Physical Inactivity Cost Calculator

How the Physical Inactivity Cost Calculator Was Developed

Acknowledgements

Principal Investigator

David Chenoweth, Ph.D., FAWHP.

Since 1979, Dr. Chenoweth has served as president of Health Management Associates, an econometrics data analysis and evaluation firm. He developed the risk factor cost analytical tool known as Proportionate Risk Factor Cost Appraisal™. David consults with private sector and public sector organizations; has published 8 books including Evaluating Worksite Health Promotion and Health Care Cost Management; authored more than 20 professional articles; and delivered more than 500 presentations to business, industrial, health care, governmental, and academic groups. He is a Fellow of the Association for Worksite Health Promotion, serves on the Medical Advisory Board of WELCOA, and is a professor and director of worksite health promotion studies at East Carolina University.

Project Architect

Walter M. Bortz, II, MD.

Dr. Bortz is one of America's most distinguished scientific experts on aging. He has spent his career at Stanford University, where he maintains a large clinical practice at Palo Alto Medical Foundation and holds the position of clinical associate professor of medicine. His research has focused on the importance of physical exercise in the promotion of robust aging. Dr. Bortz has written four books, three on aging and one on weight loss for diabetes. He is also the president of the Fifty Plus Lifelong Fitness organization, past president of the American Geriatrics Society and the co-chairman of the American Medical Association's Task Force on Aging.

Project Sponsors and Coordination

Active Living Leadership, a national project supported by The Robert Wood Johnson Foundation and coordinated at San Diego State University, developed the Physical Inactivity Cost Calculator with funding from the Fifty-Plus Lifelong Fitness organization. The National Coalition for Promoting Physical Activity co-sponsored the project, which is supported by 20 additional partner organizations.

Calculator Limitations

The Physical Inactivity Cost Calculator uses a science-based formula to compute demographic data entered by the user. It compiles data from seven state studies (76 million data points) using the most current science available from the medical costs, workers' productivity and workers' compensation fields of research. In developing the calculator, we made every effort to ensure accurate results. However, due to limitations of available research (particularly in the workers' productivity realm), the calculated estimates should be considered a general approximation that provides decision makers with a strong case for shifting resources towards programs and infrastructure that promote physical activity.

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Methods Overview

In June 2003, a planning committee including Dr. David Chenoweth, President of Health Management Associates, Dr. Walter Bortz, President of Fifty Plus Lifelong Fitness and Marla Hollander, Director of Active Living Leadership identified a process for developing the cost calculator. This 4-step process included:

Step 1: Development of Initial Calculus
Step 2: Scientific Panel Review
Step 3: Development of a Dissemination Plan
Step 4: Beta Testing and Pilot Testing

Step 1: Development of Initial Calculus. David Chenoweth, nationally recognized econometrics expert conducted a scientific review of the literature and designed an initial framework and outlined a framework to look at three cost realms including medical care costs, workers compensation, and lost workers productivity. Specific details regarding the development of these cost realms are discussed later. Using actual medical care costs obtained from various health insurers (private and public) in seven states, and available information regarding employer costs of workers compensation and lost productivity, an initial calculus was developed.

Step 2: Scientific Panel Review. An initial group of 12 experts were identified to serve as reviewers of the calculus methods and final calculus. This group included experts from private sector, academia, and government. It included public health and medical experts, measurement professionals, end users, and econometrics specialists. A list of the scientific panel can be found in figure 1. The scientific panel engaged in three rounds of review and comment. Main questions that the reviewers were asked to focus on included.

Figure 1. Scientific Review Panel Members

Terry Bazzarre, Robert Wood Johnson Foundation
Dee Edington, University of Michigan
William Evans, University of Arkansas
Reid Ewing, Rutgers University
Erik Finkelstein, RTI International
William Haskel, Stanford Prevention Research Center
Michael O'Donnel, American Journal of Health Promotion
Michael Pratt, Centers for Disease Control and Prevention
Nico Pronk, Health Partners
Larrissa Roux, Centers for Disease Control and Prevention
Jim Sallis, Active Living Research, SDSU
Andy Scibelli, Florida Power and Light
Steven Teutsch, Merck Company Inc.
Guijing Wang, Centers for Disease Control and Prevention

- Are the list of cost unit variables included in the Medical Care Computation and workers compensation worksheets inclusive of those you would identify for the medical conditions/workers comp issues associated with physical activity?
- Do the figures and computations make sense in each of the worksheets? Are there any data that you find surprising?
- Are the defined variables for each of the worksheets adequately explained? Are there variables you have questions about or feel should include other sources/information?
- We have made notations of the many limitations of the overall generalizibility of our data analysis, especially for use by communities in general. Please share what your top thoughts on limitations are.
- Please share other thoughts; ideas that will help us refine this analysis. Does the "What if" scenario outlining potential cost savings we incorporated at the end of the calculator work?
- Are there other limitation notations we should include?

