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A Hospital System's Wellness Program Linked To Health Plan Enrollment Cut Hospitalizations But Not Overall Costs

ABSTRACT Many policy makers believe that health status would be improved and health care spending reduced if people managed their health better. This study examined the effectiveness of a program put in place by BJC HealthCare, a hospital system based in St. Louis, Missouri, that tied employees' eligibility to participate in the system's most generous health plan with participation in a wellness program. The intervention, which began in 2005, was associated with a 41 percent decrease, relative to a comparison group, in hospitalizations for conditions targeted by the wellness program but with no significant decrease in other hospitalizations. We found reductions in inpatient costs but similar increases in non-inpatient costs. Therefore, we conclude that although the program did cut some hospitalizations, it did not save money for the employer in the short term. This finding underscores that wellness program incentives under the Affordable Care Act are unlikely to greatly reduce health care spending over the short run.

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Cardiovascular disease, diabetes mellitus, hypertension, and chronic lung diseases are among the leading causes of disability and mortality in the United States.[1] It is widely believed by policy makers that effective promotion of wellness will contribute to health improvement and mitigate health care cost increases. Many employers offer voluntary health screenings, fitness and smoking cessation programs, and other preventive services.[2]

However, most voluntary programs have yielded low participation and have failed to attract high-risk employees.[3,4] These results have prompted employers to introduce stronger incentives—for example, paying people for completing a health risk assessment or enrolling in smoking cessation programs, or requiring these activities as a condition for reduced insurance premiums or even access to certain plans.

The Affordable Care Act emphasizes prevention in many ways, including by expanding allowable wellness incentives for employer-based health insurance. Yet little is known about the effects of these incentives on health services use, outcomes, and costs.

This study examined the effectiveness of a comprehensive wellness program introduced in 2005 for the employees of a major hospital system and their dependents. The program tied eligibility to participate in the hospital system's most generous health plan with participation in the wellness program. We used as a comparison group employees covered by two other employers in the same metropolitan area that did not offer insurance-based wellness incentives and whose benefits were stable throughout the study period.

We used data from before and during the intervention and a difference-in-differences analytical strategy that controlled for baseline health characteristics, age, sex, and demographics. To

minimize selection issues, we estimated the effect of the program on the whole population of people exposed to the new incentives, not just those enrolled in the wellness-associated plan.

Study Data And Methods

SETTING BJC HealthCare, a hospital system based in St. Louis, Missouri, designed and implemented an insurance-based wellness incentive program for regular employees (excluding physicians-in-training) and their dependents. The new program required that starting in January 2005, employees wanting to enroll in the most generous "Gold" plan needed to complete a web-based health risk assessment; sign a health pledge promising to maintain a healthy diet and exercise regularly; report their smoking status; and, for smokers, enroll in a smoking cessation program. If the employees did not complete these activities, they were prohibited from enrolling in the Gold plan.

The health risk assessment required employees to provide biometrics including blood pressure, serum glucose, total cholesterol, height, weight, and waist circumference. People completing the health risk assessment were given automated feedback identifying their possible risk status and suggestions for follow-up actions.

Covered spouses were required to sign the health pledge; report smoking status; and, for smokers, enroll in a smoking cessation program. However, for them the health risk assessment was optional.

In conjunction, starting in February 2004 the hospital system began providing health fairs at each employment site. These fairs, staffed by the hospital system's physicians, aimed to facilitate both employees' awareness of their own health conditions and the collection of the biometrics for the health risk assessment.

At the health fairs, on-site clinicians screened employees, and those identified with one or more health risks were given physician referrals and reminder calls if necessary. These initiatives were accompanied by an intensive publicity campaign and received strong support from senior leaders, who viewed the program as integral to the hospital system's mission as a health care provider.

This program represented a significant expansion of an initial effort that started in January 2004. In this initial period, the hospital system had rolled out the four-prong wellness program described above but had used only modest premium discounts as an incentive for participation.

