Integrated Health Programs, Health Outcomes, and Return on Investment

Measuring Workplace Health Promotion and Integrated Program Effectiveness

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Objective: To explore return on investment (ROI) in workplace health promotion studies. **Methods:** Studies with high ROI attribution for workplace health promotion were reanalyzed using standardized measures. Key variables included intervention duration, sector and population size, annualized cost, and health outcomes. **Results:** ROI was often overestimated. Programs with the highest reported ROI were concentrated in large corporations, where cognitive programs incurred low per person costs. Ten of the 12 studies involved individualized health promotion only, and did not engage work organizational modification or integration with occupational health. Some effective health interventions were discounted because they were not easily monetized. **Conclusions:** ROI, an investment metric, amplifies short-term labor-related effects and discounts longer-term chronic disease prevention.

The Patient Protection and Affordable Care Act of 2010 presumes that incentive-oriented worksite health promotion (WHP) provides a critical pathway to reduced group health costs. The so-called *business case*, the short- or intermediate-term return on investment (ROI), is plausibly supported by published literature. In a heavily cited review of ROI estimates from WHP programs, Chapman quantified 42 epidemiological studies representing 537,319 employees, observed for an average of 3.6 years.[1] The case seems overwhelming for the effectiveness of modestly costed lifestyle interventions. In 20 of the 42 studies, absenteeism was reportedly decreased, with an average incidence or cost reduction of 30% (22.3% to 38.4%). Group health costs were reportedly reduced on average by 21.8% (12.7% to 31%). Two subsequent updates reinforced the earlier results.[2,3] Nevertheless, employers and insurers seem to have taken a cautious approach to this evidence base.[4]

Plausible explanations for diffidence include slow adoption because of limited knowledge dissemination; the distraction of potential innovators in a time of economic contraction; the long-term perspective needed for chronic disease mediation; and the unavailability of concise health performance metrics, which chronologically parallel more customary measures of output.[5] Goetzel and Ozminkowski[6] make the case that the major obstacles to implementation of WHP reflect the limited dissemination of information and incomplete implementation. Although information-based barriers to dissemination and adoption are increasingly understood,[7] a contrarian viewpoint would note that North American workplaces are not especially resistant to reorganization or process change. Investments in workforce retraining and in new software adoption are documented in the business literature, despite limited evidence for ROI.[8,9]

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In addition, there is conflicting evidence. In a nationally cited article in *Health Affairs*, Gowrisankaran et al[10] evaluated a program for hospital workers that included many components of a model program: a health risk assessment (HRA), participation in wellness activities, health fairs, disease targeting, extensions to families, and health insurance subsidization of $1647. Over 2 years, 82% participated; admissions for targeted conditions fell by 41%; and hospital admissions decreased by 12%. Nevertheless, there was no reduction in benefits costs, thus obviating the utility of the program investment. The authors did not explain the anomaly of reduced utilization and increased costs. Cherniack and Lahiri[5] explained why effective prevention might not lower benefits costs, because of costly replacement technology and cost shifts by capital-intensive medical organizations.

Diffidence does not prove ineffectiveness. Adult life is significantly centered on the workplace in terms of the allocation of time and life demands, environmental health factors, and group health financing. The evidence base for preventive interventions is substantial. The associations between reduced metabolic syndrome components and cardiovascular disease risk and between blood pressure control and stroke are fluent in their preventive message. The success of the National Diabetes Prevention Program in reducing the progression of prediabetes to diabetes by as much as 70% through lifestyle alteration and health coaching has been replicated.[11,12] Although more arcane, the Whitehall studies on the association of work organizational relationships with cardiovascular disease have informed the corporate policy.[13–15] Finally, the dramatic reduction in work-related cancer risks through national regulation of workplace carcinogens[16,17] and secondarily through smoke-free workplace policies[18] represents a public health success in industrial countries, albeit a success that was hard fought in the United States. Furthermore, traditional occupational health and safety and ergonomic programs directed to the organizational level are recognized for their positive effect on health outcomes.[19] These accomplishments within the field of occupational safety and health deepen the mystery around less-than-vigorous adoption of WHP in the integrated National Institute for Occupational Safety and Health (NIOSH) Total Worker Health format.

