

Economics of Reducing Out-of-Pocket Costs for Cardiovascular Preventive Services for Patients with High Blood Pressure and High Cholesterol

Summary Evidence Tables

Study Monetary Conversion	Population Interventions Comparison Time Horizon	Effectiveness	Program Cost	Healthcare Costs Averted Productivity Effects	Summary Economic Measure
<p>Author (Year) Bunting (2008)</p> <p>Design: Pre-post</p> <p>Economic Analysis: Incomplete program cost and healthcare cost averted.</p> <p>Use 2005 as index year. Reported in US dollars.</p>	<p>Location: Asheville, NC</p> <p>Population: Drawn from Employer Plan</p> <p>Sample Size: Assessed 620 in Team-based Care (TBC).</p> <p>Demographics: Mean age 50; Male 47%; White 82%; Diabetic 23%.</p> <p>Intervention: Long term program of ROPC for BP and Cholesterol medications with Team-based care.</p> <p>Comparison: None</p> <p>Length of intervention: 60 months</p>	<p>Reduced SBP by 9.8 mmHg</p> <p>Controlled BP increased 27.2 pct pt</p> <p>Reduced LDL by 16.2mg/dL</p> <p>Controlled LDL increased 24.7 pct pt</p>	<p>TBC cost not provided separate from healthcare costs.</p> <p>Program cost defined as increase in pharma cost.</p> <p>Cardiovascular-related pharma cost increased \$559 per person per year.</p>	<p>Healthcare costs: Included inpatient, outpatient, ER, reduced by \$628</p> <p>Productivity: Not considered</p>	<p>Cost per unit SBP reduction: \$57 per mmHg.</p> <p>Cost per additional person with controlled BP: \$2055</p> <p>Cost per additional person with controlled LDL: \$2263</p> <p>\$928,926 in averted Cardiovascular cost.</p>

Study Monetary Conversion	Population Interventions Comparison Time Horizon	Effectiveness	Program Cost	Healthcare Costs Averted Productivity Effects	Summary Economic Measure
<p>Author (Year): Chernew (2010)</p> <p>Design: Interrupted time series</p> <p>Economic Analysis: Modeled break-even analysis.</p> <p>Use 2004 as base year. Reported in U.S dollars.</p>	<p>Location: U.S.A, Nationwide</p> <p>Population: Beneficiaries of Pitney Bowes corporate health plan. Sample of age 18-64 analyzed that were eligible for reduced co-pays on select medications.</p> <p>Intervention: VBID program in eliminated co-pays for generics (\$5 to \$0) and reduced co-pays from branded drugs (\$25 to \$12.50 for preferred and \$45 to \$22.50 for non-preferred) to treat several high-value conditions: high BP, hyperlipidemia, diabetes, and asthma. All except asthma are relevant for present review.</p> <p>Intervention Length:</p>	<p>Adherence improved by 3 pct pt, compared to non-VBID from baseline of 70%, for all VBID drugs. Sensitivity analysis for modeling varied this from 3, 4, and 5 pct pt.</p>	<p>Program cost defined as cost increase for pharma due to ROPC.</p> <p>Increase in insurer's share of drug spending due to VBID was \$7.75 PPPM (Based on analysis of 2004 data for the plan).</p> <p>No additional cost to insurer considered for VBID program</p>	<p>Healthcare cost: Assumed 85% of non-drug medical costs would be borne by the insurer. Baseline non-drug medical spending per person per mont (PPPM) \$420 (based on 2004 plan data) Considered \$500 PMPM in sensitivity analysis.</p> <p>Insurer's portion of baseline non-drug spending PPPM \$357</p> <p>Productivity: Not considered</p>	<p>Estimated reduction in non-drug spending required for VBID program to break even.</p> <p>Employer perspective: 48% (29% under favorable sensitivity analysis, including adherence)</p> <p>Societal perspective: 17% (9% under favorable sensitivity analysis, including adherence)</p> <p>Study cites other literature that improved adherence by patients with diabetes reduced non-drug cost by 58% and by those with high BP, high cholesterol, and congestive heart failure reduced it by 26, 51, and 13 percent, respectively.</p> <p>Authors conclude the VBID program is likely to break even based on existing evidence for reduction in non-drug costs. Note: The VBID drugs include those for asthma. We include</p>

