How to Present the Business Case for Healthcare Quality to Employers

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Abstract

Many employers in the United States are investing in new programs to improve the quality of medical care and simultaneously shifting more of the health care costs to their employees without understanding the implications on the amount and type of care their employees will receive. These seemingly contradictory actions reflect an inability by employers to accurately assess how their health benefit decisions affect their profits. This paper proposes a practical method that employers can use to determine how much they should invest in the health of their workers, and to identify the best benefit designs to encourage appropriate health care delivery and use. This method could also be of value to employers in other countries who are considering implementing programs to improve employee health.

I. Introduction

Recent studies by the Institute of Medicine and researchers at RAND demonstrate that quality is less than ideal in the U.S. health care system [1,2]. Numerous possible causes for these deficiencies include: poorly informed consumers, the rapid pace of technological change, administered prices that make it difficult to reward providers who have superior outcomes, the difficulty of measuring providers' performance, the delayed impact of today's investment in health promotion, turnover of enrollees and workers among insurers and employers, and providers' reluctance to embrace information and other potentially quality-improving technologies [3,4,5].

A large number of prominent health services researchers and policy makers argued recently in an open letter that Medicare should lead the effort to promote high quality health care in the United States [6]. While there are many key stakeholders in health care, including consumers, the government, health insurers, health plans, pharmacy-benefit managers, hospitals, and providers, private sector employers are an equally critical catalyst for improving the quality of health care. First, 160 million non-elderly Americans receive their health insurance from employers. Second, employers in the United States provide a substantial amount of compensation to their employees in the form of health insurance. According to a 2003 survey, employers spent an average of $6,700 and $2,900 for a family and single health plan, respectively, above and beyond the employee's contribution [7]. Third, some employers are already leading initiatives to assess the quality of healthcare services delivered and hold providers accountable. Fourth, private employers are likely to move more quickly than the public sector if/when they become convinced that investing in programs to improve the quality of medical care can improve profits.

Improvement in profits can be derived from better management of the direct costs incurred in the care of an employee or his/her family, and from increases in worker productivity. However, current action (and inaction) by employers suggests substantial confusion about what is the best future course of

action. In the U.S., many large employers are attempting to improve quality of health care by embracing National Committee on Quality Assurance (NCQA) Health Plan Employer Data and Information Set (HEDIS) measures to assess the quality of health plans and by providing disease, case, and disability management, as well as access to health promotion programs. At the same time, many of the same employers, as well as others, are attempting to reduce health care expenditures by increasing employee costs in the form of higher deductibles, tiered co-payments, and tiered insurance.

Some cost sharing strategies to reduce expenditures have been associated with decreased adherence to therapy and to worse outcomes [8,9], although not all cost sharing arrangements have had these effects [10]. These seemingly contradictory actions – investment in worker health and increased employee cost sharing without an understanding of the associated health consequences – reflect an inability of employers to accurately assess how their decisions affect the bottom line. Short-term apparent savings in some direct medical costs may be offset (or more than offset) by increases in other direct costs and productivity losses in the short and long-term, as well as by the need to pay higher money wages when the quality of benefits is reduced. So that a clear and compelling case can be made in a business environment to identify optimal benefit designs and effective health promotion programs, a practical employer tool for accurately valuing investments in the health of their workers is needed.

We know that employers do invest in quality improvement efforts in their business operations. They are trained to apply a consistent quantitative method to all potential investments in order to identify those that should be funded, so that the firm can be encouraged to fund those that enhance profits. The most commonly used methods of estimating the value of potential investment strategies are the net present value (NPV) of discounted cash flows and the return on investment (ROI). These methods require that a manager have accurate, defensible, quantitative measures of the benefits and costs associated with a potential investment. Unfortunately, most companies cannot accurately measure the benefits associated with maintaining and enhancing their workers' health, or convert them into a

monetary equivalent, and therefore cannot put expenditures (or investments) in their workforce into the same general framework they employ for other investment decisions.

