Acknowledgements

- We acknowledge funding from the Missouri Foundation for Health, the Commonwealth Fund, and the Center for Health Policy at Washington University.
- This research has been performed by the Healthy Outcomes Team of the Center for Health Policy at Washington University in St. Louis.
- We thank “UnivCo,” “HospCo” and “LargeCo” for providing us with data for this analysis.
- We thank HSI Network (principal Steve Parente, Ph.D.) for data deidentification services.
Diabetes mellitus, cardiovascular disease and lower respiratory disease are among the leading causes of disability and premature death.

Employers bear many of the costs for these diseases, causing them to start offering prevention services.

A newer workplace intervention is the use of financial incentives tied to employer health insurance premiums.

Proposed legislation seeks to expand these discounts.
Debate about workplace financial incentives for wellness: Time magazine, Nov. 30, 2009
We examine the impact of wellness incentives using data from a hospital system based in a large midwestern metropolitan area.


We have a four year panel of data from 2003-06:
- Panel tracks virtually every employee and dependent.
- Data are deidentified but link health and pharma claim records for each enrollee.
Comparison (or control) group

- We have similar data from same metro area for employees for two comparison groups, “UnivCo” and “LargeCo”
- Benefits were stable for UnivCo and for LargeCo employees during the sample period
- This allows for a difference-in-difference identification
  - Pre-post
  - HospCo versus UnivCo and LargeCo
What wellness incentives?

- Employees and dependents at HospCo would obtain lower health insurance costs starting Jan. 2005 if they:
  - Filled out a health risk assessment form on body measurements, weight, blood pressure, blood glucose level, and cholesterol
  - Signed a health pledge
  - If they smoked, enrolled in a free smoking cessation program

- Preventive care coverage was provided without a copay
- Biometric information was optional for dependents
- Changes were not limited to insurance offerings
  - HospCo offered on-site health fairs to obtain biometrics
  - They indicated that wellness was an institutional priority
  - But, they made no changes in disease management

- Wellness changes coincided with other changes in benefits
How much money would they save?

- In Jan. 2005, employees were offered three health plans, Gold, Silver and Bronze.
- The Gold plan was only offered to wellness compliers.
- Cost of (Gold – Undiscounted Silver) to HospCo ranged from $755 (employee only) to $1,647 (family coverage).
- Gold was chosen by 79% of covered employees.
- Incentives were preceded by much smaller wellness program in Jan. 2004.
Methods

- We examine:
  - Hospitalizations associated with targeted conditions
  - Hospitalizations without targeted conditions
  - Physician visits, overall and for targeted conditions

- Targeted conditions:
  - Diabetes mellitus
  - Cardiovascular: hypertensive heart disease; ischemic heart disease; cerebrovascular disease
  - Respiratory: acute pulmonary infections, COPD

- To determine pathways, also examine medication use:
  - Overall
  - Diabetes meds
  - Antihypertensive meds
  - Anticholesterol meds
Logit or Poisson regressions of each outcome on:
- Exposure to wellness incentives, i.e., HospCo enrollee interacted with Jan. 2005 or after
- Month dummies; month-of-year employer interactions; age-gender interactions
- Drop employees who start or stop coverage in Jan. 2005 (Jul. 2004/05 at UnivCo) to minimize selection bias
## Characteristics of sample

<table>
<thead>
<tr>
<th>Sample dates</th>
<th>HospCo</th>
<th>UnivCo</th>
<th>LargeCo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of enrollees per month</td>
<td>30,212</td>
<td>16,844</td>
<td>14,723</td>
</tr>
<tr>
<td>Median age</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Percent female</td>
<td>59.9%</td>
<td>55.0%</td>
<td>54.0%</td>
</tr>
<tr>
<td>Person-months with hospital admission</td>
<td>11,462</td>
<td>4,746</td>
<td>5,973</td>
</tr>
<tr>
<td>Person-months with admission without targeted condition</td>
<td>9,800</td>
<td>4,093</td>
<td>4,787</td>
</tr>
<tr>
<td>Person-months with admission for any targeted condition</td>
<td>1,727</td>
<td>692</td>
<td>1,307</td>
</tr>
<tr>
<td>With mention of specific targeted condition of:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>diabetes mellitus</td>
<td>252</td>
<td>113</td>
<td>234</td>
</tr>
<tr>
<td>hypertensive heart disease</td>
<td>277</td>
<td>134</td>
<td>286</td>
</tr>
<tr>
<td>cerebrovascular disease</td>
<td>313</td>
<td>87</td>
<td>192</td>
</tr>
<tr>
<td>ischemic heart disease</td>
<td>645</td>
<td>276</td>
<td>450</td>
</tr>
<tr>
<td>acute pulmonary infection</td>
<td>359</td>
<td>145</td>
<td>252</td>
</tr>
<tr>
<td>COPD</td>
<td>126</td>
<td>44</td>
<td>91</td>
</tr>
<tr>
<td>Average prescription days filled per month</td>
<td>27.64</td>
<td>23.44</td>
<td>31.48</td>
</tr>
<tr>
<td>with antihypertensive medications</td>
<td>4.93</td>
<td>3.23</td>
<td>4.39</td>
</tr>
<tr>
<td>with anti-cholesterol medications</td>
<td>1.66</td>
<td>1.45</td>
<td>2.01</td>
</tr>
<tr>
<td>with diabetes medications</td>
<td>1.68</td>
<td>1.03</td>
<td>1.90</td>
</tr>
</tbody>
</table>

