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Benefit Designs for High Cost Medical Conditions

Milliman

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PREFACE

This paper provides an actuarial view of high cost patients and how their incurred medical costs are allocated between the health plan and the member. The authors chose to define high cost or catastrophic patients as those who incur over $100,000 in allowed medical claim costs in a year, although other amounts could be used for this purpose. For a typical commercially insured population, members who incur this amount in a 12 month period account for approximately 0.2% of the population. We compare benefit designs that provide generous and less generous coverage for these high cost patients and present the cost burden high cost patients incur under less generous coverage as well as actuarially equivalent benefit design changes that can protect high cost patients. The backdrop to this analysis is the on-going healthcare cost crisis and healthcare reform. Of course, health insurance programs can have very high aggregate costs without any high cost patients, but this paper focuses on issues associated with high cost individuals.

Less generous coverage means the patient pays more for care or when the cost is unaffordable may forgo medical care. There is a significant body of literature that reports the price elasticity of medical service utilization. Studies overwhelmingly report reduced utilization when cost sharing is increased, and many studies report a negative impact on clinical outcomes.[1] [2] For high cost patients, less generous coverage can mean tens of thousands of dollars in cost sharing.

Historically, health insurers and employers have varied benefit design to control their medical costs, which is one of several options to control cost. Often, employers simply increase cost sharing to reflect the ever-increasing cost of benefits. Typical cost controls attempt to discourage unnecessary utilization of medical services. For example, if an emergency room (ER) copay and an office visit (OV) copay are both $25, some people will run to an ER for routine care rather than calling a physician to schedule an OV. However, if the ER copay is $150 instead of $25, fewer people will go to the ER. More recently there has been a movement to adjust copays to promote compliance with quality therapies and decrease utilization of medically unnecessary or discretionary services. This approach, typically referred to as value based benefit design (VBBD), often involves reducing or eliminating copays for chronic disease drug therapy to improve compliance. The enormous complexity and variability of benefit designs means that specialist actuaries or underwriters are needed to compare the inherent "value" of different designs and approaches.

In this paper, we consider less common and much more expensive situations than the choice between an ER and OV or between a $15 and $30 copay – we consider the cost issues associated with high cost patients and benefits that do not limit out-of pocket (OOP) expenditures. For example, 20% coinsurance on an annual care expenditure of $250,000 would translate to a $50,000 OOP cost sharing, which would be unaffordable for most individuals. For our analysis, we used a very large database of adjudicated claims generated by commercially insured programs. We used a one calendar year "snapshot" of data.

Health benefits have evolved into a mix of insurance and health promotion. The health promotion aspects, such as wellness, generous coverage for preventive services, and selection of Centers of Excellence, have often been prominently publicized by both employers and insurers. The insurance aspects, including protection against catastrophic costs, are often under appreciated, partly because relatively few people face catastrophic costs. The authors hope this paper will shed light on the value that the "traditional" protection of insurance brings.

This paper was commissioned by Genentech, Inc., which discovers, manufactures, and commercializes biotechnology products. The paper reflects the research of the authors. It should not be considered an endorsement of any policy or product by Milliman, Inc. Medical therapy, especially biotechnology, is a rapidly changing field, and readers should note that this paper may not reflect current therapeutic considerations. The figures presented here are, unless otherwise noted, national averages developed from historical databases. Because of the variability in healthcare and health benefits, these figures may not be appropriate for particular organizations or particular purposes.

EXECUTIVE SUMMARY

Benefit designs often do provide protection against catastrophic costs through OOP limits. OOP limits come in a variety of designs -- sometimes the limit is per person, sometimes it accumulates across a family. In some designs, certain costs are not in the limit. This complexity makes it hard to report simple "typical" coverage.

The 2009 Kaiser Family Foundation Employer Health Benefits Annual Survey (survey of 2000 firms representing 3.4 million workers) reports a wide variation in OOP limits among those who have benefits with such limits. According to the survey, 81% of covered workers have an OOP maximum. For those with an OOP maximum, 24% have a maximum less than $1500 and 26% have a maximum of $3000 or greater.[3] The National Blue Cross and Blue Shield Service Benefit Plan (administered by regional Blues plans) for the Federal Employees Health Benefits Programs reports having a $5,000 OOP limit under a Basic Option and a $7,000 OOP limit under a Standard Option.[4] According to the Patient Protection and Affordable Care Act (PPACA), policies that will be sold through the new Exchanges must have OOP limits, and those limits are set by regulation.[5]

Some benefit designs provided by employers or insurers do not contain OOP limits, or the OOP limits do not apply to certain kinds of services. For example, a plan without OOP limits may have a $500 deductible and then pay 80% of allowed cost. A catastrophic case, such as a liver transplant, could cost $250,000. In this case, the patient would be expected to pay about $50,000 OOP. Such high cost cases are, fortunately, rare. We show that, actuarially, increasing the deductible from $500 to $750 would allow the plan to include an OOP limit of $5,950, which is summarized in Figure 1. In the body of this report, we provide examples of actuarial equivalent benefit design adjustments that protect members from catastrophic cost sharing without increasing the cost to payers/employers. Figure 1 highlights an alternative, actuarially equivalent choice for benefit design for a plan without OOP limits. As described in the body of the report, when we say two benefit designs are "actuarially equivalent," we mean the expected cost to the payer/employer for the two benefit designs are the same.

FIGURE 1: INCREASING THE DEDUCTIBLE CAN PAY FOR AN OOP LIMIT

	ORIGINAL DESIGN WITH NO OUT OF POCKET LIMIT	ACTUARIAL EQUIVALENT DESIGN WITH OUT OF POCKET LIMIT
ANNUAL DEDUCTIBLE	$500	$750
COINSURANCE	80%	80%
ANNUAL OOP LIMIT	NO LIMIT	$5,950
PMPM COST TO EMPLOYER	$254	$254

PMPM = per member per month.

Health plans can use many cost control techniques beyond benefit design – beyond copays, coinsurance, deductibles, etc. Techniques that are often used include prior authorization and concurrent review of services to determine medical necessity, restricting coverage to in network providers, enhanced primary care delivery with specialty referral restriction, case management, disease management and wellness programs.

We emphasize that benefit design changes do not have to discourage these other cost control techniques. Healthcare reform through the PPACA has limited or banned other cost control techniques known as medical underwriting, such as non-coverage of pre-existing conditions. This paper does not address in detail any of these other techniques.

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A PAYER VIEW OF HIGH COST PATIENTS IN EMPLOYEE HEALTH BENEFITS PLANS

There is no standard definition for what constitutes a "high cost" patient. A payer's attention to a particular high cost case depends on whether the cost is one-time or recurring, whether some elements of the cost could be avoided, and their management philosophy. Payers may consider different time periods in evaluating a particular case's costs – for example, costs over an episode of care or costs during the calendar year. We chose to define high cost or catastrophic patients as those who incur over $100,000 in allowed medical claim costs in a year, although other amounts could be used for this purpose. For a typical commercially insured population, members who incur this amount in a 12 month period account for approximately 0.2% of the population. Our methodology is described in Appendix B, which contains important details that affect how this information should be applied.

Figure 2 and 3 present average costs a payer/employer incurs during a 12 month benefit period for members with particular conditions/medical events. Except for maternity, the average per person allowed cost reflects the average cost across all members having events or being diagnosed with a condition at various dates throughout the year and thus is a mixture of partial and complete treatment expenses for a given event/condition. For example, average per person allowed costs for stroke patients includes patients suffering a stroke in January with 11 months of follow up care costs and patients suffering a stroke in December with only one month of treatment costs. We present this view of average costs as opposed to episode of care costs to illustrate the annual payer/employer incurred cost exposure and the member cost sharing exposure. The maternity delivery example in Figure 2 is for the complete episode.

Figure 2 shows the costs of some relatively "routine" cases that most plan managers would not consider high cost or catastrophic. (Of course, some of these "routine" cases could be life-threatening or have much higher costs than the averages shown below.)

