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Impact of Benefit Design on Cost, Use, and Health: Literature Review

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Many employers use cost-sharing in their health insurance benefit designs as a means to reduce costs and, for some designs, encourage improved enrollee health behaviors. This paper summarizes the literature on the impact that three commonly used benefit designs have on cost, use of services, and health status:

1. High-deductible health plans (HDHPs), which include consumer-directed health plans (CDHPs);
2. Value-based insurance design (V-BID); and
3. Tiered pharmaceutical benefit

Definitions of each product type are included in Attachment A.

Overall, the research concludes that increased cost-sharing can significantly reduce costs for employers—often at the expense of increasing out-of-pocket costs for enrollees—but has not shown an adverse effect on health for the *average* enrollee. However, across-the-board cost-sharing reduces the use of both highly effective and less effective treatments and has been shown to adversely affect those who are sicker and have lower incomes. A more nuanced approach to cost-sharing (V-BID) can improve adherence to evidence-based treatment, though the long-term impact on cost and health is inconclusive. A full summary of the literature and definitions of the various benefit approaches is provided in Attachment B. Initially this analysis included drug cap and tiered provider network designs. However, drug caps are rarely, if ever, used and there is simply not enough research on the impact of tiered provider networks.

Impact of Benefit Designs on Cost, Use of Services, and Health Status

HDHPs/CDHPs

High-deductible health plans ($1,000 or more) show slower growth in health care spending, when compared to traditional health plans,[1] primarily through reductions in the use of outpatient services and prescription drugs. While HDHPs, which rely on cost-sharing to curb employer costs, do not adversely affect the health status of the *average* person, the poorest and the sickest people experience better health outcomes in plans with no cost-sharing.[2]

[1] See A. Haviland, et al., 2012, *Skin in the Game: How Consumer-Directed Plans Affect the Cost and Use of Health Care*, item 1 in Attachment B: Annotated Bibliography. All references in this paper correspond to the item numbers in Attachment B.

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Consumer-directed health plans—HDHPs with a Savings Option (SO), such as a health reimbursement account/arrangement (HRA) or Health Savings Account (HSA)—generally have lower premiums than health maintenance organizations (HMOs) and preferred provider organizations (PPOs). In 2011, the average CDHP premium was $4,793 for an individual and $13,704 for a family, compared to $5,350/$15,288 for an HMO and $5,584/$15,404 for a PPO.[3]

CDHPs are more likely to reduce total spending for low-risk and moderate-risk enrollees than for high-risk enrollees.[3, 4] At least a portion of the reductions are due to a decrease in spending for pharmaceuticals[5] and outpatient services. CDHPs with higher deductibles and a lower employer contribution in the linked SO shift more of the cost burden to the enrollee and are associated with larger reductions in employer health expenditures.[6]

The effect of CDHPs on the use of clinically appropriate treatments and health status is mixed, based on a review of five studies.[7, 8, 9, 10, 11] Effects are largely dependent on the deductible amount, services that apply to the deductible, the savings option, and the employer contribution. For example, enrollees with a well-funded SO are more likely to use preventive services than enrollees without an SO. When preventive services are included in deductible requirements, there may be a reduction in the use of some valuable preventive services,[1, 12] indicating that cost can be a barrier to receiving preventive care. Even when preventive services are excluded from deductible requirements, a recent study found that enrollees delay or forgo care because they were unaware that the services were available at low or no cost.[11] The Patient Protection and Affordable Care Act (ACA) now requires that the preventive services deemed most valuable be provided without cost-sharing in all non-grandfathered health plans.[3]

V-BID

More than a decade ago, private-sector payers began to implement the concept of value-based insurance design (V-BID) to encourage consumers to take better advantage of high-value services and actively participate in decision-making about treatments that are subject to misuse. The basic V-BID premise calls for a clinically nuanced benefit structure that reduces consumer cost-sharing for beneficial services and high-quality providers.[13] The majority of V-BID research is concentrated on prescription drugs and on plans that remove or reduce cost-sharing for high-value pharmaceuticals.[14, 15, 16] A recent *Health Affairs* review concluded that compared to plans without such clinically nuanced cost-sharing, V-BID programs that lower cost-sharing for targeted services have consistently demonstrated improved adherence and lower out-of-pocket drug costs. The review suggested that these programs were not associated with net increases in aggregate expenditures nor were they associated with a significant reduction in total health care spending in the short term (1–3 years).[17]

More recently, V-BID programs have incorporated nuanced disincentives (such as increased cost-sharing for low-value services) to discourage the use of low-value care.[18] While there are few studies that examine the impact of V-BID benefit design to discourage such services, early evidence from two programs reveals that increased cost-sharing may be effective at reducing the use of low-value services[19, 20] Although V-BID appears promising for improving enrollee health status based on early evidence of increased medication adherence among those with chronic conditions, more research on V-BID's effect on health status and total cost is needed before robust conclusions can be drawn.

