Comparing the Contributions of Well-Being and Disease Status to Employee Productivity

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Objective: To compare employee overall well-being to chronic disease status, which has a long-established relationship to productivity, as relative contributors to on-the-job productivity. **Methods:** Data from two annual surveys of three companies were used in longitudinal analyses of well-being as a predictor of productivity level and productivity change among 2629 employees with diabetes or without any chronic conditions. **Results:** Well-being was the most significant predictor of productivity cross-sectionally in a model that included disease status and demographic characteristics. Longitudinally, changes in well-being contributed to changes in productivity above and beyond what could be explained by the presence of chronic disease or other fixed characteristics. **Conclusions:** These findings support the use of well-being as the broader framework for understanding, explaining, and improving employee productivity in both the healthy and those with disease.

Learning Objectives

- Become familiar with recent reports suggesting that productivity is affected by non–health-related as well as health-related factors.
- Summarize the new findings on well-being as a predictor of productivity, in employees with and without diabetes.
- Discuss the construct of well-being as part of emerging, more comprehensive strategies to optimize productivity.

"The level of productivity is the single most important determinant of a country's standard of living . . . "[1] Poor employee health not only contributes to reduced profitability for companies through increased operational costs, it also results in indirect cost from decreased productivity.[2,3] Moreover, these issues threaten US well-being and competitiveness in the global environment.[4]

Although the direct costs of poor employee health have been well established,[5–10] recent literature has begun to focus on the indirect costs of poor employee health in the form of lost productivity.[11–14] By focusing on improving employee health, employers can reduce not only the direct costs (ie, medical and pharmacy) of poor health but also indirect costs due to absenteeism and presenteeism.[13–21] The costs of lost productivity are substantial. Multiple studies have found that the indirect costs of poor employee health can exceed those due to medical and pharmacy.[13,14,22] On the basis of his research, Loeppke et al[13,14] conclude that a new, more integrated and comprehensive approach to health care management that not only takes account of traditional medical and drug costs but also addresses the costs of absenteeism and presenteeism is needed.

Presenteeism has traditionally been defined as productivity loss as a consequence of attending work while ill.[20] Nevertheless, productivity loss from suboptimal performance on the job may arise from various non–health-related causes such as stress, family difficulties, and financial concerns.[23] Because of advancements in the theory and measurement of productivity, research has begun to redefine presenteeism as an outcome that is not solely a consequence of suboptimal health and several instruments have been developed to measure presenteeism stemming from both health- and non–health-related sources (eg, Health and Work Performance Questionnaire [HPQ] global presenteeism measure, Well-Being Assessment for Productivity [WBA-P]).[15,24]

Similarly, researchers have expanded the view of factors that may influence productivity. There is a considerable body of evidence that demonstrates that exposure to stress can adversely affect work performance and prolonged exposure can produce negative health effects such as obesity, heart disease, depression, etc.[16,25–30] More recent research has explored aspects of work-related factors, employee engagement, financial stress, and depression/anxiety as additional factors that influence employee productivity. Each of these were found as significant contributors to self-rated job performance in addition to physical heath factors.[31,32] Merrill and colleagues conclude from their work that "employers can maximize their employees' job performance by using a multipronged, integrated approach to well-being improvement."[32]

Despite the evidence that efforts to improve work performance should focus on areas beyond physical health, to date, most research documenting the effects of lost productivity has focused more narrowly on physical causes as the contributing factor.[12–14,17,33–38] Collins et al[39] evaluated the relative influence of employee demographics, health risk factors, chronic conditions, health care claims, and employment information and found that chronic conditions were the most important determinant of work impairment. Nevertheless, even among data available in health care claims, conditions beyond the "core chronics," including depression, anxiety, and fatigue, have emerged as significant drivers of productivity loss.[14]

With the recognition that factors beyond chronic disease must be considered to make the largest impact on productivity, the selective approach to examining these factors in existing studies represents a limited view. There is still the gap of a more comprehensive evaluation of the elements that influence performance. In fact, Loeppke et al[14] argue that health risk assessments (HRAs) represent an advancement over claims data for use by employers focused on a broader set of "business-relevant outcomes," yet HRAs still collect information that is primarily focused on physical health and the behaviors that influence physical health. Any performance deficits among employees without existing disease or health risks, or among employees who are unaware of their health risks, cannot be identified for intervention by using the information collected by an HRA. Therefore, an important limitation of prior research, given advances in the field showing that a range of factors influence productivity, is the absence of a more comprehensive measure of the factors that influence one's ability to perform optimally.