FIGURE 2: EXAMPLES OF EVENTS/CONDITION THAT ARE NOT USUALLY CONSIDERED HIGH COST OR CATASTROPHIC

"ROUTINE" EVENTS OR CONDITION	AVERAGE PER PERSON ALLOWED COST DURING YEAR OF EVENT/CONDITION
MATERNITY DELIVERY, C-SECTION, COMPREHENSIVE CARE FOR THE PREGNANCY AND DELIVERY	<$9,000
CARDIAC REVASCULARIZATION (CABG, PTCA WITH AND WITHOUT STENT) –COST IN YEAR OF REVASCULARIZATION	$72,000
STROKE -COST IN YEAR OF STROKE	$61,000
CANCER PATIENTS NOT RECEIVING CHEMOTHERAPY OR CANCER SURGERY (APPROXIMATELY 40% OF CANCER PATIENTS IN A YEAR). ANNUAL COST	$14,000

Milliman analysis of Medstat 2008 trended to 2010 cost levels. Maternity costs reflect a complete episode of pregnancy and delivery care costs. Other event costs reflect allowed costs in year of event.

Figure 3 has examples of cases that would often be considered high cost or catastrophic. The examples given are the average medical costs for affected patients over the calendar year of the event/condition.

FIGURE 3: EXAMPLES OF EVENTS/CONDITIONS THAT WOULD OFTEN BE CONSIDERED HIGH COST OR CATASTROPHIC

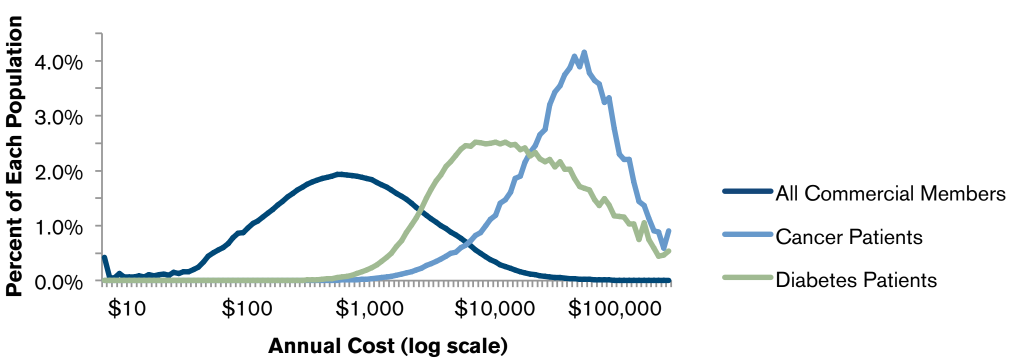
HIGH COST OR CATASTROPHIC CONDITIONS	AVERAGE ANNUAL ALLOWED COST DURING YEAR OF EVENT/CONDITION
END STAGE RENAL DISEASE	$173,000
CANCER PATIENTS RECEIVING CHEMOTHERAPY AND CANCER SURGERY (APPROXIMATELY 15% OF CANCER PATIENTS ANNUALLY)	$123,000
NEONATE WITH EXTREME PROBLEMS	$101,000

Milliman analysis of Medstat 2008 trended to 2010 cost levels. Costs reflect all allowed claims during the year of event/condition.

Figures 2 and 3 report two different kinds of cancer patients with very different costs: those not receiving chemotherapy or cancer surgery in a given year incur on average $14,000 annually, and those receiving both chemotherapy and cancer surgery in a given year incur on average $123,000 annually. The average cost across all cancer patients is approximately $49,000 annually, which indicates that the majority of cancer patients are not considered catastrophic.

Of course, few members fall into catastrophic cost levels and most members have relatively low costs. Because health plan financial accounting occurs on a 12-month basis, costs for individuals are typically tabulated for the 12 months of the plan year, and deductibles, annual maximums, and OOP limits accumulate for the plan year. Figure 4 shows the distribution of patients by their annual cost for the total commercially insured population, all diabetics and all cancer patients (with and without active treatment). For diabetics, the curve is shifted to the right relative to the curve for all commercial members, which reflects the tendency for diabetics to incur higher costs than the average member. For cancer patients, the curve is shifted even farther to the right.

FIGURE 4: PROBABILITY DISTRIBUTION OF ANNUAL COSTS FOR ALL MEMBERS, DIABETICS AND PEOPLE WITH CANCER



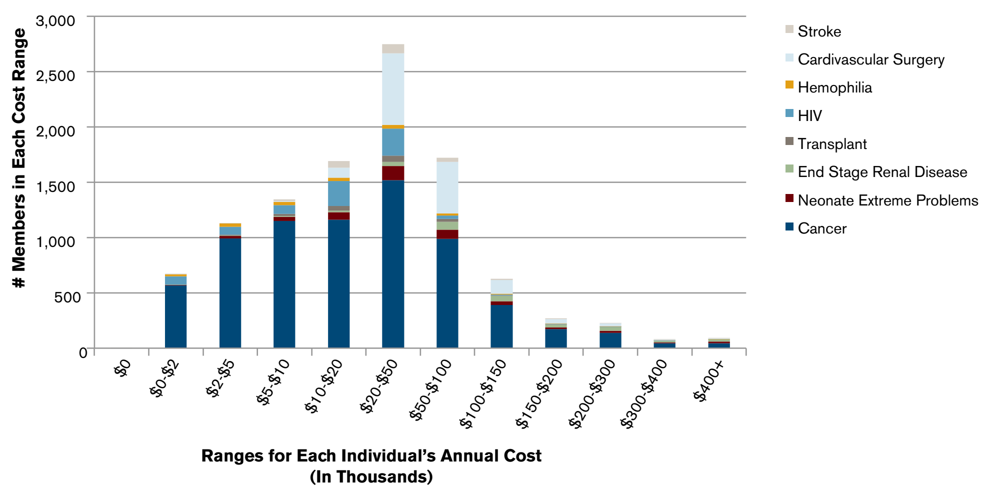
Diabetes and cancer patients are patients being actively treated or monitored based on claims coding. Source: MedStat 2008, adjusted to MillimanHCG 2009 Standard Commercial Demographics.

Annual Snapshot of High Cost Patients

To provide perspective on the distribution of costs particular high cost populations incur during a 12 month benefit period, we identified members with 8 catastrophic conditions (stroke, cardiovascular surgery, hemophilia, HIV, transplant, ESRD, neonate extreme problems, cancer) in 2008 Medstat data. Considering the annual benefit period view we are using, many individuals suffering a catastrophic medical event/condition will not necessarily incur catastrophic costs in the initial year but could incur high costs in the subsequent year, depending on the timing of the event/condition. The methodology for identification of these conditions appears in Appendix B.

The prevalence of these conditions is 1.06%. The x-axis of figure 5 provides ranges of total annual health care costs (including pharmacy), and each member with one of the selected conditions is assigned to a cost bracket according to his or her annual costs. Approximately 6% of this cohort of high cost members falls into the >$100,000 cost range, and the most common cost range for these patients is $20,000-$50,000. Some of these high cost event/condition members will incur the same or higher costs in subsequent years while others may have much lower costs. Across a population, a very large payer/employer will likely incur similar average costs for these populations each year. Individual members may incur catastrophic cost sharing under benefit designs that are not sensitive to high cost patients.

FIGURE 5: DISTRIBUTION OF MEMBERS WITH SPECIFIED EVENTS/DISEASE BY RANGE OF ANNUAL SPEND



Source: MedStat 2008, Adjusted to Milliman HCG 2009 Standard Commercial Demographics, trended to 2010. Annual spend includes all costs incurred during the year of the event/condition.

Burden of Cost Sharing for High Cost Patients

Figure 6 shows the cost sharing burden incurred by high-cost patients with and without an OOP limit where the plan scenario with OOP limits is actuarially equivalent to the plan scenario with no OOP limits. We have distributed members with annual incurred costs of $50,000 and greater into cost ranges and show the annual cost sharing incurred by members in each range based on our Medstat analysis. For a population of 100,000 members, 631 or 0.6% of the population incurs total allowed costs $50,000 or greater. The cost burden per patient was calculated by applying the simple benefit designs shown to the actual annual costs we identified in Medstat.