Tiered Pharmaceutical Benefit

Tiered pharmaceutical designs decrease total costs when compared to non-tiered pharmaceutical designs.[21, 22, 23] Results vary across medication classes, cost-sharing differentials, and patient groups but generally, tiered pharmaceutical designs reduce the use of high-cost, name brand drugs (third-tier drugs) without an increase in the use of emergency department visits, hospitalizations, or office visits, which are viewed as an indication of worsening health status.[21, 24, 25]

Research indicates that as with other benefit designs, tiered benefit enrollees are sensitive to price.[23] Medication adherence is best among drugs in the most preferred, lowest cost tier (tier one) and worst among highest cost tier-three prescriptions.[26]

However, when tiered pharmaceutical designs are implemented with increased cost-sharing across all tiers, there may be a reduction in prescription drug use including tier one drugs.[21] A 10 percent increase in cost-sharing for all medications is associated with a 2 to 6 percent decrease in medication adherence.[23]

Thus, tiered benefit designs can reduce costs without adversely affecting the use of health services if they are selectively applied to higher tiered drugs. If cost sharing is applied equally to all tiers, such plans may reduce prescription drug use for important medications.

Summary of Conclusions from the Research

Some overarching conclusions emerge from the literature. These are:

- HDHPs reduce costs but they present problems for low-income people and/or those who have chronic conditions. Those problems can be mitigated by an adequately funded HSA/HRA and better education about preventive cost-sharing exemptions.
- V-BID can improve medication adherence, but there has not been much research to show that it can have a positive impact on health status and cost savings. Additionally, there is considerable administrative and political complexity for groups that want to move in the direction of increasing cost-sharing for low-value procedures, which could help offset costs.
- Tiered pharmaceutical benefit designs reduce costs without significantly adversely affecting the use of health services, but medication adherence rates may decrease for important medications if a generic option is not available or copayments increase across all tiers.

With regard to both HDHPs and tiered pharmaceutical benefit designs, health plans and purchasers may want to take a V-BID approach to reduce some of the negative outcomes seen in these plans. Specifically, while the ACA requires coverage of preventive services with no cost-sharing, purchasers could consider reducing or eliminating cost-sharing for other evidence-based, high-value services within HDHPs. Similarly, health plans/purchasers may want to consider reducing cost-sharing in tiered pharmacy plans for high-value medications when a generic option is not available.

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Attachment A: Definitions

High deductible health plans (HDHPs) are health plans that use high deductibles (typically $1,000 or more) to increase consumer accountability for health care spending.

Consumer-directed health plans (CDHPs) are HDHPs with a savings option (SO—sometimes referred to as personal health accounts), which are tax-advantaged funds that consumers may use to pay medical bills. The two most common types of SOs are Health Reimbursement Accounts/Arrangements (HRAs) and Health Savings Accounts (HSAs). There are significant differences between the two types, which are summarized in the following table.

	Health Reimbursement Arrangement (HRA)	Health Savings Account (HAS)
Description	Employer-funded account to reimburse employees' qualified medical expenses	Tax-favored savings account to pay for qualified medical expenses
Account Funder	Employer only	Employee, employer, or both
Account Owner	Employer	Employee
Annual Contribution Limit	No federal limits	In 2012, the maximum allowable contribution was $3,100 for an individual and $6,250 for a family
Tax Treatment of Contributions	Employer contributions are excluded from the gross income of employees and not subject to taxes	Employer contributions are excluded from employee gross income and not subject to taxes; individual contributions are tax-deductible
Rollover Provisions	Employers may choose whether to allow funds to accumulate from year to year. Employers may also choose whether to allow employees to continue to withdraw any unused funds after employment is terminated	Funds in accounts accumulate over time
Non-Medical Use	Not allowed	Allowed but subject to income tax. Withdrawals before age 65 are subject to an additional penalty
Required Companion Plan	None required	In 2012, the minimum qualifying deductible was $1,200 for individual and $2,400 for family coverage and the maximum out-of-pocket expenditure was $6,050 for individual and $12,200 for family coverage
Enabling Legislation	Authorized by Treasury Department Revenue Ruling 2002-41 in 2002 and IRS Guidance 2002-45	Medicare Prescription Drug Improvement and Modernization Act of 2003, amended by Tax Relief and Health Care Act of 2006