Despite the implementation of the wellness plan in January 2005, the menu of plan premiums, employer subsidies, deductibles, coverage limits, and copayments remained similar to what it had been before. The hospital's benefit managers reported no major changes in disease or drug management programs or in provider networks in 2005. Thus, the primary difference between 2004 and 2005 was the strong financial incentive created by tying Gold plan eligibility to participation in the wellness program.

Exhibit A1 in the online Appendix details characteristics of the health plans offered during 2003–06, including premiums and discounts.[5] Nonparticipants in the wellness program were restricted to the less generous Silver and Bronze plans, while wellness participants could select from Gold, Silver, and Bronze, with Silver and Bronze discounted by $180 per year for participants. The hospital paid $1,647 more toward family coverage for participants in the Gold plan than they paid for Silver members who did not participate in the wellness program. The extra $1,647 in employer contribution for wellness compliers was 13.9 percent of the total cost of $11,828 for Gold family coverage.

The Affordable Care Act increases the limits for premium differences based on wellness factors from 20 percent to 30 percent starting in 2014, with administrative discretion to raise this differential to 50 percent.[6]

STUDY POPULATION AND VARIABLES We compared health services use among regular hospital system beneficiaries before and during the intervention with a comparison group comprising beneficiaries covered by two other large employers in the same metropolitan area: the bargained (unionized) beneficiaries of a Fortune 100 company with a major presence in St. Louis, and beneficiaries covered by a nearby university.

Benefits were stable for the comparison group throughout our observation period, and this group did not use any insurance-based wellness incentives. The focus on a single metropolitan area helped control for local variation in the adoption of new medical practices and technologies, and for local environmental causes of illness.[7]

Outcomes included the number of days with a non-inpatient medical visit; the presence of an inpatient hospitalization; the number of filled prescription days; and health care claims costs. We classified outcomes according to the presence or absence of a primary diagnosis for a condition that we judged, before the analysis began, to have been targeted by smoking cessation or by the biometric assessments.

Hospitalizations and other medical visits can, and often do, involve claims for several different primary diagnoses. We classified a targeted condition as present during a visit if any claim for

that visit listed the condition as the primary diagnosis. Coders for the hospital system reported to us that they coded primary diagnoses consistently across insurers.

Targeted conditions were diabetes mellitus (*International Classification of Diseases*, Ninth Revision, Clinical Modification, or ICD9-CM, 250), hypertensive heart disease (401–05), ischemic heart disease (410–14), cerebrovascular disease (430–38), acute pulmonary infections (466, 480–88), and chronic obstructive pulmonary disease (490–92, 496). Admissions with other diagnoses were classified as nontargeted, even though the wellness incentive might have influenced those admissions as well.

Medications for targeted conditions were identified on the basis of Food and Drug Administration–approved indications. We considered antihypertensive, cholesterol-lowering, and diabetes medications separately.

Visits were coded as non-inpatient if the service was received outside an inpatient hospital. New non-inpatient visits for a given targeted diagnosis were defined as encounters with that primary diagnosis that had not been the basis for any claim in the prior six months.

We calculated health claims costs based on the total amount paid by all parties on behalf of the patient. We divided the claims into those with an inpatient hospitalization component and all other claims, including pharmaceuticals.

We controlled for baseline health status with the Johns Hopkins Adjusted Clinical Groups, Version 9.0, score,[8,9] which generates an expected health care cost for each person—in our case, using diagnoses and pharmaceutical claims from 2003. Because the relation between baseline health care status and health outcomes may be nonlinear, we used linear splines of the Adjusted Clinical Groups score to control for the baseline. Because we used 2003 data to construct this score, we performed the regressions on 2004–06 data only.

Demographic controls included employee salary; beneficiary age in years interacted with beneficiary sex; median household income and percentage white, black, and Hispanic from the employee's census block group of residence; and quadratic terms for the census characteristics and salary.

