

## What's Mine is Yours

### *Evaluation of Shared Well-Being Among Married Couples and the Dyadic Influence on Individual Well-Being Change*

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**Objective:** To evaluate the relationship between partner well-being and outcomes of chronically diseased individuals participating in an employer sponsored well-being improvement program. **Methods:** Using the Actor Partner Interdependence Model, we evaluated whether prior partner well-being was associated with well-being change among 2025 couples. Logistic regression models were then used to explore how spousal well-being risks relate to development and elimination of risks among program participants. **Results:** High well-being partners were associated with positive well-being change. Specifically, the partner effect for spouses' high well-being on disease management participants was a 1.5 point higher well-being in the following time period ( $P=0.001$ ) while the partner effect of participants' high well-being on spouses was nearly 1.1 points ( $P=0.010$ ). **Conclusions:** Well-being within couples is interdependent, and partner well-being is an important predictor of individual well-being change.

Researchers have consistently found that individuals in close relationships, such as married couples, share similar health risks and impact each other's health trajectories over time.<sup>1-5</sup> In addition to finding concordance in health risks, there is evidence that spouses affect each other's ability to improve health behaviors.<sup>6,7</sup> Readiness to change was demonstrated to be positively associated among married couples, and further, a spouse's stage of change was a significant influence on the behavior change of his or her partner.<sup>8</sup> Existing concordance research has mainly focused on an inventory of specific health risks such as exercise, body mass index (BMI), tobacco, and alcohol use.<sup>1,4,9</sup> We take a more comprehensive approach by including measures that assess the full dimensionality of individual well-being in addition to physical health risks.

Individual well-being, assessed through the Well Being Assessment (WBA) questionnaire, is a comprehensive measure of the multidimensionality of well-being that has consistently been linked to key outcomes, including health care utilization and employee productivity.<sup>10-15</sup> Compared with physical health components alone, well-being is a superior measure of the factors that influence employee productivity.<sup>16</sup> The WBA measures psychosocial, emotional, and environmental factors in addition to physical health, which are likely to influence and be influenced by close relationships such as those with spouses. We hypothesize that well-being is concordant among married couples and that the well-being of a spouse is an important predictor of individual well-being change.

Multiple theories have been proposed to explain why health concordance occurs<sup>2</sup> and are applicable to the study of well-being among couples. One such theory, assortative mating, describes partner selection as a direct function of shared well-being characteristics. An alternative theory posits that the resources and environments shared among spouses may lead to concordant well-being risks. These could include financial aspects such as household income, debt, and financial stress; community characteristics including access to safe places to exercise and access to fruits and vegetables; as well as household factors such as the availability of high-fat foods within the home. In addition, research has shown the spread of health risks such as unhappiness, smoking, and obesity among networks of friends and family were associated suggesting that the social networks shared by spouses may impact the spread of well-being risks.<sup>17,18</sup> Spouses may also affect each other's well-being directly by exerting social control to encourage healthy behaviors.<sup>19</sup> Irrespective of the specific concordant mechanism(s), participants of a well-being improvement program are likely to influence and be influenced by the characteristics of the dyad, including spouse well-being.

This study is the first to report on interspousal well-being among a large chronically ill population participating in an employer sponsored well-being improvement program. We first expand our understanding of concordance by evaluating the spousal similarities in measures of well-being. We then estimate the relationship between partner well-being and individual well-being change among married couples. Lastly, we explore the concordance in greater detail by evaluating how spousal well-being risks relate to the development and elimination of risks among disease management participants. The results of this study increase understanding of interpersonal factors related to well-being among couples living with chronic disease.

## METHODS

### Study Population

The population was comprised of individuals employed by a national employer and their spouses; data were collected between 2011 and 2012. The employer in this study implemented a comprehensive well-being improvement solution that included a chronic disease management program. Monetary incentives were offered to employees and spouses that completed the WBA. Participants had online access to their WBA results and a personalized well-being plan. Employees and spouses identified with a chronic disease(s) based on administrative health care claims were given additional incentives to participate in a disease management program.