SOURCE: M. K. Bundorf, 2012, *Consumer-directed health plans: Do they deliver?* Research Synthesis Report No. 24 (Princeton, N.J.: Robert Wood Johnson Foundation), adapted from H.Tu and P.B. Ginsburg, 2007, *Benefit Design Innovations: Implications for Consumer-Directed Health Care*. Center for Studying Health System Change Issue Brief No. 109.

Value-based insurance designs (V-BIDs) explicitly link cost-sharing and value(i.e., evidence-based clinical effectiveness) by lowering or eliminating cost-sharing for high-value treatments, medications, and services and increasing cost-sharing for services that are not proven to be high-value services.

The **tiered pharmaceutical benefit** is a tiered formulary that provides financial incentives for enrollees to choose drugs preferred by the payer. Three-tiered formularies are most common, with tier one typically consisting of generics (lowest copay); tier two including drugs preferred by the payer (if an alternative is unavailable in tier one); and tier three, which has the highest copay, consisting of non-formulary, brand-name drugs.

Attachment B: Annotated Bibliography

High Deductible Health Plans (HDHP) and Consumer-Directed Health Plans (CDHP)

1. **A. Haviland, R. McDevitt, S. Marquis, et al. 2012. *Skin in the Game: How Consumer-Directed Plans Affect the Cost and Use of Health Care*.** RAND Health. http://www.rand.org/pubs/research_briefs/RB9672.html (accessed 10/31/13).

Researchers from RAND, Towers Watson, and the University of California conducted a series of studies looking at the effect of Consumer-Directed Health Plans (CDHPs) on cost and use of services for more than 800,000 families insured through 59 large national employers.

Key Findings: Researchers found that families who switched from a traditional health plan to a CDHP spent 21 percent less on health care after one year than those who did not switch. Two-thirds of the cost-savings came from fewer episodes of care, and one-third came from spending less per episode. CDHP enrollees received 2.8 to 4.9 percent less preventive care than those enrolled in a traditional plan. The researchers concluded that CDHPs could lead to significant cost saving but cautioned that this study did not evaluate costs beyond one year of CDHP enrollment.

2. **R. Brook, J. Ware, W. Rogers, et al. 1984. *The Effect of Coinsurance on the Health of Adults: Results from the RAND Health Insurance Experiment*.** Rand Health Insurance Experiment Series, R-3055-HHS. http://www.rand.org/content/dam/rand/pubs/reports/2006/R3055.pdf (accessed 10/31/13).

The RAND Health Insurance Experiment, a randomized controlled trial that ran from 1974 to 1982 in six sites across the country, assessed the health status of non-Medicare individuals aged 14 to 61. In this seminal study, researchers randomly assigned 2,005 families to one of several insurance plans, each with varying levels of cost-sharing, including one without cost-sharing.

Key Findings: For the average enrollee, cost-sharing did not negatively impact health. However, sicker and lower-income enrollees in plans with cost-sharing had poorer health status and a 10 percent higher risk of dying.

3. **M. K. Bundorf. 2012. *Consumer-directed health plans: Do they deliver?*** Research Synthesis Report No. 24 (Princeton, N.J.: Robert Wood Johnson Foundation). http://www.rwjf.org/content/dam/farm/reports/reports/2012/rwjf402405 (accessed 10/31/13).

This is a meta-analysis of 45 published articles (identified from a pool of over 200 studies) that provided quantitative research on CDHP products. Bundorf also used findings from simulations, qualitative studies, and experimental studies that used hypothetical decisions to support the analysis.

Key Findings: CDHPs reduced total health care spending 5 to 14 percent, particularly among low-risk and medium-risk enrollees. There were not significant reductions in use of preventive services when excluded from the deductible. Bundorf found inconclusive evidence about the effect of CDHPs on health status and the use of clinically appropriate services. Lastly, she found that CDHPs tended to attract high-income, healthier enrollees. She concluded that CDHP enrollees have a limited understanding of CDHP features and that CDHPs are likely only part of the solution to reducing health care costs.

