by Firm Size



SOURCE: KFF/HRET, 2010.

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Figure 9
Prevalence of Particular Disease-Management Programs Among Large Firms Offering a Disease-Management Program



SOURCE: KFF/HRET, 2010.

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Healthcare, undated). In Hawaii, the County of Maui recently launched the county Employee Wellness Program, challenging employees to collectively lose more than a ton over a six-month period. The program uses social-networking tools that allow employees to track their own goals, as well as the collective accomplishments of their peers (Isotov, 2011).

Evidence of Impact. There is a reasonably solid evidence base for the impact of workplace wellness programs. A frequently quoted example is the wellness program offered by Johnson and Johnson, called “Live for Life,” which was rolled out in 1979 (Henke et al., 2011). In the most-recent evaluation of the program, the study authors estimated a long-term return on investment (ROI) in the range of 1.88 to 3.92, impressively demonstrating the business case for well-executed programs (Henke et al., 2011). A recent meta-analysis of workplace wellness programs reached a similar conclusion and estimated an ROI of about 3:1 for medical costs and reduction of absenteeism (Baicker, Cutler, and Song, 2010). In terms of improving health outcomes, the Johnson and Johnson wellness program has been shown to be associated with lower prevalence of high blood pressure, increased healthful nutrition habits, and increased engagement in physical activity.

Expected Impact of the Affordable Care Act. The Affordable Care Act promotes workplace wellness by providing wellness-program start-up grants for small firms, establishing a ten-state demonstration program to permit participating states to apply for rewards for participating in wellness programs in the individual market, and establishing a technical-assistance role for CDC to provide resources for evaluating employer wellness programs. In addition, the Affordable Care Act gives employers greater latitude in rewarding staff for healthy lifestyles because it raises the limit on rewards that employers are allowed to offer employees through a group health plan for participating in a wellness program that requires meeting health-related standards. The limit, currently set at 20 percent of the cost of coverage, will increase to 30 percent in 2013, and the Secretaries of Health and Human Services (HHS), Labor, and Treasury will have the authority to raise it as high as 50 percent. These rewards may be provided in such forms as premium discounts, waivers of cost-sharing requirements, or benefits that would otherwise not be provided to wellness-program nonparticipants.

Value-Based Insurance Design

Description of Approach. The underlying goal of VBID is to steer employees toward the use of high-value care by changing incentives and providing decision support. Instead of basing copayments on types of services (e.g., outpatient visit, generic drug prescription), VBID strategies modify cost-sharing based on value in three domains: the use of high-value services, the adoption of healthy lifestyles, and the use of high-performance providers (Houy, 2009). Thus, VBID represents a significant departure from traditional plan design. High-value services, such as evidence-based preventive care, are commonly provided without employee cost-sharing, whereas lower-value services, such as high-cost imaging for back pain, remain accessible but require substantial cost-sharing. More-sophisticated designs encourage, for example, step therapy, in which high-cost options are fully covered only after lower-cost options have proven unsuccessful. To illustrate, cost-sharing for weight-loss surgery can be decreased for employees who agree to participate in a counseling program first.

VBID strategies can be either targeted to individuals with specific risk factors or conditions or offered to entire plan populations. Targeted strategies can use differential copayments based on patient characteristics. For example, hypertensive enrollees could have copayments for their blood-pressure medications waived, but copayments for all other drugs and other

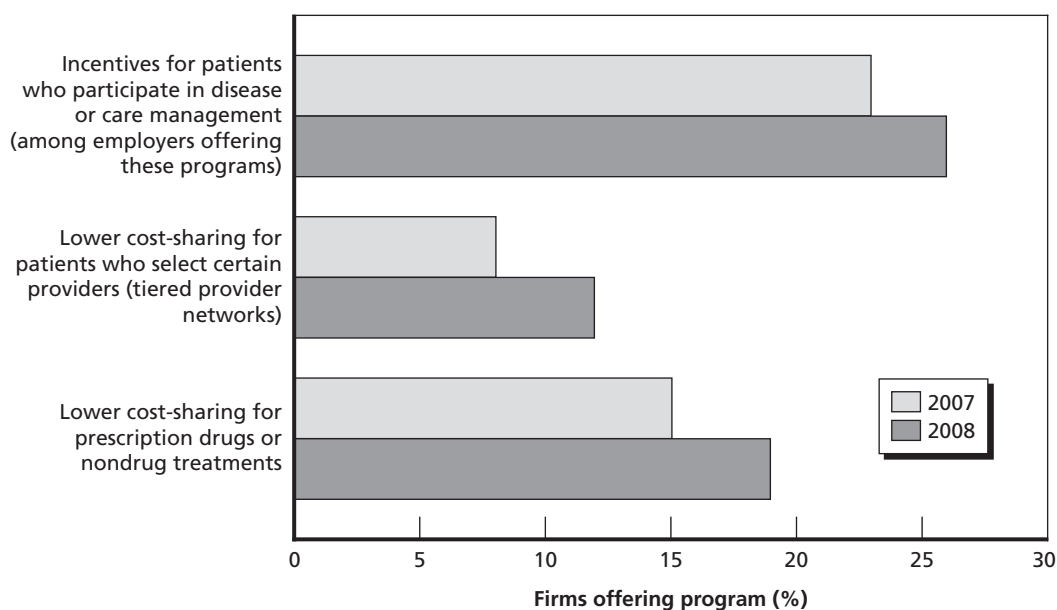
enrollees would remain unchanged. Nontargeted strategies are not tailored to specific enrollees but rather are available to everyone in a plan regardless of health or risk status, such as waiver of copayments for preventive services or lower copayments for seeking care from high-value providers.

Because VBID imposes more responsibility on the employee, such designs are commonly accompanied by decision-support tools. Those tools provide employees with information to help them understand both the health and financial implications of their treatment choices in cases in which there could be multiple options (e.g., prostate cancer). Decision-support tools can also help employees identify cost-effective providers.

Current Uptake. Approximately 36 percent of employers in 2011 indicated that they use VBID approaches (AonHewitt, 2011). Among large firms (10,000 or more employees) that had yet to adopt any VBID strategies, 81 percent indicated in a 2007 survey that they were interested or very interested in doing so within the next five years (Mercer, 2008). A variety of VBID strategies are being used by employers (Houy, 2009; Bunting, Smith, and Sutherland, 2008). These strategies include incentives for employee participation in disease- or care-management programs, lower cost-sharing for certain providers, and reductions in cost-sharing for prescription drugs or nondrug treatments. As shown in Figure 10, more and more employers are using VBID strategies (Mercer, 2008, 2009; Choudhry et al., 2010). For example, 26 percent of employers with disease- or care-management programs offered incentives for participation in 2008, up from 23 percent in 2007. Between 2007 and 2008, there was a 50-percent increase in the use of tiered provider networks and a 13-percent increase in the use of lower cost-sharing for prescription drugs and nondrug treatments.

Evidence of Impact. Various features of VBID have been shown to be effective in both reducing medical costs and improving aspects of care related to health, but results are mixed.

Figure 10
Employer Use of Value-Based Insurance Design Strategies



SOURCES: Mercer, 2008, 2009; Choudhry et al., 2010.

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The most widely cited example—and perhaps most successful to date—is the program at Pitney Bowes, where the cutting of copayments for certain medications was associated with improvements in drug adherence and lower health care spending (Choudhry et al., 2010; Mahoney, 2005). In another study, waiving copayments for diabetes-specific drugs and supplies did not increase total health care spending (versus baseline) but significantly improved glucose control (Cranor, Bunting, and Christensen, 2003). Preliminary results from a prospective study of cutting copayments for selected medications for diabetics found increases in adherence to blood pressure–lowering medications and statins, though only the result for blood pressure–lowering medications was statistically significant.

