

**From a Study
Conducted by**

David Chenoweth,
Ph.D., FAWHP

Chenoweth &
Associates, Inc.

New Bern,
North Carolina

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THE ECONOMIC COSTS OF PHYSICAL INACTIVITY, OBESITY, AND OVERWEIGHT IN CALIFORNIA ADULTS DURING THE YEAR 2000: A Technical Analysis



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EXECUTIVE SUMMARY

Introduction

Physical inactivity and obesity are major risk factors for premature illness, disability and death associated with many conditions that contribute significantly to the nation's rising medical care costs.¹⁻² In Spring 2001, Health Management Associates (HMA), a division of Chenoweth & Associates, Inc., was asked to conduct a chronic disease risk factor analysis. HMA is an econometrics consulting firm that has prepared cost analyses for the states of North Carolina (1997), New York (1999), Michigan (2003), Massachusetts (2003) and Washington (2004). The appraisal included specific medical care conditions, lost employee productivity outcome measures, and workers' compensation associated with physical inactivity, obesity, and overweight. At the time of this contract, a methodology was not available to include the additional costs of poor diet in the absence of physical inactivity, obesity, and overweight. This is the first such cost analysis conducted in California.

Table 1. Direct, Indirect and Total Costs for Physical Inactivity, Obesity, and Overweight in California Adults (in Year 2000 Dollars).

Cost	Direct	Indirect	Direct	Indirect	Direct	Indirect	Subtotals
Category	Physical Inactivity	Physical Inactivity	Obesity	Obesity	Overweight	Overweight	
<i>Medical Care^a</i>							
1. Treatment	\$241,985,581	\$725,956,744	\$135,520,641	\$406,561,922	\$93,509,242	\$280,527,726	\$1,884,061,856
2. Rx Drugs	\$1,065,943,038	\$3,197,829,114	\$595,514,095	\$1,786,542,286	\$410,605,609	\$1,231,816,827	\$8,288,250,969
	\$1,307,928,619	\$3,923,785,858	\$731,034,736	\$2,193,104,208	\$504,114,851	\$1,512,344,553	\$10,172,312,826
<i>Workers' Compensation^b</i>							
	\$50,005,040	\$200,020,159	\$17,658,344	\$70,633,376	0	0	\$338,316,919
<i>Lost Productivity^c</i>							
1. Absenteeism, Presenteeism, Short-term disability	\$7,528,629,764	0	\$3,364,013,159	0	0	0	\$10,892,642,923
2. On-the-job injury	\$274,983,844	0	0	0	0	0	\$274,983,844
							\$11,167,626,767
<i>Sub-totals</i>	\$9,161,547,267	\$4,123,806,017	\$4,112,706,239	\$2,263,737,584	\$504,114,851	\$1,512,344,553	
						Adults Total	\$21,678,256,511

^a The ratio of indirect costs to direct costs for various medical conditions is approximately 6:1 based on a range of 1.2:1 (low) to 15:1 (high).³ A conservative ratio of 3:1 was applied.

^b A multiplier of 4 was used; the ratio of indirect to direct costs associated with workers' compensation costs is generally higher than medical care expenses due to the odds that extraneous circumstances will delay and/or impair an individual's return-to-work timeframe and on-the-job performance, e.g., adjudication, poor worker attitude, return to work policy, etc.⁴

^c Indirect costs are not applicable since lost productivity measures are inherently classified as direct costs.

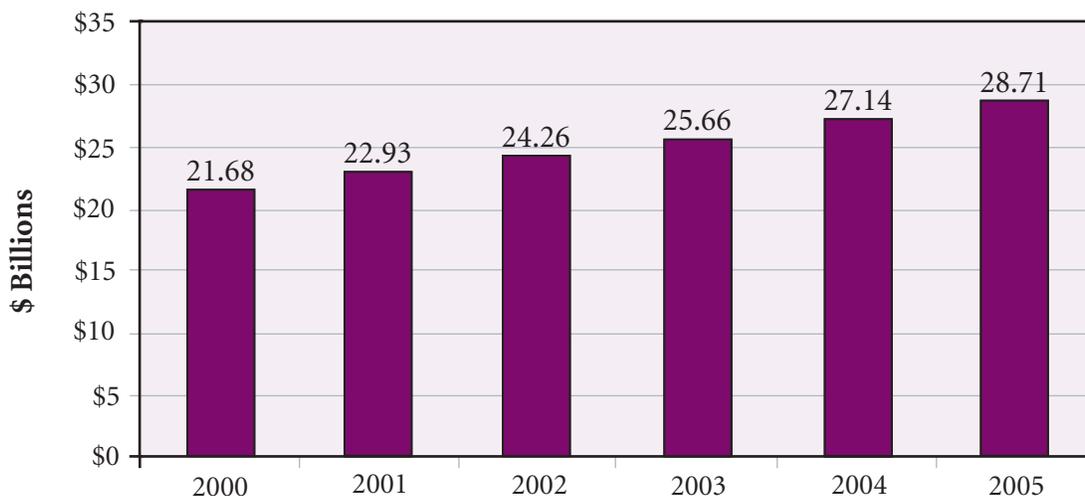
Current and Projected Costs

This economic analysis estimates **the annual direct cost in 2000 of physical inactivity at \$9.16 billion, obesity at \$4.11 billion, and overweight at \$504 million, totaling over \$13.6 billion in direct costs.** The total direct and indirect medical care costs from physical inactivity, obesity, and overweight can be attributed to 77.5% (\$7.88 Billion) from private/employer payments and 22.5% (\$2.28 Billion) from Medi-Cal payments. Total (direct plus indirect) costs of physical inactivity are estimated at \$13.29 billion, obesity at \$6.38 billion, and overweight at \$2.02 billion. **Thus, the combined annual costs for these chronic disease risk factors in California adults were estimated at \$21.68 billion in 2000.** The total costs are attributed to medical care (\$10.17 billion), worker's compensation (\$338 million), and lost employee productivity (\$11.17 billion). Approximately 1 of every 13 dollars spent on *primary medical care* tied to the targeted medical conditions was due to physical inactivity, obesity, and overweight.

EXECUTIVE SUMMARY

The total direct and indirect medical care costs from physical inactivity, obesity, and overweight can be attributed to 77.5% (\$7.88 Billion) from private/employer payments and 22.5% (\$2.28 Billion) from Medi-Cal payments. **By 2005, these costs were estimated to increase 32%, to \$28.7 billion**, due to the aging population, growth in the general population, increased prevalence of physical inactivity and obesity, and inflation (see Figure 1).

Figure 1. Appraised (2000) and Projected (2001-2005) Costs* Related to Physical Inactivity, Overweight, and Obesity in California Adults.



*Appraised (2000) and projected (2001-2005) physical inactivity- and obesity-related costs at an adjusted inflation rate of 5.779%. Projections are adjusted for anticipated population growth.

Potential Cost-Savings

If the current percentage of Californian adults who are physically inactive, obese, and overweight could be reduced, the statewide financial toll from these modifiable risk factors could be substantially decreased. A 5% increase in the percentage of physically active and leaner adults could result in a cost savings of about \$1.30 billion per year or approximately \$6.46 billion by 2005.

A Disparate Burden

Obesity and overweight are most prevalent in less-educated and people of color. Low-income is strongly associated in women with high rates of obesity and overweight. Consequently the burden of cost can be expected to have greatest impact on these groups, their employers, and publicly-funded health programs and providers. In addition, the rapidly increasing prevalence rate of overweight teenagers and children has led to earlier onset Type 2 diabetes and coronary heart disease risk factors. Consequently, there is the potential for medical and employee-related costs to escalate even more rapidly than in the past for younger workers.

EXECUTIVE SUMMARY

Limitations

Although extensive efforts were made, some data simply do not exist in the desired format, level of accuracy or degree of completeness. For this reason, the figures in this study should be viewed as *estimates* of the total costs of physical inactivity, obesity, and overweight in California adults. Some limitations of the study include:

- General population-based data were used to estimate obesity, overweight, physical inactivity, and risk factor weights. For racial/ethnic populations, lower income and lower education groups known to have higher rates, the cost would likely be greater.
- Self-report data were used for height and weight. These may substantially underestimate actual obesity and overweight prevalence when compared to measured heights and weights, such as those obtained in the National Health and Nutrition Examination Survey.⁵⁻⁶
- Data available and used for Medi-Cal estimates were cost payment data rather than the amount billed/charged.
- Data were unavailable for costs related to physical inactivity and obesity in adults between the ages of 18 and 20
- Costs attributed to overweight were estimated as risk factor weights for overweight and have not been scientifically established for most medical conditions.
- This study does not address the costs associated with poor diet in normal weight and/or physically active persons, since methods for estimating these costs are not well-established.

For a complete list of limitations, see the full report. Considering these limitations and the steps taken to deal with them as effectively and fairly as possible, it is reasonable to state that the costs listed in this report are conservative and underestimate the actual total costs of physical inactivity, obesity, and overweight for California adults.

INTRODUCTION

PURPOSE OF STUDY

Physical inactivity, obesity, and overweight are at epidemic rates throughout the United States.⁷ California is not immune.

Research estimates that absolute physical inactivity rates (no leisure time physical activity) among California adults in the 1990's ranged from a low of 21.8%⁸ in 1994 to a high of 25.5%⁸ in 1998. Among California adults, obesity and overweight rates (when combined) reached 52.5%⁹ in 1999.

Physical inactivity and obesity are major risk factors for premature illness, disability, and death for many conditions that contribute significantly to the nation's rising medical care costs.³⁻⁴ Studies in North Carolina¹⁰ and New York¹¹ revealed that physical inactivity alone (exclusive of obesity) was responsible for several billions of dollars in excess medical care, workers' compensation, and lost-time injury-related costs. Since California is the most populous state in the nation – home to approximately 34 million residents – any risk factor, especially those at epidemic rates, represents a threat to its financial welfare.¹² Yet, until now, no formal study to quantify the financial cost of physical inactivity or obesity in California has been conducted. Facts and figures are needed to identify the magnitude of the problem in this state.

In Spring 2001, Health Management Associates (HMA), a division of Chenoweth & Associates, Inc., was asked to conduct a chronic disease risk factor analysis. HMA is an econometrics consulting firm that has prepared cost analyses for the states of North Carolina (1997), New York (1999), Michigan (2003), Massachusetts (2003) and Washington (2004). The appraisal included specific medical care conditions, lost employee productivity outcome measures, and workers' compensation associated with physical inactivity, obesity, and overweight. The purpose of this study was to quantify:

- The direct financial costs of physical inactivity, overweight, and obesity, independently and collectively, on specific medical conditions, lost productivity and worker's compensation.
- An estimate of the cost of physical inactivity, overweight, and obesity if current trends continue.
- An estimate of savings if these risk factors were eliminated in 5-10 percent of California adults.