4. **A. LoSasso, L. Helmchen, et al. 2010. The Effects of Consumer-Directed Health Plans on Health Care Spending. *Journal of Risk and Insurance* 77(1): 85–103.** http://www.nber.org/papers/w15106 (accessed 10/31/13).

This study assessed how CDHPs changed employee health care spending by analyzing claims data and enrollment information for employers offering a CDHP. Lo Sasso et al. examined the impact of the CDHP's design on four types of health care spending: (1) total spending, (2) outpatient/pharmacy spending, (3) out-of-pocket spending, and (4) inpatient/outpatient surgery spending.

Key Findings: Greater employer SO contributions were associated with increased use of outpatient services and pharmaceuticals, and had no effect on use of inpatient services. Member out-of-pocket spending did not change, regardless of the size of the SO.

Employees spent SO funds at the same rate as employer's contributed to them. The authors speculated that this is due to healthier employees spending more because of their designated health care spending funds, while sicker employees were unaffected by an equal change in the SO and deductible because they use services regardless of SO contributions. They concluded that employers need to be cautious when deciding account contribution levels.

5. **P. Frostin and C. Roebuck. 2013. Health Care Spending After Adopting a Full-Replacement, High-Deductible Health Plan with a Health Savings Account: A Five-Year Study. Employee Benefit Research Institute Issue Brief 388.** http://www.ebri.org/pdf/briefspdf/EBRI_IB_07-13.No388.HSAs.pdf (accessed 10/31/13).

This retrospective pre-post design study examined spending trends over a five-year period for a large employer that replaced traditional health insurance plans with high-deductible health plans and health savings accounts (HSAs). Researchers examined pharmacy and medical claims data and insurance enrollment information for 13,278 active employees and dependents. The findings were compared with a control group with similar characteristics.

The HSA plan reduced total spending by 25% in the first year. However, these spending decreases were not sustained. Over the entire four years, only pharmacy and laboratory spending were significantly lower with the adoption of the HSA.

6. **M. Buntin, A. Haviland, et al. 2011. Healthcare Spending and Preventive Care in High-Deductible and Consumer-Directed Health Plans. *American Journal of Managed Care* 17(3): 222–230.** http://www.ajmc.com/publications/issue/2011/2011-3-vol17-n3/AJMC_11mar_Buntin_222to230/ (accessed 10/31/13).

This study analyzed the effects of HDHPs and CDHPs on total (employer and enrollee) health care spending and the use of recommended preventive care. Buntin et al. conducted a two-year retrospective study, analyzing claims and enrollment data for 53 large U.S. employers, about half of which offered HDHPs or CDHPs. Families enrolled in HDHPs or CDHPs were compared with families who were not (i.e., a control group).

Key Findings: Total health expenditures for the HDHP/CDHP group grew by 4 percent, whereas expenditures for the control group grew by 20 percent. The slower growth rate was due to a lower growth in inpatient and outpatient services and pharmacy use. Growth in emergency department (ED) expenditures did not vary between the two groups.

HDHP or CDHP enrollment was also associated with moderate reductions in preventive care, such as child immunizations and cancer screenings, even when those services were covered without cost-sharing. The authors cautioned that while their study showed a significant cost savings associated with HDHPs/CDHPs, more research is needed to determine whether the findings represent a one-time savings or whether HDHPs/CDHPs might reduce costs in the long term.

7. **J. Wharam, B. Landon, et al. 2011. High-Deductible Insurance: Two-Year Emergency Department and Hospital Use. *American Journal of Managed Care* 17(10): e410–e418.** http://www.ajmc.com/publications/issue/2011/2011-10-vol17-n10/ajmc_11oct_wharam_e410to418 (accessed 10/31/13).

This study examined the impact of HDHPs and CDHPs on high-severity, expensive medical care after two years. Using a retrospective, pre-post design with a comparison group, Wharam et al. studied ED visits, hospitalizations, and related expenditures among 15,847 HMO members for one year before and two years after switching to an HDHP, compared with 15,847 people who remained in HMOs.

Key Findings: Researchers found that HDHPs reduced costs, hospitalizations, and inappropriate ED use over the two-year period, but there were no reductions in cost and hospitalizations in the second year. The researchers speculated this could be due to deferred ED care in the first follow-up year.

8. **K. Kozhimannil, H. Huskamp, et al. 2011. High-Deductible Health Plans and Costs and Utilization of Maternity Care. *American Journal of Managed Care* 17(1): e17–e25.** http://www.ajmc.com/publications/issue/2011/2011-1-vol17-n1/AJMC_11janKozhimannil_WebX_e17 (accessed 10/31/13).