In the U.S., a program that improves the quality of care received by employees potentially can provide four benefits to an employer: reduced medical expenditures (for both employees and their families), reduced absences, improved on-the-job productivity, and reduced turnover due to employees' perceptions of the total compensation package associated with the job. In countries with nationalized health insurance or health service programs, the last three of these benefits still apply. Relative to a healthy person, an employee in poor health is more likely to be absent from work and less productive when he or she is at work [11,12], and a recent study suggests that these indirect costs of poor health may actually exceed direct medical costs [13].

To properly quantify the benefits to an employer of investing in their workers' health all sources of benefits should be considered. However, a typical U.S. company estimates how a health-benefit or health-care quality-enhancing program will affect their bottom line by considering only the direct medical costs that they reimburse as health benefits. This leads to implementation of programs where the investment return from the reduction in direct medical costs yields a positive NPV. For example, over 40% of employers have implemented disease management programs for expensive and debilitating conditions such as diabetes, heart disease, and asthma, where the evidence suggests that the NPV from direct medical savings alone may be positive.[1] However, fewer than 25% of employers have implemented such programs for lower back pain and obesity. If the benefits of reduced absences and improved on-the-job productivity could be accurately measured and included in the NPV estimate, there may be many more cases where improving the quality of medical care would yield a positive NPV.

To the extent that employers have attempted to measure the impact of programs on workers' productivity, they have generally focused only on reductions in absenteeism. Even then, most analyses underestimate the benefit of reduced absenteeism by using an employee's wage as a proxy for the value

of his/her time [14,15,16]. This conventional method assumes, usually implicitly and often incorrectly, that employees are perfect substitutes for one another, that an absent worker or a worker with impaired productivity will not impact the productivity of his teammates, and that companies do not lose sales when a worker's productivity is diminished by poor health [17]. A recent study demonstrates that the cost of lost work time, and therefore the benefit associated with reducing absences, can be quantified and can be substantially larger than the wage, when perfect substitutes are not available to replace absent workers, and there is team production or a penalty (e.g., lost sales) associated with not meeting an output target [18].

Traditional measurement methods, even those that include the cost of absence measured at the wage, are therefore likely to underestimate the true benefit of programs that improve worker health, reduce absenteeism, improve on-the-job productivity, and reduce turnover. As a result, employers who rely on existing methods to design health insurance policies and decide whether to invest in specific health promotion programs may under-invest in the health of their workers. This paper proposes and illustrates a general approach that would enable employers to more thoroughly examine all of the ways that an investment in the health of their employees could improve the bottom line, in the same fashion that companies analyze potential investments in other capital projects. This approach provides a more intuitive and rigorous framework as a step forward in improving manager understanding of the implications of company decisions regarding health benefit design and provision of health services, including health promotion, disease and case management programs.

II. A General Method to Help Employers Determine Whether to Invest in Programs That Improve the Quality of Health Care Received by Their Workers

Most businesses calculate the net present value (NPV) or the return on investment (ROI) of a project to help decide whether to purchase a new property, plant, or equipment. In the NPV method, the

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[1] Mercer Human Resources Consulting, as cited in the *Wall Street Journal*, October 20, 2004.

first step is to forecast all benefits of a particular project in each future year, measured in dollars. These benefits are then discounted to the present year using the company's opportunity cost of capital or some other generally acceptable interest rate. The discount rate reflects the fact that the company's investors (stockholders and bondholders) are implicitly funding the project. Investors expect a certain rate of return given a project's risk; otherwise they will shift their funds to a different company. A project has a positive net present value if the sum of the discounted benefits exceeds the sum of the program's discounted costs. A company that invests in such a project will be exceeding investors' required return, and therefore will increase the company's value.[2] Likewise, companies should invest in a project if its ROI exceeds the discount, or "hurdle", rate.

Managers can apply this standard investment framework when evaluating investments in health improvement programs, if and when they have good data. In 2002 the Integrated Benefits Institute surveyed 269 chief financial officers (CFOs), over 80% of whom were in small or mid-size companies (less than 10,000 employees). Sixty-one percent of the CFOs believed there is a "strong" link between employee health and productivity; another 32% perceived this link to be "moderate" [19]. Their most common productivity metrics were revenue per employee and output per hour worked. When asked how large a financial return would be required in order to demonstrate that a health promotion program was valuable, almost one-third of them did not specify a specific threshold rate of return. However, the remaining two-thirds of the CFOs would consider investing in a program that had a rate of return of at least 8%.