Finally, we controlled for unobserved differences between treatment and comparison groups by using indicators for each employer (which controlled for unobserved differences across employers in the health statuses of their beneficiaries), and for the thirty-six months in our sample (which controlled for time trends in health care costs and usage). The online Appendix details our data-merging procedures.[5]

STATISTICAL ANALYSIS In this difference-in-differences study design, we used logistic regressions to evaluate predictors of hospitalization; linear regressions to evaluate predictors of health claims costs; and Poisson regressions to evaluate other outcomes. The unit of observation was the person-month. We compared changes in health services use before and after January 2005 in the treatment group (hospital system) to analogous changes in the comparison group (other employers combined).

All regressions included controls for baseline health status and observed demographics. We performed all regressions using the statistical software Stata, and we report confidence intervals that cluster at the level of the individual.

Additionally, to test the hypothesis that health screenings might have reduced hospitalizations in 2005 and 2006 through the detection of new diagnoses, we examined the number of new non-inpatient visits for diabetes mellitus, hypertensive heart disease, and ischemic heart disease at the hospital system. We compared the numbers around the 2004 and 2005 open enrollment periods, defined by the six-month interval (October through March) around the start of the year.

LIMITATIONS There were several important limitations to this study. We could not disentangle the roles of the different program components. We do not know whether the apparent effects persisted beyond our two years of observation. We also did not directly observe health outcomes.

Moreover, because this was not a randomized trial, we could not rule out the possibility that contemporaneous changes in health care usage or health status could explain the observed changes in hospitalization rates. Thus, although we have ruled out many competing explanations, we do not claim that the effects we report are necessarily causal. Given the large magnitudes of the changes in hospitalizations that we observed, it will be important to verify the generalizability of our findings.

Study Results

The wellness program was successful from the point of view of enrollment and participation. In 2005 and 2006, 82 percent of hospital system beneficiaries chose the Gold plan. These enrollees were all required to participate in the wellness program. Health fair participation among hospital system beneficiaries went from zero in 2003 to 11,318 in 2006—representing 30 percent of beneficiaries and more than half of covered employees.

Health risk assessment completion was even

higher, going from zero in 2003 to 17,408 in 2006. Baseline characteristics were similar across the comparison and treatment groups. Exhibits A2–A4 in the online Appendix show details on plan enrollment, wellness program participation and costs, and baseline characteristics, respectively.[5]

Exhibit 1 shows the change in hospitalizations for beneficiaries of the hospital system, separately for nontargeted and specific targeted conditions. Rates of hospitalization for nontargeted conditions were very similar before and after the intervention. However, rates of hospitalization for beneficiaries of the hospital system decreased for five of the six specific targeted conditions and for targeted conditions overall.

Exhibit 2 shows the mean person-months with targeted hospitalizations, by quarter and employer. Targeted hospitalizations for beneficiaries of the hospital system began to decline between the third and fourth quarters of 2004 (after the start of the health fairs). The decline persisted strongly in 2005, dropping by 25 percent in the second quarter and 20 percent in the third quarter.

For every quarter in 2005 and afterward, the hospitalization rate for targeted conditions at the hospital system was lower than for every quarter prior to 2005. Exhibit A5 in the online Appendix shows the time path of hospitalizations without targeted conditions, which did not decrease in 2005 or 2006.[5]

Exhibit 3 reports the association of each outcome measure with the wellness intervention, based on our statistical models. The intervention was associated with a 41 percent decrease in hospitalizations for targeted conditions. In contrast, there was no statistically significant change in hospitalizations without targeted conditions.

Overall, we found a 12 percent decrease in hospitalizations. The hospitalization results remain essentially unchanged in the face of many sensitivity analyses—notably, estimation with propensity score weighting,[10] estimation based on a sample limited to those who were continuously enrolled, and inclusion of a finer-grid spline of the Adjusted Clinical Groups score.