Using a pre-post design with a control group, this study evaluated the impact of switching from an HMO to an HDHP (with or without an SO) on employer costs and enrollees' use of maternity care. Claims for 229 women who delivered babies after they switched from an HMO to an HDHP were compared to a control group of 2,180 women covered by an HMO plan. For HDHP enrollees, many recommended maternity services were exempt from having to meet the deductible (e.g., prenatal and postpartum visits, sonograms). Hospital delivery charges and many outpatient procedures were subject to the deductible but covered in full after the deductible was met.

Key Findings: The researchers found that HDHP enrollee out-of-pocket spending more than doubled, from $356 while in the HMO to $942 after transitioning to an HDHP; however, the use of recommended services did not decline. The authors cautioned that while this study indicates that HDHPs may not adversely affect the use of recommended maternity services, more research is needed on how HDHPs affect use of maternity care among lower-income women because socioeconomic status was not considered in this study.

9. **J. Greene, J. Hibbard, et al. 2008. The Impact of Consumer-Directed Health Plans on Prescription Drug Use. *Health Affairs* 27(4): 1111–1119.**

In this study, Greene at al examined prescription drug use patterns of a large employer in the first year that CDHPs were offered alongside traditional plans. Researchers examined CDHP enrollees' use of medications for chronic conditions compared to those in a PPO or indemnity plan with the same three-tiered pharmacy benefit.

Key Findings: Of the five drug classes studied (antidepressants, asthma controllers, anti-ulcerants, anti-hypertensives and lipid-lowering agents), researchers found that CDHP enrollees only increased generic drug use for antidepressants. CDHP enrollees were two to three times more likely than those in the control group to stop using anti-hypertensive and lipid-lowering drugs, which primarily treat asymptomatic conditions. The authors noted that research has shown that discontinuation of these drugs may result in higher levels of morbidity, hospitalizations, and health care costs.

10. **S. Chen, R. Levin, et al. 2010. Medication Adherence and Enrollment in a Consumer-Driven Health Plan. *American Journal of Managed Care* 16(2): e43–e50.** http://www.ajmc.com/publications/issue/2010/2010-01-vol16-n02/AJMC_10feb_ChenXclsv_e43to50 (accessed 10/31/13).

This study used a two-year retrospective cohort design to assess the impact of CDHPs on adherence to maintenance drugs in eight drug classes. Data from 33 employers that offered a CDHP were compared with that of 47 employers that offered a traditional plan.

Key Findings: The CDHP group was less likely to continue cardiac and cholesterol drugs than the control group. Compliance rates dropped in both groups, but the reduction was larger among CDHP enrollees for three drug classes (asthma, cardiac, and cholesterol drugs). This study indicates that CDHPs may adversely affect the compliance rate of key medications to a greater degree than traditional plans.

11. **M. Reed, I. Graetz, et al. 2012. In Consumer-Directed Health Plans, A Majority of Patients Were Unaware of Free or Low-Cost Preventive Care. *Health Affairs* 31(12): 2641–2648.**

This study evaluated whether CDHP enrollees understood their benefits and whether they delayed or avoided preventive care due to cost concerns. The study included a random sample of 456 adults enrolled in a Kaiser Permanente Northern California CDHP.

Key Findings: Fewer than 20 percent of enrollees were aware that their CDHP excluded preventive office visits, tests and screenings from the deductible. Approximately 20 percent reported that they delayed or went without preventive care

because of cost. Researchers suggested that better enrollee education about preventive cost-sharing exemptions may help alleviate reductions in the use of preventive services.

12. **M.Charlton, B. Levy, et al. 2011. Effects of Health Savings Account-Eligible Plans on Utilization and Expenditures.** ***American Journal of Managed Care*** **17(1): 79–86.** http://www.ajmc.com/publications/issue/2011/2011-1-vol17-n1/AJMC_11jan_Charlton_79to86/ (accessed 10/31/13).

This retrospective pre-post design study analyzed medical and pharmacy claims data and assessed the impact of a CDHP on utilization and expenditures in an employer-sponsored health plan that switched from a traditional plan to a CDHP. The findings were compared with a control group with similar characteristics.

Key Findings: Researchers found that the CDHP lowered total health expenditures (17.4 percent) and reduced office visits (13.6 percent), ED visits (20.1 percent), and drug expenditures (29.2 percent). Routine health maintenance exams and preventive care also were reduced. Researchers noted that while these results indicate that CDHPs reduce health expenditures, preventive care may be discouraged, which may lead to increased long-term health care costs.