Expected Impact of the Affordable Care Act. Although not explicitly described as VBID, the preventive-care mandate in Section 2713 of the Affordable Care Act, which requires non-grandfathered health plans to offer high-value preventive medical services for little or no cost, has mandated the implementation of elements similar to VBID. The new law encourages individuals to seek regular, low-cost screenings to catch medical conditions before they require more-expensive treatments or hospitalization. The same provision of the law states that “the Secretary [of HHS] may develop guidelines to permit a group health plan and a health insurance issuer offering group or individual health insurance coverage to utilize value based insurance designs.” HHS has already begun the process of developing guidelines for VBID implementation by issuing a request for information (RFI) seeking information on VBID best practices. Because the language regarding VBID in the Affordable Care Act is nonspecific, there is still some uncertainty, but, given the general emphasis on value over volume in the Affordable Care Act, it is likely that employers will be encouraged or required to implement some components of VBID in the future (Wagner, 2011).

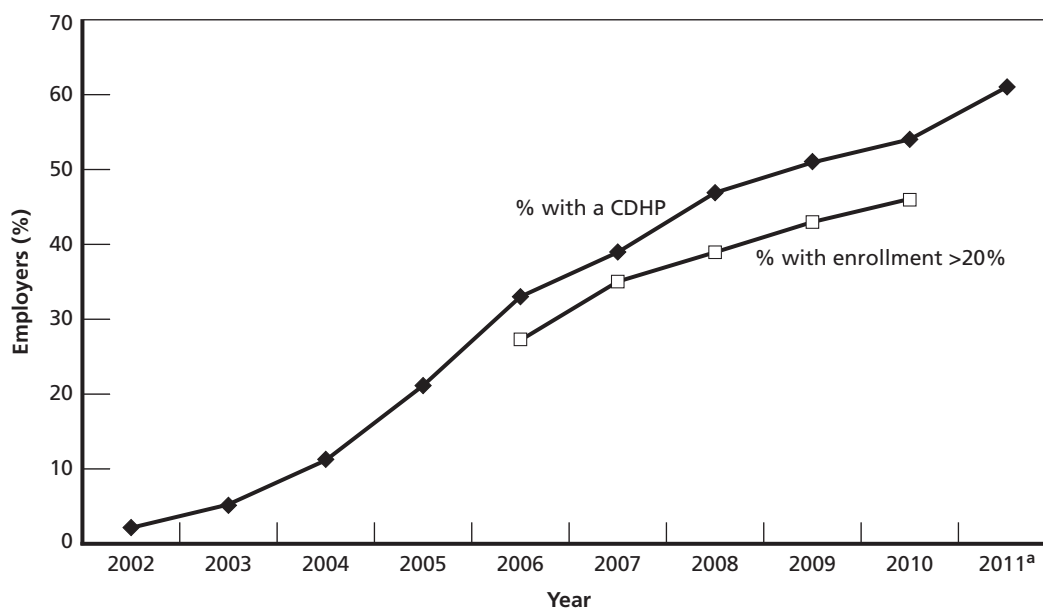
Consumer-Directed Health Plans

Description of Approach. CDHPs are high-deductible health plans, often combined with some form of a pretax payment account. CDHPs use three tiers of payment to pay for health care. The first tier is the pretax account, usually either a health savings account (HSA) or a health reimbursement account (HRA). When money in the pretax account has been spent, enrollees pay for care out of pocket until their health insurance deductible is met. From that point forward, a traditional insurance plan kicks in, in which care is paid for by an insurer. Usually, a cost-sharing provision requires enrollees to continue paying for a portion of their care until an out-of-pocket maximum is reached, after which the insurer pays for all additional care (Buntin, Damberg, Haviland, Lurie, et al., 2005; National Business Group on Health, 2011).

The underlying assumption of CDHPs is that, because the plans place the purchasing power and decisionmaking in the hands of the consumer, enrollees will demand high-value care. This logic is largely an extension of that behind the use of copayments and cost-sharing provisions in traditional health plans. The logic suggests that enrollees will carefully consider when it is necessary to seek care and that, when they do, they will demand care that is of high value. Enrollees might also be incentivized to learn more about ways to stay healthy or about effective disease self-management strategies.

Current Uptake. The prevalence of CDHPs is on the rise. In 2002, the prevalence was 2 percent, and, by 2010, the prevalence had steadily grown each year, reaching 54 percent (Figure 11) (Towers Watson, 2010). This upward trend appears set to continue: More than

Figure 11
Proportion of Employers Offering at Least One Consumer-Directed Health Plan with Enrollment Greater Than 20 Percent



SOURCE: Towers Watson, 2010.

^a Planned for 2011.

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60 percent of firms indicated that they are planning to offer a CDHP in 2011. Not only is the prevalence of CDHPs on the rise; so, too, is enrollment in these plans by employees. Figure 11 shows how the proportion of firms with enrollment of more than 20 percent in their CDHPs has grown over time.

Some firms are choosing to offer a CDHP as the only coverage option. Rather than encourage movement into a CDHP, these firms are migrating their entire workforces at once in what is called a *total replacement CDHP*. In 2010, 7.6 percent of firms had made the move to a total replacement CDHP, up from 5.4 percent in 2009. However, not all firms are choosing to use the same CDHP designs. When asked what type of CDHPs they offered (or planned to offer), 69 percent of firms indicated a CDHP with an HSA, 6 percent a “build your own,” 6 percent a multitier or high-performing network, and 37 percent a CDHP with an HRA (AonHewitt, 2011).

Evidence of Impact. Initial evidence suggests that enrollees in CDHPs have lower medical costs than those in traditional plans do, even after controlling for differences in health status or other enrollee characteristics (U.S. Government Accountability Office [GAO], 2010; Buntin, Haviland, et al., 2011; Buntin, Damberg, Haviland, Kapur, et al., 2006; Miller, 2005). The evidence of CDHPs resulting in improvements in health or quality of care is mixed (Buntin, Damberg, Haviland, Kapur, et al., 2006). For example, CDHP enrollees, as compared with non-CDHP enrollees, have been shown to exhibit modest reductions in preventive-care service utilization and are more likely to report that they failed to see a doctor as needed (Buntin, Haviland, et al., 2011; Dixon, 2008). However, CDHP enrollees have been shown to be more likely than non-CDHP enrollees to follow treatment regimens for chronic conditions (Agrawal et al., 2005).

Expected Impact of the Affordable Care Act. The Affordable Care Act is likely to accelerate the move to CDHPs by employers because CDHPs, relative to more-traditional plans offered by employers, such as HMOs or preferred provider organizations (PPOs), are lower cost in terms of total annual premiums, even after employer contributions to HSAs or HRAs are taken into account (McDevitt and Savan, 2011; McDevitt et al., 2010; American Academy of Actuaries, 2009). In addition, under the Affordable Care Act, employers offering CDHPs will avoid the excise tax on more-generous “Cadillac” plans, adding to the financial attractiveness of CDHPs to firms (McDevitt and Savan, 2011). Health insurance exchanges will enable health insurance companies to offer a variety of plans with broad parameters. Consumers who are willing to accept higher cost-sharing in exchange for lower premiums may purchase different levels of coverage. The availability of these “bronze” plans will likely expand enrollment in consumer-driven plans because these lower-premium plans might be attractive to people who have not previously purchased health insurance (McDevitt and Savan, 2011; Haviland et al., 2011).