We present a hypothetical evaluation of a disease management program in Table 1 in order to demonstrate the data elements that are necessary for a comprehensive financial analysis of a quality-improvement program. A similar type of analysis could be performed to analyze the business case for any other health-related program, such as a pay-for-performance program that offers financial incentives

[2] Companies that are not able to raise enough money to finance all projects with a positive NPV will generally rank projects and pursue those with the largest NPV.

to physicians and hospitals that achieve superior patient outcomes or adhere to clinical guidelines, or a smoking cessation program that provides financial incentives to employees who quit smoking.

The hypothetical disease management program described in Table 1 would assign registered nurses to monitor employees with chronic health conditions to ensure they receive appropriate, timely medical care. We consider a company that currently spends $2,000 per employee per year on medical care for each of its 1,000 employees, of which 600 have a chronic health condition.[3] We assume there is a onetime cost of $200 per worker to screen employees and identify those who have a high health risk, and then an ongoing cost of $60 per employee per year cost for a disease management firm to monitor, educate, and coach the high-risk employees. By redesigning medical services (e.g., encouraging employees to take their prescription medication to avoid emergency room visits), we assume the company will reduce medical spending by 2% per year over the next five years among the chronically ill employees.[4] A company that considers the reduction in medical expenditures as the only benefit of the disease management program would clearly not implement this hypothetical program. The cost of the program over the course of five years ($440,000) is considerably larger than the estimated reduction in medical spending (about $75,000).

The program's value is much more apparent when improvements in absenteeism and on-the-job productivity are included as possible benefits.[5] After one full year, we assume that the program reduces absenteeism among chronically ill employees by 5%, and increases their on-the-job productivity by 5%.

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[3] In a recent survey at The Dow Chemical Company, sixty-five percent of workers reported having a chronic health condition [24].

[4] Villagra and Ahmed [20] estimate that a diabetes disease management program reduced medical expenditures by 8%. Although Fireman, Bartlett, and Selby [21] report that medical expenditures increased 9 percentage points less over a four-year period among enrollees with chronic conditions that were targeted by Kaiser Permanente's disease management programs relative to enrollees without a chronic condition, the authors caution that the programs may not have been responsible for the cost savings. Goetzel *et al.* [22] report mixed evidence for 44 disease management programs targeting five different conditions, with the largest and most consistent cost savings for congestive heart failure programs and the weakest results for depression programs. The Congressional Budget Office [23] reviewed the disease management literature and concluded that there is limited evidence that these programs reduce medical expenditures, in large part because most studies focus on intermediate health outcomes (e.g., blood pressure or cholesterol levels) rather than medical costs. We assume a more modest expenditure reduction of 2%.

The baseline absence rate, average wage, incidence of a chronic condition, and impact of a chronic condition on on-the-job productivity are taken from a recent study of the United States-based workforce at The Dow Chemical Company.[6] We also assume that 2.4% of the employees leave the firm each month, which implies that 75% of the workers who were initially enrolled in the disease management program will still be working for the company in the second year of the program, and only 31% in the fifth year.[7] Only workers who were involved in the initial health screening and remained employed will generate benefits.

In the first year program costs exceed benefits by $176,000; in the subsequent four years when the productivity effects take hold, the net benefits are positive. Using a 12 percent discount rate, the disease management program would have a cumulative NPV of $36,000 over the five years. The positive NPV implies that there is a business case for the company to invest in their workers' health. However, since the NPV is small and relies on a number of uncertain assumptions, the benefits director at this company may not feel confident enough to press the case to senior management.

