

Alternative Valuations of Work Loss and Productivity

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In this article, we examine the indirect costs (ie, work loss and productivity costs) of employee illness from the employer's perspective. We provide a conceptual framework to help employers consider alternative views with regard to assessing indirect costs and valuing the health care they purchase. First, we discuss the matter of perspective and how an employer should view and assess indirect costs. We briefly review current models of measuring indirect costs, and we critique these models. Then we introduce a simple, conceptual framework based on the ideas of health capital and labor productivity, and we lay out the effects of health investment on indirect costs while considering what employees desire and employers can provide. Finally, we offer an agenda for further research. (J Occup Environ Med. 2001;43:18–24)

With spending for health care benefits (ie, insurance coverage) and other health-related activities (eg, fitness centers, health fairs) increasing, employers are under pressure to control and/or justify the increased cost. One could decide to simply buy the least expensive coverage and minimize or eliminate investments in other health activities, but without good information on the value of these investments (ie, cost vs benefit), eliminating or reducing them may have adverse effects and negative economic impact. Potential negative results may be lower employee morale, increased morbidity and mortality, and a subsequent increase in absenteeism and turnover costs that the employer must offset in some other way. Hence the question, what is the value of health-related investments?

The need for more and better information on the value of health care has been a major driver in the quest for accountability and quality improvement. Quality and accountability measures are comprised of clinical performance indicators (eg, use of preventive screening procedures, care of chronic disease) and/or subjective ratings (eg, access, satisfaction) by consumers on health plans and physicians. These results are aggregated to the level of the providers and/or health plans, disseminated by means of report cards, and used by employers in their purchasing decisions (ie, the selection of a health plan for their employees).

Information on the quality of health care coverage is necessary, but it alone is not sufficient. Quality information should be translated into

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the benefits obtained by the employer and employee that result from the provision of higher quality. Better information is also needed on the advantages to the employer of providing the health benefits and services, and better estimates are needed of the impact of the total costs of illness, including the cost of work loss and reduced productivity due to poor health and health care. Studies have estimated that, on average, indirect costs represent over half of total disease costs.¹ For depression and other chronic diseases, the proportion is even higher.² Although employers realize that sick leave and mortality have a meaningful economic impact, questions are still unanswered about the best way to measure the gains and costs in a manner that helps decision makers analyze the consequences of their health investment decisions.

A Matter of Perspective: Individual Versus Society Versus Employer

Indirect costs are typically expressed in terms of the costs incurred from mortality and absenteeism and the reduced productivity while an affected employee is still working (Table 1). These costs can be measured from different perspectives.

From the individual worker's perspective, indirect costs are costs to the worker that are associated with the lost or impaired ability to work or engage in leisure activities because of morbidity, and costs to dependents that are associated with the loss of economic contributions in the event of the worker's premature death. These dimensions are usually measured in either lost income and/or the value of lost leisure time.

The societal view is the more common perspective taken when researchers assess indirect costs. In this perspective, the measurement of indirect costs is based on the premise that the value of an individual's work and its contribution to society is measured in terms of a person's po-

TABLE 1
Components of Indirect Costs

Component	Costs
Mortality	Employee replacement Effect on family and friends Value of lost future income
Morbidity	Lost wages <ul style="list-style-type: none"> • Paid sick-leave days • Unpaid sick-leave days • Payroll and benefit costs for absent employee Loss of vacation and personal leave Disability Lost leisure time Idle employer assets
Reduced productivity	Return-to-work productivity Employee's health capital investment On-the-job training New-hiring administration and training Motivation and uptake of training Teamwork and communication Institutional effect among coworkers Effect on family members

tential income generation. This can be further refined along the two dimensions of morbidity and mortality. The impact of mortality is measured in terms of the present value of forgone future income. The impact of morbidity is measured in terms of lost income from missed work.

We propose that neither the individual nor the societal perspective provide an appropriate method for valuing indirect costs for an employer assessing a health care purchasing decision; the employer perspective is different. We also propose that an employer's perspective retains the two dimensions of morbidity and mortality but that the valuation within these dimensions is different (Table 2). From an employer's perspective, the valuation of morbidity and mortality should include only the costs incurred by an employer. The valuation of work loss may include (but not be restricted to): (1) higher wage costs, (2) lost production, (3) idle assets, and (4) other non-wage costs incurred by the employer. The loss to the workforce due to excess or above-average mortality should be valued as the cost of rehiring and retraining replacements for workers who died because of disease or poor care plus any additional wage

costs for the initial set of workers. The cost of mortality to the employer may differ from the societal perspective because it excludes the present value of future earnings forgone because of premature death, whereas the wage offset (if any) in firms with less effective benefit plans may not be equal to the present value of lost future income. The cost of morbidity differs because it includes the cost of idle assets and non-wage factors.