When health outcomes are separated from investment, there are variables but positive results for WHP. A review of 316 studies that evaluated WHP programs found positive results for weight control, borderline positive results for nutrition, exercise and cholesterol management, and weak results for health risk appraisals.[20] Other literature reviews have reported overall positive impacts of worksite programs,[21,22] but equivocal success in changing lifestyle characteristics such as dietary habits or physical activity.[22,23] Although only the study by Dishman et al[22] was a formal meta-analysis and was restricted to a single outcome (fitness), these reviews were well constructed and selective. They included all eight studies selected for this article, published before 2001.

In the contemporary workplace, where cost and value are explained as symmetrically associated through the intelligent factoring of markets, health effects are either an externality or a measured investment in the generation of value. This differs from the native world of the eighteenth-century classical economics, where the

wealth of the nation was envisioned as a direct translation into the health of individuals. Thus, the stipulation for "making the business case" presumes that individual health may bear on work, but is not in itself central to work. This article is offered as a clarification of the problems inherent in making the business case for WHP and also suggests an alternative direction. It addresses ROI through a structured reanalysis of the methods and outcome estimations of major national studies that substantiate the positive ROI argument.

METHODS

Criteria for Review of Prior Studies

ROI calculations are assessed through the detailed reanalysis of the 12 studies reviewed by Chapman that had the highest reported ROI. Chapman provided a score on the quality of the studies, which was not included, the emphasis being on the reported ROI, not the quality of the Chapman analysis. The ROI in the 12 selected studies varied from 3.4 to 15.6. Two studies that were included in the Chapman analysis were excluded from this analysis, although they fell within the reported ROI range. Specifically, a study by Leigh et al[24] (ROI = 4.73) was excluded because it only involved retirees, and a study by Chapman et al[2] (ROI = 6.52) was excluded because it has not been published. Table 1 lists the common variables that were used in this reanalysis.

For reanalysis, the following general precepts were followed:

1. Specific group health costs (direct costs, estimated costs, econometric projections) were included.
2. Where long-term health care cost and utilization information was available on a comparable nonintervention population, savings trends were corrected.
3. Populations not targeted by identified interventions were removed from both cost and outcome determinations, thus restricting ROI calculations to the target population.
4. Calculations of ROI that were purely estimates, not directly derived from data, were excluded.

The ROI is defined as a standardized monetization of diverse outcomes that include the valuation of absenteeism, group health costs, and/or productivity. The health outcome is not distinguished by comparative costs with another health intervention, as in cost–benefit analysis, or as a nonmonetized change in status, as in cost-effectiveness analysis. Rather it is treated as an investment that would include indicators such as net present value, internal rate of return, and payback period. The ROI calculation in this analysis is not milieu specific and does not readjust for inherent differences in outcome characteristics.

TABLE 1. Variables Used in ROI Calculations

Variable Name	Variable Description
Population	Characterization of the workforce by site and industry
Design	Key characteristics of the study design: on-site or off-site, cognitive or practice driven, national HRA or locally designed instrument
Goal	A priori single or multiple expected outcomes
Participants	Number of workers participating
Duration	Length of the intervention
Absenteeism	Whether measured or included as an outcome
Productivity measure	How productivity was used as an outcome measure
Medical cost reduction	Whether and how group health costs were assessed
Costs annualized per person	Annualized WHP per person costs in the target population
Productivity savings	Estimated monetization of productivity savings
Avoided costs	Health and productivity costs reduced during the intervention
Savings annualized per person	Calculable net costs on a person basis
ROI (Chapman)	Reported ROI in the Chapman reviews
ROI (recalculated)	Recalculated ROI based on criteria explained in this text; ROI was the annualized per person savings/annualized per person cost

HRA, health risk assessment; ROI, return on investment; WHP, workplace health promotion.