Step 3: Development of a Dissemination Plan. In order to ensure widespread use and input into the development of a usable tool, a group of diverse organizations were asked to participate in designing usable products and widely distributing the products decision makers across the country. Specific activities requested of the partners included:

- Participation in product development review
- Development of and participation in distribution of cost calculator and resource materials
- Participation in joint media activities announcing the availability of the calculator.

A list of partners can be found in Figure 2.

Step 4: Beta Testing and Pilot Testing. The final step in the development process involved looking at the reliability and usability of the tool. We applied a series of beta test applications to check reliability. This process consisted of using demographic information from the original seven states comprising the foundation of this project with the online calculator. Cost estimate outcomes for the three different cost units [medical care, workers' compensation, and lost productivity] were compared between the original state-wide analyses outcomes and those of the calculator to determine what, if any, cost differences existed between the two formats. Any difference between these cost outcomes suggested the need to revise the cost unit *multiplier*. This multiplier is one of several variables which comprise the equation that determines the respective cost outcomes. As a result of this series of beta tests, slight cost outcome differences between the initial state-wide analyses were identified and slight changes to the multiplier values were made to ensure the online calculation tool consisted of reliable values (table 7).

Figure 2. Outreach Partners

AARP, Active Living Network, American College of Sports Medicine, Centers for Disease Control and Prevention - Physical Activity and Health Branch, Center for Medicare and Medicaid Services, Funders Network for Smart Growth and Livability, International Council on Active Aging, Medical Fitness Association, National Association of City and County Health Officials (NACCHO), National Association for Health and Fitness, National Coalition for Promoting Physical Activity, Partnership for Prevention, PE for Life, Prevention Institute—Strategic Alliance for Nutrition and Physical Activity, Rails to Trails Conservancy, Smart Growth America

Active Living Leadership organization partners including the International City/County Management Association, Local Government Commission, National Association of Counties, National Conference of State Legislatures, National Governors Association Center for Best Practices and the United States Conference of Mayors

In addition to the beta testing above, a two-week pilot-testing period was provided to communities, businesses and project partners. This pilot period provided an opportunity to assess both the reliability and the usability of the calculator and its accompanying materials. We asked pilot testers to complete a six-question survey. The online calculator and resource materials were revised based on comments from the survey. Subsequently, a final series of beta tests were conducted on the calculator to determine if the final algorithm formulas in the online software would yield appropriate outcomes based on changing values in each of the independent variables. These "what-if" scenarios provided a basis for perfecting the online calculations.

The following information provides detailed information regarding steps 1-2 and 4 of the development process.

METHODOLOGY FOR STEP 1-2

Development of Initial Calculus and Scientific Panel Review

Physical Inactivity Study Definition

We have defined physical inactivity according to the Surgeon General as l*ess than 30 minutes of moderate physical activity most, if not all, days of the week.* The preceding definition is being used as a representative level to classify the percentage of physically inactive adults based on reviewing the state-specific definitions (CA, MA, MI, NC, NY, TX, WA) that were used in original data collection (Table 1). We realize that the original state-specific definitions vary slightly, but feel the combination of all the state-level data (76 million adults) compensates for slight outcome variances incurred by minor variations in inactivity definition.

Scientific Framework

The framework used to develop this tool includes several key steps. The first step was to identify appropriate cost-sector fields to use as the basis for the spreadsheet. Upon an extensive review of the professional literature, three cost fields were identified: (1) medical care, (2) workers' compensation, and (3) lost productivity.

Table 1. Physical Inactivity Study Definition

State	Physical Inactivity Index
California	Less than 30 minutes of moderate physical inactivity most, if not all, days of the week
New York	No moderate exercise for a total of at least 30 minutes on three or more days per week
North Carolina	Combination of (1) No reported physical activity –and- (2) irregular physical inactivity [any physical activity or pair of activities done for less than 20 –or- less than three times per week]
Massachusetts	Less than 30 minutes of moderate physical inactivity most, if not all, days of the week
Michigan	No moderate exercise for a total of at least 30 minutes on five or more days per week –and- do not do vigorous activities for a total of at least 20 minutes on three or more days per week
Texas	Less than 30 minutes of moderate physical inactivity most, if not all, days of the week
Washington	Do not engage in any regular pattern of physical activity beyond daily functioning –or- any activity or pair of activities less than 5 times per week and 30 minutes/time and vigorous activity less than 3 times per week and 20 minutes/time.