RELEVANCE AND DEFINITION OF TARGETED RISK FACTORS

Physical Inactivity

It is important to choose a scientifically acceptable parameter appropriate for the specific scope and specificity of this analysis. Moreover, it is important that the operational definition of physical inactivity used in this cost analysis meets an acceptable standard of validity and reliability. Such standards have been established and employed in the Behavioral Risk Factor Surveillance Survey (BRFSS)⁸ to provide the scientific community with a clear understanding of the relationship between physical inactivity and specific medical conditions. Thus, the following served as the operational definition of physical inactivity for this study:

“No leisure time physical activity in the past month or irregular physical activity (less than 3 times per week or less than 20 minutes per session) in the past month.”

Using the preceding BRFSS definition of physical inactivity, and data from the 1998 California BRFSS, a physical inactivity prevalence rate of 49.5% was used in this analysis.¹³

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Obesity and Overweight

Body Mass Index (BMI): refers to a person’s relative weight for height. The BMI calculations are¹⁴:

$$\frac{\text{Weight (kg)/height(m}^{\text{sq)}}}{\text{-or-}} [\text{Weight (lbs.)/ht.(inches}^{\text{sq)}}] \times 703$$

Overweight: defined as a BMI between 25.0 and 29.9¹⁴

Obesity: defined as a BMI between 30.0 and 39.9, with severe obesity defined as BMI > 40.0.¹⁴

The 1999 BRFSS conducted on California adults indicated the following obesity and overweight prevalence rates.⁹

	Overweight, %	Obesity, %	Overweight + Obesity %
Overall	35.0	17.5	52.5
Females	26.3	18.7	45.0
Males	44.0	16.7	60.7

Based on the preceding profiles, a prevalence rate of 17.5% (adjusted to reflect the statewide female: male ratio) was used to conservatively represent the relative percentage of persons who are obese. Similarly, a prevalence rate of 35.0% (adjusted) was used to represent the approximate percentage of California adults who are overweight.

SCOPE OF STUDY

The scope of this statewide analysis is based on a cost appraisal framework that includes three major risk factors and three cost units: medical care, lost productivity (excluding workers’ compensation), and workers’ compensation. For additional details about the methodology, see Appendix A. Specifically, this cost analysis consists of and is influenced by the following parameters:

Physical Inactivity

Physical inactivity is an independent risk factor or an aggravating agent for the conditions listed in Table 3.⁷

Obesity

Obesity is an independent risk factor or an aggravating agent for conditions listed in Table 3.¹⁵⁻¹⁸

Overweight

Overweight is a precursor for obesity-related conditions listed in Table 3.¹⁵⁻¹⁸

INTRODUCTION

Medical Conditions Associated with Physical Inactivity and Obesity

The following 9 medical conditions have been associated with increased medical care costs related to physical inactivity and obesity.

Table 2: Medical Conditions Associated with Physical Inactivity and Obesity

Circulatory	Table 6
Cancer	Table 7
Diabetes/Gout/Impaired Immune Response	Table 8
Mental Health	Table 9
Musculoskeletal	Table 10
Neurological	Table 11
Pregnancy	Table 12
Digestive and Renal	Table 13
Signs/Symptoms/Ill-Defined	Table 14

Medical Care Costs

- Inpatient-based employer paid and private charges from January 1, 1999 to December 31, 1999 were provided by the Office of Statewide Health Planning & Development (OSHPD).
- Outpatient-based employer paid and private paid claims and costs were based on Health Management Associates' (HMA) California corporate health database that included approximately 25,000 workers throughout the State from occupations including service, manufacturing, and health care.
- Inpatient and outpatient claims and costs for Medi-Cal from July 1, 1999 to June 30, 2000 were provided by the California Department of Health Services (CDHS). A semi-annual medical inflation index of 1.0352 (3.52%) was used to calculate projected costs for mid-2000. Persons over 18 years of age eligible for Medi-Cal during this timeframe numbered 2,554,444.
- The medical claims data obtained for this paper originated in 1999. It was necessary to adjust the 1999 cost data upward to reflect an approximate cost value in 2000 dollars. Therefore, a semi-annual inflationary multiple of 3.525% was used to convert the 1999 costs into a representative 2000 level.
- Since some Diagnostic Related Group (DRGs) and International Classification of Disease codes (ICDs) apply to both physical inactivity and obesity, it is necessary to avoid “double counting” a specific DRG or ICD cost by using a cost figure only from one risk factor.

NOTE: Managed care recipients of Medi-Cal services were not included in the cost data provided to HMA. Fee-for-service payments comprised 80% of all Medi-Cal costs with the remaining 20% of costs attributed to managed care enrollees. Thus, the total Medi-Cal costs for fee-for-service users were multiplied by a factor of 1.25 to approximate a more representative cost for all users.

- Medi-Cal data reports provided claims and costs for two specific age groups (<18 vs. 18 and above) while OSHPD provided claims and cost data for multiple age groups by 5 year intervals. For OSHPD data, the risk factor cost analysis used the 20-24 year-old interval as the youngest age category for “adults” since it aligned most closely with the 18 and above age group.

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Workers' Compensation Costs

- Targeted workers' compensation claims and cost data were based on data obtained from HMA's California corporate health database, the Workers' Compensation Research Institute, and the 2001 Official Disability Manual.¹⁹
- Costs attributable to physical inactivity and obesity were calculated, while those due to overweight were not, because the relationship between workers' compensation and overweight had not been clearly established in the economic professional literature at the time the analysis was conducted.

Lost Productivity

- Short-term disability days associated with the 9 medical conditions were based on data obtained from HMA's California corporate health database and the 2001 Official Disability Manual published by the Work Loss Data Institute.¹⁹
- Lost productivity costs possibly due to overweight were not calculated because a conclusive relationship between lost productivity and overweight had not been established in the professional literature when the analysis was conducted.
- Absenteeism and "presenteeism" (productivity loss that occurs when workers are on the job but not fully functioning) rates associated with physical inactivity and obesity were based on U.S. worksite case studies published between 1998-2001.²⁰⁻²⁹
- Wage and salary data were obtained for the 4th quarter of 2000 from the Employment Development Department (Labor Market Information Division) within the California Department of Labor; thus, an inflationary adjustment was not needed.

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Table 3. Medical Conditions Associated with Obesity and Physical Inactivity for Persons 20 Years of Age and Older

Condition	Obesity		Physical Inactivity	
	Inpatient DRG*	Outpatient ICD*	Inpatient DRG*	Outpatient ICD*
CIRCULATORY				
Cardiovascular Disease	103-112, 120-145	402-405, 412-414.9		
Deep Vein Thrombosis	128	437.6		
Chronic Venous Insuff.		459.81		
Essential Hypertension	134	401	134	401
Hypertensive Heart Disease			134	402.9
Hypertensive Renal Disease			316-317	403
Hypertensive Heart and Renal Disease				404
Acute Myocardial Infarct			122	410
Acute and Dubacute ISCHD				411
Old Myocardial Infarction				412
Angina Pectoris			140, 143	413
Atherosclerosis			132-133	440
Coronary Atherosclerosis			132-133	440
Congestive Heart Failure			127	428.9
Unspecified Heart Disease				429.9
Stroke	14-17 ⁺	430.0-436		
Subarachnoid Hemorrhage	14-17 ⁺	430	14-17 ⁺	430
Intra-cerebral Hemorrhage	14-17 ⁺	431	14-17 ⁺	431
Unspecified Intracranial Hemorrhage	14-17 ⁺	432	14-17 ⁺	432
Occlusion Precerebral	14-17 ⁺	433	14-17 ⁺	433
Occlusion Cerebral Arterial	14-17 ⁺	434	4-17 ⁺	434
Trans-Cerebral Ischemia	14-17 ⁺	435	14-17 ⁺	435
Acute Ill-defined CVD	14-17 ⁺	436	14-17 ⁺	436
Other Cerebral Vascular Disease	14-17 ⁺		14-17 ⁺	437
Late Effect Cerebral Vascular	14-17 ⁺		14-17 ⁺	438
Heart Transplant			103	
Coronary Bypass			106-107	
CANCER				
Breast in Women	274-275	174-175		
Breast in Men	274-275	175.9		
Esophagus/Gastric	154-156	150.1-151.0		
Colorectal	148-49, 172-173, 179	153.0-154.1	152, 159, 179	230.3
Endometrial	354-355, 357-359	182.0-182.8		
Renal Cell	318-319	189.0-189.1		

INTRODUCTION

Condition	Obesity		Physical Inactivity	
	Inpatient DRG*	Outpatient ICD*	Inpatient DRG*	Outpatient ICD*
DIABETES/GOUT/IMPAIRED IMMUNE RESPONSE				
Diabetes (NIDDM)	294	250.0-250.9	294	250.9#
Diabetes (NIDDM)	294	250.0-250.9	294	250.0##
Gout		274.0-274.9		
Impaired Immune Response	488-490	279.0-279.9		
MENTAL HEALTH				
Neurotic Depression ⁺⁺			426	300.4
Depressive Disorder			426	311
Anxiety States			427	300
MUSCULO-SKELETAL				
Osteo-arthritis Knee Hip	221, 222, 237	715.0-715.9	245	715-715.9
Rheumatoid Arthritis	242, 244, 245-246	714	241	714
Low Back Pain	243	724.1-724.5	243	724.5, 847.9
Pain In Joint				719.4
Stiffness In Joint				719.5
Lumbago				724.2
Polymyalgia Rheumatica				725
Synovitis & Tenosynovitis			248	727
Rheumatism				729
Osteoporosis				733
NEUROLOGICAL				
Carpal Tunnel Syndrome	6	354.0-354.1	6	354.0-354.1
Pain		307.8-307.80		307.8-307.80
PREGNANCY				
Obstetric Complications	354, 358, 366			
	368, 370, 372			
DIGESTIVE				
Gallbladder Disease	195-198	575.0-575.9		
Liver Disease	199-203	570.0-573.9		
End Stage Renal Disease	316-317	585-586		
Biliary & Alcoholic Pancreatitis	193-194, 204, 207- 208	577.0-577.1		
SIGN/SYMPTOM/III-Defined				
Impaired Respiratory Function	87-88	518.5-519	87-88	518.5-519
Sleep Apnea		780.5-780.57		780.5-780.57
Urinary Stress Incontinence		788.3-788.39		788.3-788.39

* Inpatient & Outpatient Charges, 1999 for Diagnostic Related Groups (DRG) and International Classification of Diseases (ICD)

+ Neurological DRG's

with unspecified complications

without complications

++ Excludes brief depressive reaction and prolonged depressive reaction

PART I: MEDICAL CARE CLAIMS & CHARGES

To accurately measure the financial impact of physical inactivity and obesity on targeted medical conditions, all medical claims provided by OSHPD and cost data provided by CDHS were reviewed. The following tables list each of the targeted medical conditions and their respective costs.

