



Covering Smoking Cessation as a Health Benefit: A Case for Employers

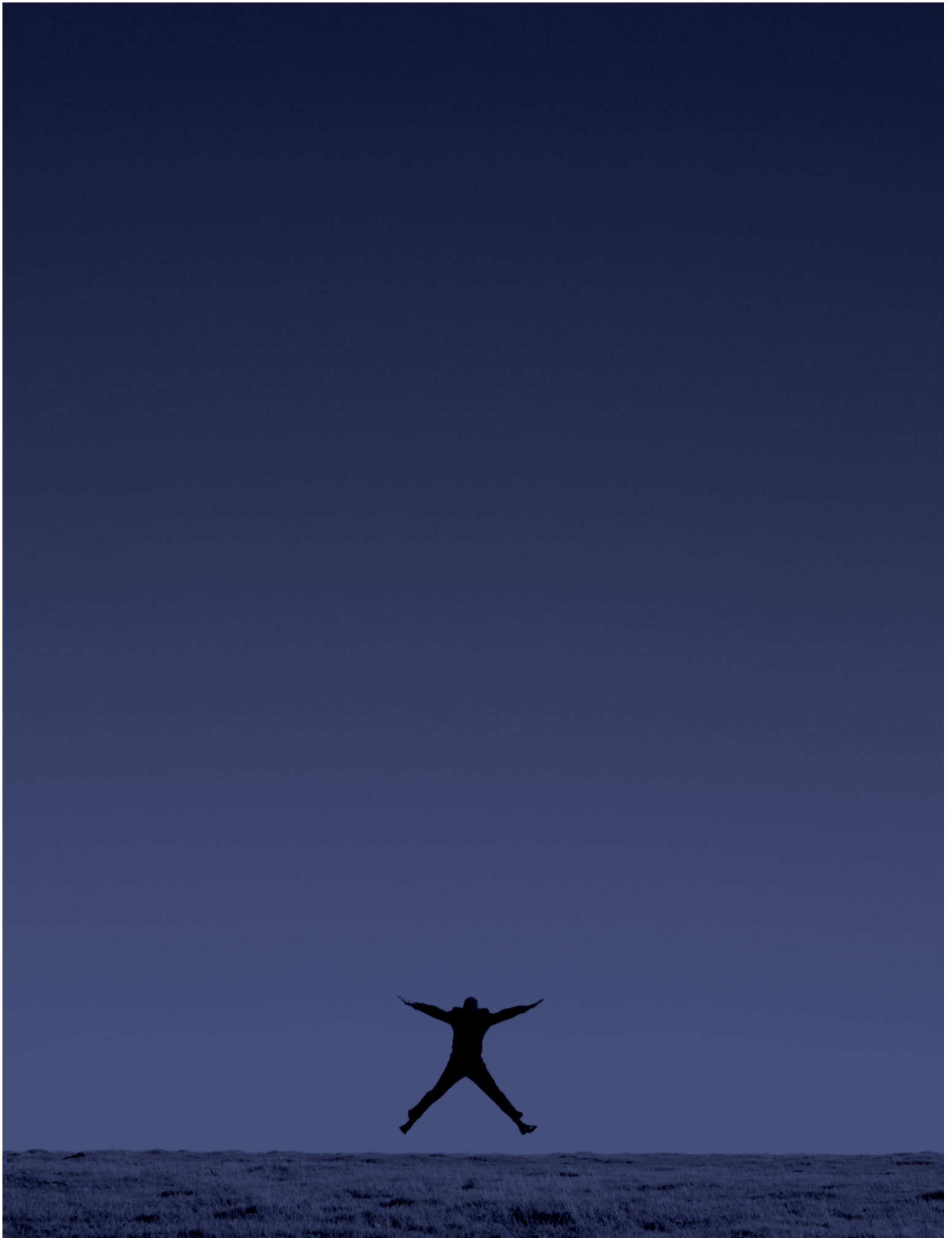


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Covering Smoking Cessation as a Health Benefit: A Case for Employers

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Preface: Smoking and Employers’ Benefits Choices

While the portion of Americans who smoke has dropped from 42.4% in 1965 to 22.5% in 2002¹, smoking is still the leading preventable cause of disease and death in the United States. Smoking adds well over \$165 billion to healthcare and disability costs each year.² If smokers quit, the savings would go a long way to solving today’s healthcare cost crisis. Much of the healthcare savings would accrue directly to smokers’ employers.

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Employers pay for most of the health insurance coverage for workers and their dependents, and they pay for group life insurance coverage. In this report, we demonstrate that employers can quickly realize reduced medical and life insurance costs when employees quit smoking even when the assessment is limited to direct short term health care savings. Smoking cessation programs work, and we show that covering these programs costs employers little.

Smoking is an extremely addictive behavior and quitting is extremely difficult. While 70% of smokers say they want to quit, only five percent quit in a given year. An employer can choose to help increase the proportion who quit successfully by funding smoking cessation programs known to be effective.

This report provides information so employers can make informed choices based on the costs and benefits of smoking cessation programs – and compare these to other routinely provided benefits.

Executive Summary

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We provide current estimates of smoking's short-term cost impact on employer-sponsored health and life insurance benefit programs. We also provide cost estimates for smoking cessation programs. We find that,

- Smoking cessation programs are low cost. A comprehensive and effective smoking cessation program will usually cost less than \$0.50 per member per month (PMPM).
- Each employee or dependent who quits smoking reduces annual medical and life insurance costs by at least \$210 almost immediately.

It is well known that smoking causes cancer, but cancers can take years to develop. Some employers have very short time frames for the value of employee benefits, perhaps as employee turnover rates have increased. Consequently, this report considers only short-term consequences of smoking and does not include cancer. We evaluate the impact of smoking and quitting on four conditions, cited in the Surgeon General's report,⁴ where quitting smoking has short-term benefits:

- Coronary heart disease (CHD) and stroke
- Adult pneumonia
- Low birth weight babies
- Childhood respiratory diseases including asthma, pneumonia, bronchitis and otitis media

Numerous other expensive and serious medical conditions are associated with smoking, and each brings its burden of treatment cost, disability and lost work-time. It is difficult or impossible to accurately measure each of these; **we are confident our approach underestimates the short term benefits of quitting for employers.**

Today, scientific studies prove the effectiveness of smoking cessation programs. The programs' low cost compares favorably with other health benefits that employers routinely fund – including benefits that are more expensive and have less empirical evidence of effectiveness. The low cost and effectiveness of smoking cessation programs, combined with the cost impact of quitting, challenges the legacies of smoking and of employee benefit designs that do not support quitting.