The second step was to identify and confirm variables to use in building a statistical formula for each of the cost sectors. Upon conducting a nationwide search of professional articles, databases, and industry norms pertinent to each cost-sector, the following major sources were identified and used in developing calculations.

Medical Care: *Surgeon General's Report on Physical Activity,* Centers for Disease Control & Prevention, American Heart Association, and the National Heart, Lung and Blood Institute.

Workers' Compensation: Workers' Compensation Research Institute, Crawford, American College of Occupational and Environmental Medicine, and Liberty Mutual.

Lost Productivity: Journal of Occupational & Environmental Medicine, American Journal of Health Promotion, Work Loss Data Institute, Business & Health.

The third step was to develop cost formula computation worksheets that would be used to calculate nationwide physical inactivity cost norms for each of the three cost sectors (medical, workers' comp, and lost productivity). The computations can be found in the attached worksheets.

Medical Care. The worksheet computing medical care costs provides an estimation of the medical costs associated with physical inactivity based on a meta-analysis of seven (7) previous cost studies

done for the states of California, Massachusetts, Michigan, New York, North Carolina, Texas, and Washington for conditions listed in Table 2. The majority of conditions listed in Table 2 were identified by the *1996 Surgeon General's Report on Physical Activity and Health* as conditions conclusively associated with physical inactivity. A few conditions were added based on other research sources (see table notes for more detail). Statewide costs were determined by using a Proportionate Risk Factor Cost Appraisal™ technique which took into account the following factors: # and payments for inpatient and outpatient claims, ratio of inpatient to outpatient claims and payments, risk factors associated with each of the targeted conditions, risk factor (epidemiological) weights for each risk factor, and percentage of adults with a specific risk factor. As a final check , we compared the risk factor weight used in this cost analysis with risk factors weights used for the RTI-CDC 2003 study and made adjustments to our risk factor weights for cancer and circulatory conditions A median risk factor weight was constructed for each of these categories, based on the mid-point of the RTI-CDC weights and the initial weights in this analysis. This was done to provide a more objective perspective of the relationship between these conditions and physical inactivity, based on input from multiple parties.

Using actual medical care costs obtained from various health insurers (private and public) in seven states, per claimant and per capita claim and cost norms were computed. Medical care costs reflect inpatient and outpatient claims payments associated with employer-paid health plans and out-of-pocket expenses incurred by patients. Pharmaceutical (prescription) and over-the-counter (OTC) costs were not included. Sample sizes (# of adults with some form of health insurance coverage in each state) were substantial, ranging from a low of 21% in Washington to more than 80% in California. Collectively, the aggregate (all 7 states) number of adults totaled more than 76 million adults or nearly 4 of every 10 adults in the U.S.A. Demographic profile can be found in Table 3.

Table 2: Medical conditions associated with Physical Inactivity[1]

	MDC: Cancer (neoplasm)	
DRG #	**Condition**	**ICD Code**
152,159,179	Colon cancer	230.3
274, 275	Breast cancer	174, 175
	MDC: Endocrine & Metabolic	
294	Diabetes >35 years of age	250.0
		250.9
296-297	Obesity	278
300-301		
	MDC: Circulatory	
134	Essential hypertension	401
134	Hypertensive heart disease	402.9
316 & 317	Hypertensive renal disease	403
	Hypertensive heart & renal disease	404
122	Acute myocardial infarction	410
	Acute & subacute ischemic heart disease	411
412	Old Myocardial infarction	412
140 & 143	Angina Pectoris	413
132 & 133	Coronary Atherosclerosis	414
127	Congestive Heart Failure	428.9
	Unspecified Heart Disease	429.9
014-017	Subarachnoid Hemorrhage	430
014-017	Intra-cerebral Hemorrhage	431
014-017	Unspecified Intracerebral Hemorrhage	432
014-017	Occlusion Precerebral arteries	433
014-017	Occlusion Cerebral Arteries	434
014-017	TransCerebral Ischemia	435
014-017	Acute Ill-defined cerebro vascular disease	436
014-017	Other cerebrovascular disease	437
014-017	Late Effects of Cerebrovascular Disease	438
132 & 133	Atherosclerosis	440
103	Heart transplant	
106 & 107	Coronary bypass	
	MDC: Injury & Poisoning	
236	Hip Fracture	808
		808.1
	MDC: Musculo-skeletal	
241	Rheumatoid Arthritis	714
245	Osteoarthritis	715-715.9
	Pain in joint	719.4
	Stiffness joint	719.5
	Lumbago	724.2
243	Backache	724.5
	Polymyalgia Rheumatica	725
248	Synovitis &Tenosynovitis	727
	Rheumatism	729
	Osteoporosis	733
243	Strain/Sprain of back	847.9
	MDC: Mental	
426	Neurotic Depression	300.4
426	Depressive Disorder	311
427	Anxiety states	300
	MDC: Nervous system	
6	Carpal Tunnel Syndrome	354.0