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In their groundbreaking article, "Beyond Money: Toward an Economy of Well-Being," Diener and Seligman[40] contend that well-being should be the ultimate goal around which economic, health, and social policies are developed, not simply because well-being is an important indicator in itself but also because well-being is many times a cause of other valued outcomes, such as worker productivity and rewarding relationships. They conclude that organizations and nations would benefit from regular assessment of well-being and finding ways to improve it. An individual's well-being is sensitive not only to physical health factors that contribute to absenteeism and presenteeism but also to non–health-related factors (eg, psychosocial, environmental, financial, work, etc) that may serve as barriers to optimal productivity.

In addition to the macrolevel argument put forth by Diener and Seligman[40] that well-being is an important indicator of societal health, this construct is gaining acceptance as an integral part of health care measurement continues to gain adherents. Both the National Institutes of Health and the Centers for Disease Control and Prevention have recognized well-being as an important indicator of physical and mental health and therefore an essential component in the measurement of public health outcomes.[41,42]

The purpose of this study was to evaluate well-being as measured by the Well-Being Assessment (WBA) as such a comprehensive measure with the aim of maximizing opportunity for productivity improvement across entire populations, regardless of health status. Individual well-being scores (IWBSs) as measured by the WBA have demonstrated strong relationships to a number of standard health care outcomes, including expenditures, inpatient admissions, and emergency department visits,[43,44] as well as productivity outcomes in the form of absenteeism and presenteeism,[24,31,32,45,46] lending support to this well-being measure as the broader framework for understanding what influences business outcomes, including productivity. Nevertheless, research to date has not directly compared well-being with the traditional factors known to affect productivity. Here, IWBS is compared with the prevalent chronic condition diabetes to determine whether well-being contributes to productivity levels and changes over and above what can be explained by physical health alone.

METHODS

Study Design

The study used a longitudinal, retrospective panel study design, using survey data collected in 2 consecutive years (T1 and T2). The data for the panel were composed of employees from three US companies. One company was a large health care vendor, another was a nationally based insurance company, and a third was an internationally based manufacturing company. Study eligibility required completion of the WBA at T1 and T2, with valid well-being and productivity scores from both time points, and a documented age between 18 and 64 years. Two study groups were identified from the data panel: (1) *nondiseased*—individuals who self-reported no chronic conditions at T1 and T2 ($n = 1858$) and (2) *diabetes*—individuals who self-reported a diagnosis of diabetes at T1 and T2 ($n = 771$). Individuals in the diabetes group were not restricted on the basis of the presence or absence of other comorbid conditions. Because of the negligible risk, retrospective design, and use of de-identified data, this study was exempt from institutional review board approval based on exclusion criteria outlined in the US Code of Federal Regulations (45 CFR §46.101).

Measures

Well-Being: WBA and IWBS

The WBA was developed as an extension of the Gallup-Healthways Well-Being Index (WBI),[47,48] a community survey of well-being, for use with employer populations and other organizations, such as health plans and health systems, interested in total population health and well-being. The instrument includes health risk and productivity measures in addition to the WBI item set. Individual well-being score was developed from WBI items and domains to allow calculation of well-being at the individual level.[49] The IWBS is calculated using 40 questions from the following six domains of well-being that are included in the WBI and WBA: physical health, emotional health, healthy behaviors, work environment, basic access, and life evaluation. Each domain is weighted equally in the calculation of the IWBS, because they are in the WBI, and scores range from 0 to 100 for each respondent.