Table 4 Medical Claims & Payments for 1999

Medical Diagnoses Condition (MDC)	OSHPD Private Pay/Employer Total Charges		CDHS Medi-Cal Total Charges Paid	
	Total Inpatient %	Total Outpatient %	Total Inpatient %	Total Outpatient %
Circulatory	10	90	39	61
Cancer	4	96	60	40
Diabetes/Gout/Impaired Immune Response	10	90	40	60
Mental Health	1	99	29	71
Musculoskeletal	1	99	14	86
Neurological	5	95	66	34
Pregnancy	100	0	100	0
Digestive and Renal	5	95	38	62
Signs/Symptoms/Ill-Defined	1	99	6	94

Proportionate Risk Factor Cost Appraisal™ (PRFCA™)

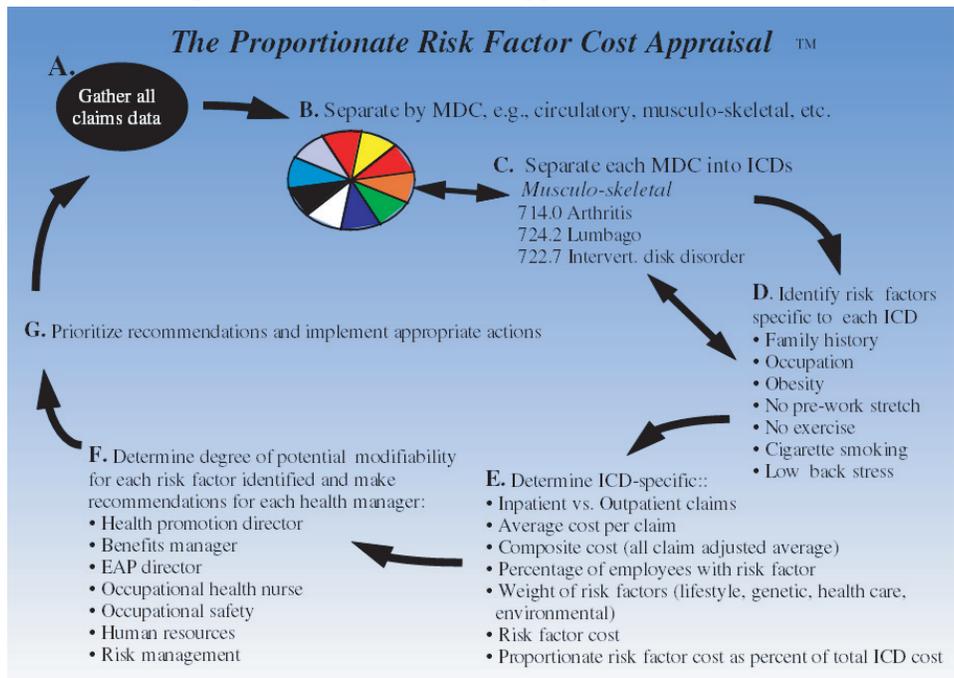
The second phase of the analysis was to determine the portion of each medical condition claim cost associated with physical inactivity and obesity. To do so, a customized Proportionate Risk Factor Cost Appraisal (PRFCA) framework was constructed to factor in California’s claims and charges.¹⁰⁻¹¹ It is based on the risk factor prevalence in California, the total value of inpatient and outpatient claims and charges for each diagnosis in California, and the probability that an individual will experience a specific illness or condition.

The validity of any PRFCA depends largely on its ability to factor in actual health care claims and costs by all delivery sites (inpatient and outpatient). By factoring in all delivery sites, the PRFCA can statistically account for the fact that individual inpatient claims are significantly less common, yet significantly more expensive, than outpatient claims.

To reiterate, inpatient claims, charges, and costs used in Table 4 originated from two data sources: 1999 charge data obtained from OSHPD and mid-1999 to mid-2000 Medi-Cal payment data provided by CDHS. Statewide outpatient charge data for privately paid health care on the targeted conditions were not available from OSHPD files; only “Primary Care Clinic” utilization data by county, age group, and type of service for 1998 were available. However, DHS did provide claims and payments incurred by Medi-Cal enrollees for each of the targeted inpatient DRGs and outpatient ICDs. Thus, statewide outpatient claims and charges were estimated, in part, by using California’s DHS data and HMA’s database of California worksites.

PART I: MEDICAL CARE CLAIMS & CHARGES

Figure 2: The Proportionate Risk Factor Cost Appraisal (PRFCA)TM Framework



Source: HMA

The first step taken to determine estimated statewide outpatient charges and claims for each of the targeted DRGs and ICDs was to identify their associated Major Diagnostic Categories (MDCs). Using a median (midpoint) between the DHS data and HMA’s database of California worksites, an approximate percentage of claims and charges was computed for each of the targeted conditions.

Due to the large percentage differences between inpatient and outpatient charges existing in targeted MDCs, it was necessary to apply several statistical adjustments to compute a representative (statewide) cost. The Circulatory MDC is used here as an example. Approximately 90 percent of all targeted circulatory claims are outpatient, while nearly 40 percent of targeted circulatory charges are inpatient. To account for these disproportionate ratios, the following formula was used to generate appropriate net costs (weighted) per delivery site (outpatient & inpatient):

Table 5: Circulatory MDC Example

Site	Claims %		Charges %	Subtotal	Divided by	# Sites	= Ratio: Out/In
Outpatient	0.900	+	0.610	1.51	/	2	0.755
Inpatient	0.100	+	0.390	0.49	/	2	0.245

The numerator (.755) and denominator (.245) of the ratio was then multiplied by the average charge per claim to calculate a site-specific net cost. Finally, the two net costs were added and a respective average was computed and serves as the “Composite”. Essentially, the composite represents a weighted cost of a targeted circulatory claim.

PART I: MEDICAL CARE CLAIMS & CHARGES

After the composite cost was computed, the remainder of the PRFCA framework was constructed, consisting of the following components:

- **Risk factor weights:** the proportionate influence or probability that an individual will experience a specific illness/condition and/or incur one or more claims pertaining to that illness/condition.
- **Risk factor prevalence:** the estimated percentage of all California adults with a specific risk factor e.g. circulatory disease.
- **# of claims and charges:** the total number of inpatient and outpatient circulatory claims and associated charges.

NOTE: Risk factor weights are subject to change as new scientific evidence evolves and/or utilization patterns change.

The PRFCA frameworks on the following pages show the prevalence and costs of specific risk factors relevant to MDC-specific conditions associated with physical inactivity and/or obesity.

Adjustment/ Estimate for Overweight

After these calculations were made for each condition, the proportion of costs attributed to overweight was calculated by:

- establishing risk factor weight differences between obesity and overweight based on the prevalence in California.
- then assigning approximate medical care costs incurred by the overweight sector.

Risk Factor Cost for Targeted Medical Conditions

In the following tables, a rounded composite cost was calculated using the average of the net cost for inpatient and outpatient medical charges. Risk factor costs for each condition were calculated by multiplying the rounded composite by the risk factor weight, risk factor prevalence, and number of claims.

$$\begin{array}{ccccccc} \text{Rounded} & & & & & & \\ \text{Composite} & \times & \text{Risk Factor} & \times & \text{Risk Factor} & \times & \text{\# Claims} \\ \text{Cost} & & \text{Weight} & & \text{Prevalence} & & \text{and} \\ & & & & & & \text{Charges} \\ & & & & & = & \text{Risk Factor Cost} \end{array}$$

PART I: MEDICAL CARE CLAIMS & CHARGES

CIRCULATORY

Physical inactivity, obesity, and overweight, are major risk factors for various circulatory (cardiovascular) ailments.^{7, 30-36} Specifically, the major risk factors associated with these ailments include one or more of the following:

- Obesity
- Physical inactivity
- Diabetes
- Smoking
- Hypertension
- High cholesterol
- Alcohol abuse
- Depression
- Family history
- Age > 40

Overall, the PRFCA showed physical inactivity costs of \$90.49 million and obesity costs of \$45.27 million in 1999.

Table 6. Proportionate Risk Factor Cost Appraisal for Circulatory Ailments

MDC: Circulatory					
Site	# Claims	Total Paid	Avg. Charge	Ratio:Out/In	Net Cost
Outpatient	3,756,150	1,265,500,000	336.91	0.755	254.37
Inpatient	417,350	809,080,000	1938.61	0.245	474.96
Total	4,173,500	2,074,580,000			
Composite					364.67
Risk Factor	Rounded Composite (\$)	Risk Factor Weight	Risk Factor Prevalence	# Claims	Risk Factor Cost
<i>Obesity</i>	365	0.17	0.1748	4,173,500	45,267,200
<i>Physical Inactivity</i>	365	0.12	0.4950	4,173,500	90,485,654
Diabetes	365	0.18	0.0450	4,173,500	12,338,953
Smoking	365	0.14	0.1800	4,173,500	38,387,853
Hypertension	365	0.12	0.2000	4,173,500	36,559,860
High cholesterol	365	0.11	0.1900	4,173,500	31,837,545
Alcohol abuse	365	0.05	0.7150	4,173,500	54,458,958
Depression	365	0.04	0.2000	4,173,500	12,186,620
Family history	365	0.04	0.1670	4,173,500	10,175,828
Age > 40	365	0.03	0.5500	4,173,500	25,134,904
Total*					\$356,833,374

* Medical Care Payments Only

PART I: MEDICAL CARE CLAIMS & CHARGES

CANCER

Research shows that breast, esophageal, colon, rectal, endometrial, prostate and renal cell cancers are more prominent in persons with any of the following risk factors.³⁷⁻⁴⁶

- Obesity
- Physical inactivity
- Smoking
- Family history of cancer
- Low fiber/high fat diet
- High alcohol intake
- No breast self-exam
- Never had mammogram
- Environmental exposure
- No PSA/DRE
- Age > 40
- African-American

All inpatient cancer costs used in Table 7 were actual 1999 statewide data obtained from the OSHPD and CDHS databases.