The study sample included 2025 couples that completed the WBA in both 2011 (T1) and 2012 (T2) and had evidence of one person participating in disease management during the 2011 program year; couples with two participants were excluded. Spouses that were diseased but declined to engage in the program, however, were included and represented approximately 40% of spouses. Table 1 provides additional details on the baseline characteristics of the disease management participants and spouses.

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**TABLE 1.** Descriptive Statistics of Disease Management Participants and Spouses (2,025 Couples)

Variables	Disease Management Participants	Spouses
Member count	2,025	2,025
Demographics		
Age	49.78	49.49
Female	49.48%	47.36%
Employee	50.86%	49.14%
Well-being		
Individual well-being score (0–100)	74.16	77.73
Partner reports high well-being*	58.77%	40.40%
Individual well-being score change (2011–2012)	0.93	0.25
Disease status		
Diseased	100%	41.6%
Asthma	24.89%	7.75%
Coronary artery disease	9.63%	3.36%
Diabetes	24.94%	7.06%
Chronic obstructive pulmonary disease	2.77%	1.09%
Heart failure	1.48%	0.74%
Non-chronic conditions†	66.91%	30.07%
Disease burden‡	1.69	0.66
Utilization (per 1,000 members)		
Emergency room visits	514	341
Hospital admissions	128	73
Health care spending (allowed monthly amount)	\$682	\$349
(Standard deviation)	(\$1,413)	(\$872)

\*High well-being defined by predetermined cut points reported in Shi et al (2013).

†Non-chronic conditions include: acid-related stomach disorders, atrial fibrillation, decubitus ulcers, fibromyalgia, inflammatory bowel disease, irritable bowel syndrome, low back pain, osteoarthritis, osteoporosis, and urinary incontinence.

‡Disease burden is a rudimentary metric of comorbidity; it is the number of listed diseases and conditions a member was found to have.

**Measures**

Data were collected using a combination of plan eligibility files, administrative claims data, and completed WBA questionnaires. The key variable of interest was overall well-being measured using the individual well-being score (IWBS). Other measures included demographics as well as disease status.

**Overall Well-Being**

Self-reported measures of well-being were assessed using the WBA, which captures the multidimensionality of an individual including information on six, scientifically developed domains of well-being: physical health, emotional health, healthy behaviors, work environment, basic access, and life evaluation. The domains were averaged to quantify a holistic measure of well-being, the IWBS, which ranges on a scale from 0 to 100.<sup>20</sup> Assessments where IWBS could not be calculated due to missing item responses were not considered complete and were excluded from this analysis.

**Demographics**

Demographics such as age, sex, and employee status were sourced from plan eligibility files. Employee spouse dyads were grouped based on shared numeric identifiers unique to each family.

**Chronic Disease Status**

A proprietary algorithm based on diagnosis and procedure codes, by place of service, observed over a 24 months window was

applied to administrative claims data to identify specific targeted conditions and several non-chronic conditions (Table 1).

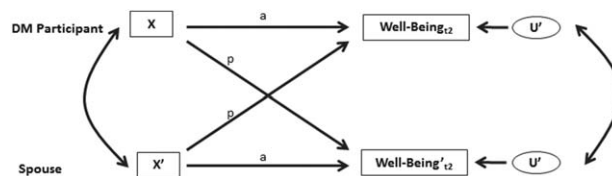
**Analysis Plan**

Within couple well-being correlation both overall and by each domain was estimated using the Pearson product–moment correlation. The purpose of this step was to assess whether well-being was independent of the dyad; if significant correlation was found, then proceeding with econometric analysis assuming independence would have resulted in biased and inaccurate parameter estimates.<sup>21,22</sup> As expected, well-being within dyads was correlated, therefore we employed a theoretical model called the Actor-Partner Interdependence Model (APIM) to evaluate prior spousal well-being as a predictor of well-being among couples with one participant in disease management.