These differences may have a profound impact on the relative contributions of morbidity and mortality to indirect costs. In the societal perspective, the majority of the estimated indirect costs comes from premature mortality and the present value of lost future income. For example, the American Heart Association estimates indirect costs for coronary heart disease (CHD) from the traditional societal perspective. They estimated that the indirect costs of CHD were \$46.7 billion in 1999. Of this total amount, \$6.9 billion (19%) were due to morbidity and the remaining \$39.8 billion (81%) were due to mortality.³ Using the employer perspective, and assuming no wage offset, we and others have reported that the indirect cost of CHD to employers was a total of

TABLE 2
Indirect Cost of Illness From the Individual, Societal, and Employer Perspectives

	Individual Perspective	Societal Perspective	Employer Perspective
Definition	Value of a human life in terms of a person's income and value of leisure time	Value of a human life in terms of a person's potential income generation	Cost of the disease to the employer from illness and/or death
Calculation			
Mortality	The ultimate loss Effect on family	Present value of forgone future income	Cost of replacing workers (hiring and training)
Morbidity	Loss of income (eg, unpaid sick-leave days, decrement in income when on disability) and loss of leisure time	Lost income from missed work	Workloss, idle assets, and non-wage costs (eg, benefits and fixed payroll costs)

TABLE 3
Comparison of Human Capital and Friction Cost Methods

	Lost Wages	Friction Cost
Perspective	Society Individual	Society
Theoretical foundation	Neoclassic economic model	None
Assumption	Marginal productivity = marginal cost Perfect market competition Earnings reflect productivity	Unemployment
Production cost measurement	Mortality and morbidity	Mortality and morbidity
Variables for production calculation	Time span Forgone activity Forgone paid labor Forgone benefits and fixed payroll costs	Frequency of friction period Length of friction period Absence and productivity Value of lost production Macroeconomic consequences
Limitations	Some groups are undervalued Does not incorporate quality of life Few reduced-productivity measurements	No theoretic model Does not incorporate quality of life Few reduced productivity measurements
Valuation of lost production	Aggregate or average production value per employee and per person	Aggregate or average production value per employee and per person

\$4298 per employee with CHD per year.⁴ This estimate, from the employer's perspective, was overwhelmingly the consequence of work loss due to morbidity (ie, \$4092, or 95.2% of the total) rather than workforce reduction due to mortality, which was only \$206 per employee with CHD, or 4.8% of the total indirect cost.

Current Models for Measuring Indirect Costs

When it comes to estimating an actual dollar value, the two methods that are currently used for the valuation of indirect costs are the lost wages method and the friction cost method (Table 3). We will examine each of

these approaches briefly to understand them, and more importantly, to uncover potential weaknesses and possibilities for enhancement.

The Lost Wages Method

The most frequently used method of estimating indirect costs is the lost wages method (sometimes called the "human capital" method, even though discounted future lost wages are sometimes not fully considered). It is simple and straightforward. According to the neoclassic economic model, wage rates equal the value of marginal revenue generated by an additional worker under full employment. Thus, indirect costs are quantified in terms of forgone earnings.⁵ Lost production is measured using

gross compensation at the individual level, and absenteeism loss is calculated by multiplying the estimated number of workdays missed by the estimated average daily earnings. Reduced productivity while working is estimated as the percentage of the productivity reduction on days the employee works while having symptoms—typically measured by employee self-report.^{5,6}

Although the lost wages approach is founded in economic theory, the estimation of indirect costs from a societal perspective considers only compensation and ignores other dimensions and metrics that have intrinsic and economic value, such as loss of leisure time and the consump-

tion value of any change in health status. In addition, the estimates obtained are sensitive to assumptions built into the calculations.⁷ For example, some studies assume a fixed time period, whereas others use a variable time period such as life expectancy. Some studies include only paid labor, some include all activities, and a few include unemployment. In addition, the method used to value forgone paid work varies among different studies. Most studies use the all-industry average wage to calculate the value of lost labor time; others use the minimum wage or the wage rate for a specific group. Subjectivity in these dimensions may account for the wide variation in the results.