Study Monetary Conversion	Population Interventions Comparison Time Horizon	Effectiveness	Program Cost	Healthcare Costs Averted Productivity Effects	Summary Economic Measure
	Not reported. The program started Jan 2005.				these results for the CVD prevention review because all other drugs covered were relevant to CVD.
<p>Author (Year): Choudhry 2012</p> <p>Design: Interrupted time series with concurrent comparison.</p> <p>Economic Analysis: Drug and medical costs to insurer.</p> <p>Use 2007 as Index year. Reported in U.S dollars.</p>	<p>Location: U.S.A, Nationwide</p> <p>Population: Beneficiaries of Pitney Bowes corporate health plan. Two cohorts studied: those prescribed statins and those prescribed blood thinner.</p> <p>Demographics and Health Status: Age 53 to 59. Female 36% to 40%. Income \$56K to \$58K. Black 11.5% to 11.9%. Diabetes 34% to 36%. High BP 50% to 60%. Coronary Artery Disease or Congestive Heart Failure 27% to 28%.</p> <p>Sample:</p>	<p>Adherence measured by proportion of days covered, with full adherence defined as 80%. VBID vs Non-VBID increased adherence for statins by 2.8 pct pt (3.1 pct pt adjusted) and maintained in 1 year follow-up.</p> <p>Statin fillings per month increased by</p>	<p>Program cost defined as increase in cost of pharma due to ROPC.</p> <p>Significant increase in insurer statin prescription spending, \$1.14 per patient per month.</p>	<p>Healthcare cost: Medical spending by insurer per patient per month increased for statin cohort by \$1.02, compared to non-VBID. Includes outpatient, inpatient, ER, Long term care.</p> <p>Productivity: Not considered.</p>	<p>Medical plus pharmacy spending per patient per month for insurer increased \$1.08, compared to non-VBID.</p> <p>Note there was reduction in utilization in many categories but these did not translate to reductions in insurer medical spending.</p> <p>Study states the overall effect was cost-neutral, probably because the PPPM cost increase was relatively small, \$1.08.</p>

Study Monetary Conversion	Population Interventions Comparison Time Horizon	Effectiveness	Program Cost	Healthcare Costs Averted Productivity Effects	Summary Economic Measure
	<p>Focus of present review is statins. Statin VBID n=2051 Statin Non-VBID n=38,174,</p> <p>Intervention: Reduced co-pays for statins for those with diabetes or vascular disease and for a blood thinner (Clopidogrel). Voluntary disease management program in place prior to VBID. Statin co-pays per patient per month were reduced from \$24.18 to near zero for VBID and increased \$8.86 for controls.</p> <p>Intervention Length: Analysis covered Jan 06 to Dec 07.</p>	<p>7.1 pct pt, VBID vs Non-VBID.</p> <p>Physician visits, inpatient, and ER were reduced significantly compared to Non-VBID. Major CVD events were unchanged.</p>			
<p>Author (Year): Elhayany (2011)</p> <p>Design:</p>	<p>Location: Israel</p> <p>Population:</p>	<p>1 year reductions SBP by 3.2 mmHg</p>	<p>Program cost defined as ROPC per person per year.</p>	<p>Healthcare cost: Not reported</p> <p>Productivity: Not reported</p>	<p>Cost per unit SBP reduction: \$176 per mmHg. Cost per unit DBP reduction: \$209 per mmHg.</p>