Covering Smoking Cessation as a Health Benefit

This report was commissioned by the American Legacy Foundation. Milliman does not intend to endorse any position or product with this report; this document reports the findings of the authors. As with any economic forecast, changes in technology and local circumstances can render our findings inapplicable to particular employer situations. This report should be read in its entirety because items taken out of context could be misleading.

Numerous other expensive and serious medical conditions are associated with smoking, and each brings its burden of treatment cost, disability and lost work-time.

Background

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Since the first Surgeon General's Report on smoking and health was released in 1964, 27 additional Surgeon General's reports have concluded that tobacco use is the single most avoidable cause of disease, disability and death in the United States. The Center for Disease Control and Prevention reports that smoking causes approximately 440,000 premature deaths in the U.S annually and approximately \$165 billion in annual health-related economic losses during 1997-2001.⁵

The 2004 report, *The Health Consequences of Smoking: A Report of the Surgeon General*,⁶ concluded that evidence is sufficient to infer a causal relationship between smoking and an extensive list of diseases.⁷ The Surgeon General's Report concludes that "quitting smoking has immediate as well as long-term benefits, reducing risks for diseases caused by smoking and improving health in general".⁸ Our work quantifies certain short term benefits that employers can achieve when employees or dependents quit. We also provide cost estimates for a range of different smoking cessation programs. Finally, we bring together the savings and costs to present an integrated economic picture for employer-sponsored health benefit programs.

Findings

This section provides 2006 estimates of the savings to employer-sponsored health benefit programs for people who quit smoking. We studied certain conditions for which research studies⁹ demonstrate a significant reduction in incidence shortly after quitting smoking.

For each individual who quits smoking, the average annual medical and life insurance claims incurred by an employer would decrease by the amounts shown in Table 1 for year one. Costs would decrease further in subsequent years. We are confident that the total medical savings is higher than shown, and including disability and other costs would further increase the potential savings.

Typical administrative charges increase the savings to about \$210 per quitter per year. Table 1 understates the benefits of quitting as this study did not seek to account for numerous other smoking-related conditions or the disability, lost work-time, or replacement costs employers may incur. The CDC estimates that of the \$165 billion health related costs attributable to smoking, \$92 billion are attributed to lost productivity resulting from smoking attributable diseases.¹⁰

Table 1

| Short Term Consequences of Smoking on Selected Conditions | Annual Medical Savings per Smoker Who Quits |
|--|--|
| Coronary Heart Disease & Stroke | \$153 |
| Adult Pneumonia | \$3 |
| Low Birth Weight Babies | \$9 |
| Childhood Asthma | \$14 |
| Other Childhood Respiratory Conditions | \$8 |
| Childhood Otitis Media (ear infections) | \$5 |
| Total Annual | \$192 |

Demographics Of Smokers In An Employer-sponsored Health Benefit Program

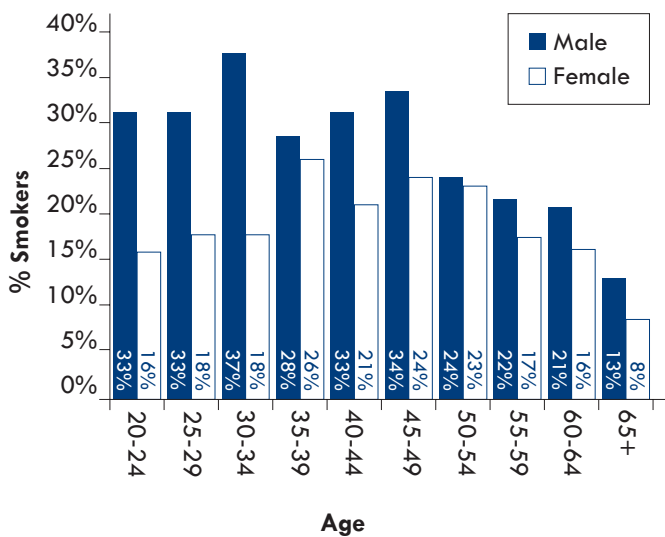
Approximately 22.5% of all adults were smokers in 2002.¹¹ Although smoking has steadily declined since the First Surgeon General's Report in 1964 (from 42.4%), the reduction has recently slowed.¹² The Healthy People 2010 goal of reducing adult smoking prevalence to 12% appears difficult to achieve.

The portion of smokers in the workforce is higher than for all adults. Our analysis of the National Health and Nutrition Examination Survey (NHANES) 1999-2000 data¹³ shows that 25% of a typical working age population (including dependent adults) smoke. Chart 1 shows the portion in each age-sex group that smokes. The prevalence of smoking decreases after age 50, which is thought to reflect the increased prevalence of smoking-related co-morbidities among smokers – and awareness of these co-morbidities by smokers. Chart 2 illustrates the number of smokers by age in a typical employer-sponsored health benefit program with 10,000 employees and 4,721 spouses.

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Chart 1

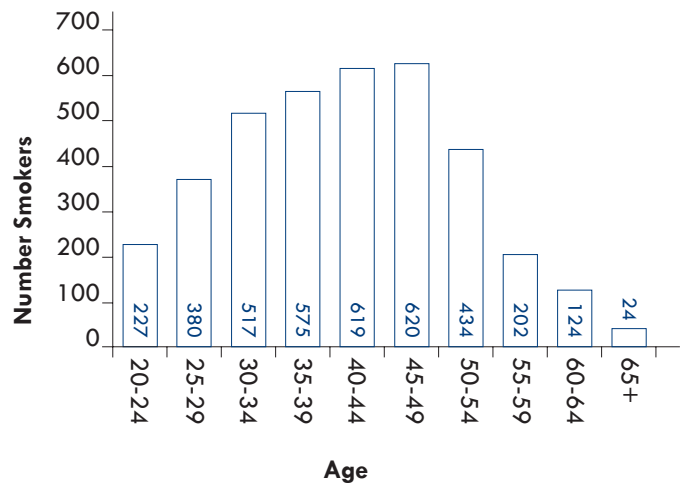
Percentage of Smokers in Each Age Cohort