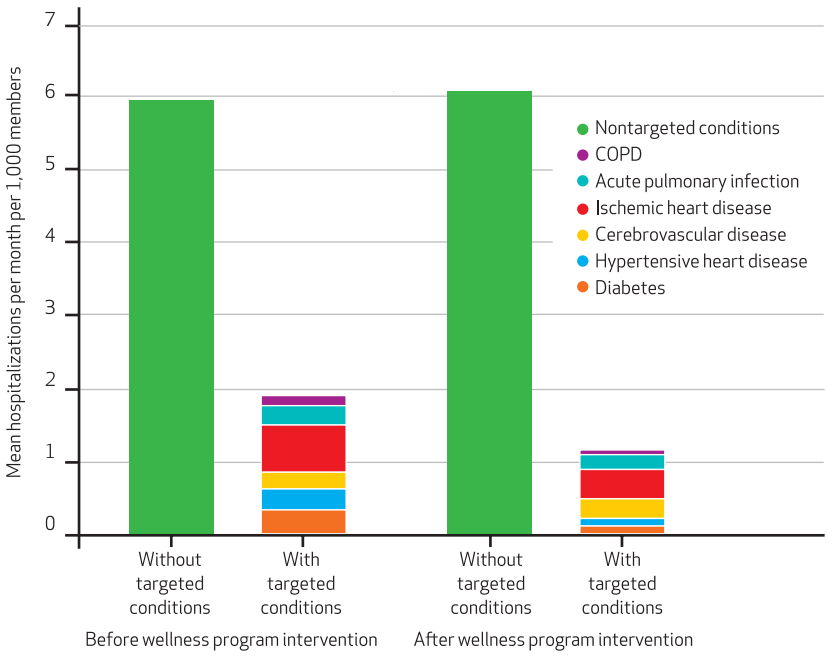
We found that the intervention was associated with a 1.9 percent increase in overall medication-days and with increases of 4 percent for antihypertensives and 6 percent for cholesterol-lowering medications, respectively, with no statistically significant change for diabetes medications. Non-inpatient visits for targeted conditions rose relative to visits without targeted conditions, but this finding is statistically significant at only the 10 percent level.

The intervention was associated with a drop of $22.20 per month in inpatient health claim costs. However, this drop was almost exactly counterbalanced by an increase of $19 in non-inpatient claim costs, including prescription drugs. Thus, when combined with the total wellness program costs—which were slightly over $500,000 for each year starting in 2004, or a bit below $15 per covered beneficiary per year—it is unlikely that the program saved money.

Exhibit 4 examines total new non-inpatient visits for selected targeted diagnoses. Between the six-month intervals around the 2004 and 2005 open enrollment periods, the rates of new non-inpatient visits for hospital-system beneficiaries significantly increased for diabetes, hypertensive heart disease, and ischemic heart disease. In contrast, in unreported results, we found no significant changes in new non-inpatient visits for the comparison group.

EXHIBIT 1

Inpatient Hospitalizations Before And After The Wellness Program Intervention: Mean Hospitalizations With And Without Targeted Conditions At The Hospital System



SOURCE Authors' calculations based on analysis data. **NOTES** Year for "before intervention" is 2004. Years for "after intervention" are 2005–06.

Discussion

We found that an insurance-based wellness incentive was associated with a large decrease in associated hospitalizations, wide participation in health fairs and health risk assessments, and modest increases in associated non-inpatient visits and prescriptions filled. To the best of our knowledge, this is the first rigorous evaluation of a comprehensive, insurance-based

wellness program with financial incentives for participation. Our study also improves on many previous observational studies of wellness incentives by using a quasi-experimental design that estimates the net effects of the intervention on all exposed beneficiaries and by using more detailed health status and demographic controls.

Despite these substantial reductions in hospitalizations, we do not believe that the program saved money for the employer in the short run. Our estimates imply that the inpatient savings were more than offset by the use of non-inpatient services and the cost of implementing the wellness incentives. The costs of the incentives themselves would further increase employer spending. We cannot rule out the possibilities that in the long run the financial profile of the incentives may improve or that productivity gains could outweigh increased medical spending and implementation costs.