Under Plan A (20% cost sharing), members who incur $200,000-$299,000 in annual costs and have no OOP limit will incur about $49,000 in member cost sharing. Implementing an OOP limit, for example, of $5950 (specified in the Patient Protection and Affordable Care Act for Exchange plans) would require an increase in all members' annual deductible from $500 to $750 to make the plans actuarially equivalent to each other, which means the expected costs for the payer is the same. For each plan, the added benefit of the OOP limit is "paid for" by increasing the deductible. Savings for high cost members are paid by the non-high cost members.

In Plan B, adding an OOP limit of $5950 will increase the annual deductible for each member from $1000 to $1075. A $75 increase in each member's deductible will protect members who experience catastrophic events/conditions from tens of thousands of dollars in cost sharing.

FIGURE 6: BENEFIT ALTERNATIVES: ANNUAL PER PERSON OOP COST FOR SIMPLE BENEFIT DESIGNS

ANNUAL COST RANGE	# OF PEOPLE OUT OF 100,000 MEMBERS	20% COST SHARING		10% COST SHARING	
		AFTER $500 DEDUCTIBLE WITH NO OOP LIMIT PLAN A	AFTER $750 DEDUCTIBLE WITH A $5,950 OOP LIMIT PLAN A'	AFTER $1000 DEDUCTIBLE WITH NO OOP LIMIT PLAN B	AFTER $1,075 DEDUCTIBLE WITH A $5,950 OOP LIMIT PLAN B'
$50,000-$99,999	421	$14,000	$5,950	$8,000	$5,950
$100,000-$149,999	106	$25,000	$5,950	$13,000	$5,950
$150,000-$199,999	42	$35,000	$5,950	$18,000	$5,950
$200,000-$299,999	35	$49,000	$5,950	$25,000	$5,950
$300,000-$399,999	13	$69,000	$5,950	$35,000	$5,950
$400,000+	14	$125,000	$5,950	$63,000	$5,950

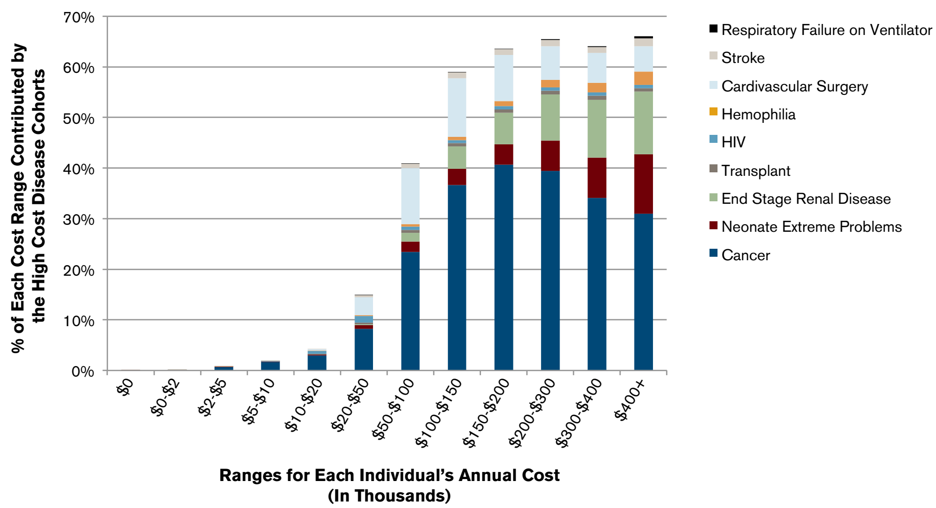
Source: Milliman analysis of Medstat 2008 trended to 2010 cost levels.

Figure 6 is a simplification in that it does not consider that some of the people would not have incurred the high costs (deciding to forgo the high costs) if they had to pay the OOP costs shown. For many people, the smallest amounts in the above chart would be unaffordable and may affect treatment decisions. The degree of burden depends on income. In 2008, the median household income was about $52,000, while the mean income was about $71,000.[7] The high cost of medical care combined with limited insurance coverage or no insurance coverage has caused medical problems to become a major contributor to family bankruptcy.[8]

Who Are the High Cost Patients

Among high cost patients, some events/conditions are more common than others – and some events/conditions are rarely seen among low cost patients. Figure 7 shows the distribution into annual cost ranges of commercially insured members with 9 events/conditions that are considered high cost. The bars represent the portion of the total cost in each annual cost range that is contributed by members with each of the 9 events/conditions. These 9 events/conditions account for slightly more than 40% of patients who fall into the $50,000 to $100,000 range and account for 59% to 66% of the members in the $100,000 and greater annual cost range. Cancer patients make up a significant portion of each of the higher cost ranges. See appendix B for event/condition identification logic.

FIGURE 7: WHICH DISEASES ACCOUNT FOR THE HIGH COST PATIENTS?

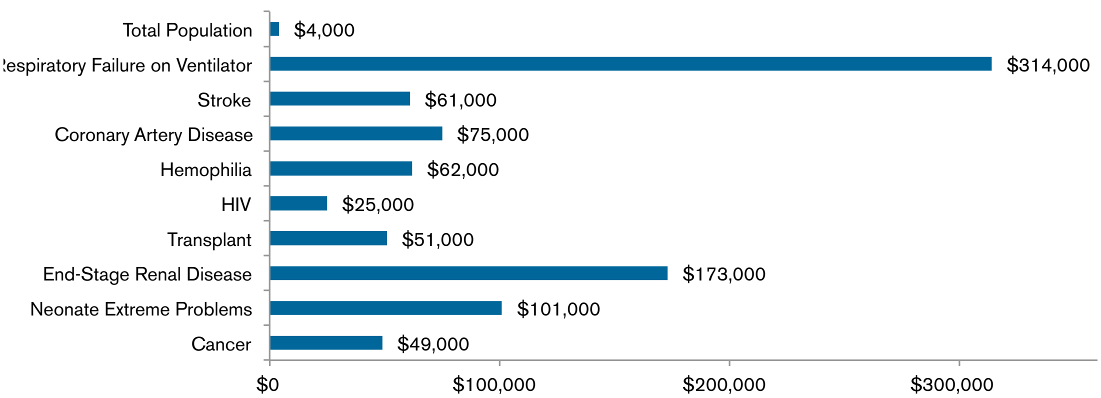


Source: MedStat 2008 adjusted to Milliman HCG 2009 Standard Commercial Demographics, trended to 2010. Annual spend includes costs incurred during the year of the event/condition

The average annual cost for people with the 9 conditions varies dramatically by condition, as shown in Figure 8. Again, the average per person allowed cost reflects the average cost across all members having events or being diagnosed with a condition at various dates throughout the year and thus is a mixture of partial and complete treatment expenses for a given event/condition. Although the episode of care cost for a heart transplant could exceed $200,000, the average annual cost in Figure 8 includes a distribution of transplant types (kidney being the most frequent) with a distribution of index dates contributing to the average annual $51,000 transplant cost. Subsets of these populations such as heart transplant patients or cancer patients receiving chemotherapy (22% of the cancer population) would have significantly higher average per patient annual costs.

The average annual per capita cost for the total population (rounded to $4000) is shown for comparison. All figures are rounded to the nearest $1,000. People with these events or conditions are at high risk for catastrophic OOP costs under benefit designs that are not sensitive to high cost patients.

FIGURE 8: AVERAGE ANNUAL COST OF PERSONS WITH EVENT/CONDITION



Costs in year of treatment or event. Cancer patients are all cancer patients including those with monitoring only and those with active therapy including chemotherapy, radiation, surgery. Source: MedStat 2008 adjusted to Milliman HCG 2009 Standard Commercial Demographics, trended to 2010.

Cancer Patients: A High Cost Population

In this section, we present average costs across all kinds of cancers and all kinds of patients. Not all patients will receive all of the services shown.

High cost patients, on average, use a different mix of services than lower cost patients. Figure 9 shows that inpatient care dominates costs for patients with high annual costs. For cancer patients, shown in Figure 10, inpatient costs don't contribute as much to total costs. For cancer patients, inpatient spending reaches about 75% of cost for the highest cost patients. By contrast, in Figure 9, for all members, inpatient costs reach about 85% of cost for the highest cost patients. In both Figures 9 and 10, the percentages of the inpatient, outpatient and pharmacy costs, within each annual cost per member range, total to 100%.