Value-based Insurance Design

13. **M. Chernew, A. Rosen, and A. Fendrick. 2007. Value-based insurance design. Health Affairs 26(2): w195–203.**

This descriptive article explains major tenets of V-BID related to cost sharing. Research evidence suggests that higher cost sharing reduces the use of both highly valuable and marginally valuable health care services. This necessitates a flexible benefit design to encourage high value care while discouraging the use of low-value services. Furthermore, cost sharing is often uniform for a specific service, even though the service would provide varying benefit to different patients. The V-BID approach advocates that copayments be set based on the value of the clinical services, rather than only the cost of the service. There are two general approaches to V-BID targeting. The first approach targets clinically valuable services for a reduced copayment. The second approach targets patients with select clinical diagnoses (i.e., congestive heart failure) and lowers copayments for specific high-value services.

14. **M. Chernew, et al. 2008. Impact of Decreasing Copayments on Medication Adherence within a Disease Management Environment. Health Affairs 27(1): 103–112.** http://www.sph.umich.edu/vbidcenter/registry/pdfs/impact_of_decreasing_copayments.pdf (accessed 10/31/13).

This pre-post study assessed the effect of the Pitney Bowes V-BID program on adherence to high-value prescription drug medications. The V-BID program reduced copayments for five therapeutic medication classes: (1) angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs), (2) beta-blockers, (3) diabetes medications (including oral therapies and insulin), (4) cholesterol-lowering statins), and (5) inhaled corticosteroids (steroids). Enrollees also had the option of participating in a disease management program. The researchers compared the Pitney Bowes data to a second large employer that offered the same disease management program but did not reduce prescription drug copays.

Key Findings: Pitney Bowes enrollees showed a statistically significant increase in adherence to drugs within four of the five medication classes—ACE inhibitors, beta-blockers, diabetes drugs, and statins. The researchers concluded that decreased cost-sharing increases adherence to high-value medications, which can lead to improved health outcomes.

15. **J. Farley, et al. 2012. Medication Adherence Changes Following Value-based Insurance Design.** ***The American Journal of Managed Care*** **18(5): 265–274.** http://www.ajmc.com/publications/issue/2012/2012-5-vol18-n5/Medication-Adherence-Changes-Following-Value-Based-Insurance-Design (accessed 10/31/13).

This pre-post, quasi-experimental design study examined whether a V-BID program improved medication adherence for eight therapeutic drug classes for diabetes, hypertension, hyperlipidemia, and congestive heart failure treatments. In 2008, Blue

Cross Blue Shield of North Carolina instituted a V-BID program that waived generic copayments and reduced brand-name medication copayments for drugs in those classes for 74,748 enrollees.

Key Findings: Researchers found that the V-BID plan was associated with improved medication adherence within two years of implementation (ranging from 2.1 percent to 3.2 percent). Adherence improvements were greatest among enrollees with the lowest adherence rates prior to V-BID implementation.

16. **T. Gibson, et al. 2011. A Value-Based Insurance Design Program at a Large Company Boosted Medication Adherence for Employees with Chronic Illnesses. *Health Affairs* 30(1): 109–117.**

This three-year retrospective, pre-post study assessed how a V-BID program that reduced cost-sharing for asthma, hypertension and diabetes drugs affected the use of those medications and related medical services. The intervention (i.e., V-BID) group included 25,065 enrollees in Pitney Bowes' self-insured plan. The comparison group included 50,130 enrollees in firms that did not implement a V-BID program.

Key Findings: Pitney Bowes' prescription drug spending per V-BID enrollee increased at a higher rate than the comparison group. However, Pitney Bowes' combined spending for related medical services and drugs declined, while the comparison group's spending increased. Ultimately, the program was cost neutral.

The aggregate adherence of all medications covered by the V-BID program improved significantly in response to the change. The authors noted that while the V-BID program was cost neutral, more research is needed to conclude whether the program reduces other medical costs.

17. **J. Lee, M. Maciejewski, S. Raju, et al. 2013. Value-based insurance design: quality improvement but no cost savings. *Health Affairs* 32(7): 1251–1257.**

This review examined 13 observational studies that evaluated the effects of V-BID policies. In every study, copayment reductions were applied for chronic disease medications. Eleven of the 13 studies evaluated only medication adherence, and six followed results for only one year after implementation.