The lost wages method is widely used to measure the societal costs of illness. Nevertheless, it is argued that this method may not provide reliable estimates of the economic consequences of disease.⁸ As Drummond pointed out, unperformed work may be made up by the sick employee when he or she returns to work after a short-term absence.⁹ For long-term absences, someone drawn from the ranks of the unemployed might cover the work, making it possible that society does not actually suffer loss but instead has replaced the income generation of one worker with a previously unemployed person who generated no income. This assumes perfect interchangeability between workers and no value to the leisure of the unemployed, which may not always hold and, therefore, may not accurately estimate work-loss costs.

The Friction Cost Method

Recently, Koopmanschap and colleagues developed an alternative explicit approach to measuring indirect costs when workers' unemployment is involved, called the friction cost method.¹⁰ This method presumes short-term and medium-term effects of illness on production output or loss. Short-term production loss depends on the time span that organizations require for restoring the ini-

tial level of production. It is assumed that production losses are confined to the period needed to replace a sick worker—ie, the friction period.^{8,10,11} The length of this period and the resulting indirect costs depend on the labor market. Even though the employer often must pay sick leave benefits to the absent *worker* plus pay for a substitute, the argument from a societal perspective is that the opportunity cost of the replacement is zero because the substitute would otherwise have been unemployed. Given this assumption, the indirect costs consist of the value of the lost production plus the extra costs of maintaining production and of filling a vacancy and training new personnel. In the medium-term period, there will be further changes in labor costs per unit of output, labor supply changes, and so forth that may influence national income and other economic indicators. These production costs can be estimated macroeconomically. It is estimated that medium-term production losses occur over a period of about 5 years.

The friction cost method attempts to estimate the real value of indirect costs attributable to disease by considering the situation within firms and in the labor market.¹ To estimate indirect costs using the friction cost method, it is necessary to estimate the frequency of friction periods, length of the friction period, valuation of lost production, and macroeconomic consequences. Most studies that use the friction cost method consider national data because it is hard to collect detailed data at the level of an individual firm. A friction cost estimate may not accurately estimate indirect costs, because in each firm there is an internal labor pool that could buffer the effects of absenteeism or disability. It is argued that this method may be appropriate for European countries, where the level of both registered and hidden unemployment is substantial.⁸

Although the friction cost method is an attempt to derive more realistic estimates of indirect costs in special

circumstances, there is no comprehensive theoretical framework underpinning the calculations. The method considers that the national income changes because of changes in labor costs per unit of output, social insurance premiums, and labor supply, but as discussed above, there are other factors that can influence wages and incomes. More specifically, it attaches no value to the leisure the formerly unemployed lose (or, equivalently, the disutility they attach to working). In addition, it provides no method for determining the unemployment level at which the analyst should switch from the lost wages method to the friction cost method.

Limitations of Both Methods

Along with others, we have proposed that the lost wages and the friction cost methods are based on excessively simplified assumptions that are unlikely to hold in general application, and we have examined the cost of work loss under alternative assumptions (Pauly et al, manuscript submitted). With full employment, wages represent a lower bound for losses that could actually be much larger in some fairly common circumstances. Thus, traditional methods could underestimate the true gain to employers and to society from implementing policies that would reduce absenteeism.

It is also naïve to assume that any single method of valuing work loss can be applied to all firms. Rather, there exist specific characteristics of firms and markets that determine whether the costs of work loss will be large or small and how these costs will be distributed between the employer and employee. For example, a firm that has a production unit based on team performance rather than on individual performance will require a different model for valuing work loss, because the impact on output of a worker's absence will be quite different. The same holds true if there is a large dependence on firm-specific human capital (eg, knowl-

		Small inventory costs or small costs associated with variations in output		Large inventory costs or large costs associated with variations in output	
		Labor-intensive	Capital-intensive	Labor-intensive	Capital-intensive
Individual Production & little firm-specific human capital		<ul style="list-style-type: none"> • Claims processing • Telemarket 	<ul style="list-style-type: none"> • Telephone & Cable Installation and Repair 	<ul style="list-style-type: none"> • Reservation agents • Stock Brokers • Retail Sales People 	Truck drivers
	Team Production, &/or firm-specific human capital	<ul style="list-style-type: none"> • R&D of new products • Sales People (Scheduled calls) 	<ul style="list-style-type: none"> • Manufacturing of durable goods (e.g., airplanes) 	<ul style="list-style-type: none"> • Law, consulting advertising firms • Patient Care at hospitals • Hotels • Customer Support 	<ul style="list-style-type: none"> • Airlines • Construction • Overnight delivery • Hospital surgery

Fig. 1. Dimensions of a firm's characteristics that affect the valuation of indirect costs.

edge workers) versus a small dependence (eg, a job that can easily be done by temporary workers). Another important characteristic is whether the job function is labor intensive, capital intensive, or a combination of both. Finally, valuation of work loss depends on how work loss affects the flow of output. In a firm that has small inventory costs or small costs associated with variations in output, valuation of work loss will be very different than in a firm having large inventory costs or incurring large costs when output falls short of the expected or desired level. These characteristics, along with examples of firms where different combinations of the dimensions may hold true, are shown in Fig. 1. We propose that they are important to consider when predicting an incremental valuation of work loss that is higher than a simple estimate of lost wages for a given firm or department within a firm.