Productivity: WBA-P Overall Score and WBAP_Alt Score

The primary measure of productivity in the study was the WBA-P that is administered as part of the WBA and provides an informative evaluation of on-the-job productivity loss (presenteeism) due to well-being–related barriers. Criterion-related validity of the WBA-P has been established through multivariate analysis to a number of health and well-being measures.[24]

The WBA-P score is taken from 11 items on the WBA with the shared question stem "During the past 4 weeks (28 days), how often have you had trouble at work concentrating or doing your best because of . . . " and then lists 11 possible reasons or barriers. Scoring of this measure ranges from 0 (not at all) to 100 (a lot for all 11 reasons).[24] For the purposes of the study, the WBA-P overall score was converted from a measure of productivity loss to one of productivity functioning. This was accomplished by taking the complement of the WBA-P, that is, WBAP_Alt = 100 − (WBA-P). This converted score is designed to reduce or eliminate zero scores for statistical analyses. Higher scores reflect higher levels of productivity.

Productivity (Secondary Measure): HPQ Self-Rated Performance Scale

The HPQ contains a global, self-rating of job performance measured on a 0 to 10-point scale that is considered an absolute measure of presenteeism;[15] this question was included in the WBA. The item reads, "On a scale from 0 to 10 where 0 is the worst job performance anyone could have at your job and 10 is the performance of a top worker, how would you rate the usual performance of most workers in a job similar to yours?" Responses to this global item were used in sensitivity analyses to further strengthen conclusions drawn with the primary productivity measure of the study, the WBA-P.

Statistical Methods

First, cross-sectional, linear models were used to examine the relative contribution of well-being and other selected covariates (Table 1), including disease status, on productivity among

TABLE 1. Study Model Variables

Variable	Type	Categories/Range
Productivity score (WBA-P_Alt)*	Continuous	0–100
Disease status	Categorical	Nondiseased or diabetes
Well-being (IWBS)	Continuous	0–100
Age, yrs	Continuous	18–64
Gender	Categorical	Men or women
Comorbidities count	Continuous	1–21
Employer	Categorical	A, B, or C
Time	Categorical	T1 = 2010; T2 = 2011

*Dependent variable.
IWBS, individual well-being score; WBAP_Alt, Well-Being Assessment for Productivity, complement of score.

nondiseased and those with a chronic condition (ie, nondiseased vs diabetes).

To assess how changes in well-being relate to changes in productivity, fixed-effects regression (ie, first differencing) was used to further test the robustness of well-being in explaining changes in productivity. Fixed-effects techniques have often been referred to as the "criterion standard" for observational studies.[50] Among fixed-effects techniques, fixed-effects regression was chosen over fixed-effects estimation found in mixed models because it provides a more straightforward way to assess the impact of changes in well-being (IWBS) on changes in productivity (WBAP_Alt). The appeal of fixed-effects techniques is their ability to control for bias from all time-invariant sources whether measured or unmeasured, thus addressing the potential limitation of omitted variable bias.[51–54] Also, fixed-effects regression removes hierarchical sources of bias due to nesting (eg, employees nested within companies). These attributes of the technique are achieved through use of the within-person variation (each case, in essence, serves as its own control).

Although fixed-effects techniques cannot provide reliable estimates for the effects of time-invariant sources, this limitation was of minor consequence to this study, given that a detailed evaluation of covariate contribution was not an objective. Aligned with our study goals, first differencing provides a powerful test of the robustness of observed, time-varying variables.[50] Additional sensitivity analyses were also conducted to assess the stability of results. All statistical analyses were conducted using SAS 9.2 (SAS Institute Inc, Cary, NC).