FIGURE 9

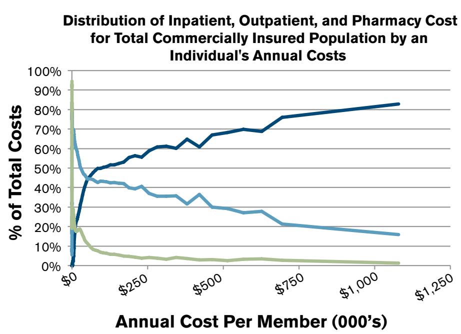
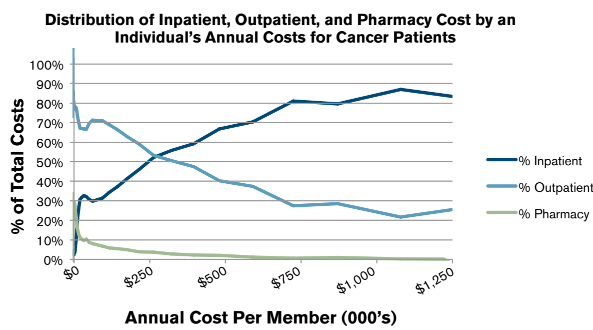


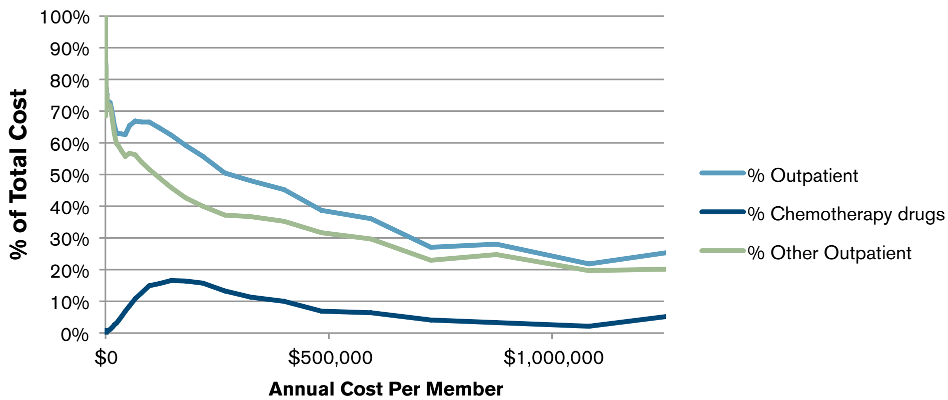
FIGURE 10



Source: Milliman Analysis of Medstat 2007, Milliman Health Cost Guidelines 2009. All costs are for calendar year 2007. Cancer patients are all cancer patients including those receiving only monitoring and those receiving active treatment. Pharmacy costs are those covered under the prescription benefit and include oral chemotherapy

Figure 11 provides the portion of total outpatient costs contributed by chemotherapy drug costs. Our Medstat analysis identified that 22% of a cancer population in a given year will be receiving chemotherapy, which is most commonly administered by infusion in an outpatient setting – either a physician office or hospital outpatient facility. Although the drug cost of chemotherapy contributes a significant portion to the total cost of cancer patients receiving chemotherapy, it is much less significant when considered as a portion of total outpatient spend across all cancer patients (those on and not on chemotherapy).

FIGURE 11: OUTPATIENT COSTS FOR CANCER PATIENTS SPLIT INTO CHEMOTHERAPY PHARMACY COST AND OTHER OUTPATIENT COST

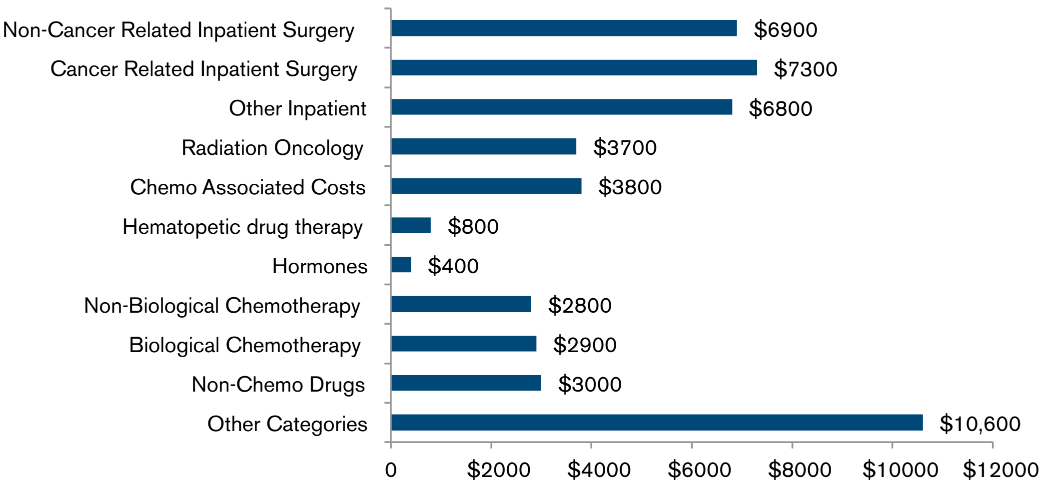


Source: Milliman Analysis of Medstat 2007, adjusted to Milliman HCG 2009 Standard Commercial Demographics. All costs are for calendar year 2007. Cancer patients are all cancer patients including those receiving only monitoring and those receiving active treatment.

Contribution of Surgery, Radiation Therapy and Biotechnology to Cancer Treatment Costs

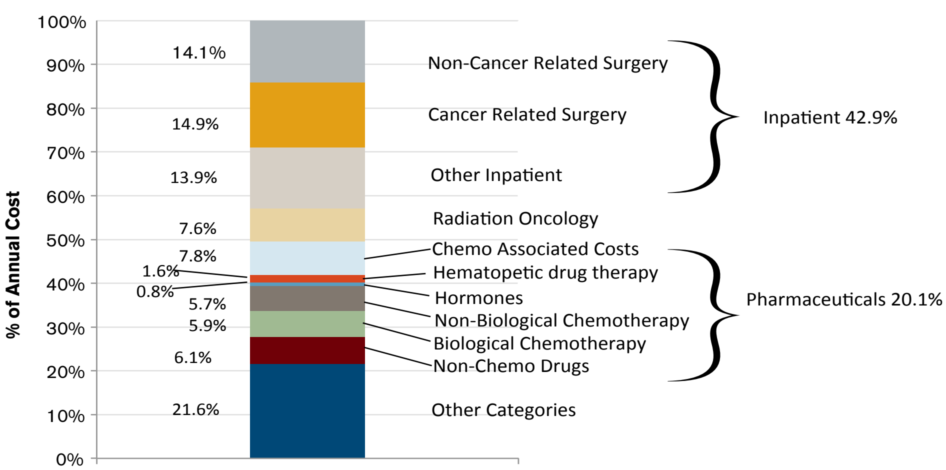
Figures 12 and 13 show the distribution of the $49,000 average annual per cancer patient cost by major cancer related and non cancer related categories. Cancer related surgery, radiation oncology therapy and chemotherapy contribute significantly to cancer costs. The cost components reflect the distribution of annual costs for cancer patients on active treatment with chemotherapy, surgery and radiation as well as for cancer patients with monitoring only.

FIGURE 12: ANNUAL COST PER CANCER PATIENT



Costs trended to 2010. Cancer patients are all cancer patients including those receiving only monitoring and those receiving active treatment. Individual patients may have higher or lower costs than the averages shown. Individual patients undergoing/not undergoing active treatment are likely to have higher/lower average costs than the figures shown. Not all patients will receive all categories shown. "Other categories" includes outpatient surgery, radiology, laboratory, physician visits etc. See appendix B for methodology. Adjusted to Milliman HCG 2009 Standard Commercial Demographics. Source: MedStat 2008.