Overall, the PRFCA showed physical inactivity costs of \$25.84 million and obesity costs of \$12.55 million in 1999.

Table 7. Proportionate Risk Factor Cost Appraisal for Certain Cancers (breast, esophageal, colo-rectal, endometrial, prostate and renal cell).

MDC: Cancer					
Site	# Claims	Total Paid	Avg. Charge	Ratio:Out/In	Net Cost
Outpatient	188,544	101,318,760	537.37	0.678	364.34
Inpatient	7,856	153,751,240	19571.19	0.321	6282.35
Total	196,400	255,070,000			
Composite					3323.35
Risk Factor	Rounded Composite (\$)	Risk Factor Weight	Risk Factor Prevalence	# Claims	Risk Factor Cost
<i>Obesity</i>	3323	0.11	0.1748	196,400	12,548,908
<i>Physical inactivity</i>	3323	0.08	0.4950	196,400	25,844,433
Smoking	3323	0.20	0.1800	196,400	23,494,939
Family history of cancer	3323	0.20	0.3000	196,400	39,158,232
Low fiber/High fat diet	3323	0.09	0.7000	196,400	41,116,144
High alcohol intake	3323	0.08	0.0715	196,400	3,733,085
No BSE	3323	0.04	0.2500	196,400	6,526,372
Never had mammogram	3323	0.04	0.2500	196,400	6,526,372
No PSA/DRE	3323	0.04	0.4800	196,400	12,530,634
Environ. Exposure	3323	0.04	0.6540	196,400	17,072,989
Age > 40	3323	0.04	0.5500	196,400	14,358,018
African American	3323	0.04	0.0700	196,400	1,827,384
Total*					\$204,737,511

* Medical Care Payments Only

PART I: MEDICAL CARE CLAIMS & CHARGES

DIABETES/GOUT/IMPAIRED IMMUNE RESPONSE

Diabetes, gout, and impaired immune response are three conditions associated with physical inactivity, obesity, and overweight.⁴⁷⁻⁴⁹ Obesity not only increases the risk of developing type 2 diabetes, but it also complicates medical management.⁴⁷ Gout is one of the most painful rheumatic diseases. It results from deposits of needle-like crystals of uric acid in the connective tissue, joint spaces, or both. Impaired immune response is considered an immunodeficiency disease due to the lack of one or more components of the immune system. These can be inherited, acquired through infection or other illness, or produced as an inadvertent side effect of certain drug treatments. Overall, individuals with one or more of the following risk factors are at greater risk of developing at least one of the preceding conditions:⁴⁷⁻⁵²

- Obesity
- Physical inactivity
- Family history of these conditions
- African American woman
- Poverty
- Alcohol abuse
- Smoking
- Substance abuse*
- High cholesterol
- Hypertension
- Indiscriminate sexual behavior*

* Not risk factors for diabetes or gout

Overall, the PRFCA showed physical inactivity costs of \$30.94 million and obesity costs of \$21.17 million in 1999.

Table 8. Proportionate Risk Factor Cost Appraisal for Diabetes Mellitus, Gout, and Impaired Immune Response

MDC: Diabetes/Gout/Impaired Immune Response					
Site	# Claims	Total Paid	Avg. Charge	Ratio:Out/In	Net Cost
Outpatient	511,214	271,602,000	531.29	0.75	398.47
Inpatient	56,801	181,068,000	3187.76	0.25	796.94
Total	568,015	452,670,000			
Composite					597.70
Risk Factor	Rounded Composite (\$)	Risk Factor Weight	Risk Factor Prevalence	# Claims	Risk Factor Cost
<i>Obesity</i>	598	0.3565	0.1748	568,015	21,167,129
<i>Physical inactivity</i>	598	0.1840	0.4950	568,015	30,937,414
Family history	598	0.1525	0.0830	568,015	4,299,411
African American female	598	0.0980	0.0360	568,015	1,198,366
Poverty	598	0.0800	0.1600	568,015	4,347,814
Alcohol abuse	598	0.0715	0.0715	568,015	1,736,493
Smoking	598	0.0590	0.1800	568,015	3,607,327
Substance abuse	598	0.0500	0.2000	568,015	3,396,730
High cholesterol	598	0.0400	0.1900	568,015	2,581,515
Hypertension	598	0.0300	0.2000	568,015	2,038,038
Indis. Sexual Behavior	598	0.0100	0.0500	568,015	169,836
Total*					\$75,480,072

* Medical Care Payments Only

PART I: MEDICAL CARE CLAIMS & CHARGES

MENTAL HEALTH *

Depression is an ubiquitous problem in the Western world. Current estimates suggest approximately 15% of the American people experience sufficient symptoms to warrant a diagnosis of clinical depression.⁵³ Moreover, depression is felt to be a major contributor to lost work time and decreased productivity. Research shows both depression and anxiety are more common in persons with any of the following risk factors:⁵³⁻⁵⁶

* Recent studies suggest a relationship may exist between obesity and depression but at this time of this analysis, data did not point to this relationship, and obesity and overweight were not included as risk factors for mental health illnesses, leading to a more conservative estimate of the total cost of obesity, overweight, and physical inactivity.

- Physical inactivity
- Sexually/physically abused female
- Have health problem
- Alcohol or other drug abuse
- Poverty
- Experienced recent trauma
- 40-55 years of age
- Family history of mental health problems
- Female gender
- Race: minority
- Metropolitan resident

Overall, the PRFCA showed physical inactivity costs of \$62.60 million in 1999.

Table 9. Proportionate Risk Factor Cost Appraisal for Depression and Anxiety

MDC: Mental (Depression & Anxiety)					
Site	# Claims	Total Paid	Avg. Charge	Ratio:Out/In	Net Cost
Outpatient	4,415,954	516,810,000	117.03	0.85	99.48
Inpatient	44,606	211,091,000	4732.35	0.15	709.85
Total	4,460,560	727,901,000			
Composite					404.66
Risk Factor	Rounded Composite (\$)	Risk Factor Weight	Risk Factor Prevalence	# Claims	Risk Factor Cost
<i>Physical inactivity</i>	405	0.070	0.4950	4,460,560	62,596,154
Abused Female*	405	0.115	0.1305	4,460,560	27,111,451
Health problem	405	0.115	0.2120	4,460,560	44,043,123
Alcohol/Drug abuse	405	0.115	0.0715	4,460,560	14,854,167
Poverty	405	0.115	0.1600	4,460,560	33,240,093
Recent trauma	405	0.120	0.0500	4,460,560	10,839,161
Age: 40-55	405	0.070	0.4000	4,460,560	50,582,750
Family history	405	0.070	0.2000	4,460,560	25,291,375
Female	405	0.070	0.5100	4,460,560	64,493,007
Race(minority)	405	0.070	0.5100	4,460,560	64,493,007
Urbanite	405	0.070	0.6540	4,460,560	82,702,797
Total*					\$480,247,085

* Medical Care Payments Only

PART I: MEDICAL CARE CLAIMS & CHARGES

MUSCULOSKELETAL

Numerous musculoskeletal conditions are associated with physical inactivity and obesity. These include back injuries, arthritis, osteoporosis and others. Risk factors for targeted musculoskeletal conditions as reported in the literature are as follows: ⁵⁷⁻⁶³

- Physical inactivity
- Obesity
- Work dissatisfaction
- Medical history
- Stress
- Repetitive motion
- Heavy labor
- No pre-work stretch/warm-up
- Age > 35
- No job rotation
- Smoking
- Gender

Overall, the PRFCA showed physical inactivity costs of \$10.53 million and obesity costs of \$3.72 million in 1999.

Table 10. Proportionate Risk Factor Cost Appraisal for Musculoskeletal Conditions

MDC: Musculoskeletal					
Site	# Claims	Total Paid	Avg. Charge	Ratio:Out/In	Net Cost
Outpatient	4,749,126	301,645,000	63.52	0.925	58.75
Inpatient	47,971	49,104,000	1023.62	0.075	76.77
Total	4,797,097	350,749,000			
Composite					67.76
Risk Factor	Rounded Composite (\$)	Risk Factor Weight	Risk Factor Prevalence	# Claims	Risk Factor Cost
<i>Physical inactivity</i>	68	0.0652	0.4950	4,797,097	10,527,863
<i>Obesity</i>	68	0.0652	0.1748	4,797,097	3,717,718
Work dissatisfaction	68	0.1087	0.2130	4,797,097	7,552,601
Medical history	68	0.1087	0.1347	4,797,097	4,776,223
Stress	68	0.1087	0.2000	4,797,097	7,091,644
Repetitive motion	68	0.1087	0.0500	4,797,097	1,772,911
Heavy labor	68	0.0870	0.0500	4,797,097	1,418,981
No prework stretch	68	0.0870	0.9500	4,797,097	26,960,645
Age > 35	68	0.0652	0.6000	4,797,097	12,761,046
No job rotation	68	0.0652	0.9500	4,797,097	20,204,989
Smoking	68	0.0652	0.1800	4,797,097	3,828,314
Female	68	0.0326	0.5100	4,797,097	5,423,444
Male	68	0.0326	0.4900	4,797,097	5,210,760
Total*					\$111,247,138

* Medical Care Payments Only

PART I: MEDICAL CARE CLAIMS & CHARGES

NEUROLOGICAL

Carpal tunnel syndrome (CTS) and pain are two neurological conditions associated with obesity and overweight.⁶⁴⁻

⁶⁵ An estimated 420,000 Americans experience CTS each year. Carpal tunnel syndrome is defined as the entrapment of the median nerve of the hand and wrist in the passageway (tunnel) through the wrist's carpal bones. The carpal tunnel is between the carpal bones and the transverse carpal ligament. Research indicates that individuals with one or more of the following risk factors are at greater risk of incurring CTS:

- Obesity
- Physical inactivity
- Repetitive motion with deviated wrist position
- No job rotation
- Family history of neurological disorders
- Age > 40 years of age

Overall, the PRFCA showed physical inactivity costs of \$3.26 million and obesity costs of \$1.53 million in 1999

Table 11. Proportionate Risk Factor Cost Appraisal for Carpal Tunnel Syndrome

MDC: Neurological					
Site	# Claims	Total Paid	Avg. Charge	Ratio:Out/In	Net Cost
Outpatient	231,533	6,058,800	26.17	0.645	16.88
Inpatient	12,185	11,761,200	965.22	0.355	342.65
Total	243,718	17,820,000			
				Composite	179.77
Risk Factor	Rounded Composite (\$)	Risk Factor Weight	Risk Factor Prevalence	# Claims	Risk Factor Cost
<i>Obesity</i>	180	0.20	0.1748	243,718	1,533,669
<i>Physical inactivity</i>	180	0.15	0.4950	243,718	3,257,291
Repetitive Motion	180	0.30	0.0500	243,718	658,039
No Job Rotation	180	0.20	0.9500	243,718	8,335,156
Family History	180	0.10	0.0100	243,718	43,869
Age >40 yrs	180	0.05	0.5500	243,718	1,206,404
				Total*	\$15,034,427

* Medical Care Payments Only

PART I: MEDICAL CARE CLAIMS & CHARGES

PREGNANCY

Obstetric complications represent a myriad of conditions that are more likely to occur in women who have one or more of the following risk factors:⁶⁶⁻⁶⁹

- Obesity
- No prenatal monitoring
- Diabetes
- Hypertension
- Poor diet
- Smoking
- Low socio-economic status
- Substance abuse
- Age >35
- Family history of pregnancy complications
- Mental illness
- Existing sexually transmitted disease
- Anemia

Overall, the PRFCA showed obesity, and overweight, costs of \$ 9.29 million in 1999.