RESULTS

Studies With Most Positive ROI

Table 2 lists the studies used in this analysis. The most impressive results involved City of Birmingham workers (study 1) where health costs were compared with a state average from 1985 to 1990.[25] A direct staff model of services was coupled to screening and health counseling. The authors did not themselves offer an ROI estimation, which was acknowledged by Chapman.[1] Although Chapman did not describe the basis for the reported ROI ratio of 19.4:1, it seems to be the ratio of the City of Birmingham's employee health care interval cost differential between program inception in 1985 and 1990, the most favorable year for cost reduction, the latter being, compared to the annualized direct cost operating budget of $400,000. If the 5-year comparative average costs are annualized and compared against program expense for all program years, the ROI is 1.5:1. Given that health promotion interventions may require an induction period for acceptance or effect, weighting toward the final year of observation may be legitimate. More importantly, there were major changes in health care service organization, which were fully acknowledged by Harvey et al.[25] Health Maintenance Organization (HMO) representation went from 0% to more than 90% from 1985 to –1990; duration of hospital stays declined by 72%; and the number of admissions declined by 63%. The authors of the Birmingham study are guarded in their assessment of the contribution of health promotion to reduced group health costs, attributing the majority of the change to revisions in the health care delivery system. It is not unreasonable to assume that over a relatively short 5-year interval, a dramatic systemic reform will affect costs more substantially than WHP. In addition, although the program is categorized as WHP, there were no actual workplace interventions and no analyses of participant versus nonparticipant differences in utilization.

The next most impressive ROI (15.6%) in study 2 was reported by Aldana et al.[26] It cites reduced absenteeism costs totaling $3.04 million among school personnel over a 2-year interval. In all, 2401 members of a school district participated in an insurer-provided and electronically accessed wellness program. They were compared with 2309 current and retired nonparticipants. Participants averaged 14.7 absentee days a year, whereas nonparticipants averaged 15.4 days. The ROI is based on an apparent estimation of replacement costs compared to modest program expenses of approximately $100,000 per year. The program also included data on group health claims costs, but the results were not included in the cost–benefit analysis. Even with estimated reduced participant cost of less than $50 per person, the estimate of monetary benefit seems overgenerous. Daily personnel replacement costs were estimated at $103 to 306 ($231 for lost wages + $75 for replacement). Although it is arguable that sick time should be categorized as a net cost, in this reanalysis of ROI, the cost was accepted but the retiree population was removed from the cost per person calculation, because their inclusion produces a

TABLE 2. Studies and Key Variables Included in the Analysis

Study	Authors	Population	Design	Goal	Participants	Duration	Absenteeism	Productivity Measure
1	Harvey et al[25]	Municipal workers	Staff model interventions	Multiple	4,000	5 yrs	ND	ND
2	Aldana et al[26]	School employees	Electronic media	Multiple	1,407	5 yrs	↓0.7 d/yr	ND
3	Henritze et al[27]	National brewery	Life check/wellness center	Multiple	692	8 wks	ND	ND
4	Shephard et al[28]*	Insurance corporate offices	On-site fitness	Medical claims data	534	1 yr	ND	ND
5	Shephard[29]	Insurance corporate offices	On-site fitness/ screening/cognitive	Multiple	400	6 yrs	ND	Estimated
6	Stave et al[30]	Pharmaceutics	Stages of change contract	Multiple	1,275	3 yrs	↓1.0 d/yr (30%)	ND
7	Fries and McShane[31]	General employed	HealthTrack cognitive	Medical visits	50,576	1 yr	ND	ND
8	Ozminkowski et al[32]	Bank employees Citibank	HealthTrack cognitive	Multiple	11,194	~3 yrs	ND	ND
9	Golaszewski et al[33]	National insurance company	HRA/site activities/wellness centers	Estimated costs based on life-years	~30,000	15 yrs	ND	Quantified
10	Mills et al[34]	Consumer products	HRA, portal, and classes	Multiple	618	1 yr	↓4.3 d/yr	Anamnestic
11	Hall-Barrow et al[35]	Hospital workers	Staff model/educational	Worker's compensation; absenteeism	3,000	1 yr	↓50/person/yr	ND
12	Dalton and Harris[36]	Telecommunications company	Direct integrated, multilevel	Health care cost reduction	158†	4 yrs	↓48%	ND