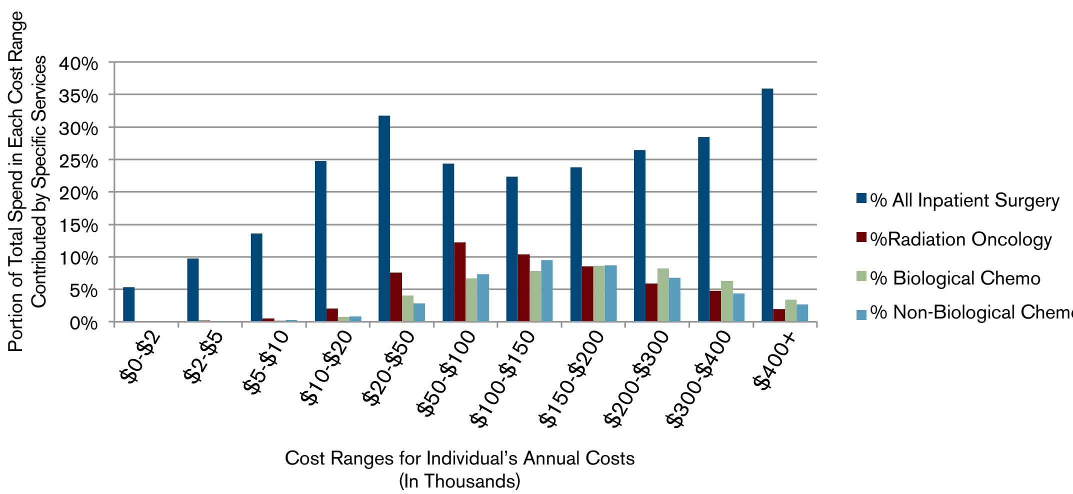
FIGURE 13: DISTRIBUTION OF COST FOR CANCER PATIENTS



Costs trended to 2010. Cancer patients are all cancer patients including those receiving only monitoring and those receiving active treatment. Individual patients may have higher or lower costs than the averages shown. Individual patients undergoing/not undergoing active treatment are likely to have higher/lower average costs than the figures shown. Not all patients will receive all categories shown. "Other categories" includes outpatient surgery, radiology, laboratory, physician visits etc. See appendix B for methodology. Adjusted to Milliman HCG 2009 Standard Commercial Demographics. Source: MedStat 2008.

Figure 14 provides a look at the contribution of several cost drivers by cancer patients' annual cost range expenditure. Surgery (including facility and professional services) contributes over 15% for all but the lowest cost range. Biological chemotherapy contributes less than 6% of costs in all cost ranges, while non-biological chemotherapy contributes less than11% of costs in all ranges.

FIGURE 14: % OF INPATIENT SURGERY, RADIATION ONCOLOGY, BIOLOGICAL CHEMOTHERAPY, AND NON-BIOLOGICAL CHEMOTHERAPY COST IN TOTAL ANNUAL COST FOR EACH COST CATEGORY

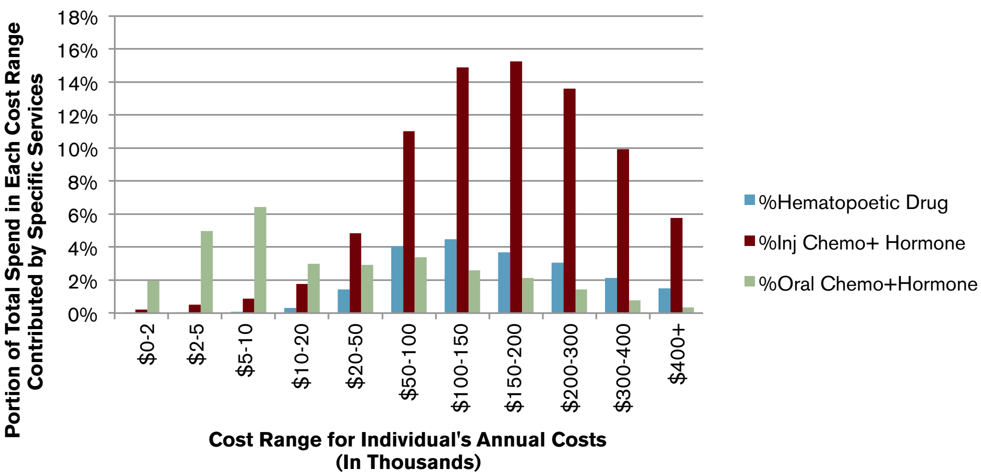


Cancer patients are all cancer patients including those receiving only monitoring and those receiving active treatment. Adjusted to Milliman HCG 2009 Standard Commercial Demographics. Source: MedStat 2008.

Some services that cancer patients use help manage the side effects of cancer treatment, rather than treat the cancer itself. Cancer patients may receive hematopoetic drugs, which can help restore blood cell functions after chemotherapy has damaged white or red blood cells. In Figure 15, we examine in further detail the portion of spending due to hematopoetic drugs and also show chemotherapy drugs split between injected/infused and oral. We note that recent therapy changes have likely reduced the use of hematopoetic drugs in more recent years.

Approximately 21% of chemotherapy costs are incurred under the pharmacy benefit, which points to the need for catastrophic cost sharing sensitivity for both the pharmacy and medical benefit. With OOP limits that apply to the medical benefit only, a cancer patient on oral chemotherapy covered under the pharmacy benefit may face high cost sharing.

FIGURE 15: CONTRIBUTION OF HEMATOPOETIC DRUGS, ORAL CHEMOTHERAPY AND INJECTABLE CHEMOTHERAPY TO TOTAL ANNUAL COST FOR EACH COST BRACKET

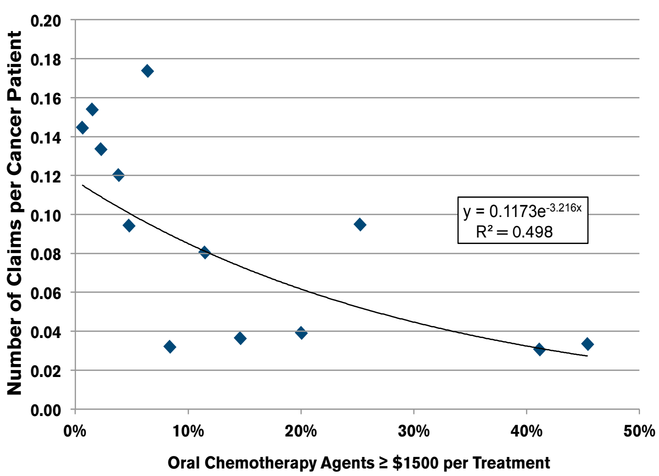


Adjusted to Milliman HCG 2009 Standard Commercial Demographics. Source: MedStat 2008 Cancer patients are all cancer patients including those receiving only monitoring and those receiving active treatment

Higher OOP costs reduce the use of medical services and products, and this has been shown for high-cost pharmaceuticals.[9] Figure 16 below, which is based on examination of the medical claims of thousands of cancer patients, shows this for high cost oral chemotherapy agents, but the dynamic applies across all medical services.[10]

The diamonds in Figure 16 correspond to different plan designs, each diamond representing a distinct percent cost share for oral chemotherapy drugs. The chart shows an inverse relationship between the percent cost sharing, and number of claims per patient. In other words, higher percent cost sharing leads to fewer claims per patient for oral chemotherapy. The formula in the chart shows the elasticity function fitted to the data points.

FIGURE 16: RELATIONSHIP BETWEEN % COST SHARE OR ORAL CYTOTOXIC RX AND NUMBER OF ORAL CYTOTOXIC CLAIMS PER CANCER PATIENT AGE 20-69



N = 24,474 cancer patients spread among 13 cost-sharing categories. Source: Milliman's analysis of MedStat Commercial 2007, 2008Q1-3 and Milliman proprietary data from 2007. Oral chemotherapy category does not include hormonal therapies. The box shows the formula for the best fit of a typical elasticity curve.

BENEFIT DESIGN CONSIDERATIONS FOR EMPLOYERS

Many health benefit designs that do not provide OOP limits could be adjusted to provide coverage for high cost patients on an actuarially-equivalent basis by making relatively minor changes in plan design. Because of the huge variety of plan design details, we choose some relatively simple designs to illustrate the point.