[1] The majority of conditions were selected from the *1996 Surgeon Generals Report on Physical Activity* as those conditions conclusively associated with physical inactivity.[1a] The remaining conditions were identified from other sources.[17a-22a, 25a-26a, 41a-43a]

Overall, there is strong similarity between the 7 states' composite profile and the USA profile and, thus, it is plausible to generalize the findings from the former population to that of the nation.

The medical cost analysis within the seven state studies was based on data provided by the following organizations:

- **California.** Office of Statewide Health Planning and Development data representing approximately 90% of residents.
- **Massachusetts.** Harvard Pilgrim Health Plan and Tufts Health Plan data representing approximately 40% of residents.
- **Michigan.** Blue Cross & Blue Shield of Michigan data representing approximately 55% of residents.
- **New York.** NY State Strategic Planning and Research Cooperative System data representing nearly 90% of residents.
- **North Carolina.** Blue Cross Blue Shield of NC data representing approximately 25% of residents.
- **Texas.** Texas Health Care Information Council data representing approximately 90% of residents.
- **Washington.** Regence BlueShield data representing approximately 21% of residents.

Table 3. Demographic Profile Comparisons Between Seven States vs. USA

Characteristic	7-States	USA
Persons with some type of health insurance	89%	85%
Percentage of persons who are female	51%	50.9%
Percentage of persons who are male	49%	49.1%
Persons under 18 years of age	33	25.7%
Persons between 18 – 64 years of age	55%	61.9%
Persons 65 + years of age	12%	12.4%
Caucasian	72.5%	75.1%
Hispanic/Latino	12.2%	12.5%
African-American	12.0%	12.3%
Asian	3.2%	3.6%
American Indian/Alaska Native	.1%	.9%

The preceding data sources capture a substantial portion of all claims and payments incurred by adults in each of the targeted states; however, due to various reasons – ranging from possible miscoding to accounting errors – some claims and charges may not have been identified for inclusion in this analysis.

Workers' Compensation. Employers fund state-mandated workers' compensation programs. The workers' compensation worksheet provides an estimation of the costs associated with workers compensation data from each of the seven states and was used to compute a representative per capita (per worker) cost of physical inactivity relevant to workers' compensation conditions. Workers' compensation data were extracted from both state workers' compensation agencies and the Workers' Compensation Research Institute (a national research clearinghouse). Among all types of worker's comp; musculoskeletal strains and sprains were extracted from each of the databases [1b-10b] based on their classification by The American College of Occupational and Environmental Medicine as a primary injury group that are most applicable to physical inactivity. Strains and Sprains have been closely associated with physical inactivity.[35a, 11b-22b] Several studies indicate physically inactive persons are more likely to incur workers' compensation injuries and, concomitantly, have longer recovery periods than physically active persons.[35a,11b-12b]

Lost Productivity. The purpose of this worksheet is to compute a representative per capita (per worker) cost of physical inactivity relevant to two measures of lost productivity: (1) absenteeism and (2) presenteeism. An annual work schedule consisting of 2,000 hours was based on 50 weeks @ 40 hours per week. Lost absenteeism and presenteeism hours data were extracted from actual worksite studies, while median compensation costs were obtained from each state's labor or commerce department. NOTE: the presentation data used are suggestive due to the limited number of published studies on this presumed association. We believe productivity-related costs of physical inactivity are substantial and may be consistently greater than medical-related costs; the current data base is too preliminary to demonstrate a strong relationship at this time.