One nice feature of the NPV method is that it allows a manager to identify a breakeven threshold for a certain parameter that is difficult to estimate empirically. For example, since there are few reliable estimates in the literature regarding the productivity effects of a disease management program, a manager could calculate the productivity improvement that would cause the project to "breakeven" – to have an NPV of zero. Managers could then rely on their intuition and experience to assess whether the program could deliver that type of improvement in their workforce. In Table 1, if the program were able to

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[5] Situations where a person is present for work but functioning at less than full productivity are sometimes referred to in the literature as "impaired presenteeism."

[6] Dow employees based in the United States were surveyed in the summer of 2002 [24]. The employees missed 1.1% of work days due to a health condition, on average. Sixty-four percent of the workers reported having a chronic health condition and these employees reported that their productivity while at work was 11.5% lower than usual over the previous four weeks due to their health condition. The average hourly wage among the Dow workforce is $31.90.

[7] The seasonally-adjusted national average turnover rate for June through August of 2004 was 2.4% according to a Bureau of Labor Statistics survey.

improve absenteeism and presenteeism by 4.5% instead of the assumed 5%, the program would still have a positive NPV and would merit investment.

One issue is whether the company or the employees would in fact capture the health-related improvements in productivity. If the program permanently improved a worker's health and productivity and this was apparent to all other employers, then in the long run the employees would receive the benefit in the form of higher wage [17]. However, even in this situation an employer would be wise to invest in health-related programs with a positive NPV because these programs would help the company offer a competitive wage, and thereby attract and retain employees in a competitive labor market.

Notice that the benefits in Table 1 decline considerably from the second to the fifth year due to employee turnover – fewer workers who were initially enrolled in the program remain employed at the company. A program that improves workers' health could lower the turnover rate by creating a stronger attachment between the employees and the company. A worker who values the health improvement for reasons above and beyond the boost in productivity (e.g., he/she is healthier on the weekend as well as being healthier while at work) may be less likely to leave the company. In a recent study the median annual turnover cost per employee was estimated to be $3,700, so companies that reduce their turnover rate should spend less on recruiting and training new employees [25].

There are two reasons why more health insurers, disease management companies, and employers have not used the simple model described in Table 1. First, there are few studies demonstrating that health improvement programs reliably translate into fewer absences and improved on-the-job productivity. Second, the studies that do estimate the productivity effects associated with health improvement either do not place a value on these improvements, or place too small a value on the improvements [5,15,20],. The first problem would be solved in principle by careful use of evaluation methods (e.g., by comparing participants to non-participants in a rigorous way). The second problem, which is more complex in theory and in practice and will be discussed in the next section, weakens the case for employer adoption at a crucial juncture. Given these shortcomings, it is not surprising that

businesses tend to focus on direct medical expenditures only when evaluating investments in their workers' health. Once we discuss new methods of valuing health improvements in the next section, we will apply them to the hypothetical example at the bottom of Table 1.

III. Results

a) Measuring the Benefits to Employers of Improving Employee Health Status

As mentioned earlier, there are four primary, financial benefits to an employer from investing in programs that improve employees' health: reductions in unnecessary medical costs (for both workers and their families), reductions in work absences due to poor health, improvements in on-the-job productivity, and reduced employee turnover. We have already discussed cases in which medical costs are reduced by enough to cover the cost of a program, so we focus below on how to measure the indirect, or productivity-related, benefits.

Most studies that evaluate the financial benefit of reducing absenteeism assume that the value of each work day lost is equal to the employee's daily wage. In the neoclassical economic model, wage rates should be equal to the value of the incremental output produced by each worker. According to the typical method, if an employee misses one fewer day of work the company gains the value of his/her output, which is assumed to be equal to his/her daily wage.[8]

Traditional methods for assessing the financial impact of health-related absences are likely to underestimate the true gain to employers and employees from implementing policies that improve worker health and ability to work. Mark Paul*y* and his colleagues have argued that if competitive labor markets are in equilibrium, a worker's wage is the *lower-bound* estimate of the cost of an absence [17]. If, for example, companies can predict absences perfectly and hire enough equally-productive workers to cover