Implementation Challenges

Although they understand the potential of new approaches to benefit design, many employers regard their implementation as a major challenge. Despite compelling evidence that CDHPs are an effective mechanism for controlling costs, only 54 percent of employers offered CDHPs to their employees in 2010 (Haviland et al., 2011; Towers Watson, 2010). Employers that choose not to offer CDHPs cited several reasons for not doing so, including regulatory restrictions, inadequate decision-support tools, and delays between when care is provided and when providers are paid (GAO, 2006). The last reason, also called *delayed account transactions*, refers to the added level of complexity caused by an HRA or HSA in that providers may receive payments from the insurer, the HRA or HSA, and out of pocket from the patient. This added level of complexity can be frustrating for patients and makes it difficult for a patient to know at a given point in time how much money he or she has in an HRA or HSA due to delays between when care is provided and when bills eventually reach patients (GAO, 2006).

Like they have with CDHPs, many employers are also finding it difficult to realize the full benefits of VBID; a recent analysis of the Mercer National Survey of Employer-Sponsored Health Plans indicates that a large portion of employers are still unsure that their VBID implementations have been successful (see Figure 12).

Poor Employee Engagement

Lack of employee engagement and lack of adequate decision support for employees are often seen as key obstacles to successful implementation of wellness programs, VBID, and CDHPs. Levels of patient engagement vary considerably: A study by the Center for Studying Health System Change found that engagement is particularly low in vulnerable populations and that higher engagement was associated with much lower levels of unmet need for medical care (Hibbard and Cunningham, 2008). Lack of engagement is commonly seen as a key obstacle to realizing the full benefit of workplace wellness programs. Although participation rates vary across organizations, they remain low overall (see Figure 13). For example, 52 percent of companies that offer health risk assessments to their employees report that fewer than half receive such assessments. Participation rates in other programs, such as weight management, health

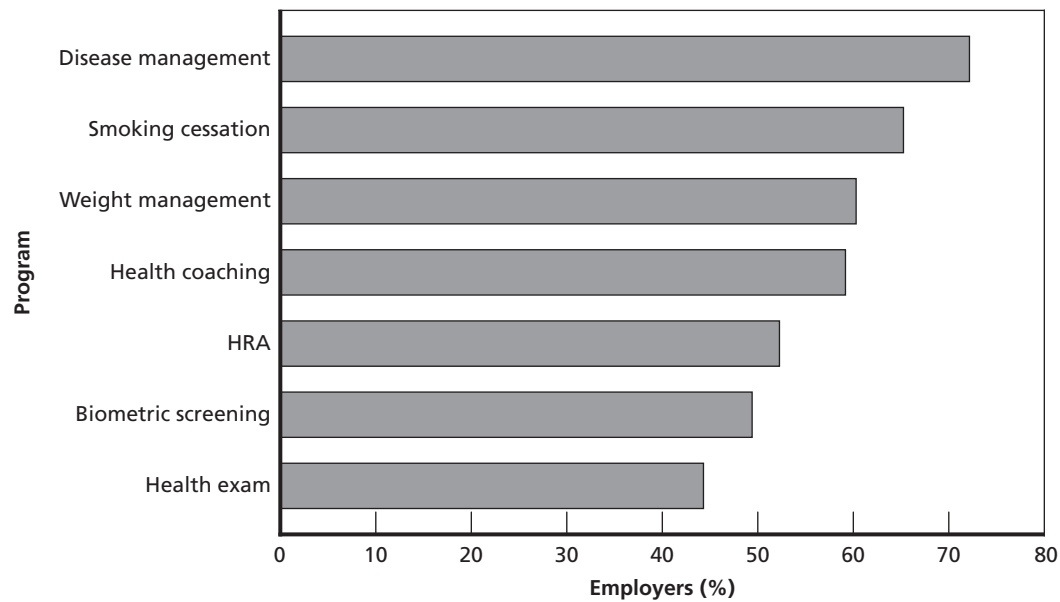
Figure 12
Employer Satisfaction with Value-Based Insurance Design



SOURCES: Mercer, 2008, 2009; Choudhry et al., 2010.

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Figure 13
Percentage of Employers with Fewer Than Half of Employees Participating in Offered Workplace Wellness Programs



SOURCE: Nyce, 2010.

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coaching, and smoking cessation, are also typically quite low, and evidence suggests that participation is heavily influenced by the degree to which employees bear the costs of these programs (Baicker, Cutler, and Song, 2010).

The most common reason that employees did not participate in workplace wellness programs is that they believe they are capable of making lifestyle changes on their own. Lack of time and “not needing” these programs because of perceived good health were also commonly cited as reasons (Fronstin, 2010).

Lack of Adequate Decision Support

A second important obstacle to realizing the full potential of benefit redesign is a lack of adequate decision-support tools. For example, comparing the quality of providers continues to be difficult for patients. A 2006 GAO report on CDHPs found that tools provided to enrollees by insurance carriers did not provide sufficient information for enrollees to identify high-quality care (GAO, 2006). In addition, the quality metrics to assess individual physicians were not useful for comparative purposes because the types of quality measures reported were not consistent across physicians. Similarly, the report found that there were no user-friendly sources of comparative cost data for providers. Although comparative cost tools have become more available thanks to data from the Centers for Medicare and Medicaid Services (CMS) and other sources, a more recent survey of consumers enrolled in both traditional health plans and CDHPs found that few consumers use online cost-comparison tools (20 percent), few check the quality rating of doctors or hospitals (22 percent), and only slightly more check the price of service before getting care (27 percent) (Fronstin, 2010).

The Role of Consumer Support Solutions in Benefit Redesign

To overcome the obstacles of successful implementation and uptake of these new approaches to employee benefit design, new and innovative tools will be required that promote employee engagement and provide employees with actionable data with which to act on the incentives that the new benefit designs create.

This paper seeks to describe consumer support solutions as a class of tools that provide such encouragement, data, and decision support to individuals. There is no universally accepted term for such tools at the moment. Developers refer to them descriptively as *enhanced personal health record* or *personal health platform* and by their respective product names. For the purposes of this paper, we use the term *health management system* (HMS).

Broadly, an HMS is a person-centric repository of data from various sources combined with a suite of other features and functions that are designed to engage and assist individuals in the management of their own health and wellness. Its capabilities fall into the following three categories:

- health information management
 - personal health record (PHR)
 - health risk assessment
 - integration of monitoring data
- promotion of wellness and healthy lifestyles
 - educational content
 - reminder systems
 - integration with incentive systems
 - social-networking tools
- health care decision support

- data on price and value of providers
- telehealth consultations.

Evidence of the Potential Impact of Health Management Systems

The concept of an HMS is relatively new and not widely used yet. Consequently, data on its impact as an integrated solution do not exist, but several of its functionalities have been evaluated, and similar models have been rolled out successfully in other industries. In this section, we present the evidence of the impact of selected HMS functionalities, as well as a case study on a similar solution in personal finance.

Health Information Management

Personal Health Record. The most fundamental function of the HMS is to serve as a person-centric repository for health information, or PHR. Currently, there are no agreed-upon standards that define the form or content of the PHR. However, some PHR vendors have adopted standards, such as the Health Level Seven International (HL7)–developed Continuity of Care Document (CCD), that allow the PHR to send and receive patient information from other data sources that also use these standards. Generally, the typical CCD-compliant PHR will include the following data elements:

- patient-identifying information and demographics
- patient insurance or financial information
- advance directives
- medical conditions, diagnoses, or problems
- family history
- social history and risk factors
- adverse reactions and allergies
- medications
- immunizations
- vital signs and physiological measurements
- imaging studies
- lab results
- care documentation
- care plan recommendation
- health care providers (Ferranti et al., 2006).