Study	Medical Cost Reduction‡	Cost/Annualized per Person	Productivity Savings	Avoided Costs, $	Savings Annualized per Person, $	ROI Chapman	ROI Recalculated
1	3	600,000/45	ND	902,000	207	19.4	1.5
2	3 NS	<100,000/42	ND	1,500,000	214	15.6	5.0
3	2	64,841/94	ND	ND	ND	10.1	ND
4	1	ND	ND	106,918	52	4.9	6.9
5	3	587,600/1,414	ND	136,000	340	ND	ND
6	3	~127,500/100	ND	1,670,000	313	6.1	2.6
7	3	1,500,000/30	ND	4,398,000	87	6.1	2.9
8	1	590,000/53	ND	~2,200,000	143	4.6	3.7
9	1	4,000,000/309§	55%	10,000,000	200	3.4	2.5–3.3
10	2	85,300/138	91%	919,500	1,490	6.2	1.9
11	4	104,000/34	ND	152,000	50	8.0	1.4–8.0
12	2	ND	ND	ND	ND	7.1	ND

*Adjusted to 1990 dollars.
†Pilot only.
‡Medical costs: 1, econometric projection on the basis of intervention; 2, not calculated; 3, group health utilization; 4, reduced worker's compensation/absenteeism costs.
§Includes gym costs to the employee.
HRA, health risk assessment; ND, not determined; NS, determined but not significant; ROI, return on investment.

dilution effect in analyzing absenteeism. By removing retirees, the annual additional absenteeism costs associated with nonparticipation would amount to $214 a year per employee or $495,000 a year. The residual 5:1 ROI is still impressive, and may represent a legitimate achievement, although a final determination on cost utility would necessarily require a longer-term systemic evaluation of attendance and absenteeism in the participating population. Assessing cost savings on the basis of absenteeism in a selected population is somewhat problematic for occupations where professional absenteeism is built into the cost structure. For teachers, a retained substitute/replacement group is often maintained as a permanent reserve educational workforce, and reimbursed at a replacement rate that is below standard pay.

The study by Henritze et al[27] (study 3) involved an evaluation of health effects from an 8-week relatively intensive program. There were slight positive directional changes in weight and physical activity, and 6% reduction in the Framingham risk score for initial cardiac event. Nevertheless, there was no attempt to monetize these changes, which was the appropriate decision, given the type of data that was collected. For that reason, no ROI reanalysis is offered.

The studies on Canadian life insurance home office employees by Shephard et al[28] and Shephard[29] (studies 4 to 5) address the effectiveness of a fitness center and a cognitive WHP program. A complication of the two studies is that the first-year data (1978) involves preinflationary start-up costs, so both reports have been standardized to 1990 dollars in Table 2. The authors estimated that ROI was 6.85 at initiation when participation was high and there were no exercise facility rental costs. Nevertheless, the component of avoided costs rested on a differential between 1977 and 1978 health care costs in a Canadian and American office. Curiously, nonparticipants in the Canadian home office had a larger decrease in health care costs during the WHP project than active participants, although the absolute cost difference was continuously lower for the participant group. By 1984, the participation rate had dropped to 13% and physical performance improvement had plateaued, although the authors did not account for age-related performance reduction. The authors observed a minimal company-wide effect on absenteeism (−0.13%), in part because the small group of active participants seemed to have had a low level of absenteeism at baseline that was maintained. They estimated that at 6-year reduced absenteeism and estimated improvements in productivity half of the first year estimates, with similarly less impressive returns from health care cost reduction. When actual use costs for the on-site facility were calculated in 1990 dollars, they estimated that costs ($1414 per participant) exceeded benefits. Contrary to Chapman's conclusion, the author interpreted their results as not justifying long-term investment in WHP. Nevertheless, the project costs are distorted because the opportunity cost was based on conversion from a subsidized to a market rental rate in a costly metropolitan center. Moreover, participation rates were consistently low over time but also consistently maintained among a small adept group. In the reanalysis, the authors' original short-term ROI estimate is accepted, and the Shephard et al's[28] interpretation of long-term ROI as less than 1:1 was not reinterpreted. There is a more positive case that can be made. A first floor exercise facility in a city center that engages even a small sector of the workforce can be a successful investment if the scope of a cost–benefit analysis is narrowed, because office space costs and company interest and subsidization can wax and wane over intervals that are considerably longer than the induction period for chronic diseases. Contrarily, a small number of highly motivated individuals who are generally healthier than coworkers may not require on-site incentivization.