Comprehensive Physical Inactivity Cost Calculus worksheet. The comprehensive cost calculation uses summarized data from the 7-study meta-analysis (from the three cost estimation documents – medical costs, workers' compensation and lost productivity) and information culled from a specific demographic population /community (population size, number of working adults, median compensation, physical inactivity rate). Each of the three cost units are listed on the top half of the spreadsheet and then combined to provide a ***total cost summary*** and a ***per capita (per adult) cost.*** It is important to note cost estimations listed in this spreadsheet should be viewed as relative (approximate), not absolute.

Other General Assumptions

Costs related to injuries occurring from physical activity were not considered in this calculation series as the goal of the project is to provide only a gross estimate of costs of physical inactivity for budgeting and resource reallocation purposes.

While the cost of human life has been used in estimating the public health costs of such things as air pollution and traffic accidents, the value of a human life is not easy to quantify, and for the purpose of the development of this tool, has not been incorporated into the calculations.

While there is a possibility of an overlap between medical-only and workers'comp-specific disability claims, efforts were made to keep medical care charges for non- workers' comp strains and sprains separated from workers' comp-related charges for strains and sprains. For example, only claims reportedly paid exclusively by a ***state-approved workers' compensation*** payor organization were classified as workers' comp payments.

We have made assumptions used in the corporate world in looking at lost productivity issues and applied them to a breakdown of selected cost areas.

To adjust for the fact that adults older than 65 tend to have significantly higher medical costs, we have included a multiplier of 2.0 to the percentage of adults 65 year of age and older.. A baseline multiplier of 2.0 was selected based on research showing that adults in this age group incur two or more times more health care services and costs than persons under 65 years of age.[58a-59a]

METHODOLOGY FOR STEP 1-2

Computation Worksheets

Medical Care Cost Computation Worksheet

SECTION I

A. **Seven-state cost distribution**: reflects the percentage of seven states' [combined] total medical charges attributed to each of the seven (7) MDCs related to physical inactivity, e.g., .097 or 9.7% of total medical care charges among all seven states are tied to cancer. *Source: actual inpatient and outpatient medical claim charges obtained from large insurers and state departments of health services. NOTE:* The majority of conditions listed in table 2 were identified by the *1996 Surgeon General's Report on Physical Activity and Health* 2 as conditions conclusively associated with physical inactivity.[1a] A few conditions (breast cancer, stroke, carpal tunnel syndrome, and hip fracture) were added based on compelling documentation from other research.[17a-22a, 25a-26a, 41a-43a]

B. **MDC % of targeted MDC charges**: reflects the percentage of charges among the seven MDCs tied specifically to each of the targeted MDCs, i.e., breast and colon cancer charges comprise 16.7% [.167] of total charges for the seven MDCs; circulatory charges comprise 28.7% of total charges, etc.

NOTE: The preceding factors (A & B) were included in the preliminary phase of preparing the actual cost analysis framework primarily to *determine if the targeted MDCs comprised a sufficient percentage of total charges to merit this analysis.* A review of these data shows a sufficient percentage of claims and charges do exist in each of the seven states.

C. **Average cost per MDC**: reflects the average weighted cost of each MDC claimant (shown in row "H"). See Section II in which average MDC-specific costs were calculated and averaged across each of the seven states.

D. **# Of claims per capita**: reflects the # of MDC-specific claims per capita (per adult) – see **Table 2** for complete listing of targeted MDCs.

E. **Annual cost per capita**: "C" multiplied by "D"

F. **Physical inactivity risk factor weight**: reflects the percentage by which physical inactivity influences the conditions listed within each of the targeted MDCs, i.e., physical inactivity contributes approximately 8% of all risk for cancer, 12% for circulatory claims, etc. NOTE: risk factor weights were determined by reviewing selected research studies listed in the references. [3a-43a]

Risk factor weights for physical inactivity were calculated initially by identifying all risk factors associated with each of the targeted medical conditions [as shown in Table 2]. Second, ***physical inactivity and other risk factors*** identified in the professional literature were compared and ranked to

see which risk factors had the highest statistical significance for each condition. Risk factor values were grouped from the selected articles and averaged.[7a-43a] Specific articles selected for constructing risk factor weights focused on physical inactivity and associated risk factors and their independent and collective impact on each of the targeted medical conditions.

G. **Risk Factor Cost:** **"**E" multiplied by "F" reflects a weighted **medical** cost of physical inactivity for each of the targeted MDCs.