There is general consensus among informatics experts, medical professional associations, and employers that PHRs have the potential to yield significant benefits to patients, providers, payers, employers, and population health (Tang et al., 2006; Endsley et al., 2006; National Committee on Vital and Health Statistics [NCVHS], 2006; Ahern et al., 2011). Some of the specific benefits are provided in Table 1.

The empirical evidence regarding the effects of PHRs is still very limited. There are only a handful of studies that evaluate PHRs' effects on health care costs or clinical outcomes. However, what little empirical evidence that does exist suggests that PHR use can result in better health outcomes and adherence to best practices (Tenforde, Jain, and Hickner, 2011). Occa-

Table 1
Personal Health Records: Benefits to Patients, Providers, Payers, Employers, and the Health of the Population

Beneficiary	Benefit
Patient	<p>Improved access to information might facilitate improved self-management and wellness.</p> <p>A patient with a chronic condition might be better able to track key indicators and intervene before the condition results in a costly exacerbation.</p> <p>PHRs might make it easier for the patient to ask questions, set up appointments, and request refills and referrals.</p> <p>PHR systems can reduce a caregiver's (e.g., spouse's or parent's) data-management burdens by providing convenient and comprehensive access to the patient's health data.</p> <p>Patients have ready access to test results.</p>
Provider	<p>Additional data sources might result in improved care coordination and help clinicians make better decisions.</p> <p>Patients might be more engaged and adherent.</p> <p>Improved communication between the patient and the provider via the PHR might enhance the effectiveness of in-person contacts.</p>
Employer, payer, or population health	<p>PHR use might result in lower costs for chronic disease management, medication, or wellness programs or increases in patient safety, quality of care, or health information privacy.</p> <p>The PHR could serve as a scaled-down EHR for on-site clinics.</p>

NOTE: EHR = electronic health record.

sionally, the terms *PHR* and *patient portal* are used interchangeably; however, *patient portal* generally refers to a secure website operated by a health care provider that provides patients with access to their health information and other resources. A recent review sponsored by the California HealthCare Foundation concluded that evidence that patient portals affect health care costs or outcomes is not yet well established (Emont, 2011).

Health Risk Assessment. A health risk assessment is typically the cornerstone of any workplace wellness program (Baicker, Cutler, and Song, 2010). CDC defines *health risk assessment* as “a systematic approach to collecting information from individuals that identifies risk factors, provides individualized feedback, and links the person with at least one intervention to promote health, sustain function and/or prevent disease” (CDC, 2010). Currently, health risk assessments come in many different forms, with no general consensus on which approaches are most effective. However, the Affordable Care Act specifies that a health risk assessment be part of the annual wellness visit for Medicare beneficiaries. To promote best practices, CMS requested that CDC provide recommendations regarding best practices for health risk assessments. Although CDC's guidance has not been finalized, its interim recommendations are that the following questions or topics be addressed during the health risk assessment:

- demographics
- self-assessment of health status
- biometric assessment
 - height, weight, body mass index

- systolic and diastolic blood pressure
- blood lipids
- blood glucose
- psychosocial assessment
 - depression and life satisfaction
 - stress and anger
 - loneliness and social isolation
 - pain and fatigue
- behavioral risks
 - tobacco use
 - physical activity
 - nutrition and oral health
 - alcohol consumption
 - sexual practices
 - seat-belt use
 - home safety
- compliance with U.S. Preventive Services Task Force (USPSTF) recommendations.

In addition, CDC indicates that the preferred modality for health risk assessment is the Internet and that, preferably, the web-based health risk assessment should interface both with the primary care provider's EHR and the patient's PHR. Health risk assessments can also be used to understand an employee's preferences and attitudes in order to better tailor interventions. For example, they can collect information on readiness to change health-related behaviors and thus identify the employees who are most likely to engage with a wellness program. For example, a recent study found that a web-based health risk assessment with tailored feedback, administered at the workplace, reduced risk of cardiovascular disease (CVD) by nearly 18 percent among participants at high CVD risk and by nearly 5 percent among all participants (Colkesen et al., 2011).

Integration of Monitoring Data. Patients with chronic disease can benefit from frequent monitoring of physiological indicators, such as blood pressure and weight in patients with heart failure, glycated hemoglobin (HbA1c) in patients with diabetes, and peak expiratory flow rate in patients with asthma. Low-cost devices enable patients to measure these key indicators, and, increasingly, these devices are capable of transmitting their measurements. This new connectivity enables a range of new opportunities for patients and providers alike to monitor key physiological variables without a trip to the doctor's office. HMSs have the capacity to integrate with remote monitoring devices. This additional source of data would help patients and providers monitor and track key physiological indicators. In addition, the inclusion of these physiological variables into the patient's medical record could facilitate customized decision support for patient and provider.

Remote monitoring has the immediate benefit of reducing office visits, and some evidence suggests that it also results in other savings. A joint statement by the American Heart Association, American Society of Hypertension, and Preventive Cardiovascular Nurses Association called for increased use of home blood-pressure monitoring, stating that home blood-pressure monitoring overcomes many of the limitations of traditional office blood-pressure measurement and is cheaper, easier to perform, and more accurate and representative than ambulatory blood-pressure monitoring (Pickering et al., 2008). A meta-analysis of more than 30 studies

of the use of remote monitoring in heart-failure patients found that remote monitoring was associated with fewer deaths and hospitalizations than traditional monitoring methods were (Klersy et al., 2009). A remote-monitoring study of asthmatic adults found that an Internet-based self-management program with remote monitoring resulted in greater improvements in asthma control and lung function than found in usual care, and Tildesley and colleagues found that diabetic patients whose HbA1c levels were monitored improved significantly more than those of a control group of patients who received conventional treatment (van der Meer et al., 2009; Tildesley, Mazanderani, and Ross, 2010).

Promotion of Wellness and Healthy Lifestyles

Educational Content. This section describes educational content related to promoting wellness and healthy lifestyles.

Personalized Health Education and Messaging. Health education is any combination of learning experiences designed to help individuals improve their health by increasing their knowledge or influencing their attitudes (World Health Organization [WHO], undated). The Internet has become one of the main sources of health education. According to a report by the Pew Research Center, 59 percent of adults in the United States report that they look online for health information (Fox, 2011). Despite the availability of many credible educational resources, identifying the relevant and actionable information can be very difficult. In addition, users might also be presented with resources that are of low quality or misleading. This information-overload problem can be resolved by providing personalized health education and messaging that is verified and tailored to an individual's needs. The provision of personalized health education has shown promise in modifying numerous health behaviors, including substance use, dietary habits, and the self-management of chronic conditions (Terre, 2011; Noar et al., 2011).

Nutrition Solutions and Physical Activity. Diet is a major component of overall health, and improved dietary habits consistently reduce the risk of many diseases (McCullough et al., 2002; Park et al., 2011). Regular physical activity is associated with improved cognitive function and productivity; lower morbidity and mortality rates from cardiovascular disease, diabetes, cancer, and osteoporosis; and lower health care costs (Physical Activity Guidelines Advisory Committee, 2008; Berlin and Colditz, 1990; Helmrach et al., 1991; Giovannucci et al., 1995; Bravo et al., 1996; Andreyeva and Sturm, 2006). Despite these benefits, the majority of adults do not meet recommendations for physical activity (CDC, 2011). For these reasons, effective interventions that positively affect dietary habits and physical activity are likely to be effective strategies for holding down health care costs.