RESULTS

Of the 2629 employees who qualified for the data panel, 771 (29.3%) self-reported they had diabetes at T1 and T2, with 1858 (70.7%) self-reporting the absence of the surveyed disease conditions at T1 and T2. Participant demographics are presented in Table 2 by disease status. The study group was largely composed of men, though gender is more balanced in the diabetes group. As the table reveals, the nondiseased members have higher productivity and well-being scores than their diabetes counterparts and are also younger, on average. Of the three employer groups, employer B had the lowest percentage of members with diabetes.

Contribution of Well-Being on Productivity in the Context of Disease Status

Cross-Sectional Examination at T1 and T2

General linear models were used in a cross-sectional analysis of well-being and other variables as contributors to productivity (WBAP_Alt) at each time point (Table 3). A positive coefficient for the continuous variables of age and well-being indicates a positive relationship with productivity. A negative coefficient for categorical variables (ie, gender, disease status, and customer) reflects lower productivity compared with the reference group. In both years, well-being is the most influential predictor and is fairly consistent in effect. Nevertheless, there seems to be a general increase in the influence of the other covariates going from T1 to T2, suggesting an effect for time.

TABLE 2. Participant Demographics ($N = 2629$)

Variable	Disease Status Group: Diabetes ($n = 771$)	Disease Status Group: Nondiseased ($n = 1858$)
Productivity score (WBAP_Alt; mean)	80.6	87.8
Well-being (IWBS; mean)	69.3	81.6
Age (mean), yrs	50.5	37.9
Women, %	48.8	41.5
Number of comorbid conditions (mean)	5.3	0
Employer A (% by group; $n = 881$)	34.2	65.8
Employer B (% by group; $n = 1472$)	25.2	74.8
Employer C (% by group; $n = 276$)	35.9	64.1

IWBS, individual well-being score; WBAP_Alt, Well-Being Assessment for Productivity, complement of score.

Fixed-Effects Regression (First Differencing)

The results of fixed-effects regression evaluating the influence of well-being change on changes in productivity (WBAP_Alt) are presented in Table 4. Because this approach controls for all time-invariant factors whether measured or unmeasured, fixed covariates are not included in the structural model. Results revealed a large, statistically significant coefficient for the relationship between well-being and productivity, indicating that changes in well-being explain changes in productivity beyond what can be explained by disease status or other fixed characteristics.

Sensitivity Testing

Because of the disproportionate number of nondiseased to diabetes group members, sensitivity tests were conducted on the groups separately to confirm that the results were not driven by a particularly strong relationship between well-being and productivity in one group or the other. Specifically, by evaluating the stability of the fixed-effects regression results between the two groups, it is possible to evaluate whether well-being is similarly predictive regardless of disease status. Results, presented in Tables 5 and 6, reveal that change in productivity (WBAP_Alt) is significantly related to change in well-being in both the nondiseased and the diabetes groups.

As an additional sensitivity test to ensure that conclusions are robust to different measures of productivity, changes in well-being (IWBS) were modeled in predicting changes in the global work performance measure from the HPQ (Table 7). Well-being was found to make a statistically significant contribution to performance self-rating, corroborating findings with the WBA-P.

DISCUSSION

In the new globally competitive marketplace, human capital has become the competitive advantage that employers can no longer afford to take for granted. Research to date linking productivity to individual factors has focused on health problems as the source of worker productivity loss, with particular focus on chronic conditions.[12–14,17,33–39,55,56] Nevertheless, a growing body of literature is demonstrating that a wider array of personal factors, namely individual well-being, together represent powerful predictors of outcomes that affect business performance and competitiveness—worker health care costs, hospital utilization, performance, productivity, and retention.[43–46,57–60] Nevertheless, the research has yet to directly compare worker well-being to the traditional view of poor health (ie, chronic disease) as variables predicting performance.