Source Data: NHANES 1999-2000

Chart 2

Number of Smokers for 10,000 Employees and 4,721 spouses



Source Data: NHANES 1999-2000 adjusted for typical employer demographics using the Milliman Health Cost Guidelines

Comparing The Costs Of Smokers, Ex-smokers And Non-smokers

The conditions we studied are more prevalent among smokers than ex-smokers or never smokers and result in higher medical costs and increased mortality for smokers. Quitting reduces the risk for these conditions, but the reduction and timing varies by condition. For example, the excess risk for childhood respiratory conditions from exposure to household second hand smoke goes away shortly after a parent quits smoking. However, the excess risk for stroke takes 15 years to completely disappear after a smoker quits.

In this section, we show key findings on quitting's impact on a working age population. Our methodology is described in Appendix A.

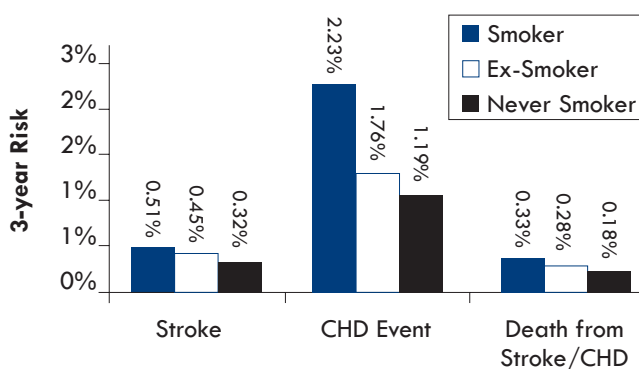
Stroke and Coronary Heart Disease

Smokers have a short-term higher risk of stroke and Coronary Heart Disease (CHD) (including heart attack and coronary revascularization surgery), and that risk decreases dramatically during the ten years after a smoker quits. Chart 3 shows the 3-year risk of CHD and stroke events and deaths for working age smokers, ex-smokers and never-smokers. The figures for ex-smokers are for the 3 years after quitting. During the three years after quitting, an ex-smoker's risk of CHD is reduced by 21%, stroke by 12% and death from these causes by 15%. The higher death rate for smokers increases life insurance costs for large employers under typical life insurance programs.

Although the 3-year risk of a CHD or stroke event is relatively low even for smokers, the costs of such events are high, as shown in Chart 4. Individuals who suffer a CHD or stroke event incur higher costs for several years after the event. In Table I, the \$153 annual savings per quitter associated with CHD and stroke comes from applying the savings associated with reduced CHD and stroke events. This understates the true savings because we do not consider cost savings associated with better cardiovascular health for those quitters who would not have had a CHD or stroke event.

Chart 3

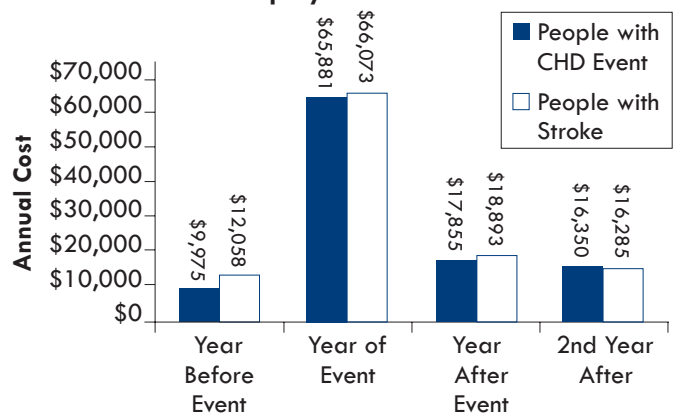
Average 3-year Risk of Stroke, CHD, and Deaths for Smokers, Ex-smokers and Never Smokers For a Typical Employer Demographic Mix



Source Data: NHANES, Framingham Risking, Surgeon General's Report

Chart 4

People with Coronary Heart Disease (CHD) or Stroke Events Add to Employer Costs for Several Years



Source Data: Milliman Actuarial Models using Medstat 2000-2003 data. Costs trended to 2006.

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Adult Pneumonia

Smokers have excess risk of pneumonia. The risk for ex-smokers declines over time and reaches the same level as for never-smokers after 10 years. Chart 5 shows the typical employer PMPM medical costs for pneumonia treatment of smokers, ex-smokers (for the first 3 years after quitting) and never smokers. The longer an individual has stopped smoking, the lower their excess risk of pneumonia. The savings in the first year after quitting is \$3 per quitter as reported in Table I.

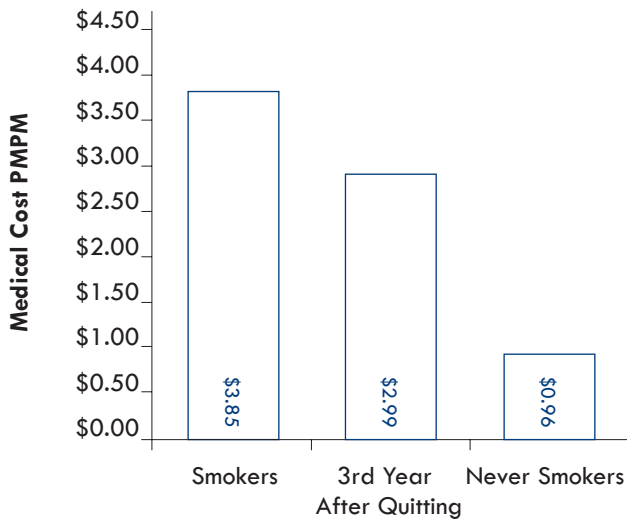
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Low Birth weight Babies

Maternity deliveries are among the most common hospital admissions for health benefit programs. Smoking increases the risk of a woman delivering a low birth weight baby, which can generate very expensive medical care. Chart 6 shows the risk of low birth weight babies for smokers, ex-smokers and non-smokers. Chart 7 illustrates how much more expensive low birth weight babies are.