[8] Pauly et al. [17] show that the cost to a firm when a worker is absent is the worker's marginal revenue product, which would be equal to the daily wage if workers were never expected to miss work or if they are not paid when they are absent. Observed wages will usually be slightly lower than a worker's marginal revenue product because

for the absent workers, absences should have no impact on the company's output: the only cost is that of paying the wage to the employee who did not work. Likewise, for jobs where workers perform discrete and measurable tasks and work individually, the worker's wage is likely to be an accurate estimate of the cost of an absence. Workers rarely function in such an isolated way in today's market, however. If a company loses revenue, for example, due to a worker's absence (e.g., a commercial flight is delayed or cancelled when the pilot is sick), all of the rest of the team is affected, and the cost of an absence is lost revenue, which will often exceed a single worker's wage.

A recent study examined whether the cost of an absence does indeed vary across jobs according to (a) the likelihood that a manager can find a perfect substitute for the absent employee, (b) the extent to which the employee functions within a team, and (c) the extent to which the employee's output (or his team's output) is time sensitive [18]. After identifying 35 jobs in 12 industries that involve different types of production functions, over 800 managers were interviewed to determine the extent to which the three characteristics were embodied in a given job, as well as the financial consequences of absences. They provided empirical support for the hypothesis that the cost associated with missed work varies across jobs according to the three key characteristics. Based on these manager interviews, the authors estimated wage "multipliers" for each of the 35 different jobs, where the multiplier is defined as the cost to the firm of an absence as a proportion (often greater than one) of the absent worker's daily wage. We present some selected multipliers in Table 2. The mean multiplier for the 35 jobs included in the study is 1.61, and the median multiplier is 1.28. This implies that for the median job the cost of an absence is 28 percent higher than the worker's wage. To get an accurate estimate of the cost, the employee's wage is multiplied by the appropriate multiplier for that job, or for a job with the same combination of job characteristics. This will yield higher, more accurate estimates of the financial return on health-related

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most workers are paid when they are absent (up to certain point), and the expected absence rate will be considered when determining the wage per day paid.

interventions to reduce absence, and will enable more informed investments in specific health programs, services or benefits.

Until recently, most employers assumed that absences were the only source of health-related work loss. However, employees who come to work but are not feeling well may not be able to perform at their usual level of productivity. This is sometimes referred to in the literature as "impaired presenteeism." Wayne Burton, Corporate Medical Director at Bank One, was one of the first to estimate the magnitude of this on-the-job productivity loss. Examining Bank One's data on absence and short-term disability from 1994-1995, he measured actual decreases in work output for "isolated" jobs and found that as the number of health risks increases, an employee's productivity decreases; and that disease states that have produced disability events are also associated with work loss [26]. The field of health-related productivity measurement is evolving rapidly, and a number of self-report measures of productivity have been developed, tested, and published [11,27,28]. In a recent study, Ron Goetzel and his colleagues estimated the cost of absenteeism and presenteeism for several chronic illnesses [13].

Many of the findings in these studies suggest that the costs of impaired on-the-job productivity are larger than the costs associated with absences. To place a dollar value on this work loss, Walter Stewart and colleagues gauged the extent of "lost productive time (LPT)" through a national, randomized telephone survey in 2001-2002. Using the wage rate as a measure of the cost of workloss, they estimated that health-related LPT costs employers $226 billion per year, or $1,685 per employee per year—71% of which was explained by reduced performance at work [12]. It is likely that many of the same factors that produce multipliers for absenteeism also operate for impaired presenteeism, but these multipliers have not yet been estimated on a large scale. Measuring and monitoring all three drivers of health-related employer costs—direct health care costs, absence and impaired presenteeism—provides employers with a more complete picture of the financial impact of workforce health on a company's performance, and helps employers prioritize programs and evaluate the financial impact of those programs. This

management discipline places workforce health investment decision making processes on par with that of other company assets.