Table 12. Proportionate Risk Factor Cost Appraisal for Pregnancy Complications.

MDC: Pregnancy (Complications Only)					
Site	# Inp Days	Total Paid	Avg. Charge	Ratio:Out/In	Net Cost
Outpatient	0	0	0	0	0
Inpatient	381,382	552,399,130	1,448	1	1448.41
Total	381,382	552,399,130			
Composite					1,448.41
Risk Factor	Rounded Composite (\$)	Risk Factor Weight	Risk Factor Prevalence	# InpDays	Risk Factor Cost
Obesity	1448	0.09	0.1870	381,382	9,294,218
No prenatal monitor	1448	0.15	0.0500	381,382	4,141,809
Diabetes	1448	0.10	0.0450	381,382	2,485,085
Hypertension	1448	0.10	0.2000	381,382	11,044,823
Poor diet	1448	0.10	0.5000	381,382	27,612,057
Smoking	1448	0.10	0.1700	381,382	9,388,099
Low SES	1448	0.07	0.1600	381,382	6,185,101
Substance abuse	1448	0.07	0.0715	381,382	2,763,967
Age 35-50	1448	0.05	0.2720	381,382	7,510,479
Family History	1448	0.05	0.0500	381,382	1,380,603
Mental illness	1448	0.05	0.0100	381,382	276,121
STD infect	1448	0.05	0.0800	381,382	2,208,965
Anemia	1448	0.02	0.0100	381,382	110,448
Total*					\$84,401,774

* Medical Care Payments Only

PART I: MEDICAL CARE CLAIMS & CHARGES

DIGESTIVE AND RENAL

Among the numerous digestive conditions that have been studied over the past decade, four in particular, are directly associated with obesity and overweight:⁷⁰⁻⁷²

- Gallbladder disease
- Biliary & alcoholic pancreatitis
- Liver disease
- End-stage renal disease

Research indicates that persons with one or more of the following risk factors are at greater risk of developing any of the preceding digestive conditions:⁷⁰⁻⁷²

- Obesity
- Low fiber diet
- Non-steroidal anti-inflammatory drugs (NSAIDs)
- Stress
- Alcohol abuse
- Smoking
- Current digestive illness

Overall, the PRFCA showed obesity and overweight costs of \$ 27.39 million in 1999.

Table 13. Proportionate Risk Factor Cost Appraisal for Gallbladder Disease, Liver Disease, Biliary and Alcoholic Pancreatitis and End-Stage Renal Disease

MDC: Digestive and Renal					
Site	# Claims	Total Paid	Avg. Charge	Ratio:Out/In	Net Cost
Outpatient	6,110,495	631,254,500	103.31	0.783	80.89
Inpatient	321,605	395,175,555	1228.76	0.218	267.87
Total	6,432,100	1,026,430,055			
Composite					174.38
Risk Factor	Rounded Composite (\$)	Risk Factor Weight	Risk Factor Prevalence	# Claims	Risk Factor Cost
<i>Obesity</i>	174	0.14	0.1748	6,432,100	27,388,705
Low fiber diet	174	0.16	0.7000	6,432,100	125,348,765
NSAIDs	174	0.16	0.2500	6,432,100	44,767,416
Stress	174	0.16	0.2000	6,432,100	35,813,933
Alcohol abuse	174	0.13	0.0715	6,432,100	10,402,828
Smoking	174	0.13	0.1800	6,432,100	26,188,938
Existing illness	174	0.12	0.1000	6,432,100	13,430,225
Total*					\$283,340,810

* Medical Care Payments Only

PART I: MEDICAL CARE CLAIMS & CHARGES

SIGNS / SYMPTOMS / ILL-DEFINED

Among the hundreds of conditions which comprise SSIs, three conditions - impaired respiratory function (not including asthma), sleep apnea, and urinary stress incontinence - are directly associated with physical inactivity and obesity.⁷³⁻⁷⁶ Interestingly, impaired respiratory function occurs at similar rates in both males and females; while sleep apnea is predominately a male disorder and urinary stress incontinence is most common in females. Overall, individuals with one or more of the following risk factors are at greater risk of developing at least one of the preceding conditions:⁷³⁻⁷⁶

- Obesity
- Physical inactivity
- Existing illness
- Family history
- Gender
- Smoking
- Air pollution

Since physical activity may predispose and/or aggravate urinary stress incontinence,⁷⁵ risk factor weights applied in the preceding PRFCA have to be based on the overall prevalence of each risk factor, gender-specific prevalence, and whether obesity and physical inactivity are associated with each risk factor. Thus, the lowest risk factor weight (.05) was assigned to physical inactivity.

Overall, the PRFCA showed physical inactivity costs of \$10.11 million and obesity costs of \$ 9.99 million in 1999.

Table 14. Proportionate Risk Factor Cost Appraisal for Impaired Respiratory Function, Sleep Apnea, and Urinary Stress Incontinence

MDC: Signs/Symptoms/Ill-Defined					
Site	# Claims	Total Paid	Avg. Charge	Ratio:Out/In	Net Cost
Outpatient	1,567,211	677,542,600	432.3237905	0.964	416.76
Inpatient	15,831	43,247,400	2731.81732	0.036	98.35
Total	1,583,042	720,790,000			
Composite					257.55
Risk Factor	Rounded Composite (\$)	Risk Factor Weight	Risk Factor Prevalence	# Claims	Risk Factor Cost
<i>Obesity</i>	258	0.14	0.1748	1,583,042	9,994,973
<i>Physical inactive</i>	258	0.05	0.4950	1,583,042	10,108,515
Existing illness	258	0.20	0.1000	1,583,042	8,168,497
Family history	258	0.15	0.1000	1,583,042	6,126,373
Female	258	0.13	0.5100	1,583,042	27,078,567
Smoking	258	0.12	0.1800	1,583,042	8,821,976
Male	258	0.11	0.4900	1,583,042	22,014,099
Air pollution	258	0.10	0.6500	1,583,042	26,547,614
Total					\$118,860,613

* Medical Care Payments Only

PART I: MEDICAL CARE CLAIMS & CHARGES

SUMMARY OF PRIMARY AND SECONDARY MEDICAL CARE CLAIMS AND CHARGES

Table 15. Summary of Proportionate Risk Factor Cost Appraisals for MDC-Specific Condition Related to Physical Inactivity and Obesity Alone

MDC-Specific Conditions	Risk Factor Cost
	Physical Inactivity Direct Cost*
Circulatory	\$90,485,654
Cancer	\$25,844,433
Diabetes/Gout/Impaired Immune Response	\$30,937,414
Mental Health	\$62,596,154
Musculoskeletal	\$10,527,863
Neurological	\$ 3,257,291
Pregnancy	0
Digestive	0
Signs/Symptoms/Ill-Defined	\$10,108,515
Total	\$233,757,324
	Obesity Direct Cost*
Circulatory	\$45,267,200
Cancer	\$12,548,908
Diabetes/Gout/Impaired Immune Response	\$21,167,129
Mental Health	0
Musculoskeletal	\$ 3,717,718
Neurological	\$ 1,533,669
Pregnancy	\$ 9,294,218
Digestive	\$27,388,705
Signs/Symptoms/Ill-Defined	\$9,994,973
Total	\$130,912,520

*1999 dollars in millions

Primary Medical Care Costs – Factoring in Overweight Based on Obesity

Although overweight is a precursor of obesity, it was neither independently classified nor included in the PRFCA calculations. However, it is a clinical and behavioral risk for many of the conditions listed in Table 2. Thus, it was necessary to determine the approximate influence of overweight on health care utilization and cost patterns. To do so, HMA reviewed published research and its database to establish risk factor weight differences between obesity and overweight.^{15-18, 41-49, 57-76} Overall, the risk factor weight ratio was approximately 1.38 to 1 (i.e., the research suggested obesity contributes approximately 38% more risk than overweight on the targeted medical conditions). Second, HMA took into consideration prevalence rates of obesity (17.5%) and overweight (35.0%) among California adults, or a ratio of 1 to 2. Finally, upon factoring in these data, it was determined that overweight adults are approximately 31% less likely to incur one or more of the targeted conditions listed in Table 2 than obese adults.

PART I: MEDICAL CARE CLAIMS & CHARGES

Therefore, a composite risk factor percentage of .69% [100%-31%] was used to discount medical care costs incurred by the overweight sector.

Primary Medical Care Costs Associated with Obesity	*	Multiplying factor	=	Estimated Primary Medical Care Costs Associated with Overweight
\$130,912,520		.69		\$90,329,639

The Contribution of Physical Inactivity, Obesity, and Overweight to the Total Cost of Primary Medical Care

The total cost of primary medical care in California in 2000 was \$6,178,000,000, based on adding the outpatient and inpatient total paid columns for each of the PRFCA tables 6-14 presented earlier. Direct medical costs for each risk factor and the percentage of total primary medical care costs attributable to that risk factor are listed below:

Table 16. Estimated Contribution of Physical Inactivity, Obesity, and Overweight to Year 2000 Primary Medical Care Costs

Risk Factor	1999 Direct Medical Care Cost	Mid-2000 Inflator	2000 Costs	Percentage of Total Cost of Primary Medical Care
Physical Inactivity	\$233,757,324	x 1.0352	\$241,985,581	3.92%
Obesity	\$130,912,520	x 1.0352	\$135,520,641	2.19%
Overweight	\$90,329,639	x 1.0352	\$93,509,242	1.51%
	\$454,999,482		\$471,015,464	7.62%

Thus, approximately 1 of every 13 dollars spent on *primary medical care* tied to the targeted medical conditions was attributed to physical inactivity, obesity, and overweight.