The study by Stave et al[30] (study 6) involved 3-year cognitive stages of change program/contract, which tracked 1275 participants over 10 years. The ROI of 6:1 is an approximation on the basis of estimated yearly cost savings of $713 per participant. A breakdown of actual program costs is not reported; the authors' $100 per person estimate is accepted. The data allow for a more quantitative and appropriate estimation of cost reduction because costs for health care, disability, and worker's compensation are available for a comparison group that did not participate in WHP. The nonparticipant population seems a more appropriate comparison group than the within-cohort assessment used in the ROI calculation. When the nonparticipating group is used, total annual per person savings seem to be less approximately $213, an approximate 9% reduction in health care costs. Worker's compensation costs were also higher in the nonparticipating group. The ROI ratio, although still impressive, is reduced to 2.6:1, less than half of the published estimate.

The study by Fries and McShane[31] (study 7) is not based exclusively on a working population but instead on a high-risk general patient population group. When the analysis was restricted to the employed subcohort, the ROI was smaller (2.9:1) as reported in Table 2. Moreover, the estimated program cost ($30 per person per year) is low because the intervention was primarily computer based.

Study 8 by Ozminkowski et al[32] involved more than 20,000 Citibank employees. Using simple annualization, the reanalyzed ROI was 20% lower than was reported by Chapman, a difference that is sufficiently small that it does not distract from the original conclusion. More serious limitations stem from outcome estimates that were econometric projections, on the basis of presumed changes in health care utilization patterns. These changes were not externally measured but were presumed from reported results on an HRA (HealthTrack). There was no validation procedure to determine whether the presumed monthly differential in health care costs ($42→$77) for participants versus nonparticipants was actual or an anamnestic artifact associated with re-evaluation after the administration of a cognitive program.

Golaszewski et al[33] (study 9) took a more sophisticated approach to estimating health care cost reductions over a 15-year interval in a corporate wellness program that included an HRA and an on-site health facility (annual out-of-pocket employee cost of $179). More than half of the benefit of the program is attributed to productivity gains. Nevertheless, productivity gains were not observed, but estimated from the available literature. Furthermore, the ROI was assessed to be 25% higher in nonparticipants on the basis of productivity gains, although this may be misleading because the participant category was sufficiently broad to encompass the greater part of the workforce. The inverse relationship between participation and cost savings calls the methodology into question. Even more important, the project had only 4 years of observation with savings from 1990 to 2000 being projections. The projected ROI in 2000 was higher than the observed cost–benefit ratio in 1990; hence, the estimate in this analysis of 2.5 to 3.3 reflects the differential of observed and extrapolated costs. Some problems with basing ROI calculations on productivity are addressed in the Discussion section.

Study 11 by Hall-Barrow et al[35] presents a different interpretive problem. There was a broad employee health initiative that included pre-employment and annual evaluations and screening, a worker's compensation cost reduction program, and WHP classes and materials on nutrition, smoking cessation, accident avoidance, and stress reduction. The reported 8:1 ROI is based on a presumptive first-year savings of $817,000, 81% attributed to a reduced worker's compensation claims and 19% to reduced lost work time. Although the combination of workplace health and safety with health promotion represents integration, the primary savings came from changes in worker's compensation policy and reporting frequency, not from WHP. Reduced worker's compensation costs were due to a 17% drop in payment for claims. Restricting outcomes to lost work time alone reduces the ROI to 1.4:1, which is perhaps too parsimonious. Because cost reductions may reflect either decreased risk or higher barriers to reporting, it is unclear whether costs were avoided or transferred. Chapman[2] recognized problems with this study and gave it a low meta-evaluation priority score, but residual questions remain

on whether administrative change rather than health change can be meaningfully included in a study of ROI.