How important is it to use the most accurate estimates of the cost of workloss? At the bottom of Table 1 we repeat the financial analysis of the disease management program assuming that the firm employs workers in job types that have the median multiplier (1.28) among the 35 different jobs analyzed in a recent study by Sean Nicholson and his colleagues [18]. We also assume that the multipliers we derived for absences are also appropriate for presenteeism. When the estimated productivity benefits increase by 28%, the cumulative NPV of the program in the first 5 years increases from $36,000 to $136,000, and the breakeven productivity level decreases from 4.5% to 3.6%. A benefits director using the multiplier method would be able to make a much more persuasive case to senior management for investing in the disease management program.

One implication of using multipliers is that companies that have many employees in jobs with high multipliers would be more likely to invest in their workers' health, because the benefits of productivity improvements would be relatively high. In a number of cases, workers in jobs with high multipliers have more education and higher wages, which implies that the greater use of this method could accentuate rather than ameliorate health disparities. There are exceptions, however. Restaurant cooks, for example, have a relatively low annual salary ($19,800) but a relatively high multiplier (1.48).

b) Application to the United States Workforce

To quantify the extent to which the cost to employers of illness-related absences has been underestimated, we used the 2000 Current Population Survey (CPS) to apply the absence multipliers to a nationally representative sample of workers. The CPS is a monthly survey of 50,000 randomly-selected households, where one-quarter of the sample is asked their wage rate. We combined all 12 surveys from 2000 for the sub-sample of workers who reported their wage. The health-related absence rate was estimated as the percentage of the usual weekly hours that were missed due to illness in the past week.

Workers were classified into nine industry groups (e.g., manufacturing) and nine occupation groups (e.g., executive, administrative, and managerial). We used the 35 job-specific multipliers described above to calculate the average multiplier for each of the nine occupation groups. We then applied the relevant occupation-specific multiplier to each worker to derive an industry-specific multiplier. The annual cost of health-related absences without multipliers was estimated by multiplying average annual earnings per industry by the industry absence rate. Then we multiplied this result by the industry-specific multiplier to arrive at the annual cost of health-related absences, taking into consideration the effect on co-workers, sales, and other company expenses.

Table 3 shows that health-related absence rates are very similar across industries, ranging from 1.1% to 1.7%. Employers face an estimated annual cost of workforce absences due to illness of $55 billion if one assumes the cost of an absence is equal to the wage of the absent worker. The estimated cost is 35% higher ($74 billion) if one considers the spillover effect absences can have on the output of an entire team, the potential impact on lost sales, and the cost of preventive measures (e.g., overtime, overstaffing) to minimize the impact of worker absences. The lowest multiplier is in the mining and construction industry and the highest multipliers are in finance/insurance/real estate and transportation/communication industries, although the range is fairly small.

c) Application to The Dow Chemical Company

The analysis in the previous section addressed illness-related absenteeism, but not the impact of health on on-the-job productivity. The Dow Chemical Company, a large employer headquartered in Michigan, surveyed over 12,000 U.S.-based employees in the summer of 2002 to develop a comprehensive understanding of the costs associated with chronic health conditions. Sixty-five percent of employees reported having one or more chronic condition, with the two most common being allergies and arthritis/joint pain or stiffness (first column of Table 4) [24]. A worker also reported how many days she was absent from work due to her primary condition and the percentage of her “usual productivity” she

was able to achieve in prior four weeks, given her primary health condition. The annual cost of absenteeism and presenteeism per worker is estimated separately for each condition in Table 4 by multiplying the self-reported absence days and on-the-job productivity "loss" by a worker's wage. The final two columns report the sum of medical, absence, and presenteeism costs, without and with a multiplier. We used a multiplier of 1.41 based on Dow's distribution of workers in nine different job categories and the job-specific multipliers developed in the Nicholson study [18].

The survey provided Dow with an accurate estimate of the true prevalence rate of chronic conditions among their workers. By using the prevalence and the per-person cumulative costs (medical costs, absenteeism, and presenteeism), Dow could calculate the total cost impact to the company by health condition. In addition, when analyzing costs on a per worker basis, several conditions with large medical costs, such as diabetes, arthritis and circulatory disorders, were not in fact the most expensive conditions when productivity effects were included. Depression/anxiety was the most expensive condition (on a per worker basis) due in large part to substantial presenteeism costs. In fact, the estimated presenteeism costs exceeded medical costs for each of the nine conditions studied.