Chart 5

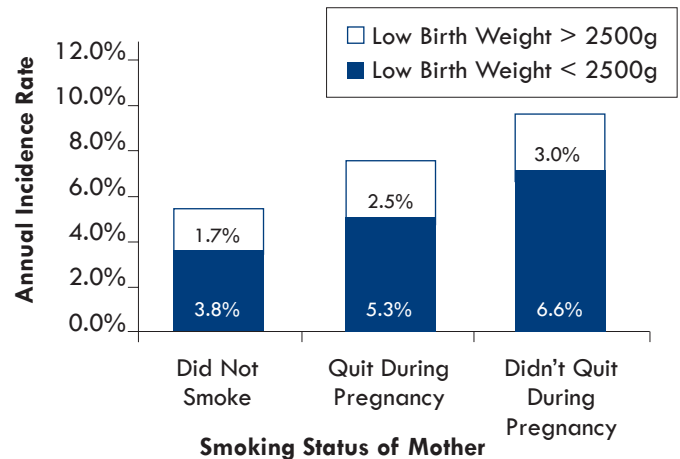
PMPM Cost of Pneumonia for Smokers, Quitters, & Never Smokers



Source Data: Milliman Actuarial Models using Medstat 2000-2003 data. Costs trended to 2006.

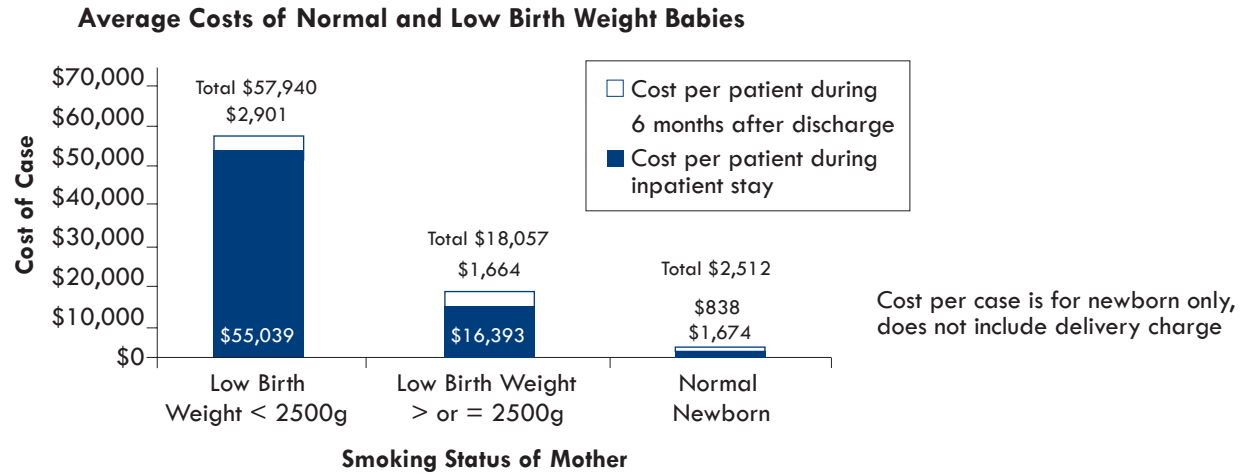
Chart 6

Incidence of Low Birth Weight Based on Smoking Status of Mother



Source: Hueston et. al. A cost benefit analysis of smoking cessation programs during the first trimester of pregnancy for prevention of low birth weight. J Fam Prac. 1994;39:353-357.

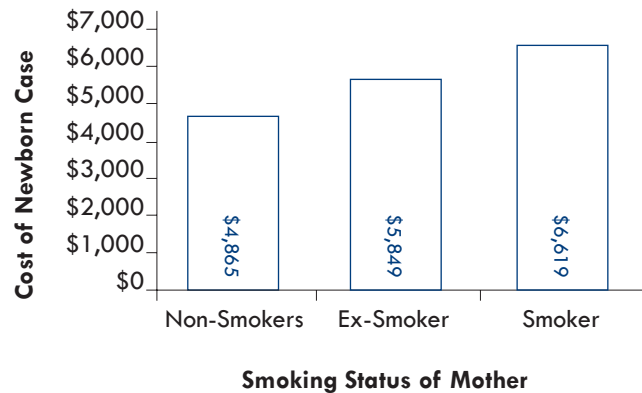
Chart 7



Source: Milliman Actuarial Models using Medstat 2000-2003; Costs trended to 2006

Chart 8

Average Cost of Newborn Case by Smoking Status Based on Smoking Status of Mother



Source: Milliman Actuarial Models using Medstat 2000-2003; Costs trended to 2006

When averaged across deliveries and members, pregnant smokers have more expensive deliveries, as shown in Chart 8. Applying the incidence of deliveries in a working age population and the prevalence of smoking among pregnant mothers, we calculated a \$9 annual savings per smoker who quits as reported in Table I. The savings per pregnant smoker who quits is much higher, but the \$9 shown in Table I is an average across all quitters so that the columns can be added. We assumed that pregnant smokers quit at the same rate as other smokers.

Childhood Respiratory Diseases

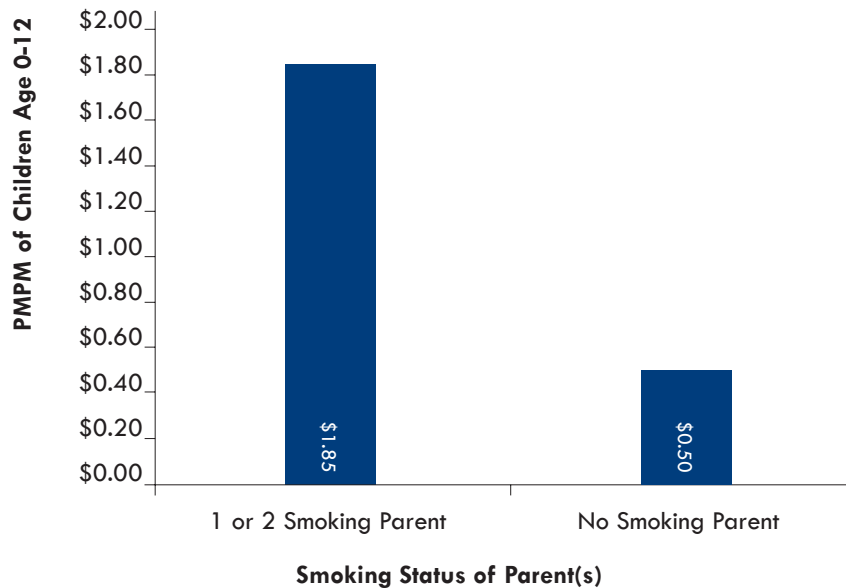
More children (under age 16) have asthma if they live in a household with one or more smoking parent -- and this increases medical costs. Getting parents to quit reduces the prevalence of asthma in their children by about one-third and saves \$14 per quitter annually as reported in Table I.