Secondary Medical Care Costs (Pharmaceuticals)

However, the 1 to 13 ratio above does not take into consideration another direct medical care commodity: pharmaceutical (Rx) drugs. On average, 1.3 Rx medications are written per health care visit.⁷⁷ Consequently, Rx drug costs are commonly referred to as a “secondary” (yet direct) type of medical care cost because they typically occur *after* a primary diagnosis or treatment is provided. Nonetheless, the cost of pharmaceuticals can comprise a significant portion of an organization’s total expenses. The State of California, if viewed as an organization/ employer, would be no exception, as is shown below.

DHS provided pharmaceutical (Rx) drug costs for the Medi-Cal population by specific ICD-9 codes relevant to physical inactivity and obesity. Costs (net payments) were provided solely by age group for the entire group of ICDs, not by individual ICD-9 code or targeted ICDs within a specific MDC. The Rx drug costs were tabulated for the 12-month period of July 1, 1999 to June 30, 2000 for fee-for-service eligible and, thus, did not include enrollees in the managed care plans. Moreover, the available data did not include any Rx drug costs incurred by persons using private and employer-sponsored health plans. Given the limited amount of actual Rx drug costs available for analysis, it was necessary to use baseline data to estimate approximate Rx drug costs associated with physical inactivity, obesity, and (extrapolated) overweight for all California adults.

PART I: MEDICAL CARE CLAIMS & CHARGES

The following framework was used to quantify these costs in the adult population:

Table 17. Total Payments for Prescription Drugs for Targeted Risk Factors

Net Payments for > age 20 ^a	x Multiplier ^b	Estimated Rx Costs	x Multiplier ^c	Total Payments for Rx drugs
\$2,201,815,744	X 1.25	\$2,752,269,680	x 9.88 =	\$27,192,424,440

^aThis amount represents fee-for-service only.

^bA multiplier of 1.25 was used to estimate the costs for 100% of the adult Medi-Cal recipients, including enrollees in managed care plans.

^cA multiplier of 9.88 was used to estimate total Rx drugs for targeted ICDs by dividing the total number of California adults (24.55 million) by the estimated number of adult Medi-Cal enrollees (2,483,150).

Assuming total payments for Rx drugs tied to targeted ICDs and DRGs are similar to the same ICDs and DRGs payments for medical care, it is possible to estimate pharmaceutical costs attributable to these risk factors, individually and collectively:

Table 18. Total Prescription Drug Costs for Physical Inactivity, Obesity, and Overweight

	Total Payments	x % Multiplier [*]	Total Payments
Physical Inactivity	\$27,192,424,440	x 0.0392	\$1,065,943,038
Obesity	\$27,192,424,440	x 0.0219	\$595,514,095
Overweight	\$27,192,424,440	x 0.0151	\$410,605,609
		Total Drug Cost	\$2,072,062,742

* % multiplier comes from table 16 and represents the % each risk factor contributes to the total cost of primary medical care.

PART II: WORKERS' COMPENSATION

Many workers' compensation claims have a musculoskeletal origin⁷⁸ so this category alone was used for worker's compensation estimates. In particular, approximately 46% of these claims are sprains or strains commonly associated with cumulative trauma disorders (CTDs). CTDs are among the most costly and preventable work-related conditions in the nation.⁷⁹

The financial cost of musculoskeletal injuries results from two cost categories: medical care and workers' compensation. Consequently, medical care costs (highlighted in Part I) represent only a portion of all musculoskeletal-related costs incurred in California. The remaining portion of this cost analysis is tied to workers' compensation claims and charges. Part II of this analysis focuses on musculoskeletal claims and costs pertinent only to workers' compensation. Compensable musculoskeletal injuries and costs were included in this analysis because a substantial percentage of workers' compensation costs are associated with musculoskeletal conditions,⁷⁹ and a substantial percentage of workers' compensation-based musculoskeletal claims are associated with physical fitness and obesity.^{19,79}

The California Workers' Compensation Institute (WCI) is responsible for tracking and monitoring all workers' compensation claims and costs. HMA initiated several requests to WCI for the following specific types of workers' compensation data:

- Total number of and charges for *all* workers' compensation claims
- Total number of and charges for workers' compensation by *type of injury*
- Total number of and charges for workers' compensation claims by primary body part

Unfortunately, none of the requests resulted in a tangible response. As a result, HMA accessed its California corporate database and the 2001 Occupational Disability Guidelines¹⁹ to obtain musculoskeletal injury prevalence and incidence norms, median disability days for selected conditions, and other pertinent workers' compensation data.

In California, the prevalence of workers' compensation claims experience varies considerably from area to area and industry to industry.²¹ Since the actual prevalence of workers' compensation claims in California is maintained in proprietary databases, it is virtually impossible for HMA to know the state's workers' compensation status.

Using its proprietary California database in conjunction with national norms, HMA estimated that an average of two (2) sprain/strain-related workers' compensation claims were filed per 100 California workers per year. This estimation is justified since the Workers' Compensation Research Institute (WCRI) found that California, in a six state comparison, was comparable to the other five states in frequency and costs.⁷⁹ Specifically, the WCRI benchmark indicated that the average charge per workers' compensation claim for sprains and strains was approximately \$4,560 (1996 dollars), resulting in estimated charges of approximately \$1.3 billion.

Worker's Comp Injury Estimates for California

Injury	# Claims*	Total Charges	Ave. Charge Per Claim ⁷⁹
Strains & Sprains	286,009	\$1,304,201,040	\$4,560

* Based on 2 percent of California's workforce (14,300,483) incurring a strain/sprain-related workers' comp claim per year.

To determine the level of financial impact that each of the two measurable targeted risk factors has on specific types of musculoskeletal ailments within workers' compensation, a PRFCA was conducted (see Table 19).

PART II: WORKERS' COMPENSATION

Table 19. Proportionate Risk Factor Cost Appraisal for Musculoskeletal Risk Factors Related to Workers' Compensation Costs

Risk Factor	Composite (\$)	Risk Factor Weight	Risk Factor Prevalence	# Claims	Risk Factor Cost
<i>Physical inactivity</i>	4,560	0.0652	0.4950	286,009	42,091,784
<i>Obesity</i>	4,560	0.0652	0.1748	286,009	14,863,927
Medical history	4,560	0.1087	0.0200	286,009	2,835,333
Work dissatisfaction	4,560	0.1087	0.2130	286,009	30,196,297
Repetitive motion	4,560	0.1087	0.0500	286,009	7,088,333
Stress	4,560	0.1087	0.0500	286,009	7,088,333
Heavy labor	4,560	0.0870	0.0500	286,009	5,673,275
No prework stretch	4,560	0.0870	0.0500	286,009	5,673,275
Age > 35	4,560	0.0652	0.5550	286,009	47,193,819
No Job Rotation	4,560	0.0652	0.9500	286,009	80,782,212
Smoking	4,560	0.0652	0.1800	286,009	15,306,103
Female	4,560	0.0326	0.5100	286,009	21,683,646
Male	4,560	0.0326	0.4900	286,009	20,833,307
				Total	\$301,309,645

Note: The preceding PRFCA is based on an outpatient:inpatient claims ratio of 86:14 and an outpatient:inpatient cost ratio of 93.5:6.5; a representative median between HMA's California database data and California's DHS Medi-Cal cost data distributions. Overall, physical inactivity and obesity costs associated with targeted workers' compensation claims are estimated as follows:

Table 20. Workers Compensation Cost Attributable to Physical Inactivity and Obesity

Risk Factor	Cost (1996) ^a	Multiple ^b	Adjusted Cost 2000
Physical Inactivity	\$42,091,784	x 1.188	\$50,005,040
Obesity	\$14,863,927	x 1.188	\$17,658,345
Total			\$67,663,385

^a See Risk Factor Costs from Table 19.

^b Multiple b is based on an increase of 18.88% in cumulative health plan costs (or an average of 4.72% annual increase) from 1996 to 2000⁷⁹

PART III: LOST PRODUCTIVITY

To date, no state has conducted a formal study to determine what impact, if any, physical inactivity and obesity have on lost productivity. Most of the health-productivity research published in the past decade has evolved from corporate (worksites) case studies.²⁰⁻²⁷ Productivity studies are hampered by the shift from manufacturing and piecework to providing information and services. Matching productivity loss to individual risk factors is even harder, since it requires detailed employee health records.

When measuring the cost of lost productivity, most analysts look only at direct medical costs. Others consider indirect costs but focus strictly on absenteeism and disability. Only recently has a new dimension been added to the productivity equation: “presenteeism.” It is defined as, *productivity loss that occurs when workers are on the job but not fully functioning.*²² When integrated, absenteeism, short-term disability, and presenteeism yield a far more accurate picture. However, it is important to ensure there is no inter-group duplication or “contamination” between two or more outcome measures. Based on categorical delineations used by various productivity researchers, specific lost productivity outcome measures selected for this statewide cost analysis included the following:

- Absenteeism
- Short-term disability
- “Presenteeism”
- On-the-job (lost-time) injuries

Due to the different methodologies that are used to analyze each of the preceding outcome measures, the first three entities will be addressed here, followed by on-the-job injuries in the subsequent section.

Absenteeism, Presenteeism, and Short-term Disability

Since California’s economy and workforce is arguably the most diversified in the USA, it was important to use methodological formulas that sufficiently account for this heterogeneity. Thus, the formulas used to compute the cost of each lost productivity outcome measure were based on composite data, derived from the 2001 Official Disability Guidelines,¹⁹ HMA’s database of California workers, and worksite profiles described in the professional literature.²⁰⁻²⁹ Using these aggregate data sources, the socio-cultural-economic diversity which comprises California’s marketplace and population is better represented than if a single methodology or database had been used.