H. **Cost per Claimant**: reflects the average cost per claimant by dividing total dollars charged by # of claimants. The medical care inflation rate for each state has been used to adjust cost per claimant to 2004 dollars. In order to establish current cost per claimant figures, we used state-specific medical care inflation rates from 7.05% to 10% to convert cost data obtained from 1998 to 2003 into 2004 dollars.

I. **Per capita claims**: reflects the number of claims by specific MDC incurred on a per capita (per adult) basis; calculated by dividing number of adults in each state by the number of MDC-specific claims

PLEASE NOTE: DATA LISTED IN SECTIONS I AND II WERE USED TO DEVELOP ROWS C, D, E. F, AND G IN SECTION I.

Table 4. Medical Cost Computation Worksheet

		SECTION I *Major Diagnostic Categories*						All MDC
	Breast and			Hip	Anxiety &	Musculo-	Carpal	
COST UNIT VARIABLE	Colon Cancer	Circulatory	Diabetes	Fracture	Depression	Skeletal	Tunnel Syn	**Total**
A. 7-state$distribution	0.097	0.166	0.036	0.001	0.064	0.211	0.005	0.58
B. MDC%:Targeted MDCs	0.167	0.286	0.062	0.002	0.110	0.364	0.009	1
C. Ave. Cost per MDC	3355.86	1688.14	1175.57	24050.29	1039.57	812.29	1878.43	
D. # of claims per capita	0.013	0.043	0.043	0.002	0.108	0.131	0.010	**0.35**
E. Annual cost per capita	44.11	72.83	50.72	54.32	112.57	106.18	18.46	
F. Phys Inact.R.F.Weight	**0.13**	**0.16**	0.22	0.08	0.07	0.065	0.15	
G. Risk factor cost	5.73	11.65	11.16	4.35	7.88	6.90	2.77	**50.44**
* State		Section II	**Cost Per Claimant**					State Ave.
N.Carolina	1533	2683	759	31374	1529	1754	621	5750.43
New York	2699	2179	1899	16335	561	406	2205	3754.86
California	4075	364	597	16350	918	265	230	3257.00
Texas	11073	2349	1718	32235	1685	863	2750	7524.71
Michigan	1669	961	2295	23395	1400	1085	4990	5113.57
Massachusetts	1510	1784	821	24867	365	1082	365	4399.14
Washington	932	1497	140	23796	819	231	1988	4200.43
H. Average	3355.86	1688.14	1175.57	24050.29	1039.57	812.29	1878.43	
*** State**		Section III	**Per Capita Claims**					State Ave.
N.Carolina	0.017	0.088	0.093	0.0058	0.028	0.054	0.016	0.043114
New York	0.008	0.172	0.023	0.00034	0.181	0.195	0.0002	0.082791
California	0.008	0.17	0.023	0.00174	0.182	0.195	0.009	0.084106
Texas	0.004	0.127	0.067	0.0003	0.003	0.202	0.005	0.058329
Michigan	0.023	0.028	0.007	0.00591	0.002	0.027	0.017	0.015701
Massachusetts	0.024	0.023	0.024	0.00035	0.176	0.224	0.02	0.070193
Washington	0.008	0.055	0.065	0.00137	0.186	0.018	0.0016	0.047853
I. Average of 7 states	0.013	0.095	0.043	0.002	0.108	0.131	0.010	0.057441

POPULATION PROFILE	# adults
N.Carolina	6,085,266
New York	13,922,216
California	24,500,000
Texas	15,015,000
Michigan	7,567,350
Massachusetts	4,850,710
Washington	4,519,892
Total (7 states)	76,460,434
Average of7 states	10,922,919
USA adults	202,000,000
7 states as % of USA	0.38

Table 5. Workers' Comp Cost Calculation

Source:	Census Bureau	Census Bureau	OSHA/ODG[1]		OSHA/ODG[1] or state database[2]		WCRI[3]	
State	# of Adults	# of Workers	Claims Per Worker	Total # W.C. Claims	# of Strain/Sprains	Total $ Paid Strain/Sprain	Average $ Per Str/Sprain Claim	PER WORKE
California	24,500,000	14,300,483	0.018	257,409	118408	2,632,801,863	22,235	184.11
North Carolina	6,085,266	3,914,300	0.018	70,457	32410	663,473,380	20,471	169.50
New York	13,922,216	8,850,100	0.018	159,302	73279	1,401,311,028	19,123	158.34
Massachusetts	4,850,710	2,971,072	0.018	53,479	24600	311,392,827	12,658	104.81
Michigan	7,567,350	5,136,130	0.018	92,450	42527	813,246,812	19,123	158.34
Texas	15,015,000	9,351,500	0.018	168,327	77430	1,635,795,053	21,126	174.92
Washington	6,083,301	3,360,000	0.018	60,480	27821	290,236,998	19,123	86.38
7 State Avg	13,003,974	7,980,598	0.018	143,651	66079	1,291,376,327	22,310	***135.72***