In addition to providing a potentially biased estimate of the value of work loss, the lost wages method, the friction method, and the more general model we propose do not consider the indirect effects of health on the quality of life and employee well-being beyond the workplace setting.¹² Some authors argue that only the value of the production that is lost until the absent employee

returns or is replaced, plus the replacement costs, may be counted as indirect costs. However, others argue that when an individual engages in productive work, the real loss is leisure time and the real gain is the productive output.¹³ When an individual is unable to work because of a health problem, that individual experiences a loss of leisure time and removes productive capacity from both an employer and society. Therefore, an extension to our general model would suggest that, in addition to obtaining more accurate financial estimates of work loss from the employer's perspective, employers must determine the value their employees place on their own health and the management's willingness to pay for what employees value. The impacts of health investment on personally valued health and on how employers should value their investment in health are closely correlated and should be measured together. It has been suggested that productivity is a function of human health (which determines the ability and motivation to work) but that by maximizing the personal value they place on health, employees allocate their work time and effort to consume and produce health. Improving health status could benefit the employer, not only by decreasing absenteeism and mortality but also by motivating workers to

increase their efficiency, by improving workers' production ability, and by reducing employee turnover.

To maximize workers' productivity at a given level of labor and health benefit costs, the employer must make decisions from a system-wide perspective. While considering the labor market and their employees' preferences, employers must invest efficiently in their workers' health. Simple cost-shifting to workers or cost-containment may harm the interests of the workers and, in turn, indirectly hurt the profitability of the firm as workers require higher cash wages or morale falls and turnover increases. The real challenge to employers is to improve the management and design of the health benefits and amenities they provide to their employees.

We propose that health is a quantifiable measure and that health status can be measured by a variety of available instruments.¹⁴ As such, health is a commodity that can be purchased and about which decisions can be made regarding how much to invest. Health status, in conjunction with other dimensions of health care (eg, quality, accountability) and accurate total costs from the employer's perspective, should be factored into employers' health care purchasing decisions to provide an accurate and comprehensive assessment of these decisions.

Conceptual Framework

Given the concerns about the current methods of valuing work loss, we propose a new conceptual framework that attempts to position health status in relation to other aspects of an employee's well-being and an employer's need for on-the-job productivity from employees (Fig. 2). In the simplest view, we propose that the following relationships exist. An employer maximizes its profits with investment in infrastructure through capital investment and its labor force. It is assumed that a firm purchases and uses these investments efficiently. Employees split their

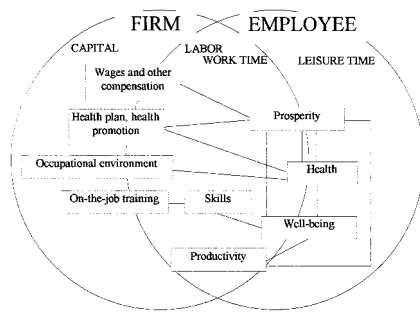


Fig. 2. Interrelationships of productivity cost components.

time and efforts between work and leisure time. Workers find equilibrium between their investment in their job and the value of outside leisure time relative to their own internal values and preferences. It is assumed that an employee selects a job on the basis of these internal preferences, values, and the sense of fulfillment obtained from a particular job versus all available employment opportunities. Within the framework is a balance between (1) the worker's internal values and needs, and (2) the firm's need to acquire and maintain a productive workforce. In addition to the traditional investments of wages, benefits, a positive work environment, and training, a key factor in achieving a feeling of well-being for the employee and productivity for the employer is an investment in maintaining the health status of the employee.

First, we consider the individual employee's preferences and the role of health. Michael Grossman¹⁵ proposed that "good health is a commodity sought after by every individual." It is assumed that individuals are given an initial measure of health that depreciates over time. This initial measure of health can be maintained (or at least the rate of decline slowed) by investment in health-related activities (eg, preventive care, exercise, health care when necessary).^{15,16} Nevertheless, every job has aspects that will help or hinder health and health status through factors such as stress (ie, mental health) and fatigue, not to mention the pos-

sibility of work-related injury (ie, decrement of physical health status). In short, workers place a value on health, and health factors directly affect their decision when choosing a career or a specific job.