DISCUSSION

Programs with the highest reported returned value for the WHP investment share a common feature—the very low per person annualized cost. They are sited in large corporations or organizations—where company-wide or global policy tends to decant around conventional commercial programs—that administer and interpret conventional HRAs and software-enhanced interventions. Notably, the four representative low per person cost studies presented in Table 3 are characterized by telephonic, electronic, and cognitive interventions. In almost no cases were there attempts to integrate WHP with the consideration of physical demand, scheduling, or work organizational changes. Workforce participatory programmatic review, let alone participation in design of interventions, was generally absent. Accordingly, the positive net-cost determinations whether from Chapman's report or from this revision involve marginal input costs. Only the study by Mills et al[34] involved annualized per person costs that exceeded $100, and had the lowest ROI. An additional feature is that intervention success was often based on improved productivity, assessed by self-report and occurring in a service sector where productivity measurement has been elusive.

Another important feature of these studies is a singular concentration on personal behavior and the almost complete absence of workplace interventions that NIOSH terms, Total Worker Health™ (http://www.cdc.gov/niosh/twh/).[37,38] The program described by Dalton and Harris[36] (study 12) stands out because of multiple levels of intervention: changes in the work environment, tripling participation in a Health Maintenance Organization (HMO), developing health and safety programs, providing on-site primary care services, and providing on-site nurse-directed counseling. There was little change in fitness as surveyed in the pilot group by questionnaire, although there were small positive changes in blood pressure and VO_2 max. Smoking and work stress were reduced, as was severe hypertension. There were a number of positive trends around hospital admissions and changes in treatment patterns. No cost–benefit analyses or even estimates of program costs were projected. Chapman[2,3] reported a cost–benefit ratio of 7:1, an observation that is misleading and not representative of the rigor of the study. There was a short paragraph describing the provision of on-site primary care medical services. The authors estimated $1.2 million in indirect benefits, thus providing a cost–benefit ratio of 16:1, but the nature of these benefits and the coefficients are not provided. On-site medical care had clear lost time saving benefits for the employer, but is not the basis for an overall ROI estimation; selecting a nonrepresentative ROI number does not do justice to a carefully conceived report that recognized many long-term changes in health care that may have influenced results. Perhaps the most important conclusion is that an integrated and comprehensive intervention program does not lend itself to a simple ROI calculation.

Chapman concludes, "Worksite health promotion represents one of the key strategies for maintaining the productivity of American workers at a time when their average age is increasing faster than most of our global competitors." The rationale for reconsideration of the Chapman studies is based on the assumption that the reduction of interventions to a single ROI may overlook contingencies and findings that generate different conclusions. In these 12 high ROI studies, the errors almost uniformly result in overstatement of ROI. Although there may have been some optimized presentation of results by Chapman, the more basic problems are structural. They are related to systemic problems with meta-analyses and to the application of ROI to health outcomes, which are often better evaluated in terms of comparative effectiveness rather than through monetization or monetization surrogates. Stated differently, the accounting of avoided costs and the reduction of projected health changes

TABLE 3. Estimating Cost-Effectiveness of Cognitive Interventions

Authors	Population	Design	Participants	Time, yr	Productivity Measure	Medical Cost Reduction*	Cost per Person/ Annualized, $	Productivity Savings	Savings per Person/ Annualized, $	Recalculated ROI
Aldana et al[26]	School employees	Electronic media	1,407	5	ND	3 NS	42	ND	214	5
Fries and McShane[31]	General employed	HealthTrack cognitive	50,576	1	ND	3	30	ND	87	2.9
Ozminkowski et al[32]	Bank employees	HealthTrack cognitive	11,194	~3	ND	1	53	ND	143	3.7
Mills et al[34]	Consumer products	HRA, portal, and classes	618	1	Self-report	2	138	91%	1,490	1.9

*Medical cost reduction: 1, econometric projection from reduced risk factors; 2, not calculated; 3, group health utilization, estimated.
HRA, health risk assessment; ND, not determined; NS, determined but not significant; ROI, return on investment.

because of preventive interventions into simple monetary units is a complex procedure and also sufficiently specific to workplace sectors and populations. The ROI is not a unit-less vector. The methods involved in attributing costs, monetizing health outcomes, assessing relative effectiveness, and accounting for long-term trends in group health costs may require a nuanced application of cost-effectiveness. An additional and fundamental problem affecting semiquantitative aggregated reviews is homogenization of key outcomes and cost variables that cross noncomparable interventions and populations. A meta-analysis that associates outcomes as diverse as long-term group health costs, workplace productivity, and estimated cardiovascular disease risk will flounder over concrete variables, such as absenteeism, because replacement costs cut variably across different occupational sectors. Thus, the formulaic satisfaction of a priori categories, such as absenteeism or even worker's compensation utilization, when stripped of the context, will tend to aggregate noncongruent cost variables when studies assess different populations with context-specific interventions. This amplifies the problem of linking outcomes to dissimilar explanatory variables, when the outcomes themselves are unstable. The selection of a global ROI estimate may isolate the most positive appearing statistical associations from a diversified intervention.