These data helped Dow develop focused intervention strategies on specific conditions that may have been less well informed without the survey. The overall magnitude of these costs helped motivate a philosophical change from managing direct medical costs to an investment-based approach incorporating direct and indirect costs. As a result of this analysis, Dow's strategy is focusing more on prevention, quality of care, and more sophisticated purchasing, such as pay for performance programs.

IV. Discussion

When health benefits are considered by employers as a production cost similar to raw materials, it makes sense to shift costs to employees (or abolish health benefits entirely). Indeed, the recent embrace of tiered co-pays and co-insurance might be understood in part as a short-term fix for double digit increases in health care costs that employers have incurred – in the face of a relatively tight job market.

Although employers recognize that this can only be pushed so far -- and indeed may have unintended negative consequences in terms of adherence and compliance with needed therapies, as well as costly problems in recruiting and retaining workers because of employee dissatisfaction with the benefits package -- they nonetheless have justified these strategies under the rubric that they "need to keep their cost structures competitive."

Unless these unintended consequences can be quantified and incorporated into business decisions, employers may underinvest in health interventions that improve worker productivity. The framework we have outlined here provides corporate managers with a way to make the case that their companies should carefully consider their approach to employee health benefits and health promotion as an investment in their "healthy human capital." We would argue that the current cost-shifting trend by many businesses may be "penny wise and pound foolish." Short-term savings achieved in decreasing direct medical costs could be more than outstripped by the costs of lost productivity and worker dissatisfaction.

Additional research is required to show how effectively improvements in workforce health translate into improved productivity and a stronger bottom line. This research will require both private and public investment. Indeed, the CDC has expressed interest in examining strategies to improve worker health and has funded projects to test the application of health and productivity management programs, and to develop tools to predict the corporate return on investment in future programs. We are currently extending our work on the multipliers to explore their relevance for presenteeism. However, much more needs to be done to understand the relation between the production function in a firm and individual and collective employee health.

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Table 1: Modeling the Financial Impact of an Investment in Workers' Health

Employees at the company:	1,000				
Percent with a chronic condition	60%				
	Year 1	Year 2	Year 3	Year 4	Year 5
Cost of program	-$200,000	-$60,000	-$60,000	-$60,000	-$60,000
Probability worker remains employed with the company (2.4% monthly turnover)	100.0%	74.7%	55.8%	41.7%	31.2%
Benefits:					
- 2% reduction in medical spending	$24,000	$17,931	$13,397	$10,009	$7,478
- 5% reduction in absenteeism		$14,823	$11,075	$8,274	$6,182
- 5% reduction in presenteeism		$150,640	$112,548	$84,089	$62,825
Net value of program	-$175,999	$123,395	$77,021	$42,373	$16,486
Discounted value (at 12%)	-$175,999	$110,174	$61,400	$30,160	$10,477
Cummulative Net Present Value	-$175,999	-$65,825	-$4,424	$25,736	$36,213
Reduction in absenteeism and presenteeism that would produce an NPV=0 project:					4.5%

With Multipliers

Employees at the company:	1,000				
Percent with a chronic condition	60%				
Median multiplier	1.28				
Probability worker remains employed with the company (2.4% monthly turnover)	100.0%	74.7%	55.8%	41.7%	31.2%
	Year 1	Year 2	Year 3	Year 4	Year 5
Cost of program	-$200,000	-$60,000	-$60,000	-$60,000	-$60,000
Benefits:					
- 2% reduction in medical spending	$24,000	$17,931	$13,397	$10,009	$7,478
- 5% reduction in absenteeism		$18,973	$14,176	$10,591	$7,913
- 5% reduction in presenteeism		$192,820	$144,062	$107,633	$80,416
Net value of program	-$176,000	$169,724	$111,635	$68,234	$35,808
Discounted value (at 12%)	-$176,000	$151,540	$88,994	$48,567	$22,756
Cummulative Net Present Value	-$176,000	-$24,460	$64,534	$113,101	$135,858
Reduction in absenteeism and presenteeism that would produce an NPV=0 project:					3.6%