Children in a household with one or more smoking parent also have higher rates of respiratory conditions including lower respiratory infections, pneumonia, bronchiolitis and bronchitis -- and they generate more hospital inpatient and outpatient treatment for each of these conditions. Chart 9 shows the difference in these costs for children with at least one smoking parent -- and for children with no smoking parents. We assume no reduction if only one of two smoking parents quits. This produces an \$8 annual cost savings per quitter, as shown in Table 1.

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Chart 9

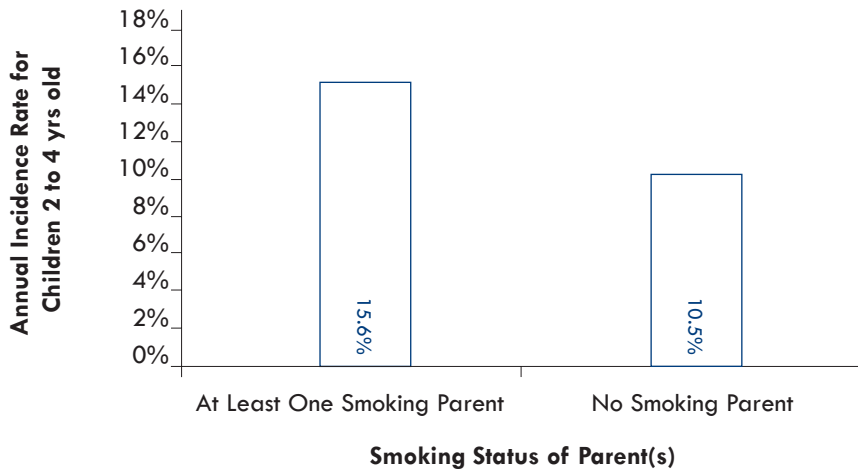
Cost Associated with Lower Respiratory Infections, Pneumonia, Bronchiolitis and Bronchitis (inpatient, outpatient, and ER visits) For 0-12 Years Olds



Source: Milliman Actuarial Models using Medstat 2000-2003; Costs trended to 2006

Chart 10

Incidence of Recurrent Otitis Media Based on Parental Smoking Status



Source: Milliman Actuarial Models using Medstat 2000-2003; Costs trended to 2006

Childhood Otitis Media (ear infection)

Children in a smoking household have a higher incidence of recurrent otitis media. Chart 10 compares incidence for smoking and non-smoking households. Using the costs associated with otitis media and occurrence rates for children of smokers compared to children of non smokers, we calculated a \$5 annual cost savings per quitter.

The Cost And Efficacy Of Smoking Cessation Programs

We developed smoking cessation program costs as dollars per-member-per-month (PMPM), because employers typically pay for health benefit program on this basis.

According to evidence based medical studies¹⁴, effective smoking cessation programs combine the following elements:

- Temporary pharmaceutical support, including nicotine replacement therapy (NRT) and the anti-depressant bupropion.
- Supportive services such as Quitlines, advice sessions and individual or group therapy sessions.

Programs can vary as follows:

- Employee cost sharing for any element of the program
- The kind and duration of pharmaceutical support
- The number of therapy sessions offered

We priced six smoking cessation programs as shown in Table 2. The six are shown starting with the lowest cost and lowest intensity of covered services.

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Table 2

| Program | Pharmaceutical Component | Professional Component |
|------------------------|------------------------------|---|
| Quitline ¹⁵ | None | Self-help booklet and up to 5 telephonic counseling sessions |
| Very Low | 8 weeks NRT | 1 PCP evaluation plus 1 advice session (with social worker or nurse practitioner) |
| Low | 8 weeks NRT and/or bupropion | 1 PCP evaluation, no advice or therapy sessions |
| Moderate | 8 weeks NRT | 1 PCP evaluation plus 1 advice session plus 6 individual/group therapy sessions |
| High | 8 weeks NRT | 1 PCP evaluation with 1 advice session plus 12 individual/group therapy sessions |
| Very High | 8 weeks NRT and bupropion | 1 PCP evaluation with 1 advice session plus 12 individual/group therapy sessions |

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Table 3

| Option | PMPM Program Cost | Portion of Smokers Starting Program* |
|-----------|-------------------|--------------------------------------|
| Quitline | \$0.02 | 3.0% |
| Very Low | \$0.19 | 5.8% |
| Low | \$0.24 | 6.2% |
| Moderate | \$0.28 | 5.8% |
| High | \$0.35 | 5.8% |
| Very High | \$0.45 | 5.8% |

*The difference in starting portion % for the Low option is not significant and reflects slightly lower average cost sharing.

Table 4

| Option | Efficacy of Smoking Cessation Programs ¹⁷ | Program Cost Per Quitter |
|------------------------|--|--------------------------|
| Quitline ¹⁸ | 10% | \$580 |
| Very Low | 16% | \$1,497 |
| Low | 19% | \$1,514 |
| Moderate | 21% | \$1,689 |
| High | 24% | \$1,876 |
| Very High | 31% | \$1,865 |

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We applied typical managed care reimbursement and set cost sharing for each program so each had about 25% effective cost sharing. Using published research¹⁶ that shows how uptake of cessation programs varies with cost sharing (i.e. copays, coinsurance) we estimated the portion of smokers who would enter each program. Table 3 PMPM program costs include a 10% allowance for administrative costs (a 90% loss ratio).

If an employer has a very effective promotion program, the percent uptake and PMPM program cost may be higher than the figures shown above.

Applying quit rates from the literature to the above programs produced the annual program costs per quitter shown in Table 4.