These hazards are reflected in the 2012 weight loss study reported by Lahiri and Faghri[39] (Table 4). A participatory weight loss intervention involved incentivized and nonincentivized nursing home workers. The 6.3:1 ROI reported by the investigators requires interpretation. A cost–benefit analysis might presume a 3:1 efficacy for incentivized weight loss. Nevertheless, the ROI representation would be more discouraging, as the cost of incentivization would not seem justified in terms of the monetized outcomes. The two outcome measures used for the ROI calculation—absenteeism and productivity—pose different dilemmas. This nursing home workforce had low rates of baseline absenteeism. The productivity measures were anamnestic, provided by line workers and requisite supervisors. A more objective outcome measure, such as reduced infection rates and costs in patients, has been adopted only sporadically in the nursing home sector of health care. Accordingly, if productivity was removed from the equation because of uncertainty, the ROI would be bleak and not justify programs that actually seemed to have quite positive health outcomes. The example only restates the well known problems associated with estimating productivity in health care work.

Cost-effectiveness ratios may be relevant for evaluating interventions in terms of health benefits, but ROI or monetary-based valuations (if computed accurately) are important for decision makers in the private sector, responsible for implementing WHP intervention and allocating resources to WHP. Nevertheless, such ROI calculation would require prospective studies that would measure costs and benefits of WHP accurately from each of the relevant stakeholder's perspective and help bring about an alignment of incentives to overcome barriers to implementation of WHP interventions. The following examples serve to question whether a *business case* for preventive health interventions can be made realistically through observations and generalizable measures that must conform to a short-term investment cycle. The term "business case" is highlighted because the term's ubiquity essentially strips it of putative meaning. In Table 5, two of the 12 studies that were reanalyzed[33,34] are grouped with two recent illustrative studies—from Lahiri and Faghri,[39] and a Kaiser Foundation study on hotel workers in Hawaii by Meenan et al.[40] The latter study is included because of its detailed economic analysis and a priori experimental design. Like Lahiri and Faghri,[39] it included costs of absenteeism, presenteeism (productivity loss), and group health costs. The four studies are illustrative because they attempt to provide cost justification in terms of worker productivity, which is a frequent denominator in making the *business case.*

The authors acknowledged the difficulty of productivity estimates on the basis of measurable output. The simplest approach was to align a combination of self-assessment of performance and external observation as coefficients of usual pay and performance. Lahiri and Faghri[39] monetized productivity by attempting to quantify task-specific changes with self-report and supervisory confirmation, using the current wage rate to estimate a marginal productivity gain. Mills et al[34] addressed the problem of administrative and service

TABLE 4. Net-Cost Model for Weight Loss in the Nursing Home Sector

	Average Subject Cost, $	Average weight loss, lb	ROI (Productivity + Absenteeism)	ROI (Absenteeism Only)
Incentivized group ($n = 51$)	129	7.3	6.5	0.2
Nonincentivized group ($n = 48$)	97	2.1	6.6	0.6

ROI, return on investment.

TABLE 5. Contributions to ROI in Studies Using Productivity Estimators

Study Identification	Productivity Measure	Calculation	Result	Net Effect	Effect on ROI
Meenan et al[40]	Self-report	Presenteeism + absenteeism	Presenteeism ↓ Y2 Y1 ±↑	No net effect	No effect
Lahiri and Faghri[39]	Self-report	Productivity + absenteeism	Productivity 80% of avoided cost	↑↑	80% of effect based on productivity
Mills et al[34]	Observed absenteeism Self-report productivity	Productivity + absenteeism	↓0.36 d lost ↑10.4% productivity	↑↑	72% of effect based on productivity
Golaszewski et al[33]	Productivity based on literature	Sensitivity at 4% productivity gain (STD), 0% and 25%	ROI 4.0 at 4% ROI 1.4 at 0% ROI 14 at 25%	↑↑	65% of ROI based on productivity