Key Findings: All thirteen studies reported an increase in medication adherence with the greatest improvement in adherence for diabetes medications. Improvements in medication adherence were not associated with significant reductions in overall medical spending or total insurer spending. While V-BID may not significantly reduce health care spending in the short term (1–3 years), some V-BID plans improved medication adherence and reduced patients' out of pocket expenses.

18. **A. Fendrick, D. Smith, and M. Chernew. 2010. Applying value-based insurance design to low-value health services. *Health Affairs* 29(11): 2017–21.** http://www.sph.umich.edu/vbidcenter/registry/pdfs/HAApplying%20VBID%20to%20LowValueHealthServices1110.pdf (accessed 10/31/13).

This descriptive article examines V-BID strategies to increase cost sharing for low-value services. The majority of V-BID programs to date have focused on decreasing cost sharing for services with a high clinical value. While cost effective, these services are not necessarily cost-saving. Both increasing the use of effective health care services and decreasing the use of ineffective services could help improve quality and control spending. The authors describe different strategies for designating health care services as "low-value." The "untargeted" strategy increases cost sharing for all services that are not designated high value. The "service-specific" strategy identifies specific low-value services for cost-sharing increases.

19. **N. Shah, J. Naessens, D. Wood, et al. 2011. Mayo Clinic Employees Responded To New Requirements For Cost Sharing By Reducing Possibly Unneeded Health Services Use. Health Affairs 30(11): 2134–41.** http://www.naic.org/documents/committees_b_senior_issues_120110_health_affairs_mayo_clinic_cost-share-study.pdf (accessed 10/31/13).

This pre-post study evaluated the long-term effects of an employer's implementation of a V-BID plan on the use of physician and ancillary services, including imaging and testing. The plan increased cost-sharing for specialty care visits (adding a $25

copayment) and other services such as imaging, testing, and outpatient procedures (adding 10 or 20 percent coinsurance, depending on the health plan option). All cost-sharing was removed for primary care visits and preventive services, such as colorectal screening and mammography.

Key Findings: Researchers found that the V-BID plan reduced diagnostic testing and outpatient procedures, and sustained those reductions for four years. The study also showed an immediate decrease in imaging, though levels of use increased after the first year.

Enrollees decreased visits to specialists, but did not increase the use of primary care services. These results suggest that relatively low increases in cost-sharing can lead to long-term decreases in use of lower-value services but do not increase primary care use.

20. J. Kapowich. 2010. Oregon's Test Of Value-Based Insurance Design in Coverage for State Workers. *Health Affairs* 29(11): 2028–32.

This descriptive article summarizes Oregon's experience incorporating V-BID into public employee benefits. The Oregon Educators Benefit Board and Public Employees Benefit Board, with a combined total enrollment of approximately 283,000 people, both incorporated V-BID into their plans. The boards elected to increase copayments for overused services or services of low relative value. The plans also covered preventive and high-value services, such as screenings and tobacco cessation programs, at low or no cost.

Tiered Pharmeutical Designs

21. H. Huskamp, et al. 2003. The Effect of Incentive-Based Formularies on Prescription-Drug Utilization and Spending. *New England Journal of Medicine* 349(23): 2224–2232. http://www.nejm.org/doi/full/10.1056/NEJMsa030954#t=articleDiscussion (accessed 10/31/13).

This study assessed the impact of changes to two employers' drug formulary administrations on prescription drug use and spending. One employer switched from a one-tier to a three-tier formulary and increased copayments for medications in all three tiers. The second employer switched from a two-tier to a three-tier formulary and increased only the copayments for tier-three drugs. Claims data was analyzed from each plan, comparing utilization of three drugs—ACE inhibitors, proton-pump inhibitors, and statins—and spending with those in comparison groups covered by the same insurers.

Key Findings: Results showed that when cost-sharing is increased for the lowest-tier drugs, adherence goes down and costs increase to employees. When cost-sharing is increased for the highest-tier drugs, employees were more likely to move to lower-tier drugs, but it had no effect on adherence. The authors concluded that changes in copayments can substantially shift out-of-pocket spending to enrollees and adversely affect medication adherence.

22. K. Fairman, et al. (2003). Retrospective, long-term follow-up study of the effect of a three-tier prescription drug copayment system on pharmaceutical and other medical utilization and costs. *Clinical Therapeutics* 25(12): 3147–3161.