It is well established that smokers lose more time due to illness than non-smokers. Assuming a \$55,000¹⁹ annual average salary for large employers and 250 work days per year produces a daily wage of \$220. The program cost per quitter figures shown above translate into between 3 and 8.5 days of lost wages at this daily rate. Under this model, a quitter could pay for the cost of the program if the replacement cost of his or her sick time were eventually reduced by between 3 and 8.5 days.

However, the valuation of sick time is controversial. Some employers assume that many employees will take most or all of their sick time whether or not they are ill. Many employers are adopting a “Paid Time Off” (PTO) approach to absenteeism where sick time, personal time and vacation are combined under a “use-it-or-lose-it” policy. PTO means that reduced sick time (for ex-smokers or others) will effectively add to the worker’s vacation time and not reduce the employer’s cost. For this reason, we note that while small reductions in lost time could easily pay for smoking cessation, structural issues could mean that savings will not materialize.

The estimated cumulative medical only cost savings per quitter, including administrative expenses are shown in Table 5. We note that for pneumonia, the ex-smoker’s savings increases arithmetically for several years.

For the diseases and years shown, the medical savings do not entirely pay for the expense of the program other than the quitline. Table 4 understates the actual savings because this study did not seek to account for the impact of numerous other smoking related conditions or take into consideration disability, lost work-time, or replacement costs for individuals suffering from the conditions we modeled.

Table 5

| Short Term Medical Savings Per Quitter | | |
|---|--------|---------|
| Cumulative Savings | Year 1 | Year 5 |
| Total Annual Claim Savings | \$192 | \$986 |
| Gross Savings (divide by .90 Loss Ratio)* | \$213 | \$1,096 |

* The .90 loss ratio accounts for administrative costs

Smoking Cessation Programs Cost Little Compared to Other Benefits

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The health benefits that employers offer – or don't offer -- their employees should be management's deliberate decision. Increasingly, corporate benefit managers want some form of "evidence based benefits," where, within a budget, the benefits chosen are ones proven to improve the health of the employees and their dependents. We believe smoking cessation benefits are a good choice for employers who want to support evidence based benefits.

Corporate benefit decisions typically follow the annual insurance renewal cycle. Before renewal, the employers' vendor (HMO, insurer or Third Party Administrator) or actuarial consultant will develop financial forecasts for the coming year. The employer then receives information about the impact of possible changes in benefit designs. For example, if an employer wants to limit its cost increase to 5%, but its annual medical trend rate is 10%, the employer might consider increasing deductibles, copays or coinsurance.

Smoking cessation benefits cost much less than other commonly offered benefits or options. Table 6 below compares the expected cost of a very rich smoking cessation program to costs of other benefit decisions. We note that savings generated by medical management efforts (precertification, inpatient concurrent review, etc.) that decrease inpatient utilization even modestly (5 days per 1,000) can more than pay for a substantial smoking cessation program. Table 6 does not reflect any of the savings we estimated for successful program participants.

Table 6

| Possible Benefit Decision | Cost Impact | Typical PMPM Cost from Milliman Actuarial Analysis Costs Trended to 2006 |
|---------------------------------------|-------------|---|
| Remove Chiropractic Benefits | Savings | \$1.35 to \$4.00 |
| Increase Generic Utilization by 10% | Savings | \$2.65 to \$3.05 |
| Reduce Inpatient Days by 20/1000 | Savings | \$3.60 to \$8.00 |
| Top Quality Smoking Cessation Program | Added Cost | \$ 0.45 |

Potential Benefit Trade-Offs

We built actuarial models to estimate, for a typical employer population, the cost savings of potential benefit changes that could offset the cost of a smoking cessation benefit. The following assumptions were used in our estimates.

Chiropractor

This benefit provides for visits to a licensed chiropractor's office including visits involving manipulations with a \$15 copay per visit. Radiology services are not included. We projected 2006 charges ranging from 100% national average RBRVS (low) to national average charges (high). We projected 2006 utilization for a loosely managed health plan based on the Milliman 2005 *Health Cost Guidelines*.

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Increased Generic Utilization

Increasing the portion of generics generally reduces cost. We assumed a 10% increase in the portion of generic utilization (from about 45% of scripts) for a benefit design with copays of \$10 generic / \$20 on-formulary brand / \$30 off-formulary brand. To produce the range shown we applied typical ranges of prescription utilization and discount.

Reduction of Inpatient Days thru Improved Medical Management

To produce the range shown for reducing 20 inpatient days per 1,000, we developed average charges by trending two different sources to 2006. The high estimate was based on national average per diem charges from the 2005 Milliman *Health Cost Guidelines*, while the low estimate was based on national average allowed per diem cost from the Milliman 2004 *Group Health Insurance Survey*.

What Employers Can Choose to Do

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This section provides guidance to employers on resources and approaches to offering smoking cessation programs. Top management can encourage more people to take advantage of a smoking cessation benefit by championing the program.

Obtaining the Benefit

An employer wanting to bring this benefit to its employees has a variety of options to administer these benefits, including:

- Its existing health benefits carrier or insurer
- Behavioral carve-out companies, Employee Assistance Plans (EAPs) or special wellness programs

Employers that offer a choice of benefit options may find that not all carriers offer a smoking cessation program. In this case, for consistency across plans, an employer may choose to use a carve-out company. A typical employer will want a smoking cessation benefit to begin at the same time as its plan year.

Employer demand for smoking cessation programs is relatively new, and we recommend that employers carefully examine the available prices and program designs. Employee benefits consultants and actuaries can help assess the costs, benefits and potential benefit trade-offs as well as evaluate vendors' bids.

We note that smoking brings a very high burden to pregnant women and people with certain chronic conditions. Consequently, we recommend that employers measure and reward their disease management companies on their success in getting high risk members into smoking cessation programs and quitting.

Increasing Smokers' Premium Contributions

The annual savings shown in Table 1 also reflect the estimated short-term excess costs of smokers who do not quit. As such, these figures provide a basis for charging smokers a higher premium contribution.

Charging smokers higher premiums is well-established for life insurance. However, some jurisdictions may regulate how this can be done for health benefits, so an employer should consult a benefits attorney.