Note: non-targeted and overall conditions exclude visits with mental health diagnoses; new visits defined by no previous visit with condition in the past 6 months; UnivCo data include slightly less observations for prescription days.
Claims data

- Medical/hospital claims data contain:
  - Date of beginning of service
  - Date of end of service (for overnight hospital stays)
  - ICD-9-CM diagnosis codes – at least 1, sometimes 3
  - CPT1 procedure codes

- We calculate days in the hospital by recording all days with at least one multi-day claim

- We calculate ER and physician visits by the presence of at least one claim with a given “from” date

- We calculate presence of a condition in a month by at least one claim in that month with that ICD-9 code

- Pharma claims data:
  - Provides NDC number and number of days supplied
  - We created data on drug category by NDC number
Hospitalization for targeted conditions

![Graph showing hospitalization rates for different companies over time. The y-axis represents the average per 1000 member month, ranging from 0 to 2.5. The x-axis represents the quarters from 2003q1 to 2007q1. The graph compares HospCo, UnivCo, and LargeCo targeted hospitalization rates.](image-url)
Hospitalization for non-targeted conditions

The graph shows the average number of hospitalizations per 1000 member month for different companies over the quarters from 2003q1 to 2007q1. The companies include HospCo, UnivCo, and LargeCo. The data is presented in a line graph with the x-axis representing the quarters and the y-axis representing the average hospitalizations per 1000 member month.
Non-inpatient visits for targeted conditions

![Graph showing the average per 1000 member month for targeted visits from 2003q1 to 2007q1 for HospCo, UnivCo, and LargeCo.](image)
Non-inpatient visits overall

![Graph showing the trend of non-inpatient visits overall from 2003q1 to 2007q1 for HospCo any visit, UnivCo any visit, and LargeCo any visit.]
Hospitalization for diabetes

Average per 1000 member month

HospCo diabetes hospitalization
UnivCo diabetes hospitalization
LargeCo diabetes hospitalization
Hospitalization for ischemic heart disease

![Graph showing hospitalization rates for ischemic heart disease](image-url)

- HospCo ischemic HD hospitalization
- UnivCo ischemic HD hospitalization
- LargeCo ischemic HD hospitalization

Average per 1000 member month

- 2003q1
- 2004q1
- 2005q1
- 2006q1
- 2007q1
Hospitalization for hypertensive heart disease

Average per 1000 member month

2003q1 2004q1 2005q1 2006q1 2007q1

HospCo hypertensive hosp
UnivCo hypertensive hosp
LargeCo hypertensive hosp
Number of days of medications

![Graph showing the average number of days of medications per member month for different companies over quarters from 2003Q1 to 2007Q1. The graph compares HospCo, UnivCo, and LargeCo for any medication.]
Number of days of antihypertensive medications

Average per member month

2003q1 2004q1 2005q1 2006q1 2007q1

HospCo antihypertensive meds
UnivCo antihypertensive meds
LargeCo antihypertensive meds

Average per member month

2003q1 2004q1 2005q1 2006q1 2007q1

HospCo antihypertensive meds
UnivCo antihypertensive meds
LargeCo antihypertensive meds
<table>
<thead>
<tr>
<th></th>
<th>2003q1</th>
<th>2004q1</th>
<th>2005q1</th>
<th>2006q1</th>
<th>2007q1</th>
</tr>
</thead>
<tbody>
<tr>
<td>HospCo anticholesterol meds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UnivCo anticholesterol meds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LargeCo anticholesterol meds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Number of days of diabetes medications

![Graph showing the number of days of diabetes medications from 2003Q1 to 2007Q1 for HospCo, UnivCo, and LargeCo.](image_url)
## Regression results