The APIM, specified as a mixed effects linear regression model, accounts for the mutual influence of members in close relationships by treating the dyad as the unit of analysis and the individuals nested within the dyad.<sup>22,23</sup> The nested structure allows for quantification and subsequent statistical testing of the directionality and magnitude of two main components within the model, actor and partner effects. Figure 1 displays the direct and indirect effects tested within APIM. The actor effect (labeled “a”) measures an individual’s own characteristics as a predictor of his or her well-being change (direct effects). The partner effect (labeled “p”) measures a partner’s characteristics as a predictor of the actor’s well-being change (indirect effects). Estimating actor and partner effects for both members of the dyad as a single entity explicitly controls for the interdependence among disease management participants and their spouses which in turn yields more efficient and accurate results.

The primary outcome was T2 well-being measured using 2012 IWBS. Actor variables consisted of an individual’s own baseline (2011) well-being, age, employee status, sex, and chronic disease prevalence. Partner well-being was included as a dichotomous variable representing whether or not the partner had high baseline well-being. High well-being was defined by predetermined cut points<sup>24</sup> reported in Shi et al (2013) and included the groups associated with the top two segments of well-being (high and medium-high well-being). A second partner variable was included to estimate the impact of spouse chronic disease on participant partners. The mixed effects model allowed for estimation of the actor effects while controlling for the partner effects and vice versa simultaneously for both dyad members.<sup>22,25</sup>

Finally, we estimated a series of logistic regression models to gain a deeper understanding of how spousal well-being related to the development and elimination of well-being risks among disease management participants. Several risks from multiple well-being



**FIGURE 1.** The Actor-Partner Interdependence Model. Adapted from diagram presented in *The Actor-Partner Interdependence Model: A model of bidirectional effects in developmental studies* by Cook and Kenny.<sup>22</sup> DM stands for disease management. X represents the characteristics of the DM participant. X' represents the characteristics of the spouse. The label “a” refers to actor effects. The label “p” refers to partner effects. U and U' represent the respective residuals. Lines with double arrows represent correlation.

domains were evaluated including diet, obesity, stress, lack of enjoyment, and life satisfaction. Respondents were identified as being at risk for inactivity or diet if they reported exercising at least 30 minutes less than three times a week or eating five servings of fruits and vegetables less than 4 days per week, respectively. Obesity risk was based on reported body mass index (BMI) greater than or equal to 30. Individuals were identified as being at risk for stress and lack of enjoyment if they answered yes and no, respectively, to the questions “Did you experience stress during a lot of the day yesterday?” and “Did you experience enjoyment during a lot of the day yesterday?” Life satisfaction risk was based on responses to the following question. “Please imagine a ladder with steps numbered from zero at the bottom to 10 at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time?” Respondents that answered six or less were designated at risk.

Our analysis sought to gain insight into how spousal well-being risks impact the development and elimination of well-being risks, which in turn drive overall well-being change, among disease management participants. The analysis consisted of three separate logistic models, with each model specified according to the particular behavior change and spousal factor under investigation. Model 1 was limited to disease management participants that did not have the baseline risk. To evaluate whether the presence of risk in spouses increased the participants’ odds of developing risk, we regressed a binary variable defined by whether the participant developed the risk in the following time period on whether the spouse had the risk at baseline. Model 2 was limited to disease management participants that had each risk at the baseline. To estimate whether the presence of spousal risk reduced the odds that participants would eliminate the risk in the next time period, we regressed whether the participant eliminated the risk in the following time period on the presence of spousal risk at baseline. Finally, Model 3 was limited to disease management participants where both partners were at risk. We

regressed whether the participant eliminated the risk on whether the spouse eliminated the same risk in the same time period. Figure 2 displays Model 3 using inactivity risk as an example. All three models controlled for age, sex, employee status, number of chronic conditions, and number of successful telephonic encounters with clinicians.