Study Monetary Conversion	Population Interventions Comparison Time Horizon	Effectiveness	Program Cost	Healthcare Costs Averted Productivity Effects	Summary Economic Measure
<p>Pre-Post</p> <p>Economic Analysis: Cost-effectiveness</p> <p>2007 assumed as index year. Reported in U.S dollars.</p>	<p>Low SES HMO adult patients from 2 small cities. Selected those who filled less than 3 months prescribed drugs.</p> <p>Sample size: 355 patients</p> <p>Demographics and health status: 260 with BP, 323 with hyperlipidemia, and 210 diabetics; Age-65.; Female-55%;</p> <p>Intervention: ROPC for HTN, hyperlipidemia, and diabetes medications.</p> <p>Comparison: None</p> <p>Intervention length: 12 months. 2 year rolling enrollment</p>	<p>DBP by 2.7 mmHg LDL-C: by 11.2 mg/dL No change in A1c</p>	<p>\$200,000 private donation to cover ROPC. \$563 per person per year.</p>		<p>Cost per unit LDL-C reduction: \$50 per mg/dL.</p>

Study Monetary Conversion	Population Interventions Comparison Time Horizon	Effectiveness	Program Cost	Healthcare Costs Averted Productivity Effects	Summary Economic Measure
<p>Author (Year): Gibson (2011)</p> <p>Design: Pre-post (time series)</p> <p>Economic Analysis: Net Benefit</p> <p>Use 2007 as index year. Reported in U.S dollars.</p>	<p>Location: U.S.A Nationwide</p> <p>Intervention: Value-based insurance design (VBID) intervention for CV, asthma, diabetes medications.</p> <p>Population: 3 cohorts with =>2 scripts within 25,784 enrolled in VBID. From employees of large self-insured pharma company.</p> <p>Sample size: Cardiovascular 1765; Diabetes 275; Asthma 833.</p> <p>Comparison: Matched control. 75% less than 44 in age; 55% female.</p> <p>Intervention length: Followed for 3 years Implemented in Jan 05.</p>	<p>Number and percentage filling scripts increased for CV but not for asthma or diabetes. Adherence improved for CV in year 1 and for asthma only in year 3.</p>	<p>Program cost defined as increase in pharma cost.</p> <p>Pharma cost increased more for VBID group than for control by \$68 per person per year.</p>	<p>Healthcare cost: Drug plus outpatient and inpatient care costs for CV group lower by \$2122 in Year 2 and by \$3722 Year 3.</p> <p>Productivity: Not considered</p>	<p>No cost-effectiveness computed for lack of clinical outcomes. Net benefits \$2054 in Year 2 and \$3654 in Year3.</p>

Study Monetary Conversion	Population Interventions Comparison Time Horizon	Effectiveness	Program Cost	Healthcare Costs Averted Productivity Effects	Summary Economic Measure
<p>Author (Year) Kelly (2009)</p> <p>Nationwide Large self-insured pharma company (Novartis)</p> <p>Pre-post</p> <p>Economic Analysis: Net Benefit</p> <p>Use 2007 as index year. Reported in U.S dollars.</p>	<p>Location: U.S.A Nationwide</p> <p>Population: 3 cohorts with =>2 scripts in 2004.</p> <p>Sample Size: 1351 with HTN; 161 with diabetes; 38 with asthma.</p> <p>Demographics: Mean age-41; female 53%</p> <p>Intervention: Value-based insurance design (VBID) intervention for CV, asthma, diabetes medications.</p> <p>Intervention length: 3 year follow-up. Implemented in Jan 05.</p>	<p>Change from 2004 to 2007. Days of supply increased for all including HTN cohort. Med possession ratio increased 64% to 73% for HTN.</p>	<p>Program cost defined as increase in pharma cost.</p> <p>HTN-related pharma cost increased \$180 per person per year from 2004 to 2007.</p>	<p>Healthcare cost: 2004 to 2007 change in HTN- related costs per person per year: Inpatient decreased \$141 Outpatient increased \$40</p> <p>Productivity: Not considered</p>	<p>No cost-effectiveness computed for lack of clinical outcomes. Net negative benefits of \$79 per person per year.</p>
<p>Author (Year): Maciejewski (2014)</p>	<p>Location: North Carolina, USA</p> <p>Population:</p>	<p>Medication adherence based on medication</p>	<p>Incremental cost of VBID program* for all 3 cohorts</p>	<p>Healthcare cost: <u>Per patient reduction in c</u></p>	<p>For all 3 cohorts, total cost to insurer was \$6.4 million and reduction in healthcare cost (statistically not significant)</p>