<table>
<thead>
<tr>
<th>Condition</th>
<th>Unit of observation</th>
<th>Baseline</th>
<th>Percent change due to wellness program</th>
<th>95% confidence interval for change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inpatient hospitalizations</strong></td>
<td>Person–months with admission per 1000 PM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any hospitalization</td>
<td></td>
<td>8.79</td>
<td>–12%***</td>
<td>[–18%, –6.4%]</td>
</tr>
<tr>
<td>Non-targeted conditions</td>
<td></td>
<td>7.50</td>
<td>–9.8%**</td>
<td>[–16%, –3.5%]</td>
</tr>
<tr>
<td>Any targeted conditions</td>
<td></td>
<td>1.42</td>
<td>–31%***</td>
<td>[–41%, –18%]</td>
</tr>
<tr>
<td>With mention of specific targeted condition of:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>diabetes mellitus</td>
<td></td>
<td>.321</td>
<td>–56%***</td>
<td>[–72%, –30%]</td>
</tr>
<tr>
<td>hypertensive heart disease</td>
<td></td>
<td>.386</td>
<td>–55%***</td>
<td>[–69%, –33%]</td>
</tr>
<tr>
<td>cerebrovascular disease</td>
<td></td>
<td>.436</td>
<td>–25%</td>
<td>[–52%, 14%]</td>
</tr>
<tr>
<td>ischemic heart disease</td>
<td></td>
<td>.821</td>
<td>–30%**</td>
<td>[–45%, –10%]</td>
</tr>
<tr>
<td>acute pulmonary infection</td>
<td></td>
<td>.257</td>
<td>–15%</td>
<td>[–41%, 22%]</td>
</tr>
<tr>
<td>COPD</td>
<td></td>
<td>.281</td>
<td>–58%**</td>
<td>[–79%, –15%]</td>
</tr>
<tr>
<td><strong>Prescriptions filled</strong></td>
<td>Days of medication per person-month</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any medication</td>
<td></td>
<td>29.33</td>
<td>–3.2%***</td>
<td>[–4.6%, –1.7%]</td>
</tr>
<tr>
<td>Anti-hypertensive medications</td>
<td></td>
<td>6.00</td>
<td>–14%***</td>
<td>[–16%, –11%]</td>
</tr>
<tr>
<td>Anti-cholesterol medications</td>
<td></td>
<td>2.00</td>
<td>–6.4%***</td>
<td>[–11%, –2.0%]</td>
</tr>
<tr>
<td>Diabetes medications</td>
<td></td>
<td>1.97</td>
<td>–7.6%*</td>
<td>[–13%, –1.4%]</td>
</tr>
</tbody>
</table>

*P<.05, **P<.01, ***P<.001  
Note: non-targeted and overall conditions exclude visits with mental health diagnoses
## Wellness incentives and new HospCo visits

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of new non-inpatient visits Q4:2003 and Q1:2004</th>
<th>Number of new non-inpatient visits Q4:2004 and Q1:2005</th>
<th>Difference between columns (3) and (2)</th>
<th>Estimated number of 2005 hospitalizations avoided by wellness incentives</th>
<th>(5) as a percent of (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes mellitus</td>
<td>375</td>
<td>456</td>
<td>81</td>
<td>52.2</td>
<td>64.4%</td>
</tr>
<tr>
<td>Hypertensive heart disease</td>
<td>1,298</td>
<td>1,498</td>
<td>200</td>
<td>50.7</td>
<td>25.4%</td>
</tr>
<tr>
<td>Ischemic heart disease</td>
<td>194</td>
<td>274</td>
<td>80</td>
<td>54.2</td>
<td>67.8%</td>
</tr>
</tbody>
</table>

Note: new visits defined by no medical visit for that condition within prior six months
Evidence from hospitalizations consistent with wellness incentives causing impact on health outcomes

Unlikely that our findings are due to non-random selection

Unlikely that results due to differences in trends at HospCo from control employers
  - Noticeable drop in 2005, soon after program commenced
  - Drop mostly occurring in targeted conditions

No changes in disease management at HospCo in 2005

Results unlikely due to trends across geographic locations
  - Not sensitive to inclusion of zip code fixed effects
Potential mechanisms

1. Smoking cessation
   - Community-wide public area smoking bans have reduced cardiac hospitalizations by 11.2% to 40% over similar time

2. Screening may have led to earlier detection
   - Entire hypertensive heart disease results explained if 25% of new HHD patients avoid hospitalization
   - A likely pathway is meds, but no conclusive results here

3. Screening process itself led to motivation for behavioral changes
   - Physicians staffing health fairs say that the fairs may have been effective at promoting group learning
   - 1,402 diabetic enrollees in 2004 and 52.2 avoided 2005 hospitalizations from incentives; hospitalization rates for diabetes may be significantly lowered by better timing and dosage of insulin
Conclusions

- We find substantial changes in hospitalization from wellness incentives.
- While behavioral changes can have big impacts, it has been hard for employer programs to impact behavior.
- One exception is Volpp et al. (2009) NEJM study which finds that financial incentives of $750 had persistent effects on smoking behavior.
- The *annual* financial incentives here are larger than in Volpp.
- It is likely that a combination of factors – financial, group learning, informational and institutional priorities – may be important in this case.
- A limitation is that we cannot disentangle different mechanisms by which the incentives had an effect.