## RESULTS

### Concordance of Well-Being

Table 2 provides descriptive statistics and Pearson correlation coefficient ( $r$ ) values for the well-being of disease management participants and spouses. Based on Myers (1979),<sup>26</sup>  $r$  values greater than or equal to 0.20 indicated concordant well-being between partners and spouses. As expected, the level of concordance varied among each of the six well-being domains. Specifically, the domains more likely to be influenced by intra-household characteristics demonstrated higher correlation than domains likely to be influenced by external factors such as work environment. While physical health risks among disease management participants and their spouses were weakly correlated ( $r=0.17$ ), dyad members were evidenced to share similar health behaviors ( $r=0.27$ ), for example, fruit and vegetable consumption and physical activity, that over time impact physical health. These results demonstrate concordance of well-being within the evaluated married couples; therefore, in the subsequent econometric analysis the unit of analysis was the dyad as opposed to the individual.

### APIM Results

Table 3 shows the actor and partner effects of interest on overall well-being change estimated using mixed effects model estimation of APIM. The results demonstrate that partners with high well-being were significantly associated with positive changes in well-being for both participants and spouses (the effect was bidirectional). Specifically, the partner effect for spouses’ high well-being

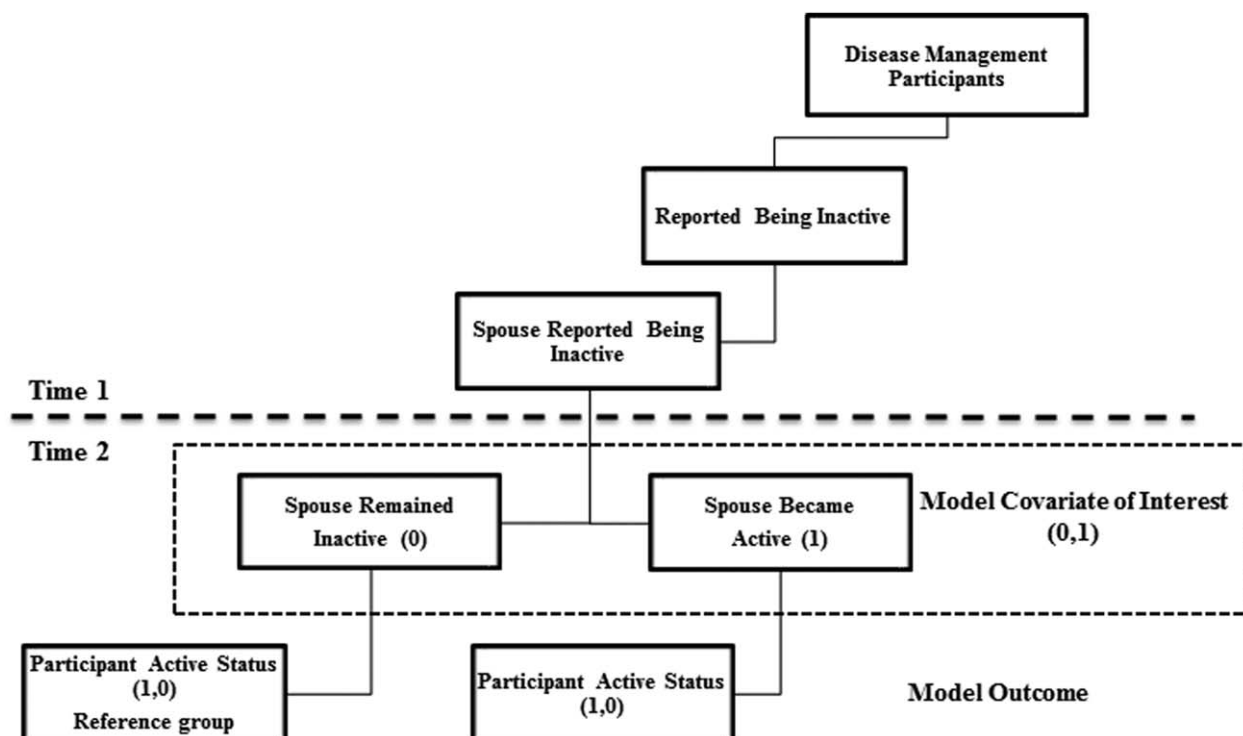


FIGURE 2. Example of the Model 3 logistic regression using inactivity risk.