Conclusion and Implications

From health benefits standpoint, smoking seems very much like a disease – it creates the risks and costs that we have quantified in this paper. “Curing” smoking reverses those risks and reduces costs. Smoking cessation programs also fit well with both the layman’s and professional’s view of medical treatment. Evidence based research demonstrates which cessation treatments work best, and the treatments include pharmaceuticals and clinical professionals.

Smoking cessation programs cost little and provide a measurable significant benefit, even when the benefit is measured only in terms of short term direct health care cost savings. The cost of these programs is small when put into the context of employers’ health benefits programs. For benefits decision making, the small cost, along with the medical effectiveness, could easily justify covering smoking cessation programs.

Appendix A: Methodology

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We used a common demographic dataset for all our analyses.

- Using National Health and Nutrition Survey (NHANES) 1999-2000, we identified all smokers >19 years of age; this yielded a sample size of 3,722 individuals.
- We determined the percent of smokers within each quinquennial age-sex band.
- We applied the percent smokers in each age-sex band to a standardized US population distribution reflecting employed workers and their dependents covered through group health insurance programs. This population is from Milliman's 2005 *Health Cost Guidelines*.

All claims estimates were based on data mining of the MedStat MarketScan™ database and projected to 2006.

Stroke and Coronary Heart Disease

To model the impact of smoking cessation on stroke and CHD we took the following steps:

- Using NHANES 1999-2000, we identified all smokers >19 years of age; this yielded a sample size of 3,722 individuals.
- Each smoker was assessed for his or her probability of having a CHD event (heart attack or coronary revascularization) or stroke over 3 years using the Framingham risk methodology for CHD and stroke.^{20 21} For stroke, only those > 50 were risked, and for CHD only those > 35 were risked, as indicated in the Framingham risk methodology.
- Based on the 2004 Surgeon General's Report, we reduced the ex-smoker's probability of stroke by approximately 10% annually: "stroke risk decreases steadily after smoking cessation, becoming indistinguishable in former smokers from that of lifetime nonsmokers after 5-15 years" (p.394)
- Based on the 2004 Surgeon General's Report, we reduced the ex-smoker's probability of a CHD event by 0% year one, 50% year two and 6% year three: "the excess risk of CHD caused by smoking is reduced by about half after 1 year of smoking cessation and then declines gradually. After 15 years of abstinence, the risk of CHD is similar to that of persons who have never smoked" (p.363). We

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note that others have interpreted this quote to mean a 50% reduction in year one and 6% in year two, so our interpretation has this reduction delayed by one year compared to others.

- We calculated the costs incurred during the year of a stroke and CHD event and the 2 years following these events using the Medstat MarketScan™ claims database.
- We modeled the occurrence and cost of CHD and stroke events with and without smoking cessation over a three-year period.
- We applied mortality rates for each of the 3 years following stroke and CHD events reported in the literature²² and modeled the number of deaths that would occur with and without smoking cessation. We attributed mortality expense based on a death benefit of 3 times salary for employees plus replacement cost of 1.2 times salary and applied this to employees only, not all adults (spouses).

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Adult Pneumonia

To model the impact of smoking cessation on adult pneumonia we took the following steps:

- Using Medstat MarketScan™ claims data we identified the incidence and cost of pneumonia among adults treated in three settings: inpatient, emergency room, outpatient
 - Costs for a pneumonia episode treated as an inpatient included claims during hospital stay for a pneumonia episode and all claims occurring 30 days after discharge
 - Costs for pneumonia episode treated in an ER included the costs of the ER visit and all claims occurring 30 days thereafter
 - Costs for pneumonia diagnosed and treated as an outpatient included the initial physician claim and all claims occurring 30 days thereafter
- The incidence in each setting was adjusted by the 4.1 odds ratio for pneumonia incidence of smokers vs. nonsmokers reported in the Surgeon General's Report.²³ The annual reduction was adjusted based on the Surgeon General's Report that "after 10 years of smoking cessation, the risk of invasive pneumococcal disease reaches that of nonsmokers." Table 5 reflects the continuing reduction in risk over the early years after smoking cessation.

Low Birth Weight Babies

To model the impact of smoking cessation on reducing low birth weight (LBW) babies in pregnant women who smoke, we took the following steps:

- Identified costs and distribution of LBW deliveries <2500 grams and >2500 grams

Covering Smoking Cessation as a Health Benefit

and costs of normal newborn hospital stay from Medstat MarketScan™

- Calculated incidence of LBW based on smoking status of mother reported in the literature.²⁴
 - Among non-smokers 5.5%
 - Among smokers who quit 7.8%
 - Among smokers 9.6%
- Calculated the cost savings per pregnant smoker who quit using the following:
 - 2.73% adults are pregnant women from the Milliman 2005 *Health Cost Guidelines*
 - 12% pregnant women continue to smoke during pregnancy.²⁵ Some experts suggest the mechanism for obtaining these figures produces an understatement. If so, we may understate the potential for reducing the number of low birth weight babies and the resulting cost savings.
- Distributed the savings across all quitters to produce results comparable to the savings for other conditions

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Pediatric Asthma

To model the impact of smoking cessation on the incidence of pediatric asthma we took the following steps:

- Using Medstat MarketScan™ claims data we identified the prevalence of asthma in children ages 1-16 (these are the ages most commonly cited in studies on asthma and household smoking)
- Using Medstat MarketScan™ claims data we identified costs associated with asthma including inpatient, outpatient and pharmacy claims
- Using standard demographics of children and parents from the Milliman *Health Cost Guidelines* and smoking prevalence rate of adults by age and sex, we estimated the household smoking prevalence rate (either or both parents smoking) for children.
- Using the odds ratio of 1.37 for prevalence of asthma in children with smoking vs. non smoking households^{26 27} we modeled the reduction in prevalence and savings associated with asthma costs for children with parents who quit smoking. We spread the resulting savings across all quitters to produce results comparable to those for other conditions.