Substantial evidence exists that tailored dietary-change programs can be effective and that a variety of communication methods, such as print or telephone, can be used to deliver the tailored advice (Noar et al., 2011). Kroeze and colleagues reviewed 26 studies of computer-generated tailored programs to change dietary behaviors and found that the majority resulted in significant positive results (Kroeze, Werkman, and Brug, 2006).

The evidence for Internet-based interventions to promote physical activity is not as well established as in other areas, such as promoting healthy eating habits. However, evidence is beginning to emerge that personalized Internet-based interventions are effective in increasing rates of physical activity. Dunton and Robertson found that healthy women who enrolled in an Internet-plus-email intervention increased walking (at least 69 minutes per week) and their moderate to vigorous physical activity (at least 23 minutes per week), and a recent review of the literature concluded that Internet-based physical-activity interventions elicited increases in

physical activity that were comparable to those elicited by more-traditional physical-activity interventions (Dunton and Robertson, 2008; Marcus, Ciccolo, and Sciamanna, 2009).

Diabetes-Management Solutions. As indicated earlier in this paper, the increased prevalence of chronic diseases, such as diabetes, is a key driver behind the growth of health care costs in the United States. Approximately one in ten health care dollars is attributed to diabetes, and the national cost of diabetes in the United States in 2007 was estimated to be more than \$174 billion. Two-thirds (\$116 billion) of these costs were attributable to medical expenditures, while the remaining \$58 billion could be attributed to lost productivity. On average, diabetics have 2.3 times the medical expenditures of nondiabetics (American Diabetes Association, 2008). Although the prevalence of diabetes increases with age, there are almost 15 million working-age adults diagnosed with diabetes in the United States (CDC, 2011a). Therefore, improved management of diabetes in working-age adults presents a major opportunity for cost savings for employers, in the form of both reduced medical expenditures and reduced productivity loss.

Some studies have evaluated the impact of Internet-based diabetes-management solutions. In a randomized controlled trial, Lorig and colleagues found that, after six- and 18-month follow-ups, patient activation and self-efficacy significantly improved for participants in an online diabetes self-management program, compared with those who received usual care. They also observed that, among those with elevated hemoglobin A1c (HbA1c > 7), patients with access to the program demonstrated more-significant reductions in HbA1c than those who received usual care (Lorig et al., 2010). In a similar trial, Noh and colleagues found that patients with access to an online diabetes educational resource that was accessible via traditional Internet browser, as well as mobile devices, were able to reduce their hemoglobin A1c levels significantly more than a set of control patients who were provided with non-web-based educational materials (Noh et al., 2010). Finally, a recent systematic review of the literature reviewed 13 different studies of web-based interventions to support the management of diabetes. The review concluded that, generally, these programs demonstrated favorable outcomes and that programs that included personalized features related to goal-setting, interactivity, and peer support were consistently impactful (Ramadas et al., 2011). Given that these features have been effective in improving the management of diabetes, it is quite possible that they could be applied more broadly to improve management of other common chronic health conditions.

Reminder Systems. This section describes reminder systems for promoting wellness and healthy lifestyles.

Medication Adherence. Prolonged use of prescription medications is often a critical component in managing chronic conditions. Patients who adhere to their medication regimens experience better health outcomes and require less urgent care and inpatient hospital services than patients who are not adherent (Roebuck et al., 2011). Obviously, increased medication adherence results in higher pharmaceutical costs; however, a recent study by Roebuck and colleagues indicates that these additional expenditures yield significant ROIs. They found that overall medical expenditures among adherent patients were significantly less than those of nonadherent patients. Specifically, annual per person savings were as follows:

- \$7,823 for patients with congestive heart failure (benefit-cost ratio 8.4:1)
- \$3,908 for patients with hypertension (benefit-cost ratio 10.1:1)
- \$3,756 for patients with diabetes (benefit-cost ratio 6.7:1)
- \$1,258 for patients with dyslipidemia (benefit-cost ratio 3.1:1) (Roebuck et al., 2011).

Yet, despite the evidence of improved outcomes and significant cost savings, evidence suggests that medication adherence is still quite low in the United States. For example, patients with chronic diseases normally take only 50 percent of prescribed doses, 22 percent of patients with such diseases take less than what is stated on the label, 12 percent of such patients do not fill their prescription at all, and 12 percent of such patients do not take any medication after they fill their prescriptions (Kocurek, 2009).

The research literature indicates that a variety of interventions can effectively increase patients' medication adherence (Haynes et al., 2008). These interventions can take different forms, including technical approaches (i.e., those focused on simplifying packaging and dosage regimens), behavioral approaches (i.e., reminders and incentives), or educational approaches (i.e., information and counseling). A single type of intervention has not been shown to be consistently superior to the others; however, some evidence suggests that multifaceted interventions might be more effective (Roter et al., 1998). In addition, some evidence suggests that highly customized interventions that account for an individual's preferences, beliefs, and attitudes might also be more effective than other interventions (Hopfield, Linden, and Tevelow, 2006). For example, some patients might be more affected by information about the benefits of the medication, while others will be more affected by information about the risks associated with nonadherence.

Given the evidence that multidimensional and customizable interventions seem superior, Internet-based HMSs offer an attractive platform for medication-adherence interventions. Web-based tools can be used to assess patients' beliefs, attitudes, and concerns regarding their condition and treatment. And, based on these assessments, the content of the intervention can be tailored to individual needs. Web-based tools provide a more practical and cost-effective channel to deliver multifaceted medication-adherence programs (Herriman and Cerretani, 2007). Such programs could include dosage regimen instructions delivered to mobile devices, automated reminders, interactive self-monitoring tools, programs for eliciting family support, and secure messaging between patients and providers regarding questions (Balkrishnan, 2005). In fact, a growing body of evidence suggests that web-based adherence programs are more effective than traditional approaches. For example, asthma patients who received web-based education and case management were more likely to adhere to treatment than those who received office-based management (Chan et al., 2007; Rasmussen et al., 2005), and other studies have shown similar improvements in adherence in patients who have congestive heart failure (Roumie et al., 2006; Artinian et al., 2003). A recent study found that a specially designed pill-bottle system that provided visual and auditory reminders to patients to take their medicine at the appointed time significantly improved medication adherence among patients with uncomplicated hypertension (Agency for Healthcare Research and Quality [AHRQ], 2011).