**TABLE 2.** Well-Being Comparison Among Disease Management Participants and Spouses (2,025 Couples)

Variable <sup>†</sup>	Average Score (0–100)		Average Difference (P-S)	Pearson Correlation Coefficient (r)
	Participant	Spouse		
Well-being assessment				
Overall well-being (IWBS)	74.16	77.73	–3.57	0.286***
Life evaluation	77.91	80.25	–2.34	0.247***
Emotional health	81.22	83.07	–1.85	0.231***
Physical health	58.11	73.31	–15.20	0.165***
Health behavior	58.65	59.69	–1.04	0.265***
Basic access	95.14	94.86	0.29	0.306***
Work environment <sup>‡</sup>	74.00	75.28	–1.28	–0.001

IWBS, individual well-being score.

<sup>†</sup>IWBS and domain scores range from 0 to 100.

<sup>‡</sup>Work environment showed no statistical significance at any level.

\*\*\**P* < 0.01.

on disease management participants was a 1.5 point higher well-being score (*P* = 0.001) while the partner effect of participants' high well-being on spouses was 1.1 points (*P* = 0.010). In addition, chronic disease prevalence among spouses (by definition not participating in disease management) resulted in significant and negative actor and partner effects; the estimated effect of spouse chronic disease was 1.7 points lower T2 well-being for the spouse and over one point lower T2 well-being for the partner participating in disease management.

### Logistic Regression Results

Logistic regression showed that spouse risks influenced the likelihood that disease management participants developed or eliminated risks, contributing to overall well-being change. Table 4 presents results of the three separate logistic regression models used to evaluate six different well-being risks. The risks were intentionally chosen ex ante to illuminate the source of within domain well-being change and included inactivity, diet, obesity, stress, enjoyment, and life satisfaction. Overall, participants were more likely to develop new risks in the follow-up period if their spouses had the risk in baseline (Model 1). Life satisfaction reported the strongest effect such that having a spouse with low life satisfaction more than doubled the likelihood of the participant developing this risk. The results also showed that participants were less likely to eliminate risks if spouses shared the risk at baseline (Model 2). Initial concordance in obesity and lack of enjoyment demonstrated the strongest association to the probability that participants successfully eliminated these risks. For instance, participants whose spouses were also obese were 62% less likely to eliminate the obesity risk than participants whose spouses were not obese. Finally, where participants and their spouses both had baseline risk, participants were more likely to eliminate the risk if their spouses eliminated the risk (Model 3). The effect was strongest for stress and diet risks. Complete logistic regression model parameters and their significance are available upon request from the author.

### Supplemental Analyses: The Modifying Effect of Sex

Existing research points to possible sex differences in the way that social relationships influence health outcomes.<sup>19,27,28</sup> Because women are more likely to engage in health-related spouse control, be responsible for family nutrition, and in a chronic disease context, be the main caretaker,<sup>28</sup> it is plausible that we would see partner effects moderated by sex. We extended the main effects model to include interaction variables of T1 well-being and sex for actor and partner variables. As suggested by Cook and Kenny,<sup>22</sup> we centered the well-being scores used in the interactions and effect

coded sex. There were no statistically significant interaction effects indicating no significant difference in partner effects between men and women.

### Sensitivity Testing

To ensure that conclusions are robust to different specifications of partner variables, we evaluated whether results differed with a continuous measure of partner well-being. Consistent with our main model, prior partner well-being was found to make a statistically significant contribution to well-being for both participants and spouses.