Relationships Between Health and Other Determinants of Productivity

We propose that health status is one of the important underlying factors in enhancing or maintaining productivity in the labor force. Health status is one of the many factors that determine the quantity (working time) and quality (productivity) of employees. The health status of employees may, in addition, affect the efficient use of capital. For example, work-loss days or reduced productivity at work result in idle physical capital, which may represent a serious loss for the company.

Workers exchange their services to employers in return for wages. However, the labor being provided is an inseparable characteristic of the worker.¹⁷ Therefore, the investment in workers made by firms usually extends beyond wages to include education, health benefits, and other forms of compensation. We accept as fact that investments made in human resources, employee services, and general workplace environment have a positive impact on productivity. However, we specifically focus on investments in health coverage and services. An investment in health benefits and other methods of maintaining or improving health is a complex investment, from both the employees' and employers' point of view. In economic theory, it is assumed that most people are risk-averse and that people have different preferences for insurance and different risk aversions. According to the model of Goldstein and Pauly¹⁸ (recently elaborated on by Pauly¹⁹), firms may profit by providing health insurance instead of paying the employee the equivalent in cash. Because of tax benefits and economies

of scale in group insurance, firms can purchase health plans that are cheaper than an individually purchased plan. As stated above, health is both a consumer commodity and an investment commodity. Individuals use their wages and leisure time to invest in health. If firms provide health benefits as compensation, workers do not need to spend their time and wages to obtain health benefits. The employee gains by receiving personal rewards and financial value; the employer gains by attracting and retaining better workers at comparable (or lower) wages.

A firm's productivity and output depend on a variety of factors that may affect the efficiency of the production process. An interesting corollary to investment in an employee's health is the investment made to improve other intrinsic characteristics of the employee (eg, improving the skills and educational level of the workforce).²⁰ It is well accepted that on-the-job training makes employees more productive.^{21,22} Many studies show that more highly educated people are healthier than less highly educated people when other factors are constant.²² A firm's investment in training its employees will be enhanced if those trained employees stay healthy and show up for work—health benefits and training/education are highly complementary.

The investment in health interacts with many other dimensions, and the pure effect of one investment cannot be disentangled from that of another. Education can help people change their health behavior by changing their beliefs and attitudes. Lifestyle and environmental factors may have long-term effects on health. According to Evans et al, well-being, or the sense of life satisfaction of the individual, may be the ultimate determinant of productivity.²³ What is clear is that health, as measured by health status, has an impact on employee prosperity and working skills that ultimately influences productivity. Although we may not have all of the answers to this complex interaction,

the remaining questions are clearly emerging as an agenda for future research.

Agenda for Further Research

Many theoretical and empirical issues, and many opportunities for further research, remain to be addressed and explored. Research is needed to analyze the costs of health care benefits and other health-improvement programs and their impact on other employer costs. Firms must consider how the costs of programs to improve employee wellness, whether provided directly or through their health plans, will relate to indirect costs and other gains for the employer. Firms need better measures of what reduced work loss will do for their productivity and customer satisfaction rates, especially when production depends on work teams, missing employees cannot be easily replaced, and customers do not want to wait. Improved health implies that future health insurance premiums should be lower than if the employees' health deteriorated. Further, if the turnover rate is lower because of improved employee health and morale, there may be savings in administrative and training costs. Solid evidence of the impact of these potential gains would help employers to better reallocate their health investment in the context of other investments.

Most indirect cost calculations are confounded; that is, whereas disease affects labor productivity, conditions in the labor market may also influence the population's health. For example, the pressure of maintaining or increasing productivity in the workplace can cause stress and accidents and can lead to drinking and smoking, which are risk factors for disease. A quantitative model must be developed to address the interrelationships between health, working

environment, and productivity. The effects of specific diseases in the workplace are hard to measure, and research should focus on developing models or instruments to measure health status and productivity in the presence of these diseases.

In summary, this discussion proposes a new general model for determining the financial impact of work loss and/or reduced productivity on employers and employees. The model opens the door to future research on productivity costs that is linked with the concept of modern firms employing knowledge workers in team production. Concrete theoretical and empirical research is needed for employers to evaluate and strategically manage their health benefits. The long-term benefits and gains to the individual, the employer, and society are too compelling to ignore or to simply assume that optimal investments in health will be made without effort.

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