Considering high cost claims also requires a discussion of stoploss insurance, sometimes termed reinsurance. This is because only very large employers have enough covered members so that the number of high cost claims is fairly predictable. For example, in the under-65 population, the number of organ/tissue transplants is about 208 per 1 million people – or about 2 per 10,000.[11] Just through random fluctuation, an employer covering 10,000 members might easily experience 4 transplants in a year. That fluctuation for a group of 10,000 members is usually easily absorbed; two transplants in a self-insured plan with 100 members could cause the plan to become insolvent. Stoploss insurance offers protection for that adverse fluctuation, and we describe some relevant stoploss issues in this section.

Actuarial Equivalence

The concept of actuarial equivalent benefit designs is widely used in the insurance industry and is used by Medicare to regulate Medicare Part D benefit designs. The basic concept is that if two different benefit designs yield about the same expected cost for the payer, then they are “actuarially equivalent” for the payer Two actuarially equivalent benefit designs can cost payers the same, but provide very different coverage of high cost patients. Benefit designs are considered actuarially equivalent if, across a broad population, the expected average costs are the same. Of course, many factors that affect health cost and utilization are unpredictable, so actuarial equivalence is not a precise statement.

In Figure 17, we illustrate triplets of benefit plans that are actuarially equivalent. We first show plans (A through F) that do not have OOP limits. Below that we show similar, actuarially equivalent plans (A’ through F’ and A” through F”) that contain OOP limits. In each case, we compensate for the extra cost of the OOP limit by adjusting other plan features, such as the deductible. For the first set of actuarial equivalents (A’ through F’), we chose an OOP limit of $5,950, which corresponds to the OOP limits mentioned in PPACA for exchange-sold policies. In the second set of actuarial equivalents (A” through F”), we chose an OOP limit of $3,000.

All of the plan designs in the above table are very basic and uncomplicated; typical benefit designs have much more complex structures with cost sharing that varies by service provider (higher copays for specialists, lower for primary care) or by network (lower cost sharing for in-network providers). Often plans have deductibles that apply across all members of the family. We do show 3 designs with integrated drug benefits (where drug costs are subject to the same cost sharing as any other service) and 3 designs where the drug benefits are “carved out” with their own copays. For each design, we show the PMPM (per member per month) cost of medical care – the average per-capita monthly cost – across a typical population. The PMPM cost does not include administrative cost.

For each of the designs, (A’–F’ and A”–F”) we added the OOP Limit and adjusted the annual deductible. The actuarial equivalence is demonstrated by plans that have the same PMPM cost. A, A’ and A” each cost $254 PMPM, etc.

Size and Stoploss Considerations and Adverse Selections

The above examples illustrate “actuarial equivalence.” On average, a payer can afford to pay more for rare and catastrophic care, if it pays slightly less for more common, but less expensive services. However, for situations involving voluntary small employer groups or individual policies, it is not this simple.

Actuarial equivalence is determined across large populations, and the term “equivalence” may overstate the precision with which actuaries practice in the real world. When it comes to small groups of insured lives, the random occurrence of a rare event can have a great impact. For example, among a small group of people, one person can suffer catastrophic costs – and those costs can impose a cost hardship on the entire small group. Actuarial equivalence, and the cross-subsidies that can cover catastrophic costs, require additional mechanisms to operate successfully among small groups of people.

FIGURE 17: TRIPLETS OF 6 PLAN DESIGNS: ORIGINAL AND TWO SETS OF ACTUARIAL EQUIVALENTS

6 PLAN DESIGNS WITHOUT OUT OF POCKET LIMITS

	PLAN DESIGNS WITHOUT OOP LIMITS					
	A	B	C	D	E	F
ANNUAL DEDUCTIBLE	$500	$1,000	$500	$500	$1,000	$500
IP DEDUCTIBLE PER DAY	N/A	N/A	$200	N/A	N/A	$200
OV COPAYS	N/A	N/A	$25	N/A	N/A	$25
COINSURANCE	80%	90%	90%	80%	90%	90%
RX DESIGN	INTEGRATED	INTEGRATED	INTEGRATED	$10/$25/$40	$10/$25/20%	$10/$25/$100
PMPM COST	$254	$261	$268	$253	$255	$253

1ST SET OF ACTUARIAL EQUIVALENT PLAN DESIGNS WITH OUT OF POCKET LIMITS

	REVISED PLAN DESIGNS WITH $5,950 OOP LIMITS					
	A'	B'	C'	D'	E'	F '
ANNUAL DEDUCTIBLE	$750	$1,075	$725	$825	$1,150	$900
OOP LIMIT	$5,950	$5,950	$5,950	$5,950	$5,950	$5,950
IP DEDUCTIBLE PER DAY	N/A	N/A	$200	N/A	N/A	$200
OV COPAYS	N/A	N/A	$25	N/A	N/A	$25
COINSURANCE	80%	90%	90%	80%	90%	90%
RX DESIGN	INTEGRATED	INTEGRATED	INTEGRATED	$10/$25/$40	$10/$25/20%	$10/$25/$100
PMPM COST	$254	$261	$268	$253	$255	$253

2ND SET OF ACTUARIAL EQUIVALENT PLAN DESIGNS WITH OUT OF POCKET LIMITS

	REVISED PLAN DESIGNS WITH $3,000 OOP LIMITS					
	A"	B"	C"	D"	E"	F"
ANNUAL DEDUCTIBLE	$975	$1,150	$925	$1,125	$1,325	$1,425
OOP LIMIT	$3,000	$3,000	$3,0000	$3,000	$3,000	$3,000
IP DEDUCTIBLE PER DAY	N/A	N/A	$200	N/A	N/A	$200
OV COPAYS	N/A	N/A	$25	N/A	N/A	$25
COINSURANCE	80%	90%	90%	80%	90%	90%
RX DESIGN	INTEGRATED	INTEGRATED	INTEGRATED	$10/$25/$40	$10/$25/20%	$10/$25/$100
PMPM COST	$254	$261	$268	$253	$255	$253

OOP Limit = out of pocket limit; IP = inpatient; OV = office visit. PMPM = per member per month.

Insurance adjusts for catastrophic risks through pooling and other techniques. For example, a group of 50 covered individuals might incur about $200,000 in health insurance claims in one year. The unlikely event of one organ transplant in that small group could cause the total cost to double. By contrast, a group of 5,000 covered individuals might incur $20 million in claims in one year. That same organ transplant in a larger group would add only 1% of incremental cost. Consequently, insurance programs use pooling, stoploss and other techniques to spread the risk of unlikely catastrophic events.

For the actuarial equivalence described in this paper to be practical, a group must have enough people so that the "contributions" of slightly higher cost sharing by many people accumulate to equal the extra cost of OOP coverage for a very few people. Furthermore, the accumulation needs to work over a relatively short time period, perhaps 1 year. In practice, there are relatively few self-insured groups with fewer than 50 employees. Insurers can make actuarial equivalence work in small groups by pooling together many small groups. There is no simple answer to the minimum group size for the actuarial equivalents discussed in this paper.

To manage the catastrophic costs, with or without the OOP coverage, self-insured employers buy medical stoploss coverage, which pays for certain costs above a threshold. Most stoploss insurance pays for the "excess" costs incurred by an individual in a year – for the costs above a specified amount, say $100,000. The dynamics of medical stoploss insurance is complex and beyond the scope of this paper.[12] The stoploss insurer will likely consider the cost of OOP coverage in its premium. Employers often obtain the advice of benefits professionals to strike their balance among benefit design decisions, costs, administrative issues and stoploss. For a self-insured employer sponsored program, decisions are also determined by the willingness of the employer to assume the risk that the program may cost more than expected.

Adverse selection occurs when individuals or groups make benefit selections based on their individual healthcare needs. Therefore, healthy people are more likely to go without insurance or chose less expensive insurance. Individuals with particular illnesses are likely to choose plans that provide more generous coverage specific to their ailments and, as a result, these individuals can concentrate in some plans.