The analyses conducted in this study address this gap and show that well-being provides explanatory power for productivity above and beyond what can be attributed to disease status, using the prevalent condition diabetes as the focus disease. As others have recognized, a focus solely on physical health as the basis to address productivity has important limitations.[61] Nevertheless, research examining the relative influence of physical health factors, including chronic conditions, health risk factors, and health care claims, together with demographic factors and work factors, on productivity still found that the presence of a chronic condition was the most important predictor.[39] The present findings offer IWBS as a highly significant predictor of on-the-job productivity and more predictive compared with other factors, including disease status. Specifically,

TABLE 3. Cross-Sectional Examination of Well-Being and Employee Characteristics as Predictors of Productivity in 2 Consecutive Years ($N = 2629$)

	T1			T2		
Parameter	**Estimate**	***t***	***P***	**Estimate**	***t***	***P***
Intercept	42.27	22.35	<0.0001	43.66	24.19	<0.0001
Disease status (nondiseased relative to diabetes)	− 0.07	− 0.11	0.9117	1.64	2.67	0.0077
Well-being (IWBS)	0.55	29.62	<0.0001	0.52	29.63	<0.0001
Gender (women relative to men)	− 0.58	− 1.13	0.2581	− 0.91	− 1.87	0.0609
Age	0.01	0.47	0.6403	0.04	1.71	0.0878
Employer A (relative to C)	0.26	0.33	0.743	− 1.98	− 2.61	0.0091
Employer B (relative to C)	− 0.89	− 1.11	0.2689	1.26	1.65	0.0989

IWBS, individual well-being score; T1, initial evaluation year; T2, second evaluation year.

cross-sectional analysis in 2 consecutive years found IWBS to be the most significant variable associated with productivity, with other covariates (including disease status) having inconsistent or not significant associations beyond what was explained through IWBS. Bolstering these findings, a longitudinal analysis of change in these measures found that, controlling for all time-invariant factors, change in IWBS was a robust predictor of change in productivity.

The WBA-P, the productivity score calculated from the WBA, was chosen as the productivity measure for this analysis because of its multidimensionality, which has the advantages of measuring more variance in a population and also providing useful information to employers about the prevalent sources of productivity loss.[24] The analysis was replicated using the overall job performance item from the HPQ and found that results were consistent with those using the WBA-P, thus lending generalizability of the results across measures of presenteeism.

Diener and Seligman[40] make the compelling case that traditional economic indicators like gross domestic product are insufficient to represent societal health and quality of life. In line with this broader notion, the present findings demonstrate that physical health is not sufficient to represent the vicissitudes of productivity in the modern workplace, but that the more global measure of individual well-being has a more important role in explaining productivity variance among workers. Does this mean that we dismiss the role that health plays in productivity? To the contrary, the role that health plays as a foundation for productivity must be acknowledged. Yet, just as income is insufficient to fully reflect quality of life in postindustrial societies, physical health alone is insufficient to explain changes in productivity now that individual well-being is recognized to have a stronger relationship with this outcome. Also, just as Diener and Seligman[40] argued that money is not an end itself but a means to an end, well-being is not an end itself for employers but a means to greater productivity and profitability. Therefore, it is in employers' interest to support and improve employee well-being as a competitive strategy.[62–64]

Well-being may have more explanatory power with respect to productivity, because it takes account of the important role that physical health plays and also addresses an array of other psychosocial, lifestyle, and environmental factors that influence productivity. These other well-being factors may also represent the "root causes" or issues that one must address as a means to optimize health and productivity outcomes. The broad construct of well-being would logically relate to higher levels of productive functioning like creativity, innovation, employee engagement, adapting to a changing market, and environment that manifests as added economic value, areas that should be explored in future research.[65,66]

Traditionally, companies have relied on disease management and wellness programs as a means of reducing or avoiding productivity loss due to poor health. To enroll employees in these programs, risks are identified using either claims data, which apply only to employees already using the health care system, or traditional HRAs, which identify only existing health risk factors and requires awareness by the employee of their risks. A strategy of well-being improvement, on the contrary, applies to the total population, not just those with known physical health risks and conditions. By evaluating the diabetes and nondiseased groups separately, this study shows that well-being explains productivity within the groups at each end of this spectrum. Therefore, well-being–improvement initiatives can benefit all employees and have the opportunity to improve productivity for an entire workforce, not just those with existing health problems, to allow employers the opportunity to shift the focus from productivity loss to productivity gain.