Vaccination and Preventive-Care Applications. Although the United States enjoys relatively high rates of childhood vaccination, recent outbreaks of vaccine-preventable disease in adults, such as mumps and pertussis, suggest that gaps in coverage do exist in adults (California Department of Public Health [CDPH], 2010). Each year, there are approximately 50,000 deaths in the United States due to vaccine-preventable diseases (National Foundation for Infectious Diseases [NFID], 2008). CDC estimates that vaccination is highly cost-effective and that every dollar spent on vaccination saves \$5.30 in direct medical costs (Zhou et al., 2005). However, the complexity of recommended vaccine schedules makes it difficult for individuals to track which vaccinations they should receive and when. The schedules are particularly difficult to follow for adults, and this complexity is cited as a major barrier to improved vaccina-

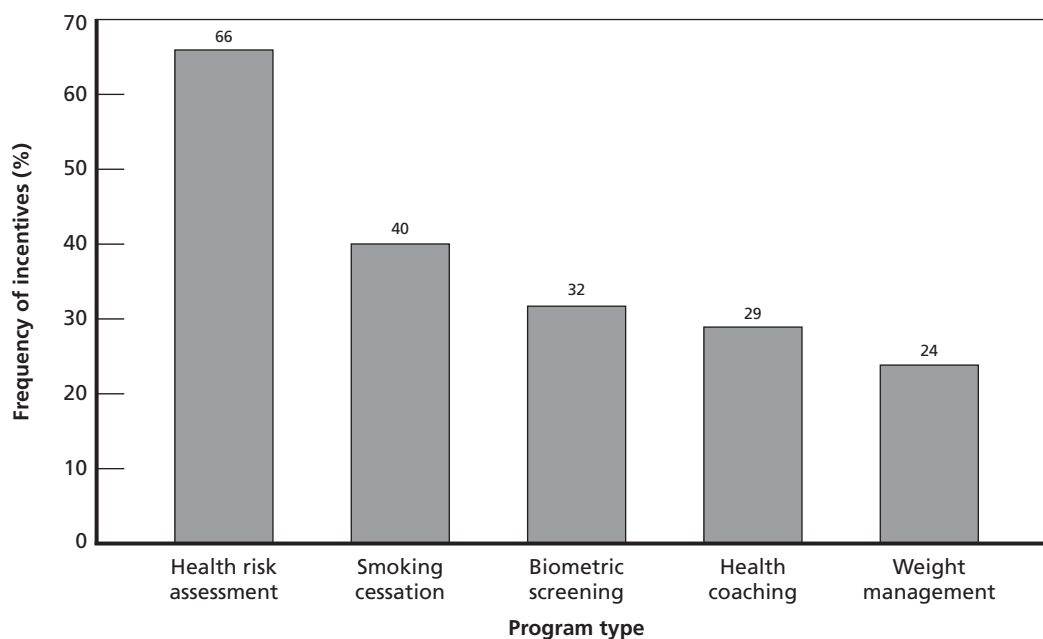
tion coverage (Committee on Community Health Services and Committee on Practice and Ambulatory Medicine, 2010).

Similar challenges exist for other preventive-care measures, such as cancer screening. Treating late-stage cancers is more expensive and less effective than treating early-stage disease. High rates of screening throughout the population are necessary to reduce the rate of late-stage cancer; therefore, it is important to identify effective approaches to increase screening rates (Swan et al., 2010).

The research literature indicates that web-based applications can effectively convey the benefits of vaccination and that patient-reminder systems are highly effective in improving immunization rates (Wallace, Leask, and Trevena, 2006; Doherty et al., 2008; Szilagyi et al., 2000). Similarly, reminders have proven to be effective in increasing the frequency of cancer screening (Feldstein et al., 2009). As was the case with delivering interventions to increase medication adherence, Internet-based HMSs offer an attractive platform for delivering customized information and reminders to encourage immunization, screening, and other preventive-care measures in compliance with USPSTF and CDC recommendations.

Integration with Incentive Systems. As noted earlier, persuading individuals to take advantage of wellness programs remains a challenge, and achieving an adequate participation rate is essential to realizing the value of these programs (Goetzel et al., 2007). Obviously, the best-intended and best-designed program will not reach its goals if people are not using it. Rewarding employees for participating in program activities through financial and nonfinancial incentives has become a common approach for boosting participation in workplace wellness programs. Data from the 2010 Towers Watson survey indicate that the most frequently incentivized activity is health risk assessment completion, with about two-thirds of companies providing rewards (Figure 14) (Towers Watson, 2010). This is consistent with the central role

Figure 14
Frequently Incentivized Components of Workplace Wellness Programs



SOURCE: Towers Watson, 2010.

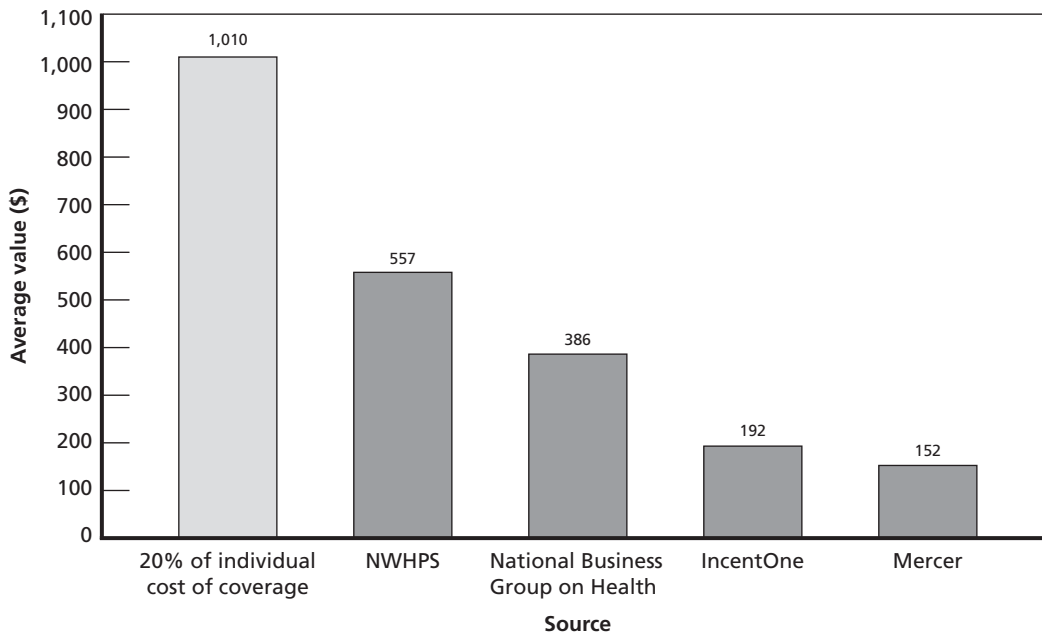
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that health risk assessments play in identifying at-risk employees and linking them up with the appropriate resources.

Incentives are offered in a variety of forms, such as cash, gift cards, merchandise, time off, awards, recognition, raffles or lotteries, reduced health plan premiums and copays, and contributions to flexible spending accounts or HSAs. The Kaiser/HRET survey reported that, among firms offering health benefits with more than 200 workers, 27 percent offer cash or cash-equivalent incentives (including gift cards, merchandise, and travel incentives), while 8 percent offer health plan premium discounts, 6 percent offer increased HRA or HSA contributions, and 2 percent offer smaller deductibles. Among employers incentivizing health risk assessments specifically, health plan premium discounts are more prominent. Kaiser/HRET reports that 27 percent of employers offer cash or equivalent incentives for completing a health risk assessment and an equal proportion offer lower premiums (KFF/HRET, 2009). Among large employers surveyed by the National Business Group on Health, 41 percent offer a premium discount for completing a health risk assessment, while only 27 percent offer cash or cash equivalents (Marlo, Dan, and Lykens, 2010).

The value of incentives can vary widely. Survey-based estimates range between \$152 and \$557 in incentive value per year, suggesting that companies are typically not close to the ceiling of 20 percent of the total cost of coverage, as specified by Health Insurance Portability and Accountability Act (HIPAA) nondiscrimination requirements (Pub. L. 104-191, 1996), considering that the average cost of individual coverage was \$5,049 in 2010 (see Figure 15) (KFF/HRET, 2009).

Figure 15
Average Incentive Value (U.S. dollars)



NOTE: NWHPS = National Worksite Health Promotion Survey.
 SOURCES: Linnan et al., 2008; National Business Group on Health, 2011; IncentOne, undated; Mercer, 2009.