Pediatric Respiratory Conditions

To model the impact of smoking cessation on the incidence of pediatric respiratory

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conditions we took the following steps:

- Using the Medstat MarketScan™ claims data we identified the incidence and cost of inpatient admissions for respiratory conditions including pneumonia, bronchitis and bronchiolitis for children 0-12 years of age (these are the ages most commonly cited in studies on smoking impact on respiratory conditions treated in an inpatient setting).
- Using the Medstat MarketScan™ claims data we identified the incidence and cost of outpatient events for respiratory conditions including pneumonia, bronchitis and bronchiolitis for children 0-4 years of age (these are the ages most commonly cited in studies on smoking impact on respiratory conditions treated in an outpatient setting).
- Using standard demographics of children and parents from the Milliman 2005 *Health Cost Guidelines* we calculated the percent of children per adult and smoking prevalence for adults age 18-50 (this is the age we assumed for parents with children 0-12 years of age)
- Using the odds ratio of 1.71 for prevalence of respiratory events (inpatient and outpatient) in children with smoking vs. nonsmoking households²⁸ we modeled the reduction in incidence and savings associated with respiratory conditions for children with parents who quit smoking. We spread the resulting savings across all quitters to produce results comparable to those for other conditions.

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Pediatric Recurrent Otitis Media

To model the impact of smoking cessation on recurrent otitis media we took the following steps:

- Recurrent otitis media is defined as three or more physician diagnosed otitis media infections by approximately age 3. We assumed each otitis media infection requires two physician or ER visits, one to make the diagnosis and a second to confirm resolution – three otitis media infections translate into 6 physician visits with otitis media diagnosis
- Using Medstat MarketScan™ claims data we identified the incidence of otitis media in 1-4 year olds (these are the ages most commonly cited in studies on the impact of smoking cessation on incidence of otitis media)
- We identified the physician costs associated with otitis media physician visits using the Medstat MarketScan™ claims database; we assumed prescription costs of \$35 per avoided infection based on average cost of pediatric doses of Augmentin™ or Zithromax™, which we chose as likely avoided expenditures. We did not use experience data for prescription drug costs because of technical data issues, including the difficulty of stratifying multipharmacy and multiple diagnoses.

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- Using standard demographics of children and parents from the Milliman Health Cost Guidelines we calculated the percent of children per adult and smoking prevalence for adults age 18-50 (this is the age we assumed for parents with children 1-4 years of age)
- Using the odds ratio of 1.48 for incidence of recurrent otitis media in children with smoking vs. nonsmoking households²⁹, we modeled the reduction in incidence and savings associated with recurrent otitis media infections for children with parents who quit smoking. We spread the resulting savings across all quitters to produce results comparable to those for other conditions.

Smoking Cessation Program Costs

We built our smoking cessation program costs using the following assumptions:

- National Average Medicare RBRVS fee schedule for physician and therapy costs.
- Typical discounted retail nicotine replacement therapy costs and bupropion costs.

We interpolated published research results to estimate the portion of smokers who will begin the programs and quit rates.

Appendix B: Description of Key Data Sources and Their Application

Sources for Medical and Mortality Data

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Medstat MarketScan™ claims data: This dataset contains all paid claims generated by roughly 4 million commercially insured lives. Member identifications codes are consistent from year-to-year and allow for multi-year longitudinal studies. Information includes diagnosis codes, procedure codes and DRG codes, NDC codes along with site of service information, and the amounts paid by commercial insurers. For this study, we used the data for the year 1999-2003. We used this data to generate medical condition incidence rates and cost.

NHANES 1999-2000 data.³⁰ This is from the series of National Health and Nutrition Examination Surveys. A department within the Center's for Disease Control's (CDC's) National Center for Health Statistics (NCHS) produces NHANES. Each year, the survey contains information from roughly 5,000 completed forms plus details of laboratory results and physical examinations. A representative sample of the noninstitutionalized civilian population ages 12 and older is selected by using a stratified, multistage sampling design. Persons with low incomes, persons aged > 60 years, black and Mexican Americans are over-sampled. The data items list contains well over 1000 items of an individual's clinical, demographic and health status.

Milliman's 2005 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 health care 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. The Guidelines are a cooperative effort of all Milliman health actuaries and represent a combination of their experience, research, and judgment. An extensive amount of data is used in developing these Guidelines, including published and unpublished data. The Standard Demographics in the Guidelines were developed to be representative of the age and sex distribution for a typical large insured group. The Standard Demographics were developed using data from large insurers combined with Department of Labor Sources. We used the standard demographics to represent the age and sex distribution for typical insured group.

The 2001 Milliman Basic Mortality Table is derived from the Valuation Basic Tables (VBT),³¹ which were created from the 1990-95 mortality study by the Society of Actuar-

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ies (SOA)³². The 1990-95 study of insured lives used data provided by several large life insurance companies. These mortality studies provide detailed information on the mortality experience of persons covered by life insurance and are used for various purposes within the life insurance industry, including product pricing and projection of future experience.

Data Sources for Life Insurance Plan Design

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Department of Labor Study, National Compensation Survey: Employee Benefits in Private Industry in the US, March 2004: Aggregate information regarding amount of life insurance for private industry. Contains information by worker (i.e. blue-collar, white collar), establishment characteristics (employer size), and geographic area.

<http://www.bls.gov/ncs/ebs/sp/ebsm0001.pdf>

Department of Labor Study, Employee Benefits in Medium and Large Private Establishments, 1997: Aggregate information regarding amount of life insurance for private industry. Contains information by worker (i.e. blue-collar, white collar), establishment characteristics (employer size), and geographic area.

<http://www.bls.gov/ncs/ebs/sp/ebsm0001.pdf>

The Hay Benefits Report: Since 1969, Hay Group has maintained an ongoing study of the benefits practices of mid- to large-size organizations throughout the United States. Findings appear annually in the Hay Benefits Report (HBR), a multi-use reference source and planning tool, and are integrated into the world's largest benefits comparison database. Over 1,000 organizations participate in the HBR, including a wide range of employers in each geographic region, industry sector, and revenue category.

http://www.haygroup.com/surveys_and_data/benefits_benchmarking_surveys.asp

Data Sources for Estimating Cost of Replacing Lost Worker

Employment Policy Foundation's HR Benchmarks

<http://www.epf.org/pubs/newsletters/2002/hb20021203.pdf>

The Hay Working Paper – The Retention Dilemma (2001). The Hay Group is a global organizational and human resource consulting firm.

http://www.haygroup.com/library/working_papers/The_Retention_Dilemma.asp

End Notes

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