### DISCUSSION

This study is the first to report on the association between partner well-being within couples coping with chronic disease. Consistent with the health concordance literature, the results showed that couples were concordant in well-being. The strength of the correlation differed across well-being domains with slightly stronger correlation in areas that were more likely to be influenced by socio-environmental factors within the household. Furthermore,

**TABLE 3.** APIM Estimates of Actor and Partner Effects on T2 Well-Being

Variable	Estimate	<i>P</i>
Intercept	24.258	<0.0001
Actor effects		
Gender	0.495	0.194
Age	0.019	0.312
Employee	1.058	0.005
Participant T1 well-being	0.655	0.001
Spouse T1 well-being	0.670	<0.0001
Spouse T1 chronic disease	–1.680	<0.0001
Partner effects		
High well-being partner on spouse T2 well-being	1.148	0.010
High well-being partner on participant T2 well-being	1.546	0.001
Spouse T1 chronic disease on participant T2 well-being	–1.064	0.017

APIM, actor partner interdependence model. T1 refers to characteristics in the baseline (2011) and T2 refers to the follow-up timer period (2012). Participant refers to individuals participating in the disease management program.

Actor effects measure the extent to which a person's characteristics influence their own well-being in T2. The partner effects measure the extent to which an actor's characteristics influence their partner's well-being in T2.

**TABLE 4.** Logistic Regression Analysis of the Influence of Spousal Risks on Disease Management Participant Development and Elimination of Specific Well-Being Risks<sup>†</sup>

	Well-Being Risk					
	Inactivity	Diet	Obesity	Stress	Enjoyment	Life Satisfaction
Model 1:						
Developed the risk <sup>‡</sup>						
Spouse had risk <sup>§</sup>	1.64***	1.58***	1.96***	1.47**	1.74**	2.13***
Model 2:						
Eliminated the risk <sup>  </sup>						
Spouse had risk <sup>§</sup>	0.63***	0.63***	0.38***	0.72**	0.48***	0.56***
Model 3:						
Eliminated the risk <sup>¶</sup>						
Spouse eliminated risk <sup>#</sup>	1.56**	2.19***	0.96	2.48***	2.02***	2.03*

<sup>†</sup>Models controlled for age, sex, employee status, number of chronic conditions, and number of successful calls. At risk definitions defined as follows: exercise less than three times per week, eat five servings of fruits and vegetables less than four times per week, BMI is greater than and equal to 30, experience stress a lot of the day yesterday, did not experience enjoyment a lot of the day yesterday, life satisfaction rating (0–10) is less than seven.

<sup>‡</sup>Sample limited to participants without baseline risk.

<sup>§</sup>Reference category is that the spouse did not have the risk at baseline.

<sup>||</sup>Sample limited to participants with the baseline risk.

<sup>¶</sup>Sample limited to participants where both the participant and the spouse had the risk at baseline.

<sup>#</sup>Reference category is that the spouse did not eliminate the risk.

\* $P < 0.1$ .

\*\* $P < 0.05$ .

\*\*\* $P < 0.01$ .

we found that having a partner with high well-being positively related to well-being change for both disease management participants and spouses. Participants in the disease management program were estimated to have 1.5 points higher well-being in T2 if their spouse reported having high baseline well-being compared with participants with low well-being spouses. Spouses were estimated to have more than 1.1 points higher well-being in T2 if the participating partner had high baseline well-being.

Evaluation of specific individual risks using logistic regression showed that the development of new risks and elimination of existing risks within participants were associated with the risks of spouses. Participants were more likely to develop a new risk if spouses reported having the risk in the prior time period. In addition, participants were less likely to eliminate an existing risk in the follow-up period if spouses had the same risk in the baseline; however, when spouses eliminated the risk in the next time period, participants were more likely to also eliminate the risk. The results of this exploratory analysis support our main findings that high well-being partners were related to greater well-being change among program participants.

## Implications

These findings have important implications for the design and evaluation of large scale well-being improvement programs which have traditionally taken an individual-level approach.<sup>29–34</sup> Existing research has demonstrated an inverse relationship between well-being and near-term health care outcomes such as hospital admissions and ER visits<sup>35</sup> as well as lost productivity.<sup>14</sup> As such, risks to individual well-being are of particular importance to employers focusing on programs designed to lower health care cost and improve employee productivity. The case for including spouses in workplace health promotion programs is compelling; spouses on average comprise one-third of an organization's health care cost yet represent only a fifth of covered members.<sup>36</sup> Of companies that offer wellness programs to employees, 60% extend the benefit to spouses, according to the Kaiser Family Foundation/Health Research & Educational Trust.<sup>37</sup> As of yet, however, there has been limited research on how to utilize our understanding of the employee spouse dyad to design programs that produce greater improvements in the

health outcomes of families participating in employer sponsored wellness programs.