Study Monetary Conversion	Population Interventions Comparison Time Horizon	Effectiveness	Program Cost	Healthcare Costs Averted Productivity Effects	Summary Economic Measure
<p>Design: Pre-post with matched pair nonequivalent comparison group.</p> <p>Economic Analysis: Program cost and healthcare cost.</p> <p>Use 2008 as index year. Reported in U.S. dollars.</p>	<p>North Carolina Blue Cross-Blue Shield members with 3 cohorts with hypertension, hypertension & hyperlipidemia, and hypertension and coronary artery disease (CAD) who opted into program. VBID – 750,000 Control – 638,000</p> <p>Demographics: Age 52 to 57 Male 44% to 63% Adherence 76.5% to 78.4%</p> <p>Samples Size: High BP only – 14,002 High BP and hyperlipidemia – 7291 High BP and CAD - 1177</p> <p>Intervention: VBID lowering co-pays starting in 2008 on drugs for hypertension, hyperlipidemia, diabetes,</p>	<p>possession ratio (MPR) of BP medications.</p> <p>Adherence improvement in year 2008 and (2009), compared to control, for the 3 VBID cohorts were: High BP only 2.2 pct pt 3.4 pct pt High BP and hyperlipidemia 1.6 pct pt 3.0 pct pt High BP and CAD 2.0 pct pt 2.7 pct pt</p>	<p>was \$6.4 million. The per patient increase ranged from \$139 to \$173 per patient per year across the 3 cohorts.</p> <p>* Calculated from increased cost of medications.</p>	<p><u>ost of outpatient, inpatient, and ER compared to control in 2008 (2009):</u> High BP only \$144 (\$67); High BP and hyperlipidemia \$145 (\$105); High BP and CAD \$581 (\$284)</p> <p><u>Reduction in total healthcare expenditures compared to control:</u> High BP only \$2.9 million; High BP and hyperlipidemia \$1.8 million; High BP and CAD \$1 million</p> <p>Productivity:</p>	<p>was \$5.7 million. Authors conclude there is limited support for cost-neutrality of VBID. Authors note business case may be made for targeting those at higher risk and cost-savings may appear in longer term analysis or VBID may target those for whom drug cost is an important barrier.</p>

Study Monetary Conversion	Population Interventions Comparison Time Horizon	Effectiveness	Program Cost	Healthcare Costs Averted Productivity Effects	Summary Economic Measure
	<p>and congestive heart failure. Branded medications moved from tier 3 to tier 2 and co-pays eliminated for generic drugs.</p> <p>Intervention length: Data from 2007 (pre) through 2008 and 2009 (post) analyzed. VBID started in 2008.</p>			Not considered	
<p>Author (Year): Musich (2015)</p> <p>Design: Pre post with VBID and non-VBID members.</p> <p>Use 2012 as index year. Reported in U.S. dollars.</p>	<p>Location: USA, Location not disclosed</p> <p>Population: Large employer’s VBID program offered for those enrolled in disease/lifestyle management coaching and diagnosed with diabetes or hypertension.</p> <p>Sample: Diabetes 814 VBID, 276 non-VBID Hypertension 2674 VBID, 580 non-VBID</p>	<p>Pct Pt change in adherence for hypertension and diabetes medications based on medication possession ratios (MPR) for VBID vs Non-VBID. <u>BP Meds</u> 13.7 to 14.3 <u>Diabetes Meds</u></p>	<p>Considering program cost as increase in pharmacy cost to plans for VBID vs Non-VBID, the per person per month cost were: <u>Hypertension Group</u> \$39.72 higher <u>Diabetes Group</u></p>	<p>Healthcare cost: Per person per month Pre to Post Change VBID vs Non-VBID for inpatient, outpatient, professional, and drugs <u>Hypertension group</u> Drug and pharmacy costs \$39.72* higher</p>	<p>Net effect of VBID for both diabetes and hypertension was to increase healthcare cost. However, total healthcare cost increases were not statistically significant for diabetes group. Overall, the VBID programs were not cost-neutral.</p> <p>Authors note the lack of significant decrease in medical expenditures for diabetes group and the increase for the hypertension group may indicate longer follow-up is required.</p>