This quasi-experimental, pre-post study examined the effect of switching from a two-tier to a three-tier drug design on cost and pharmaceutical and medical utilization. Claims data from 3,577 commercially insured, PPO enrollees was analyzed, with a comparison group of 4,132 members.

Key Findings: Switching from a two-tier to a three-tier drug design reduced the growth in net employer costs (primarily due to increased copayments) and lowered utilization of non-formulary (tier-three) medications at a greater rate than the comparison group. There was no difference in use of services (office visits, emergency department visits, or inpatient hospitalizations) in either group.

23. D. Goldman, G. Joyce, G., and Y. Zheng. 2007. Prescription Drug Cost Sharing: Associations with Medication and Medical Utilization and Spending and Health. *Journal of the American Medical Association* 298(1): 61–69. http://jama.jamanetwork.com/article.aspx?articleid=207805 (accessed 10/31/13).

This study examined published research about the effect of cost-sharing on the use of prescription drugs, related medical services and health outcomes. The authors identified 132 studies that assessed various types of prescription drug design, including tiered benefit designs, from a pool of 923 articles.

Key Findings: Researchers found that increased cost-sharing is associated with worse adherence among existing users, and more frequent discontinuation of medications. For each 10 percent increase in cost sharing, prescription drug spending decreased between 2 percent and 6 percent. For some chronic conditions, such as congestive heart failure or diabetes, higher cost-sharing was associated with increased use of medical services and worsening health outcomes. The authors concluded that the challenge for health insurance payers is to make patients more aware of the cost of treatment without encouraging them to forego cost-effective care.

24. K. Nair, P. Wolfe, et al. 2003. Effects of a 3-tier pharmacy benefit design on the prescription purchasing behavior of individuals with chronic disease. *Journal of Managed Care Pharmacy* 9(2): 123–133.

This pre-post, quasi-experimental study evaluated the impact on medication use by moving from a two-tier pharmacy benefit to three-tier on medication use. Enrollees (8,132) with chronic diseases were classified into three groups, only one of which increased the number of tiers. Pharmacy claims data was used to analyze medication compliance, generic drug use and discontinuation rates.

Key Findings: The study showed that shifting enrollees from a two-tier formulary to a three-tier formulary increased compliance rates as well as generic use rates. The intervention group was more likely to discontinue non-formulary (tier-3) medications than the two comparison groups. These findings indicate that shifting enrollees from a two-tier formulary to a three-tier formulary increases compliance rates and potentially reduces employer costs.

25. B. Motheral and K. Fairman. 2001. Effect of a three-tier prescription copay on pharmaceutical and other medical utilization. *Medical Care* 39(12): 1293–1304.

This pre-post, quasi-experimental study examined the effect of a three-tiered pharmacy benefit on pharmaceutical utilization and expenditures, and use of other medical resources. The intervention group included 6,881 PPO enrollees with a two-tier pharmacy benefit that changed to a three-tier benefit and increased copayments for all tiers. A comparison group included 13,279 enrollees who remained in the PPO's two-tier benefit.

Key Findings: Results indicated that the intervention group experienced slower increase in employer prescription drug costs, relative to the comparison group. Member out-of-pocket costs increased by 50 percent, compared to 16 percent in the control; and employers' net costs increased by 3 percent, compared to 24 percent in the comparison group. There were no significant differences in rates of physician office visits, inpatient, or emergency room use. This study indicated that three-tiered drug formularies can control employer drug costs without adversely affecting other health services, but increase out-of-pocket costs for enrollees.

26. D. Taira, K. Wong, F. Frech-Tamas, and R. Chung. 2006. Copayment level and compliance with antihypertensive medication: analysis and policy implications for managed care. *American Journal of Managed Care* 12(11): 678–683. http://www.ajmc.com/publications/issue/2006/2006-11-vol12-n11/Nov06-2388p678-683/ (accessed 10/31/13).

This retrospective observational analysis study measured the impact of medication copayment levels on compliance with antihypertensive medications. Claims data for 114,232 enrollees diagnosed with high blood pressure from a large managed-care organization was analyzed.

Key Findings: The analysis showed that compliance was lower for drugs in less preferred (and more expensive) tiers. Medication compliance decreased more for higher copay ($20-$165) drugs than for lower copay ($5–$20) drugs. The greatest compliance was identified for angiotensin receptor blockers, followed by calcium channel blockers, beta-blockers, ACE inhibitors, and thiazide diuretics. The authors suggest that cost-sharing affects medication adherence and that potential impact on compliance should be considered when making pricing decisions.