The concept of well-being improvement is aligned with the paradigm shift in which employees are considered "human capital" and are thus of strategic importance to success in the marketplace rather than an expense to be managed.[67,68] Innovative companies like IBM realize that looking out for the physical health of employees is not enough. On their Web site dedicated to well-being, IBM states "Advancing the health, safety and well-being of our global workforce is an absolute priority; it's a commitment that encompasses the environments in which employees work and the communities in which

TABLE 4. Combined Model of Well-Being Change (T1 to T2) Contribution to Productivity Level Change Among Diabetes and Nondiseased Groups Collectively ($N = 2629$)

Parameter	**Estimate**	**Standard Error**	***t***	***P***
Intercept	1.82	0.2346	7.76	<0.0001
Change in well-being (IWBS)	0.32	0.0206	15.29	<0.0001

IWBS, individual well-being score.

TABLE 5. Nondiseased Model of Well-Being Change (T1 to T2) Contribution to Productivity Level Change ($n = 1858$)

Parameter	**Estimate**	**Standard Error**	***t***	***P***
Intercept	2.24	0.2637	8.50	<0.0001
Change in well-being (IWBS)	0.28	0.0249	11.27	<0.0001

IWBS, individual well-being score.

TABLE 6. Diabetes Model of Well-Being Change (T1 to T2) Contribution to Productivity Level Change ($n = 771$)

Parameter	Estimate	Standard Error	*t*	*P*
Intercept	0.81	0.4836	1.68	0.093
Change in well-being (IWBS)	0.37	0.0370	10.05	<0.0001

IWBS, individual well-being score.

TABLE 7. Contribution of Well-Being Change to HPQ Self-Rated Performance Change ($N = 2629$)

Parameter	Estimate	Standard Error	*t*	*P*
Intercept	1.51	0.2255	6.72	<0.0001
Change in well-being (IWBS)	0.33	0.0199	16.38	<0.0001

IWBS, individual well-being score; HPQ, Health and Work Performance Questionnaire.

they live." It is further stated that "these [global] challenges require a 'total health management' framework that transcends the implementation of traditional employee well-being programs by recognizing the importance of promoting physical and psychological health".[69] Other organizations are adopting this view. A large international survey by the World Economic Forum found that organizations viewed as actively promoting health and well-being were at least 2.5 times more likely to be rated a best performer and to encourage creativity and innovation, and 4 times less likely to lose talent.[66]

Limitations to consider when evaluating the results of this study include the potential for self-report bias and the fact that nonrandom samples across three employer groups may restrict generalizability. Diabetes was chosen as the disease for analysis because of its prevalence, documented impact on productivity, and common occurrence as a comorbid condition. Another potential limitation is the under-diagnosis of diabetes in the United States giving rise to the possible contamination of nondiseased group with undiagnosed diabetics. Nevertheless, any such contamination would likely have served to attenuate the measured effect found between productivity and well-being.

Although the diabetes group did have a high prevalence of comorbidity (5.3 conditions, on average), future research should expand this focus to understand whether the results are consistent across other specific diagnoses. Although first differencing was used to control for bias due to all time-invariant sources, potential model misspecification in the form of omission of time-varying variables and the issue of simultaneity must be acknowledged. Despite the aforementioned limitations, the promise of well-being as a framework for understanding and impacting worker productivity is supported by the results. Future research should address a broader range of productivity issues not available through current models and should directly test the impact of well-being improvement initiatives on presenteeism and other forms of productivity loss.

CONCLUSIONS

The results presented here show that employee well-being is a significant predictor of productivity and suggest strategies for well-being improvement as an important means to optimize productivity above and beyond what might be achieved through approaches aimed at preventing or managing chronic conditions. The construct of well-being provides the opportunity for a more comprehensive approach to addressing the issue of employee productivity in an entire population, because workers who do not have health conditions often still have opportunities for well-being improvement.

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