A recent review found that incentives were offered in 76 percent of wellness programs documented in the peer-reviewed literature. However, there is next to no data on the incremental effect of incentives, on how incentive levels relate to outcomes, and how contextual factors, such as employer size, industry, or workplace culture, mitigate the incentive effect (Osilla et al., 2011). Still, some patterns are beginning to emerge, and a growing body of literature indicates that incentives are a key component in successful wellness programs (Baicker, Cutler, and Song, 2010).

In one study, for example, program participants were randomized to receive a \$150 cash incentive for logging minutes exercised and then compared with participants who did not receive this incentive. Compared with the nonincentivized group, incentive-group participants had significant improvements in exercise and body weight (Herman et al., 2006). Volpp and colleagues demonstrated that both lotteries and financial commitments were effective in motivating weight loss and smoking cessation (Volpp, John, et al., 2008; Volpp, Troxel, et al., 2009).

Lasting behavior change might require even stronger incentives. In one example, General Electric conducted an experiment that suggested employees were three times as likely to successfully quit smoking when they were paid a large incentive of \$750 for becoming verifiably tobacco-free (Schilling, 2009). Employing incentive-based approaches from psychology and behavioral economics might help employers increase participation in programs and modify behaviors that are typically resistant to change (Baicker, Cutler, and Song, 2010). Although the modality in which incentives are offered and delivered—such as direct cash payments, reductions in enrollee contributions to insurance premiums, or penalties for unhealthy behaviors—has not been researched, a flexible HMS would be advantageous in implementing and executing a wellness-based incentive program. The HMS would enable consumers and employers (through a third party) to accurately track behaviors (such as walking) and biometrics (such as weight or blood pressure). This capacity might promote sustained engagement and behavioral change, as well as steady progress toward health goals, thus providing employers more “bang” per incentive dollar.

Social Networking and Mobile Applications. Internet applications built around user-generated participatory content, collectively termed *Web 2.0*, are becoming increasingly popular among Americans of all ages (Fox, 2010). Examples of Web 2.0 applications include social-networking sites (e.g., Facebook), media-sharing sites (e.g., YouTube), blogs, wikis, and podcasts. The rise of Web 2.0 has led to innovation in health care and medicine; in fact, the advent of Web 2.0 applications, such as the HMS, has been hailed as a “tectonic shift in the health information economy” (Mandl and Kohane, 2008). Inherently, Web 2.0 applications foster engagement, and social-networking tools in particular provide “social” incentives to enter, update, and manage personal information (Eysenbach, 2008). For instance, the Nielsen Company estimates that 142.1 million Americans spend an average of more than six hours on Facebook per month (Nielsen, 2010). The goal of the HMS is to similarly engage users and turn their attention and energy to maintaining their personal health.

In addition to fostering engagement in patients’ own medical lives, the social-networking elements of HMSs and other Web 2.0 applications encourage engagement with others. Social networking provides new ways for individuals to identify trustworthy and credible health information and services (Eysenbach, 2008). Traditionally, health information was obtained from and filtered by *intermediaries*—e.g., physicians and pharmacists. Early Internet sites, which were made up largely of static, nonparticipatory content, enabled Internet-savvy patients to obtain health information without consulting any intermediaries; this process of information

gathering is known as *disintermediation*. *Apomediation* is a new information-seeking strategy, made feasible through Web 2.0 applications, in which consumers identify credible and useful information with the assistance of a network of their peers that “stand by” and offer assistance rather than relying on a small number of experts to filter information (Eysenbach, 2008).

The increasing prevalence of mobile devices both drives and is driven by the demand for social media. For instance, users who access Facebook via their mobile devices are twice as active on Facebook as nonmobile users are (Facebook, undated). Evidence suggests that mobile-enabled Web 2.0 applications can effect behavior change among individuals with chronic disease. A recent study evaluating an intervention in which individuals with atopic dermatitis were sent daily text messages with medication reminders and education resulted in significant improvements in treatment adherence, self-care behaviors, skin severity, and quality of life (Pena-Robichaux, Kvedar, and Watson, 2010). Another randomized controlled trial that evaluated a similar text message–based intervention in adolescents with diabetes found that the intervention significantly improved self-efficacy and adherence in this typically difficult-to-engage demographic (Franklin et al., 2006). Finally, a recent study compared two web-based interventions to increase physical activity. The first, a “nonsocial” intervention, allowed each participant to record and track his or her own step counts using a pedometer, and the second intervention was “socially enabled,” in that each participant could view and comment on the step counts recorded by the other participants. A significant increase in step activity was observed in the “socially enabled” intervention (Foster et al., 2010). The study highlights the potential of social media as a means for generating positive behavior change.

Obviously, these new “social” health care applications open up a new frontier of privacy concerns and challenges that will have to be addressed during the coming years. However, the rapid growth in the popularity of social networking in other domains of life despite the accompanying privacy risks associated with participating in these networks could be indicative that it is only a matter of time before individuals become more comfortable with sharing information online about their health and health care with others in their social networks.

Decision Support

Comparative Data on Price and Value of Providers. Wide variation in the prices for medical services of comparable quality within and across U.S. markets is well documented (Fisher, Bynum, and Skinner, 2009). Variation exists even for common procedures. For example, in New Hampshire in 2008, the average payment for arthroscopic knee surgery was \$2,406 with a standard deviation of \$1,203 (Tu and Lauer, 2009). Many studies in markets other than health care have investigated the effect of increased price transparency. Most evidence suggests that price transparency leads to lower and more-uniform prices. If these findings generalize to health care markets, increases in transparency should result in lower and more-consistent prices for medical care.

The number of online resources that provide information on price and value (i.e., the quality of the services relative to the price) has increased dramatically (Shaller Consulting, 2006). Available tools range from “report cards” (e.g., CMS Hospital Compare [see CMS, 2011]) to provider directories that offer detailed information on a provider’s background and practice (e.g., American Medical Association [AMA] DoctorFinder [see AMA, undated]) (Shaller Consulting, 2006). Some tools provide decision support for evaluating different treatment options (e.g., Consumer Reports Health.org [see Consumer Reports, undated]). These tools serve many functions. Some offer important data that serve as background and provide context for con-

sumers. Others help in sorting and prioritizing complex information and help consumers clarify their own preferences, or provide structured guidance for the decisionmaking process. Like many of the functions we have reviewed in this paper, health care cost-transparency tools are still in the early stages of development and implementation.

New approaches to benefit design, such as VBID and CDHPs, require consumers to make more-complex decisions than do traditional health plans, and consumers might be ill-prepared for that. A recent study found, for example, that consumers had limited knowledge about their health insurance benefits, yet they frequently reported changing their care-seeking behavior because of concerns about cost. Poor knowledge of benefit design combined with price sensitivity can result in unintended consequences, such as avoiding care for services that are exempt from any deductible (Reed et al., 2009). In order for complex benefit designs to have the desired effects, consumers need better information and decision support to help them understand their benefits and to differentiate between high-value and low-value services.

The evidence for the effects of price and value transparency is still relatively sparse, primarily because most efforts to provide such transparency are still in their nascent stages (Sinaiko and Rosenthal, 2011). However, the available evidence does trend toward positive effects. Decision tools related to health plan choice have been shown to increase consumers' satisfaction and knowledge, as well as increase the likelihood that they would consider alternatives to their current health plan and select a plan that best meets their needs (Shaller Consulting, 2006). Despite the limited evidence, more than 30 states are considering legislation to increase price transparency, and similar legislation was proposed at the federal level in 2010. In addition, some commercial health insurers release information to their members about the prices charged by hospitals and physicians for common services and procedures (Sinaiko and Rosenthal, 2011).