Adverse selection also affects benefit design. If a payer offers policies with and without OOP limits, people who expect to need expensive treatments will tend to choose the equivalent plan with the OOP limits. Conversely, people who expect to have relatively low costs will tend to choose the plans with the smaller deductibles but no OOP limits. The cross-subsidy that the OOP limit plans uses to fund the rare, catastrophic cases will not work well with such adverse selection.

Because a disproportionate share of expensive individuals can inflate a payer's cost, adverse selection is a real concern in benefit design. However, these issues are not new. Insurers have relied on methods such as limiting alternative options, pooling, reinsurance, benefit mandates, underwriting and other techniques to address these challenges. Actuarial literature offers additional insight, and it appears as though plans sold through Exchanges will have OOP limits.

Recommendations for Payers

We suggest that payers consider the following issues in choosing benefit designs:

1. The compatibility of benefit designs with high cost cases. Does the benefit design provide appropriate protection for potential high-cost cases, with consideration of the income/wealth of the covered members and the goals of the benefit program?

2. Benefit trade-offs. The benefit design needs to balance catastrophic coverage, coverage of more routine, low-cost services, coverage of "in-between" services and cost. Some benefit designs have moved toward more comprehensive coverage of low-cost preventive services while balancing those costs with increasing cost sharing for other services. Where does catastrophic coverage fit in that balance? Coverage of preventive care and catastrophic coverage are both prominent in healthcare reform.

3. Managing cost. The benefit plan will benefit no one if it becomes insolvent or unaffordable. Weak medical management, expensive networks, and inappropriate use of high-cost interventions are some of the obvious ways costs can run out of control. Managing risks of fluctuation and selection require attention to issues such as stoploss and the design of multiple option programs.

4. Managing adverse selection. Running an effective employee benefits program goes far beyond the basics of cost sharing and coverage. Benefit managers need to consider whether the design of the different options available to members can lead to escalating costs if low-cost or high-cost people concentrate in certain options. Avoiding this risk may mean keeping the actuarial value of benefit options fairly close.

5. Managing fluctuation risk. Self-insured programs typically buy stoploss to protect the program sponsor from high cost claims. Stoploss can be important to maintain program solvency and budgets, but, as with traditional health coverage, stoploss insurance costs have increased dramatically over the past two decades. Prudent purchasing of stoploss, including consideration of multiyear rate options, can help the employer protect itself, especially when the benefits provide comprehensive coverage of high cost claims.

APPENDIX A: DESCRIPTION OF KEY DATA SOURCES AND THEIR APPLICATION

Medstat claims data. This dataset contains all paid claims generated by approximately 28 million commercially insured lives. The Medstat database represents the inpatient and outpatient healthcare service use of individuals nationwide who are covered by the benefit plans of large employers, health plans, government, and public organizations. The Medstat database links paid claims and encounter data to detailed patient information across sites and types of providers, and over time. The annual medical database includes private sector health data from approximately 100 payers. For this study, we used MedStat 2007-2008.

Milliman's 2009 and 2010 Health Cost Guidelines. The Guidelines provide a flexible but consistent basis for the determination of health claim costs and premium rates for a wide variety of health plans. The Guidelines are developed as a result of Milliman's continuing research on healthcare costs. First developed in 1954, the Guidelines have been updated and expanded annually since that time. The Guidelines are continually monitored as they are used in measuring the experience or evaluating the rates of health plans, and as they are compared to other data sources.

Milliman Medical Index (MMI). The MMI examines key components of medical spending and the changes in these components over time. The MMI incorporates proprietary Milliman studies to determine representative provider-reimbursement levels over time, as well as other reliable sources, including the Kaiser Family Foundation/Health Research and Educational Trust 2008, *Annual Employer Health Benefit Survey* (Kaiser/HRET), to assess changes in health plan benefit levels by year. The MMI includes the cost of services paid under an employer health-benefit program, as well as costs paid by employees in the form of deductibles, coinsurance, and copayments. The MMI represents the total cost of payments to healthcare providers, the most significant component of health insurance program costs, and excludes the non-medical administrative component of health plan premiums. The MMI includes detail by provider type (e.g., hospitals, physicians, and pharmacies), for utilization, negotiated charges, and per capita costs, as well as how much of these costs are absorbed by employees in the form of cost sharing. We used the annual MMI cost trends to trend the MedStat cost data to 2010 dollars.

APPENDIX B: METHODOLOGY FOR ACTUARIAL ANALYSIS

Choice of Benefit Design

The 6 benefit designs shown, A thru F, represent a range of possible designs. For simplicity, we chose very basic designs, with cost sharing applied uniformly across most benefits. Most benefit designs have much more complicated features, with cost sharing varying by type of provider (primary care or specialist), site of service, or in-network compared to out-of-network.

The OOP limit shown in the actuarial equivalent plans, A' thru F', was set equal to $5,950, which is, in 2010, the OOP limit set for qualifying Health Savings Accounts (HSAs). The Patient Protection and Accountable Care Act references the HSA limits for policies sold through Exchanges, with lower limits for individuals with low income.

Costs

The unit price (price per service) and utilization used in the actuarial analysis are national averages consistent with the Milliman Medical Index.[13] Unit prices reflect average negotiated allowed amounts. We note that there is considerable regional variation in both unit price and utilization, as well as variation among different payers within regions. For particular groups, benefits costs will vary with health status and demographics. Consequently, a payer wanting to apply the concepts in this paper will need to perform careful analysis to understand their particular situation.

Modeling

To determine actuarial equivalents, we used the 2010 Milliman *Health Cost Guidelines*, which is a proprietary modeling tool that includes relationships among benefit design, utilization, unit price and population costs.

Because of the interrelationship between price levels, utilization and population cost, the impact of pre-set OOP limits will differ in low and high cost areas. The actuarial equivalent benefit designs presented in this report assume national averages; equivalent designs may differ from those shown in this report if the underlying costs or utilization are not national average.

Claim Identification Methodology

We used Medstat 2007 and 2008 for this analysis. From the Medstat starting population we selected the members with drug coverage, removed members in HMOs or capitated PPOs, and included members whose primary beneficiary had full time or other/unknown status, with age <70. Our analysis data set contained about 14 million lives.

For the high cost condition analysis we identified individuals for each of 9 high cost disease patient cohorts using the following coding logic. For individuals coded with more than one of these diseases, we used the order of the listing below to establish a hierarchy and assign individuals to one disease cohort only.

HIGH COST DISEASES
CANCER
NEONATE EXTREME PROBLEMS
ESRD
TRANSPLANT
HIV
HEMOPHILIA
CARDIAC SURGERY
STROKE
RESPIRATORY FAILURE ON VENTILATOR

Cancer: one inpatient or emergency room claim or two physician E&M claims on separate days with one of the following ICD-9 codes in any position of the claim.

CANCER
ICD-9 140.XX THROUGH 172.XX
ICD-9 174.XX THROUGH 208.9X

PHYSICIAN E&M CODES
99201-99205, 99211-99215, 99217-99220, 99241-99245, 99304-99337, 99341-99350, 99381-99387, 99341-99350, 99381-88387, 99391-99397, 99401-99404, 99411, 99412, 99420, 99429, 99455, 99456, 99499

Biologic and non biologic chemotherapy: one or more claims with a chemotherapy J code or NDC code (list provided upon request). We did not include individuals who were on hormone therapy only but did include those with claims for hormones along with non-hormone chemotherapy claims.

Neonate with Extreme Problems: One or more Inpatient claims with the following DRGs,

NEONATE WITH EXTREME PROBLEM
MS DRG 790
MS DRG 791

ESRD: One or more claims with one of the following codes in any position of the claim.