The first step in computing lost productivity across three of the four outcome measures was to assign a valid baseline quantity to each measure relevant to the two targeted risk factors. Using aggregate data, the average annual number of hours lost assigned per worker to each measure are as follows:

Hours Lost Per Year Due to Physical Inactivity

Outcome Measure	Physical Inactivity	Obesity
Absences	15.75	16.65
Short-term (ST) disability	13.00	19.80
Presenteeism	28.75	36.45

PART III: LOST PRODUCTIVITY

The next step was to apply the preceding data into the following framework:

Table 21. Lost Productivity Outcome Measures and Costs Tied to Physical Inactivity and Obesity

Risk Factor	Avg. Annual Hour Lost	Scheduled Workload (Hrs.)	Lost Hours % of Work	Avg. Compensation*	# CA Workers	Lost Productivity Cost
Physical Inactivity						
Absences	15.75	2000	0.0079	36,929	14,300,483	4,172,010,040
ST disability	13.00	2000	0.0065	36,929	14,300,483	3,432,666,489
Presenteeism	28.75	2000	0.0144	36,929	14,300,483	7,604,676,529
Subtotal	57.50		0.0288			15,209,353,058
					x% with risk	0.495
						\$7,528,629,764
Obesity						
Absences	16.65	2000	0.0083	36,929	14,300,483	4,383,251,055
ST disability	19.80	2000	0.0099	36,929	14,300,483	5,228,215,113
Presenteeism	36.45	2000	0.0182	36,929	14,300,483	9,611,466,168
Subtotal	72.90		0.0364			19,222,932,336
					x% with risk	0.175
						\$3,364,013,159
Total	130.40		0.0652			\$10,892,642,923

*Average Compensation is annual salary/wage value plus fringe benefits equal to 20% of annual salary/wage value, based on a low (conservative) end of HMA's California database.

Categorically, the total lost productivity cost among the three outcome measures relevant to physical inactivity is \$7.53 billion and approximately \$3.36 billion for obesity. On average, 3 or more weeks per year of lost productivity can be attributed to the designated risk factors.

On-the-Job (Lost-time) Injuries

The *Children's Safety Network: National Economics and Insurance Resource Center (CSNEIRC)* annually tracks and reports the number and rate of workplace injuries and illnesses in states including California.⁸⁰ Although lost-time injuries (LTIs) are usually classified outside the venue of workers' compensation, they still impact employees and employers. They result in:

- 1) Lost income to wage-earning (hourly) employees
- 2) Lost payroll dollars to employers who provide:
 - salary and benefits to salaried employees while they are absent
 - benefits only to wage (hourly) employees while they are absent
- 3) Lost productivity value* to employers

*Productivity based on value added per production wage dollar is defined as workers' value added at production facilities divided by their wages.⁸¹

PART III: LOST PRODUCTIVITY

The first step was to identify what types of on-the-job injuries are directly related to physical inactivity. Some of the most publicized types of injuries falling within this criterion include musculoskeletal strains, sprains, and tears.²⁹ Overexertion was added to this list due to the direct relationship between physical activity and work performance parameters such as strength, stamina, and endurance.⁷ Injury prevalence and associated absenteeism of the targeted injuries is as follows:

Type of Lost-time Injury	# of LTIs ¹⁹	% of total ¹⁹	Median Days Lost Annually ¹⁹
Sprains, strains & tears	40,599	9.20	6
Overexertion	5,252	1.19	9

The second step was to determine an average annual salary and total compensation for California workers. To do so, the California Department of Commerce was consulted to obtain an appropriate weekly wage. The data indicated average annual earnings of \$30,774 representing a 12 month average from January to December of 2000 (excluding fringe benefits).⁸² The total compensation value of approximately \$36,929 was based on annual salary/wage value plus fringe benefits equal to 20 percent of annual salary/wage value and was based on the low end of HMA's California database to give a conservative estimate.

The final step was to compute daily and yearly costs of lost-time injuries for each of the targeted injuries, as follows:

Table 22. Yearly Injury Costs to California Employers Due to Strain, Sprains, Tears, and Overexertion

Total Compensation (Salary/Wage/Benefits)		# Scheduled Workdays ^a	Direct Compensation Per Day		Indirect Production Value	Daily Loss to Employer
\$36,929	/	250	\$147.72	x	6.40 ^b	\$945.41/employee
Median # Days Lost ¹⁵		Daily Loss to Employer	Cost per Injury		# Annual Injuries ¹⁵	Annual Injury Cost to Employer
6	x	\$945.41	\$5,644.80	x	40,599	\$230,296,204
9	x	\$945.41	\$8,467.20	x	5,252	\$44,687,640
Total						\$274,983,844

^aBased on 50 work weeks @ 5 days per week.

^bA multiple of 6.40 is based on U.S. Bureau of the Census data, Annual Survey of Manufacturers.⁸¹

PART IV: DIRECT AND INDIRECT COSTS

The previous sections of this cost analysis highlight **direct** costs associated with specific medical care claims, workers' compensation claims, and lost productivity. However, direct costs represent only a portion of physical inactivity and obesity costs. As a result, HMA calculated indirect costs and factored them into the overall analysis. Specifically, indirect costs, *which can be several times greater than direct costs*, reflect some productivity losses due to ill or absent employees, inefficiencies frequently associated with replacement workers, lost opportunity costs, and other costs that are eventually borne by one or more stakeholder groups.⁸³⁻⁸⁴

Table 23. Direct, Indirect and Total Costs for Physical Inactivity, Obesity and Overweight in California Adults (in Year 2000 Dollars)

	Medical Care Cost ^a		Workers Compensation Costs ^b	Lost Productivity Costs ^c		Total Costs
	Treatment	RX Cost		Absenteeism, Presenteeism, & Short-term Disability	On-the-job Injury	
Physical Inactivity						
Direct	\$241,985,581	\$1,065,943,038	\$50,005,040	\$7,528,629,764	\$274,983,844	\$9,161,547,267
Indirect	\$725,956,744	\$3,197,829,114	\$200,020,159	0	0	\$4,123,806,017
Total Physical Inactivity Cost						\$13,285,353,284
Obesity						
Direct	\$135,520,641	\$595,514,095	\$17,658,344	\$3,364,013,159	0	\$4,112,706,239
Indirect	\$406,561,922	\$1,786,542,286	\$70,633,376	0	0	\$2,263,737,584
Total Obesity Cost						\$6,376,443,823
Overweight						
Direct	\$93,509,242	\$410,605,609	0	0	0	\$504,114,851
Indirect	\$280,527,726	\$1,231,816,827	0	0	0	\$1,512,344,553
Total Overweight Cost						\$2,016,459,404
Total Physical Inactivity, Obesity, & Overweight Cost						\$21,678,256,511

^a The ratio of indirect costs to direct costs for various medical conditions is approximately 6:1 based on a range of 1.2:1 (low) to 15:1 (high).¹ A conservative ratio of 3:1 was applied.

^b A multiplier of 4 was used; the ratio of indirect to direct costs associated with workers' compensation costs is generally higher than medical care expenses due to the odds that extraneous circumstances will delay and/or impair an individual's return-to-work timeframe and on-the-job performance, e.g., adjudication, poor worker attitude, return to work policy, etc.²

^c Indirect costs are not applicable since lost productivity measures are inherently classified as direct costs.

PART IV: DIRECT AND INDIRECT COSTS

The bulk of medical care and workers' compensation costs presented in Table 23 are paid by California employers and taxpayers. However, if the combined cost of physical inactivity, overweight, and obesity (**\$21.68 billion**) was distributed equally among California residents, workers, and worksites, each sector's proportionate costs would be as follows:

	Sector	Per Capita Cost
• Per California resident	34,000,000 people ^a	\$638
• Per California worker	14,300,483 workers ^b	\$1516
• Per California worksite	773,925 worksites ^c	\$ 28,011

^a Estimated state-wide population for 2000, U.S. Census Bureau.⁸⁵

^b U.S. Bureau of Labor Statistics.⁸⁶

^c Private non-farm establishments with paid employees in California: U.S. Census Bureau.⁸⁵

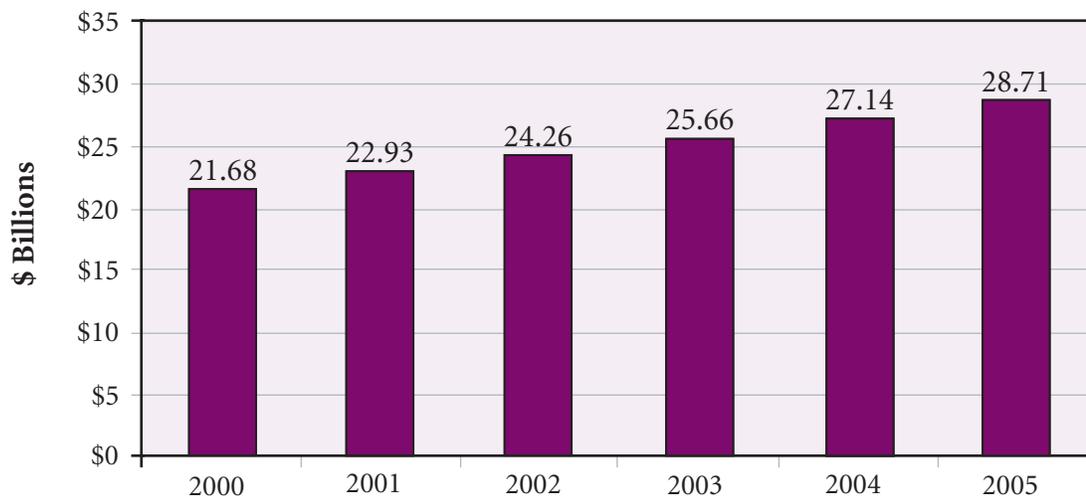
The total direct and indirect medical care costs from physical inactivity, obesity, and overweight can be attributed to 77.5% (\$7.88 Billion) from private/employer payments and 22.5% (\$2.28 Billion) from Medi-Cal payments.

PART V: PROJECTED COSTS AND POTENTIAL COST-SAVINGS

The final phase of the analysis deals with the future cost of physical inactivity, obesity, and overweight and an estimate of savings if the risk factors were to be eliminated in 5-10 percent of California adults. In 2000, the cost of physical inactivity, obesity, and overweight in California was estimated to be at least **\$21.68 billion**. Yet, even if the population prevalence does not continue to increase, the costs will inevitably increase due to growth of the population, the aging of the population, high prevalence of physical inactivity and obesity, and, medical care cost inflation. To wit, if medical care costs continue to rise at least 7.05 percent* per year, workers' compensation costs continue to rise at least 4.72 percent⁷⁹, and employment cost index components continue to rise at least 3.93 percent⁸⁶ per year, then physical inactivity-related and obesity-related costs will increase from \$21.68 billion in 2000 to more than \$28.71 billion in 2005 or a cumulative (5-year) increase of 32 percent (see Figure 3).