Our research suggests a strategy focused on engaging spouses in programs that improve their own well-being could be mutually beneficial for the spouse and the disease management participant. The non-physical health attributes that contribute to overall well-being may be even more critical for couples managing chronic conditions. For instance, one study found that stressed relationships with partners predicted medication non-adherence among individuals hospitalized for acute coronary syndrome.<sup>38</sup> Lewis et al<sup>6</sup> proposed that behavior change may be more sustaining when the health and behaviors of each individual in a couple are determined by their own as well as their partner's actions, referred to as mutual joint effects. By motivating individuals to improve their own and their partners' well-being, employers may be able to harness the power of mutual joint effects within couples to create positive and lasting behavior change. As primary shapers of their children's health behaviors,<sup>39</sup> well-being improvement programs that lead to positive and sustained behavior change in parents could translate into improved health and well-being among children within the household.

Program evaluations, which focus only on the participant, may underestimate benefits to the employer stemming from the beneficial effects that spread throughout family members also covered by employee health care plans.<sup>18,40</sup> Current program evaluations, specifically financial estimates of return on investment, do not consider the indirect impact that intervention programs have on family members of program participants. Several weight loss studies have demonstrated a spillover or "ripple" effect where non-participating spouses reported significant improvements.<sup>40,41</sup> Moreover, our results indicate that studies failing to account for spousal concordance within statistical program evaluations may be subject to omitted variable bias.<sup>42</sup> Additional research is needed to estimate the extent of bias in prior research as well as the monetary impact of spousal-induced, indirect effects to employers, which could improve the cost effectiveness of such programs.

## Limitations

This study demonstrates preliminary evidence of the impact of spouses on well-being change but does not attempt to test a

specific theory of concordance. Similar to several other published studies that do not evaluate specific concordance theories or report as a limitation distinguishing the specific mechanism,<sup>2</sup> data limitations prevent the determination of which mechanism may have contributed to the results presented here. The meta-analysis performed by Meyler et al<sup>2</sup> on health concordance in couples indicates that factors that explain concordance may differ by the health outcome evaluated. Affective contagion is the primary explanation given for mental health concordance while most studies on physical health point to shared environment. Because well-being is a multidimensional measure incorporating psychosocial, emotional, and environmental factors in addition to physical health, it is likely that multiple concordance theories could explain the findings. Further, recent findings that spouse optimism predicted better physical functioning and fewer chronic illnesses over time suggests a crossover effect may occur between different elements of well-being.<sup>43</sup> In addition, while the results of the logistic models indicate that participants are more likely to reduce risks if their partner reduced the same risk in the same time period, data limitations prevent evaluation of whether partners made the changes simultaneously or whether change in one partner motivated the other to make changes. Last, because the study population was limited to an employed population where at least one partner was diseased, the results may not be generalizable to other populations.

Data sources that include a longer time frame, more frequent observations, and measures to evaluate individual concordance mechanisms would provide additional information about the dynamic effects of interspousal well-being and allow for a study design that can directly test potential theories. Evaluating specific elements of partner well-being and their crossover effects would advance the concordance literature and contribute to our understanding of the dyadic effects of well-being within close relationships.

## CONCLUSIONS

Dialogue about workplace wellness programs traditionally focuses on the individual, yet close relationships such as those with spouses are influential in shaping individual health and well-being. To our knowledge, this is the first study to explore spousal well-being and outcomes of participants of an employee sponsored well-being improvement program. This research shows that employees and their spouses have concordant well-being and influence one another's well-being over time. Many employers already extend wellness benefits to spouses, but continue to take an individual-centric approach. A new opportunity is leveraging interspousal influence to create more efficient programs such that the benefit of a participating couple is greater than the sum of their individual outcomes.

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