Str/Sprain Per Worker Cost	%of Str/Sprain Due to Phy Inactivity	Physical Activity Per Worker National Cost
135.72	*0.065*	***8.82***

[1] OHSA data publiched in Official Disability Guidelines, 6th Edition, 2001.
[2] Strains and strains obtained from actual state-wide databases [10a-10b]
[3] Workers' Compensation Research Results Institute (Benchmarks for eleven states) data listed at website: www.wcrinet.org [Benchmark states included California, Massachusetts, North Carolina and Texas; New York,, Michigan and Washginton data are estimates based on an average of the other four states]
[4] Based on a review of the professional literature: [11b-22b] NOTE: Physical inactivity is assigned a risk factor weight of 6.5% (.065),based on the methodology listed in section 1.F.1.

WORKERS COMP COST COMPUTATION WORKSHEET

- # of workers: represent the # of workers in the target population.
- Claims per worker: represents the national prevalence of workers' compensation claims. [4b, 23b]
- Total # of workers' comp claims: represents the # of all workers' comp claims reported in each state.
- # of strains/sprains: this reflects the percentage (46%) of all nationwide workers' comp claims that are specifically classified as musculo-skeletal strains or sprains. [23b]
- Total $ paid: this is the estimated payments for sprains and strains based on multiplying the actual number of state-specific workers' comp claims [1b-10b] by the percentage of such claims classified as a musculo-skeletal strain or sprain.[4b,23b]
- Average $ per strain/sprain claim: total $ paid divided by the # of strain and sprain claims.
- $ per worker: total payments divided by # of workers
- Per worker net cost: sum of taking the strain/sprain cost per worker multiplied by the percentage of strains/sprains due to physical inactivity

Lost Productivity Cost Computation Worksheet

Absenteeism may be defined as not being present or attending to duty or work. *Presenteeism*, a term coined in 1994 by Dr. Cary Cooper, Professor of Organizational Management at Manchester University is the exact opposite of absenteeism: being at work when you should be at home, either because you are ill or because you are too tired to be effective.[1c]

Some researchers classify presenteeism as the productivity loss that occurs when workers are on the job but not fully functioning.[2c-3c] Exactly how is presenteeism measured? Not easily. Productivity studies are hampered by the difficulty of quantifying output, exacerbated by the shift [in the USA] from manufacturing and piecework to providing information and services. Matching productivity loss to individual risk factors is even harder, since it requires detailed employee records.[3c]

Despite the limited volume of published research on presenteeism and specific risk factors, at least two worksite-based studies have been conducted to explore this correlation. Using actual industry-specific productivity benchmarks, one of the studies involved customer-service employees at a large financial institution[3c] while the other represented employees from several manufacturing plants throughout the midwest.[2c] The estimates produced by this calculator should be used as an estimate only – to guide resource allocation. The estimates should not be considered absolute as the research in this area is quite young and limited.

Cost Unit (column A) – specifies the focus of "lost productivity" will be limited to: (1) *absences* (unscheduled, i.e., sick leave) and (2) *presenteeism* (performing work at a substandard level)

Average Hours Lost Per Year (column B) – reflects the average number of hours lost per worker directly associated with physical inactivity. The hours lost per worker data were obtained by taking hourly data from various articles and constructing a composite average.[2c-6c]

Scheduled Workload (column C) – reflects an annual workload of fifty weeks per year @ 40 hours per week

Lost Hours as % of Scheduled Workload (column D) – reflects the percentage of an annual workload that is lost due to absences and presenteeism

Median Compensation (column E) – represents a midpoint (50th percentile) of total compensation in which 50% of workers earn more than this amount and 50% of workers earn less than this amount

# of Workers (column F) – represents the number of individuals employed in an organization

Lost Productivity Cost (column G) – sum of column D x column E x column F

% Physically Inactive (subcategory of column F) – the percentage of individuals in the target population (e.g., organization) who are physically inactive

Lost Productivity Cost Computation Worksheet (cont)

Total Lost Productivity Cost (subcategory of column F) – the subtotal multiplied by the % of physically inactive.