ROI, return on investment; STD, short-term disability.

work by assigning the value to performance change. In both settings, the high value attached to productivity improvement cannot possibly be linked to conventional measures of productivity involving revenue gains or staff decimation. At best, the measures reflected positively on well-being of nursing home and insurance company workers, important but tangential to what is usually meant by a business case. The paradox of the productivity argument is that salaried and/or service workforces, the usual populations cited in this literature, are notoriously difficult to assess. For corporations operating in a multisite, even international milieu, the allocation of resources and the measured outcomes are more general than those faced by the public sector or by smaller employers, where stability of employment and long-term engagement with the workforce are prevalent concerns. Unless the measurement goal is firmly defined, a generic productivity measure cannot provide quantitative resolution. Furthermore, large nonindustrial employers often have the capacity to negotiate group health directly through self-insurance and scale. They can also rapidly introduce or retract programmatic change without putting operating budgets into jeopardy, or inducing nonabsorbable effects from changes in workforce morale.

The problem that comes from applying universal WHP measures across sectors is highlighted in the study of Meenan et al.[40] Cost reduction from weight loss was based on projected decreases in cardiovascular disease risk stratification and reduced future health care costs. There were high program costs without noticeable gain. A dollar spent on WHP produced 2 cents in projected health improvement, little change in weight, and increased absenteeism. There could hardly be a more negative case. There is, however, an underlying context. This was a low-wage workforce ($15.86/hr) that had an estimated 2-year turnover rate of 55.4%, and differs by virtue of income and flexibility from most of the corporate office staffs, which are summarized in this analysis. Although the content of aptness of a WHP program can always be criticized for its applicability, the "3W" program used on the hotel worker population was specifically designed by Kaiser Permanente for this workforce and included on-site and classes as well as a cognitive program.[41]

Although the term "return on investment" might seem appropriate directed to a financial officer, sonority does not resolve the issue that health benefits, and even organizational benefits, are not congruent with performance measures such as output, absenteeism, or reduced labor unit costs. Furthermore, improving workforce health in many cases requires organizational engagement in work-life quality, and almost always requires the longer-term perspective of risk factor reduction and chronic disease management. Evolving changes in health care delivery and financing are more likely to produce savings or losses in the short and intermediate terms than effective prevention, and the incumbent employer may see no direct benefit. The study by Gowrisankaran et al,[10] published as a refutation of ROI from WHP, demonstrates almost the opposite. Reduced morbidity and hospitalization for targeted primary diseases was as remarkable as the inability to lower associated health care costs because a rational market should convert lowered demand to cost reduction. That, of course, presumes that health care markets behave rationally.

If not ROI, then what? First, investment-return ratios related to operations should be routinely separated from analyses that involve health care costs and health effects. Second, health outcomes should be assessed in more traditional public health formats, involving cost-effectiveness or cost-utility approaches. Finally, if we accept that health care costs are indirectly associated with health, and that quality of work, quality of life, and reduced impairment have an intrinsic value, then the solution is a different type of assessment instrument, whose units permit a professionally directed translation into costs. The quality-adjusted life year and the disability-adjusted life year are steps in this direction, but the task before the Total Worker Health™ research community is for a more translatable metric.

CONCLUSIONS

A set of conclusions that are implicit in this analysis of ROI are as follows:

1. Workplace health promotion will likely be ineffective in a difficult and unstable work environment where there is little worker autonomy.
2. There is little rational basis for comparing dissimilar workforces through a contingent index of effectiveness such as ROI.
3. The concept of ROI in a workplace health intervention is incongruous with the more usual approach in health research of comparative effectiveness, where interventions are compared between nonmonetized outcomes, or comparable outcomes are assessed by comparative program costs.
4. There are insufficient econometric tools to enable the evaluation of preventive expenditures in the workplace on long-term, multilevel health outcomes.
5. Effectiveness in health interventions and ROI calculations are often incongruent. Reduction of chronic disease burden does not necessarily reduce health care costs, and long-term benefits may be recognized after work tenure has ended.

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