ESRD
ICD9 PROCEDURE CODES OR CPT CODES
39.95
54.98
90919
90920
90921
90923
90924
90925
90935
90937
90939
90940
90945
90947
90989
90993
90997
90999
99512

Transplant: One or more inpatient claims with one of the following ICD-9 procedure codes,

HEART-LUNG TRANSPLANTS	
33.6	HEART-LUNG TRANSPLANT

INTESTINE TRANSPLANTS- usually one of a multi-organ set of transplants	
46.97	INTESTINE TRANSPLANT

LIVER TRANSPLANTS	
50.51	LIVER TRANSPLANT, AUXILIARY
50.59	LIVER TRANSPLANT, OTHER

KIDNEY TRANSPLANTS	
55.61	KIDNEY TRANSPLANT, AUTOTRANSPLANTATION
55.69	KIDNEY TRANSPLANT, OTHER

PANCREAS TRANSPLANTS	
52.80	PANCREAS TRANSPLANT, UNSPECIFIED
52.81	PANCREAS TRANSPLANT, REIMPLANTATION
52.82	PANCREAS TRANSPLANT, HOMOTRANSPLANT
52.83	PANCREAS TRANSPLANT, HETEROTRANSPLANT
52.84	AUTOTRANSPLANTATION OF ISLETS OF LANGERHANS
52.85	ALLOTRANSPLANTATION OF ISLETS OF LANGERHANS
52.86	TRANSPLANTATION OF ISLETS OF LANGERHANS, UNSPECIFIED

HEART TRANSPLANTS	
37.5	HEART TRANSPLANT PROCEDURE
37.51	HEART TRANSPLANT (NATURAL HEART)
37.52	HEART TRANSPLANT (ARTIFICIAL HEART)
37.53	REPL/REP THORAC UNIT HRT
37.54	REPL/REP OTH TOT HRT SYS

BONE MARROW TRANSPLANTS - SEPARATE BETWEEN AUTOLOGOUS AND ALLOGENEIC	
41.0	BONE MARROW, UNSPECIFIED
41.00	BONE MARROW, UNSPECIFIED
41.01	BONE MARROW, AUTOLOGOUS WITHOUT PURGING
41.02	BONE MARROW, ALLOGENEIC WITH PURGING
41.03	BONE MARROW, ALLOGENEIC WITHOUT PURGING
41.04	HEMATOPOIETIC STEM CELL, AUTOLOGOUS WITHOUT PURGING
41.05	HEMATOPOIETIC STEM CELL, ALLOGENEIC WITHOUT PURGING
41.06	STEM CELL, CORD BLOOD - MOSTLY ALLOGENEIC BASED ON UNOS DATA
41.07	HEMATOPOIETIC STEM CELL, AUTOLOGOUS WITH PURGING
41.08	HEMATOPOIETIC STEM CELL, ALLOGENEIC WITH PURGING
41.09	BONE MARROW, AUTOLOGOUS WITH PURGING

HIV: One or more inpatient or emergency room claims or two outpatient physician evaluation & management claims with one of the following ICD-9 codes in any position of the claim.

HIV ICD9 DIAGNOSIS CODE	DESCRIPTION
042XX	HIV DISEASE
07953	HIV, TYPE 2 [HIV-2]
79571	NONSPECIFIC SEROLOGIC EVIDENCE OF HIV
V08XX	ASYMPTOMATIC HIV INFECTION STATUS

Hemophilia: One or more inpatient or emergency room claim or two outpatient physician evaluation & management claims with one of the following Codes in any position of the claim,

HEMOPHILIA ICD9 DIAGNOSIS CODES	DESCRIPTION
286.0	CONGENITAL FACTOR VIII DISORDER (HEMOPHILIA A)
286.1	CONGENITAL FACTOR IX DISORDER (HEMOPHILIA B)
286.4	VONWILLEBRAND'S DISEASE (ANGIOHEMOPHILIA A,B)
286.5	HEMORRHAGIC DISORDER DUE TO INTRINSIC CIRCULATING ANTICOAGULANTS (INCLUDES SECONDARY HEMOPHILIA)

Additionally, Hemophilia was identified with claims having one or more of the following J codes,

J CODES ASSOCIATED WITH HEMOPHILIA	DESCRIPTION
J2597	INJECTION DESMOPRESSIN ACETATE (DDAVP)
J7190	FACTOR VIII (ANTIHEMOPHILIC FACTOR, HUMAN)
J7191	FACTOR VIII (ANTIHEMOPHILIC FACTOR, PORCINE)
J7192	FACTOR VIII (ANTIHEMOPHILIC FACTOR, RECOMBINANT)
J7193	FACTOR IX (ANTIHEMOPHILIC FACTOR, PURIFIED, NON-RECOMBINANT)
J7194	FACTOR IX COMPLEX
J7195	FACTOR IX (ANTIHEMOPHILIC FACTOR RECOMBINANT)
J7199	HEMOPHILIA CLOTTING FACTOR, NOT OTHERWISE CLASSIFIED

Cardiac Surgery: One or more Inpatient claims with one of the following DRGs.

CARDIAC SURGERY DRGs
DRG 216-264

Stroke: One or more Inpatient claims with one of the following ICD9 codes in the primary position of the claim.

STROKE ICD9 DIAGNOSIS CODES
430
431
432.0 -432.9
433.01
433.11
433.21
433.31
433.81
433.91
434.01
434.11
434.91
436.XX

Respiratory failure: One or more claims with one or more of the following ICD-9 codes in any position of the claim,

ICD9 CODES FOR RESPIRATORY FAILURE	DESCRIPTION
518.83	CHRONIC RESPIRATORY FAILURE
518.84	ACUTE CHRONIC RESPIRATORY FAILURE

And one of the following HCPC or Procedure code, not necessarily in the same claim,

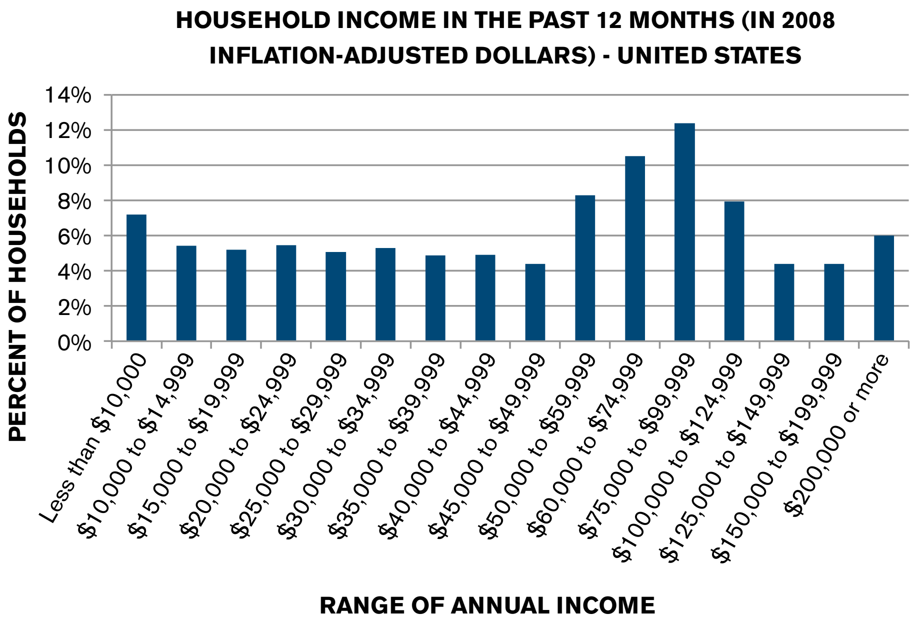
HCPCS VENTILATOR DME SUPPLIES
A4611-A4613
A4483
E0460
E0463
E0450
E0464
E0461
E0450
E0483

VENTILATOR CPT CODES	DESCRIPTION
94002	HOSPITAL IP VENTILATOR MANAGEMENT INITIAL
94003	HOSPITAL IP VENTILATOR MANAGEMENT SUBSEQUENT DAYS
94004	NURSING FACILITY VENTILATOR MANAGEMENT
94005	HOME VENTILATOR MANAGEMENT

Cancer cost categories

We created coding logic to identify cancer related costs including biologic and nonbiologic chemotherapy, chemotherapy associated costs, hormone drug therapy, hematopoetic drug therapy, radiation oncology and inpatient cancer surgery. Coding logic for these service categories is available upon request.

APPENDIX C: DISTRIBUTION OF PRE-TAX HOUSEHOLD



INCOME[14]

MEAN $71,498
MEDIAN $52,029
SOURCE: U.S. CENSUS BUREAU, 2008 AMERICAN COMMUNITY SURVEY

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