It has often proved difficult to find sustained changes in health behavior in response to financial incentives.[11] For example, a recent review of workplace smoking cessation programs concluded that financial incentives were not more effective than standard interventions.[12] However, most previous incentives have been small and short-lived,[11] with the exception of two apparently successful smoking cessation programs that used financial incentives of up to $750.[13,14]

In our study, the annual differences in employer contribution between the Gold plan and the plans available to nonparticipants in the wellness program were significantly larger, and these differences continued over time. Furthermore, an insurance eligibility–based incentive may be perceived as a potential loss (of a preferred level of insurance) rather than a potential gain, and a large body of research suggests that most people are more strongly motivated by threatened losses than by dollar-equivalent promised gains.[15,16]

There are several ways in which the insurance-based incentive may have reduced hospitalizations for targeted conditions. It is likely that the effects were caused by a combination of these factors.

One possibility is that the health fairs and the health risk assessment may have led to earlier detection and treatment[17–19] and better pharmaceutical compliance among people being treated for a targeted condition.[20] The increases in new medical visits for diabetes, hypertensive heart disease, and ischemic heart disease at the hospital system around the 2005 open enrollment period support this hypothesis.

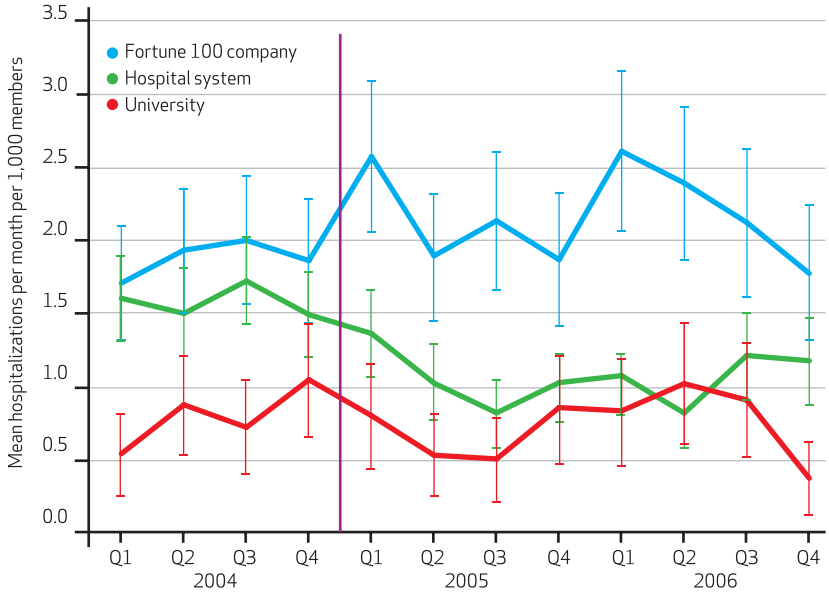
A second possibility may be that the screening process and health pledge led to better self-management, increased health literacy, and better medical care among beneficiaries already being treated for targeted conditions. A randomized trial of a low-cost health promotion program consisting of a health risk assessment; personalized risk reports; and recommendation letters, newsletters, and a self-management book found significant health care cost reductions and a 40 percent decline—although this was not statistically significant—in hospital days.[21]

Additionally, although we do not have individual-level information about smoking cessation, it is possible that a reduction in smoking could have reduced hospitalizations for cardiovascular disease and the complications of diabetes.[22–30] Communitywide public-area smoking bans have been associated with decreases in cardiac hospitalizations of 11.2–40.0 percent within six to twelve months.[31–33]

Finally, the workplace-based nature of the screening process may have led to improvements in diet, exercise, or other disease self-management among people at risk for hospitalization. The on-site health fairs provided personalized feedback in what could be construed as a group setting for the majority of hospital employees, and a growing literature suggests that group

EXHIBIT 2

Time Path Of Targeted Hospitalizations: Mean Inpatient Hospitalizations For A Targeted Condition At The Hospital System And Comparison Groups



SOURCE Authors' calculations based on analysis data. **NOTES** Targeted conditions are diabetes mellitus, hypertensive heart disease, cerebrovascular disease, ischemic heart disease, acute pulmonary infection, and chronic obstructive pulmonary disease. The purple vertical line represents the start date for changes in the hospital system's benefit design. Error bars show 95 percent confidence intervals.