Telehealth Consultations. Health care providers can deliver home care services using information and communication technology, also known as *home telehealth*. Telehealth can potentially relieve some of the increasing health care cost pressures by shifting routine care away from costly institutional settings. Telehealth is not intended to replace necessary “high-touch” professional care or visits (Polisena et al., 2009); however, telehealth can replace professional care that is not necessary and therefore wasteful.

A comprehensive literature search identified 22 studies (n = 4,871 patients) of home telehealth for chronic diseases published between 1998 and 2008. Home telehealth was found to be cost saving for the health care system and payer perspectives in all but two studies. Current evidence suggests that home telehealth has the potential to significantly reduce costs (Polisena et al., 2009). The HMS serves as a natural platform for providing users access to telehealth consultations but also as a repository for recording the outcomes of the consultations. In addition to providing a platform for telehealth in the traditional sense (i.e., remote interactions with a health care provider), the HMS would also facilitate emerging forms of telehealth, such as virtual coaching for wellness programs and access to a nurse hotline.

Consumer-Centric Support Tools in Personal Finance

The ways in which online applications will continue to affect health and health care remain to be seen. When looking ahead at how online health care applications could develop and mature, it is instructive to look back at the impact that online applications have had in other consumer industries—such as personal finance. The Internet has dramatically changed retail banking and personal finance. It is no longer necessary to make trips to the bank, speak with a

teller, wait for statements in the mail, or even balance your checkbook. Almost every standard banking transaction can now be handled online, and, with the rise of mobile technologies, these transactions can be made from almost anywhere at any time of day. Like health and wellness, personal finance is a complex component of life. An estimated 65 percent of adults have relationships with five or more financial institutions (A. T. Kearney, 2005). The development and increasing adoption of personal financial-management applications, such as Mint.com, might be an apt model for the future development and adoption of consumer-controlled health care support solutions, such as HMSs.

Mint.com was founded in 2006 to provide an intuitive online application for managing personal finances. Mint.com offers functions to help users more effectively manage their finances:

- Information gathering: Mint.com works with more than 16,000 financial institutions. Mint simply needs a user's online-banking login information and password to access his or her transactions.
- Security: Mint provides bank-level security.
- Transactions: Mint automatically pulls transaction data from financial institutions.
- Categorization: Mint provides default categorization and allows the user to create custom categories of his or her spending.
- Budgets: Mint allows the user to set a monthly budget for each spending category. As transactions are processed and captured, spending in each category is tracked against the budgets that were assigned.
- Goals: Mint allows users to define specific goals (e.g., saving for college, buying a car, buying a house) and define the total amount that the user would need to save to achieve the goals. Each goal is then broken down into a monthly savings goal that is tracked against the user's spending.
- Engagement: Mint provides a game-like approach personal finance through its "financial fitness" feature. The game is based on five principles of personal finance (e.g., spend less than you earn), and each principle has tasks associated with it (e.g., avoid bank fees). As the user completes tasks, he or she is awarded points, which the user can use toward earning "merit badges" (e.g., "financial guru") (Kincaid, 2009).
- Trends: Mint can display extensive spending trends for the user and allow the user to see how his or her spending has changed over time (Deloitte Consulting LLP and Intuit Inc., 2011).

Within a year of its founding, Mint.com had more than 500,000 users, and, as of this writing, Mint.com has more than 5 million unique users. Data also suggest that Mint.com users engage often with the site. In April 2011, Mint users visited the site 6.6 million times (an average of 1.3 times per user per month) (Compete, undated).

Although each has important privacy and security issues, health care differs from banking in that many of the "high-touch," in-person interactions in health care might not be as easily replaceable with digital proxies as financial transactions can be. Transactions involving dollars and cents lack the nuance and complexity of interactions between a patient and provider as they work together to manage a chronic condition. Given the level of complexity of health care, it is likely that an even more-comprehensive and sophisticated suite of tools will be required to provide useful decision support and engage consumers in their own health care.

Conclusion

Against the background of steadily increasing costs of providing health care coverage, employers will continue to experiment with new benefit designs to contain cost, increase value, and enhance the productivity of their workforces. In this paper, we described workplace wellness programs, VBID, and CDHPs as innovations that are widely used today. In the future, other approaches could emerge, such as defined-contribution plans (in which employers pay only a fixed amount toward health care coverage, similarly to how they handle defined-contribution pension plans). Another approach could be direct contracting of employers with provider organizations, such as accountable care organizations, to avoid the health plan as an intermediary.

Many of these innovations fundamentally change the role of the consumer by requiring consumers to become more-engaged and informed decisionmakers. Decisions about which coverage option to choose and where to seek care will become more complex and demanding, and the financial implications of those decisions will become more substantial. If executed well, these new benefit designs can support a partnership between employer and employee to obtain better value for both.

To realize this potential, however, consumers will need appropriate decision-support tools and resources to become engaged and actively manage their health risks and care utilization. There is a compelling case for employers to provide these tools and resources. First, many innovations will simply not work without employee engagement. A wellness program can achieve its intended effect only if employees understand their health risks and have access to attractive solutions to manage them. Second, an employer might feel a sense of responsibility toward its workforce and want to provide support as it shifts financial risk to its employees. Third, employers might have the most to gain in terms of increased workforce productivity and reduced health care costs. Fourth, exposing employees to greater risk might imply that employers bear a fiduciary responsibility to provide the information needed to act in an informed manner, as is the case in defined-contribution retirement plans (per the Employee Retirement Income Security Act, or ERISA, Pub. L. 93-406, 1974).

Many employers are now testing approaches to deliver such information and decision support. The most typical approach is a web portal that allows an employee to take a health risk assessment and then links him or her to programs and other resources that match his or her particular risk profile. In addition, these portals are used to communicate health-related content to all employees, irrespective of risk profiles. An HMS as described in this paper is an evolutionary step beyond existing tools, in that it integrates data from a variety of sources and customizes tools, resources, and information to a greater extent than existing tools do. In addition, the HMS can provide a platform for developers to build applications that will engage employees in their own health and health care and to make more-informed choices about their

health care consumption. The proliferation of Web 2.0 applications for wellness and health will drive innovation, but it will also make it increasingly difficult for employers to identify which applications are most appropriate for their employees. This dilemma might be most efficiently solved through establishing a “health application marketplace.” The marketplace model for applications is common and likely familiar to employee users (see Apple’s App Stores or Google’s Android Market). Integrating the marketplace into the HMS has the added advantage of leveraging the availability of an individual’s health data and social network, which would enable each person to solicit feedback about applications from similar users and identify applications that are most likely to fit his or her individual needs.

The HMS offers many capabilities that can facilitate and enhance employers’ new approaches to benefit design, and we find evidence that several of these capabilities have been successfully implemented and evaluated. As noted in this paper, these features fall into three main categories: health information management, promotion of wellness and healthy lifestyles, and consumer decision support. In addition, as new entities (e.g., accountable care organizations) emerge and become party to health cost risk, they might find that these same features are increasingly relevant to them as well.

In principle, the HMS is an attractive idea; indeed, leveraging personalized health information and integrating the presently disparate features described in this paper into a one-stop shop might make the whole greater than the sum of its parts. However, this hypothesis remains untested, and the value of HMS will be borne out as employers begin to adopt and implement these emerging technologies and further assess their effects on employee behavior, health care costs, and overall value.

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