Table 2: Estimated Absence Multipliers for Selected Jobs (ordered from highest to lowest)

Type of Job	Estimated Absence Multiplier
Paralegal	1.93
Mechanical engineer	1.57
Motor vehicle salesperson	1.57
Carpenter, non-residential construction	1.51
Restaurant cook	1.48
Flight attendant	1.43
Registered nurse, hospital	1.40
Inspector, aircraft manufacturer	1.34
General office, retail sales	1.30
Truck driver, trucking and courier	1.28
Medical records clerk, physician's office	1.23
Desk clerk, hotels and motels	1.19
Salesperson, retail sales	1.17
Bartender	1.14
Maids, hotels and motels	1.10
Construction worker, non-residential	1.09
Waiter, restaurant and bar	1.02
Fast food cook, restaurant and bar	1.00
Mean multiplier across all 35 job types	1.61
Median multiplier across all 35 job types	1.28

Source: [18].

Table 3: Applying Multipliers to the U.S. Workforce

Industry Group	Total Employment (Millions)	Average Wage	Absence Rate Due to Illness	Annual Cost of Illness Without Multiplier Per Worker	Annual Cost of Illness Without Multiplier Total (mil $)	Effective Industry Multiplier	Annual Cost of Illness Using Multipliers Per worker	Annual Cost of Illness Using Multipliers Total (mil $)
Agriculture	3.3	$12.05	1.3%	$368	$1,211	1.33	$488	$1,604
Mining/Construction	9.8	$15.72	1.6%	$505	$4,944	1.26	$634	$6,207
Manufacturing	19.8	$16.52	1.6%	$523	$10,368	1.32	$693	$13,722
Transportation/communication	8.2	$16.92	1.6%	$570	$4,694	1.41	$807	$6,641
Retail and Wholesale Trade	26.9	$12.10	1.3%	$282	$7,570	1.34	$378	$10,154
Finance/insurance/ Real estate	8.6	$17.70	1.1%	$391	$3,366	1.41	$550	$4,731
Business services	15.2	$15.14	1.4%	$372	$5,641	1.31	$489	$7,407
Personal services	33.7	$16.00	1.4%	$399	$13,460	1.37	$548	$18,485
Public Administration	5.9	$18.47	1.7%	$613	$3,630	1.36	$832	$4,929
TOTAL	131.4	$15.34	1.4%	$418	$54,884	1.35	$562	$73,882

Table 4: Estimated Average Annual Cost Per Worker With Specific Health Conditions

Medical Condition	Prevalence Among Dow Workforce[9]	Medical	Absences	Presenteeism	Total Cost Without Multipliers	Total Cost With Multipliers
Depression, anxiety, or emotional disorder	4.3%	$2,017	$1,525	$15,322	$18,864	$25,771
Stomach/bowel disorder	3.4%	2,585	800	6,790	10,188	13,287
Back or neck disorder	7.0%	2,249	839	6,879	9,975	13,131
Diabetes	2.4%	3,663	514	5,414	9,620	12,021
Heart/circulatory	7.1%	2,531	613	6,207	9,359	12,147
Migraine/chronic headaches	3.1%	1,689	945	6,603	9,232	12,332
Arthritis/joint pain or stiffness	9.0%	2,623	441	6,095	9,127	11,839
Asthma	1.3%	1,782	383	5,661	7,870	10,304
Allergies	18.9%	1,442	377	5,129	6,947	9,205

Note: The mean absence multiplier for absences (1.41) is based on the distribution of The Dow Chemical Company's U.S. workers in nine different job categories and the job-specific multipliers reported in a recent study by Nicholson and colleagues. We assume that the appropriate multiplier for presenteeism is equal to the absence multiplier, and that the multipliers are the same for each health condition.

[9] This is the percentage of surveyed Dow workers who report a particular medical condition as their "primary health condition." People who reported having more than one chronic condition are assigned in this table to the condition they indicate to be their primary condition, so these figures are underestimates of the incidence of a particular condition among the workforce.