EXHIBIT 3

Regression Results: Effects Of The 2005 Hospital System Wellness Incentives

Dependent variable	Regression coefficient on wellness incentive	Mean value in estimation sample	Predicted change in mean from intervention
HOSPITALIZATIONS (PER 1,000)			
Any hospitalization	−0.13***	7.23	−0.88
Hospitalizations without targeted conditions	−0.07	5.92	−0.40
Hospitalizations with targeted condition	−0.45***	1.56	−0.64
PRESCRIPTIONS DAYS FILLED			
Any medication	0.02**	31.90	0.6
Antihypertensive medication	0.04***	6.24	0.2
Cholesterol-lowering medication	0.06**	2.56	0.1
Diabetes medication	0.04	2.06	0.1
NON-INPATIENT VISITS (PER 100)			
Any medical visit	−0.006	53.2	−0.3
Visits without targeted conditions	−0.005	49.4	−0.3
Visits with targeted condition	0.045	5.0	0.2
COSTS OF HEALTH CLAIMS ($)			
Total inpatient claims	−22.2***	59.2	−22.2
Total non-inpatient claims, including Rx	19.0***	161.2	19.0

SOURCE Authors' calculations based on analysis data. **NOTES** Sample includes insurance beneficiaries at the three study employers from January 2004 through December 2006. Exposure to wellness incentive is measured with an independent variable for being a beneficiary of the hospital system on or after January 2005. Other independent variables are employee salary; census block group median household income, percent Hispanic, and percent black; squared terms of the above; ten spline coefficients of linear Adjusted Clinical Groups score; month indicators; employer indicators; and age in years interacted with sex. For prescriptions and visits, we used Poisson regressions; for hospitalizations, we used logit regressions; for costs, we used linear regressions. **$p < 0.05$ ***$p < 0.01$

learning may be more effective in promoting behavioral changes than physician visits alone.[34,35]

Conversations with physicians staffing the health fairs suggest that the fairs were very effective in promoting peer-to-peer conversations. Other studies suggest that peer networks may have important effects on obesity and smoking.[36,37] In addition, diabetes self-management education has been shown to reduce overall hospitalizations by 34 percent.[38] Employees may also have been spurred by expectations that the health fairs and other wellness promotions signaled a plan for the employers' requirements for "healthy" behavior to become even stricter in future years.

The institutional support for the program may have also spurred a "culture of health," which has been shown to reduce health care costs.[39] It is also possible that simply asking employees to record biometric information may have spurred changes in behavior.[40,41]

Although the hospitalization effects that we report may seem surprisingly large, we have ruled out a number of competing explanations. First, unlike many previous studies, these results cannot easily be explained by self-selection into a particular insurance plan.

For example, if the healthiest employees were the ones most likely to enroll in a voluntary wellness program, then a simple comparison of participants and nonparticipants might overstate the benefits of the program for health outcomes. However, because we studied the effects of the 2005 plan on all beneficiaries, the results cannot be driven by selection of healthier beneficiaries into the Gold plan.

Second, because we controlled for health status and other demographic characteristics, our results are not likely to be due to a changing patient mix among hospital beneficiaries.

Finally, it seems unlikely that our findings would be attributable to changes in coding practices or to some other unobserved factor that changed at the same time that the wellness incentive was introduced, because there were no such changes, according to the coding staff at the hospital systems, and because the declines in hospitalizations were specifically concentrated among admissions for conditions most plausibly targeted by the health screening or by smoking cessation.