* Median inflation rate based on data provided in the Employment Cost Index provided by Bureau of Labor Statistics.⁸⁶ NOTE: This rate is presumably the "best case" because it does not factor in the disproportionately higher rate of inflation of Rx drugs, which is typically 3 to 6 times higher than other medical care inflationary indices.

Figure 3. Appraised (2000) and Projected (2001-2005) Costs* Related to Physical Inactivity, Obesity, and Overweight in California Adults.



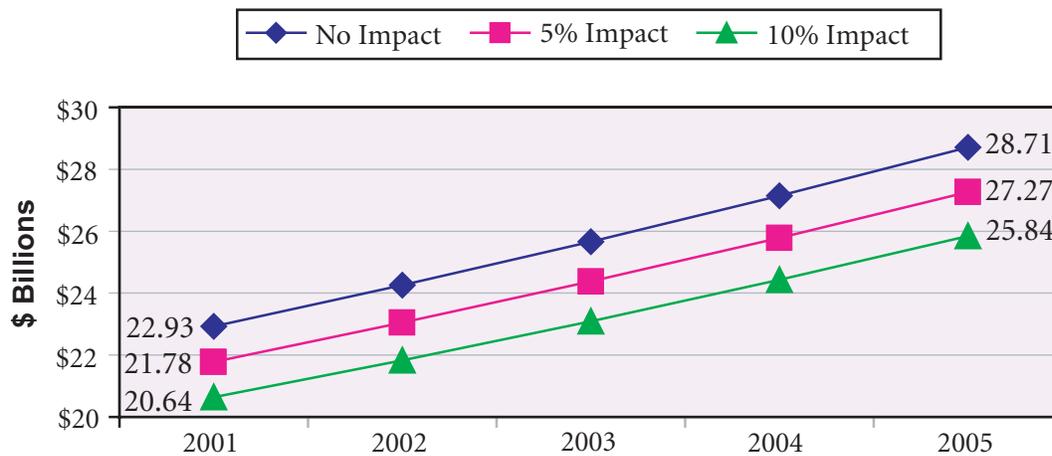
* An adjusted inflation rate of 5.779% was used based on three rates of weighted inter-commodity inflation: medical care (58%), lost productivity (37%), and workers' compensation (5%).⁸⁷ Projections are adjusted for anticipated population growth.

PART V: PROJECTED COSTS AND POTENTIAL COST-SAVINGS

Potential Cost-Savings

Alternatively, if the current percentage of Californian adults who are physically inactive (49.5%), obese (17.5%), and overweight (35.0%) could be reduced in the range of 5 - 10 percent, the statewide financial toll from these modifiable risk factors could be substantially reduced. Figure 4 illustrates a comparative view of approximate cost-savings at 5 percent and 10 percent impact intervals.

Figure 4. Projected Costs* Related to Physical Inactivity, Obesity, and Overweight With No Impact vs. Projected Costs at 5 percent and 10 percent Impact Levels.



*Assuming the state's population continues to grow approximately 1.16% with a commensurate rise in health care utilization and a composite annual inflation rate of 5.779%.

If current physical inactivity, obesity, and overweight are not reduced, an increasing cost burden will occur as the population ages and the long-term health consequences of its obesity and inactivity manifest themselves. Physical inactivity and obesity costs are projected to rise more than 18 percent from 2001 to 2005. On the other hand, a **5 percent increase** in the percentage of physically active and leaner adults could eliminate approximately **\$1.30 billion per year or \$6.46 billion** of avoidable costs over this timeframe. A **10 percent increase** would avoid about **\$2.6 billion per year or \$13 billion** from 2001 to 2005.

PART VI: STUDY LIMITATIONS AND PRECAUTIONS

Although extensive efforts were made to acquire specific types of data, some data simply do not exist in the desired format, level of accuracy or degree of completeness. For this reason, the cost figures depicted in this study should be viewed only as estimates of the total costs of physical inactivity, obesity, and overweight in California adults. Limitations and precautions applicable to the present study include the following:

1. The prevalence rates for physical inactivity (49.5%), obesity (17.5%) and overweight (35.0%) among California adults was derived from a representative population sample of over 4,000 adults surveyed in 1999. Prevalence rates are known to be higher among some racial/ethnic, lower income and lower education groups.
2. Self-report data were used for height and weight which may underestimate actual obesity and overweight prevalence substantially when compared to measured heights and weights, such as those obtained in the National Health and Nutrition Examination Survey.⁵⁻⁶
3. The risk factor weights were determined after review of several sources and pertain only to the general adult population. It is known that many of the risk factor weights are higher in ethnic/minority, lower income and lower education groups. Risk factor weights are subject to change with new scientific evidence and/or changes in utilization patterns.
4. Cost data for Medi-Cal managed care recipients were not available and had to be derived using a multiplier.
5. Actual Medi-Cal cost payment data were used rather than the amount billed/charged. This is a conservative estimate. To reflect real total costs, it would have been best if the charged amount were used rather than the paid amount for any given service. This was done with the OSHPD data which reflected the total amount charged for all pertinent conditions.
6. The only data available to estimate costs of pharmaceutical drugs came from Medi-Cal sources. Private and employer paid sources were not available.
7. Cost data available from OSHPD and Medi-Cal covered two differing time periods; thus, a monetary inflation factor was used to bring the cost time periods into alignment.
8. A variety of national, private and state databases were accessed to derive conservative median and average estimates for several components associated with computing workers' compensation, lost productivity and on-the-job injury costs.
9. A number of sources were consulted to derive conservative ratios to estimate the indirect costs of physical inactivity, obesity, and overweight.
10. There are certainly costs related to physical inactivity and obesity in persons under the age of 20, but data sources for prevalence rates and risk factor weights of the younger population were unreliable at the time of the study.
11. Costs attributed to overweight had to be estimated as risk factor weights for overweight and have not been scientifically established for most medical conditions.
12. This study does not address the costs associated with poor diet in normal weight and/or physically active persons, since methods for estimating these costs are not well-established.

Considering these limitations and the steps taken to deal with them as effectively and fairly as possible, **it is reasonable to state that the costs listed in this report are conservative and underestimate the actual total costs of physical inactivity, obesity, and overweight associated with California adults.**

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APPENDIX A: METHODOLOGY

Health Management Associates

The Health Management Associates’ (HMA) California corporate health database contains actual medical claims data representing more than 25,000 employees and adult dependents from several medium and large firms. The data pertain to the timeframe from 1995 to 1999 and were used to construct California state outpatient utilization and payment norms.

Proportional Risk Factor Cost Appraisal™

When the field of prospective medicine was conceived in the early 1960s, there was virtually nothing to guide data analysts in calculating the cost of major risk factors. Eventually, the traditional model of risk-factor influence was born and provided data analysts with a *relative* understanding of how lifestyle, environmental, genetic, and health care factors can influence a person’s health status. Yet, in most cases, it was customary to link major risk factors to a **single** influence, such as obesity, with lifestyle.

Eventually, this one-to-one [unilateral] concept gave way to a more contemporary concept known as **multi-risk factor causation**, which is based on the premise that many illnesses and diseases are often caused by *multiple* risk factors across the lifestyle, genetic, environmental, and health care spectrum. For example, **musculoskeletal claims** are one of most common and expensive claims at many worksites; **low back pain** is particularly common. Research suggests the following risk factors cause and/or contribute to low back pain and other low back injuries:

- Age (over 35 years of age)
- Obesity
- Medical history
- No pre-work stretch
- Cigarette smoking
- No job rotation
- High stress
- Low work satisfaction
- Repetitive motion
- Physical inactivity
- Heavy labor
- Gender*

* Some research indicates that females are more likely to report low back pain earlier than males; yet, men tend to postpone reporting a low back episode until it becomes severe and more debilitating.

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One simple way to calculate the cost of each risk factor is to use an **Equitable Risk Factor Weight Method** as shown below:

ICD: Low back pain

<i>Total Cost of Illness</i>	divided by	<i># of risk factors</i>	=	individual risk factor cost
\$200,000	/	12	=	\$16,666

As you can see, the equitable risk factor weight method has several limitations, most notably it is based on the premise that **each risk factor** has the same [equal] level of influence; yet, epidemiological studies done in public health *and* worksite settings clearly show that **no two risk factors have the same influence** on a person’s predisposition for low back injuries or any other illness or disability. Thus, to account for this influential difference, risk factor costing calculations should incorporate potential techniques of which the **Proportionate Risk Factor Cost Appraisal** (PRFCA) is one.

APPENDIX A: METHODOLOGY

Methodologically, PRFCA incorporates specific risk factors linked to lifestyle, environment, genetics, and health care forces - with realistic risk factor weights. Moreover, PRFCA accounts for the percentage of employees and dependents with specific risk factors and distinguishes between inpatient vs. outpatient claims and costs. This accountability is essential because:

- Outpatient claims are far more common than inpatient claims
- Inpatient claims, on average, are significantly more expensive than outpatient costs, and
- A contamination effect will occur if all claims and costs are bundled together by artificially inflating or deflating the actual **composite** (adjusted) **cost** that is used in the PRFCA calculation.

Most employers receive their claims data formatted by **Major Diagnostic Categories** (MDCs). Depending on the formatting practices of an insurer or claims administrator, the scope of claims reports provided to an employer may range from 17 MDCs to as many as 25 different MDCs. In any case, the standard MDCs are:

- Blood-related
- Circulatory
- Congenital
- Digestive
- Ear/nose/throat
- Endocrine/nutrition/metabolic
- Factors influencing health status
- Genito-urinary
- Injury & Poisoning
- Miscellaneous^a
- Mental^b
- Musculo-skeletal
- Neoplasm (cancer)
- Nervous
- Pregnancy^c
- Respiratory
- Signs/symptoms/ill-defined
- Skin/subcutaneous

^a Usually a mixture of claims from various MDCs that were, for various reasons, classified in this category.

^b Often divided into one or more of the following subcategories: *Substance abuse, Alcohol, or Drug-related*

^c Often divided into one or more of the following subcategories: *Prenatal, Neonatal, or Post-natal.*

By taking into account multiple risk factors and their unequal influence on major medical conditions, the PRFCA methodology offers a thorough picture of prospective costs.