Study Monetary Conversion	Population Interventions Comparison Time Horizon	Effectiveness	Program Cost	Healthcare Costs Averted Productivity Effects	Summary Economic Measure
	<p>Intervention: VBID additionally focused on those with at least 2 prescriptions for related drugs.</p> <p>Comparison: Non-VBID</p> <p>Intervention length: Diabetes 3 to 12 months of pre-enrollment and 3 to 36 months (mean 23) of post; hypertension 3 to 12 months of pre and 3 to 24 months (mean 13) of post F/U was through June 2013. Program start year: diabetes in 2010 and hypertension in 2011</p>	<p>13,4 to 14.1 based on different weighting</p> <p>Impact on ER and Inpatient utilization was minimal for both groups.</p>	<p>\$120.30 higher</p> <p>Cost of coaching program not included in above estimates</p>	<p>Medical \$30.41 higher Expenditures Total \$70.08 higher and \$75.91 higher by regression weighted <u>Diabetes group</u> Drug and pharmacy costs \$120.30* higher Medical Expenditures \$29 lower Total \$91.30 higher and \$75.13 higher by regression weighted * Statistically significant</p> <p>Productivity: Not considered</p>	<p>Relatively younger, highly educated participants may not be generalizable.</p> <p>Lifestyle and disease management coaching cost not included in program cost.</p>

Study Monetary Conversion	Population Interventions Comparison Time Horizon	Effectiveness	Program Cost	Healthcare Costs Averted Productivity Effects	Summary Economic Measure
<p>Author (Year): Wertz (2012)</p> <p>Design: Pre-Post with Control</p> <p>Economic Analysis: Program and healthcare cost</p> <p>Use 2008 as index year. Reported in U.S dollars.</p>	<p>Location: Cincinnati, OH</p> <p>Population: Those employees with a large self-insured employer with past claims in CV or diabetes invited. Two cohorts tracked receiving heart care and diabetes care coaching.</p> <p>Sample: 307 each in diabetes and heart care (DC and HC).</p> <p>Demographics: Age-58;AfrAmer-35%; White-51%</p> <p>Intervention: Partnership of health plan, large employer, and pharmacy. VBID plus TBC (medication management) for HTN, diabetes, and dyslipidemia.</p>	<p>For HC Group SBP reduced 6.6 mmHg; DBP reduced 4.2 mmHg; % BP Controlled increased 18 pct pt; LDL decreased 6.9; % LDL Controlled increased 13 pct pt</p> <p>For DC Group SBP reduced 5.7 mmHg; DBP reduced 4.7 mmHg; % BP Controlled increased 12 pct pt; LDL decreased 7.6; % LDL Controlled</p>	<p>TBC Cost per Person per Year Heart care \$493 Diabetes care \$552 Pharma cost increased \$41, versus control.</p>	<p>Healthcare cost: <u>HC Group HTN Related Per Person per Year Health Care Costs</u> Total reduced by \$269, versus control. Components that increased were Office visits by\$7; Outpatient by \$95; Pharma by \$41. Components that decreased were ER by \$19; Inpatient by \$392.</p> <p>Productivity: Not considered</p>	<p>TBC plus Pharma Cost for HC group: \$534</p> <p>Cost per mmHg of SBP reduction \$81 Cost per mmHg of DBP reduction \$127 Cost per unit reduction in LDL-C \$77</p> <p>Cost per additional person with controlled BP \$2967 Cost per additional person with controlled LDL \$4108</p>

Study Monetary Conversion	Population Interventions Comparison Time Horizon	Effectiveness	Program Cost	Healthcare Costs Averted Productivity Effects	Summary Economic Measure
	<p>Comparison: Usual care</p> <p>Intervention length: Average duration – 14 months. Rolling enroll 08 through 09</p>	<p>increased 11 pct pt.</p> <p>Possession ratios increased.</p>			