EXHIBIT 4

Rates Of New Non-Inpatient Visits, By Condition, At The Hospital System Around The 2004 And 2005 Open Enrollment Periods For Employee Benefits

Condition	Rate of new non-inpatient visits in Q4 2004 and Q1 2005	Rate of new non-inpatient visits in Q4 2003 and Q1 2004	*p* value for difference of means
Diabetes mellitus	2.96	2.38	0.003
Hypertensive heart disease	9.51	8.20	0.000
Ischemic heart disease	1.61	1.20	0.007

SOURCE Authors' calculations based on analysis data. **NOTES** New visits are defined by the absence of any encounter (inpatient or non-inpatient) for that condition within the prior six months. Differences in means are calculated using the Pearson chi-square test. Rates are expressed as number per 1,000 beneficiaries.

Conclusion

We found that insurance-based wellness incentives were associated with a 41 percent decrease in hospitalization rates for conditions targeted by the incentives but with no net change in health claim costs. We also found widespread participation in the health risk assessment and health fairs, as employees were probably motivated by large financial incentives and strong institutional support.

Expansions of allowable incentives under the

Affordable Care Act may lead more employers to adopt and increase insurance-based wellness incentives. We believe that these incentives may lower associated hospitalizations and may spur increases in individual health status and workplace productivity.

For these reasons, expanding wellness incentives may be in the interest of both employers and employees. However, we found no direct decrease on overall health care spending from wellness incentives.

Thus, although the expansion of allowable incentives from the Affordable Care Act may have important and positive impacts on health, it is unlikely to greatly reduce health care spending within a two-year window, such as the one we observed, and should not be relied upon as the foundation of efforts to control spending. It will be important to continue to follow this intervention and to study similar interventions in other settings in order to verify and further validate these findings. ■

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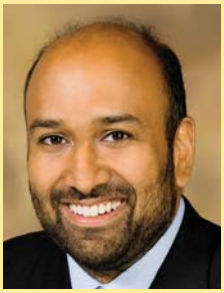

Gautam Gowrisankaran is a professor of economics at the University of Arizona.

In this month's *Health Affairs*, Gautam Gowrisankaran and coauthors report on their study of a program at one hospital system that tied employees' eligibility to participate in the system's most generous health plan with participation in a wellness program. The program was associated with a large decrease in hospitalizations for conditions that were targeted by the wellness program, relative to a comparison group—but not with any significant decrease in other hospitalizations or with savings in the employer's overall costs. The authors conclude from this example that wellness program incentives under the Affordable Care Act are unlikely to greatly reduce health care spending over the short run.

Gowrisankaran is a professor of economics at the University of Arizona. He is also a research associate with the National Bureau of Economic Research and serves on the editorial boards of the *American Economic Review*, *Journal of Business and Economics Statistics*, and *Economic Inquiry*.

Gowrisankaran's research has focused on hospital quality and competition, rural health care delivery, health plan report cards, wellness incentives, and Medicare managed care plan quality. He has published in leading economics and health journals, including *Econometrica*, *Health Services Research*, the *RAND Journal of Economics*, and the *Journal of Health Economics*. Gowrisankaran earned a doctorate in economics from Yale University.

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Karen Norberg is a medical research fellow with the National Bureau of Economic Research. Previously, she served as a senior research fellow at the Center for Health Policy at Washington University in St. Louis. She has published in leading journals, including the *Proceedings of the Royal Society (B)* and the *Journal of Health Economics*, and she has been a reviewer for the *Proceedings of the National Academy of Sciences*, the *American Economic Review*, and the *Journal of Health Economics*. Norberg earned a medical degree from Harvard University.

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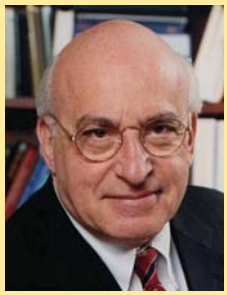

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