Per Capita Cost (subcategory of column F) – represents the lost productivity cost *tied to physical inactivity per worker*; this is computed by multiplying the % of physically inactive persons by the total cost of lost productivity

Table 6. Lost Productivity Worksheet

	Average Hours	Scheduled	Lost Hours as	Median [4]		Lost
Cost Unit	Lost per Year[1]	Workload[2]	% of Workload[3]	Compensation	# Workers	Productivity Cost
Absences	18.08	2000	0.00904	36,929	2,000	667676.32
Presenteeism	140.75	2000	0.070375	36,929	2,000	5197756.75
					Subtotal	5865433.07
					x % phys. inactive	0.5
					TotalLost ProdCost	2932716.535
					Per Capita Cost	**1466.36**

Footnotes

[1] Based on research studies 2c-6c listed in References:

Source	# of Hours	Days Per Year
Edington	3.5	0.43
Burton & Conti	16	2
IHRSA	7.6	0.95
Lechner et al	38.4	4.8
Opatz	24.88	3.11
Average	***18.08***	**2.26**

[1] *Presenteeism* hours based on the average of 131.5 (Burton & Conti) and 150 (Edi

[2] Based on 50 weeks of 40 hours per week

[3] Average hours losts per year ("B") divided by scheduled workload ("C")

[4] Annual salary and benefits

Methodology for Step 4

Beta Test

The primary goal of the beta test was to determine the reliability of the online calculator, specifically to: ensure that the Web based calculator reliably translated equations developed in steps 1 -2 and that the calculator equations yield similar cost outcome data as the outcomes from the original seven state studies used to develop the algorithms used in this calculator?

The beta test compared data sets and outcomes from the original seven studies with cost results from the calculator. Essentially, data from the preceding framework reflects a 7-state analysis which was used to develop a spreadsheet comprised of equations in three primary cost units. Within each of the cost units, combined data from all of the respective states indicated the following:

Cost Unit	Description	Multiplier
• Medical Care	Average medical care cost of physical inactivity	$50.44
• Workers' Comp	Average cost per worker due to physical inactivity	$ 8.22
• Lost Productivity	Percent of annual workload lost to physical inactivity	0.079

The main procedure used in the beta test involved subjecting each state's physical inactivity profile data to the physical inactivity cost calculator to determine itemized medical care, workers' comp, and lost productivity cost outcomes. Second, cost outcomes generated with the calculator equation for each state were compared against cost outcomes from the original state-specific analyses w. This comparison was selected to determine if the multipliers ($50.44, $8.22, and .079) established for the cost calculator accurately reflects the equations used in the original statewide analyses. Outcome of this procedure yielded a range of outcomes which are detailed in the table below. Once the ranges were identified, slight changes to the multipliers were made to establish a more representative baseline.

	Medical Care	Workers' Comp	Lost Productivity
Original multiplier	$ 50.44	$ 8.22	0.079
% Difference	- 1.9	- 6.1	-12.2
Adjusted multiplier	$ 98.92	$7.72	0.069

Table 7. Beta Test Multiplier Analysis

	Medical	Medical	Medical	Work Comp	Work Comp	Work Comp	Lost Prod.	Lost Prod.	Lost Prod.
	State analysis	LAL Cost Calc	Percentage	State analysis	LAL Cost Calc	Percentage	State analysis	LAL Cost Calc	Percentage
State	Costs	Costs	Difference	Cost	Cost	Difference	Cost	Cost	Difference
California	1.96	1.33	1.473684211	50	90	0.555555556	7.7	21.6	0.356481481
Massachusetts	1	0.401	2.493765586	3.7	28.8	0.128472222	8.2	8.41	0.975029727
Michigan	231	408	0.566176471	39.8	29.7	1.34006734	8.62	7.16	1.203910615
North Carolina	599	376	1.593085106	9.9	31.1	0.318327974	6.8	7.67	0.886571056
Washington	791	215	3.679069767	45	19.1	2.356020942	4.6	4.74	0.970464135
		Total	9.805781141			4.698444035			4.392457014
		Average	1.961156228			0.939688807			0.878491403
		Difference	1.961156228			0.939688807			0.878491403
Current Multiplier			50.44			8.22			0.079
Recommended			98.92072015			7.724241993			0.069400821

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