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Absenteeism Due to Functional Limitations Caused by Seven Common Chronic Diseases in US Workers

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Abstract

OBJECTIVE—The study examined the relationship between functional limitation due to chronic diseases and absenteeism among full-time workers. The studied chronic diseases include: arthritis/rheumatism, cancer, diabetes, heart disease, hypertension, lung disease, and stroke.

METHODS—We analyzed data from the 2011–2013 National Health Interview Survey. Economic impact was determined by workdays lost and lost income.

RESULTS—Increase in absenteeism was observed for each studied condition. Employees with multiple conditions also saw increase absenteeism. Employers lose 28.2 million workdays annually ($4.95 billion in lost income) due to functional limitation caused by chronic diseases.

CONCLUSION—The results show a burden on society due to functional limitation caused by studied chronic diseases. Employers should look into implementing intervention/prevention programs, such as the Chronic Disease Self-Management Programs, to help reduce the cost associated with absenteeism.

Keywords

absenteeism; functional limitation; chronic diseases; CDSMP

INTRODUCTION

The working population and their employers have become increasingly aware of the cost associated with chronic diseases. Chronic diseases accounted for 75% to 86% of the overall health care costs in the United States,[1,2] with total healthcare spending reaching approximately $2.6 trillion in 2010.[3] Besides the rising healthcare costs, employers are concerned due to the loss of productivity from employee absenteeism and presenteeism. On

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the other hand, employees are primarily concerned due to the loss of income.[4] Lost income can come in many ways for employees, ranging from early retirement to unpaid days off from work due to illnesses. Schofield et al. assessed that chronic diseases caused approximately $18 billion Australian dollars in 2009 in lost income among Australians aged 45–64 years old.[5]

Prior studies have quantified productivity loss due to absenteeism in the workplace for a variety of chronic diseases. Using the 2001–2003 National Comorbidity Survey Replication (NCS-R) data, Merikangas et al. (2007) estimated that Americans took approximately 3.6 billion days off annually from work due to health-related illnesses.[6] The Milken Institute used the 2003 reported cases of chronic diseases to calculate that absenteeism accounted for $127 billion in loss economic input.[7,8]

However, not everyone with chronic diseases have limitations that impede their daily activity. Functional limitation caused by chronic disease varies due to the type of chronic disease, severity of the chronic disease, age and gender of the individual, and also the number of comorbid conditions incurred.[9–13] According to the Lewin Group's analysis of the 2006 Medical Expenditure Panel Survey (MEPS), 24 million people under the age of 65 years old had a chronic disease causing functional limitation.[14]

Few studies have been conducted looking at the economic impact of functional limitation due to chronic diseases on the working population using national data.[14,15] Many functional limitation studies have instead focused on the elderly population instead of the working population.[12,16–18] As the incidence of chronic disease in the United States has increased in the past couple of decades,[19,20] it is important to use current data to understand the economic impact of absenteeism due to functional limitation caused by chronic diseases. The study results might provide economic incentives for employers to establish and promote workplace wellness programs as well as chronic disease intervention programs, such as the Stanford Chronic Disease Self-Management Program (CDSMP).[21] Modest reduction in unhealthy behaviors could prevent or delay the onset of chronic disease as well as functional limitation effects due to chronic disease. The Stanford CDSMP has demonstrated that it consistently and significantly helps individuals to better manage their chronic diseases.[22,23] As individuals are responsible for their health, these self-management interventions will allow individuals to have information and provide skills that are critical in providing a long-term success in managing their chronic diseases.

This study focuses on seven physical chronic diseases categorized in the National Health Interview Survey (NHIS): arthritis/rheumatism, cancer, diabetes, heart disease, hypertension, lung disease, and stroke. These seven conditions were selected because these are either the most common physical chronic diseases (cancer, diabetes, heart disease, hypertension, lung disease, and stroke) or the most common cause of disability (arthritis/rheumatism) in the US adults.[1,7] The study uses NHIS data to assess association between absenteeism and the status of functional limitation attributed one of the seven studied chronic diseases. With an increase in individuals with multiple chronic diseases,[24] we also assess whether there is an association between absenteeism and the number of studied chronic diseases that cause an individual's functional limitation. The study also determines

the economic impact of absenteeism for those with limitations caused by one of the studied conditions.

METHODS

Data Sources

The study uses the 2011–2013 NHIS data generated through the Integrated Health Interview Series project (https://www.ihis.us/ihis/) at the Minnesota Population Center of the University of Minnesota.[25] The NHIS is a cross-sectional in-person household survey administered since 1957 by the Centers for Disease Control and Prevention National Center for Health Statistics (NCHS) to collect information regarding the health status of the civilian non-institutionalized US population.[26] The University of Arkansas for Medical Sciences (UAMS) Institutional Review Board (IRB) has reviewed and determined that this study is exempt from the IRB approval process.

The NHIS gathers demographic and health data on each family member for each household selected for participation. In addition, one adult is randomly selected from each family to participate in the Sample Adult core in which additional questions are asked. Individuals selected respond for themselves to these additional questions unless physically or mentally unable to do so, in which a proxy is allowed to respond for the sample adult. This study used data from individuals selected to participate in the Sample Adult core. The NHIS considers an adult to be an individual who is at least the age of majority as dictated by state laws.[27] The age of majority for most states is 18 years old; however the age of majority in Alabama and Nebraska is 19 years old, and in Mississippi is 21 years old. Other methodological details regarding the NHIS can be found elsewhere.[28–31] The 2011–2013 Sample Adult core portion of the NHIS had an adult sample size of 102,096 individuals. The conditional response rate for the Sample Adult core portion was 81.6% for 2011, 79.7% for 2012, and 81.7% for 2013; the final response rate for the Sample Adult core portion was 66.3% for 2011 and 61.2% for 2012 and 2013.[28–30] The conditional rate does not take into account for nonresponse in the family section. It is calculated by dividing the number of completed sample adult interviews by the total number of eligible adults. The final response rate (also called the unconditional response rate) takes account for family nonresponse and is calculated by multiplying the conditional rate by the final family response rate.

Absenteeism and Full-Time Worker Status

The objective of this study is to examine absenteeism due to functional limitations caused by seven common chronic diseases. Absenteeism was determined based on an individual's response to a question regarding how many workdays were lost due to illness *in the past year*. Individuals were also asked about their work and employment status during the NHIS interview. Full-time status was determined based on four questions regarding their work history: (1) three questions were asked regarding how many hours an individual worked or usually worked at all jobs in a week, and (2) one question regarding how many months in the previous year did that individual have at least one job. To be classified as full-time in the study, an individual must have worked at least 35 hours in a week and worked for 12 months in the year prior to the NHIS survey. The reason for someone having to work for 12 months

in order for full-time status is that the NHIS' absenteeism question was asked for the time period of the previous "year." To ensure all individuals included in the study sample had equal opportunity to "miss" work in the previous year as well as the answers of absenteeism question can be meaningfully compared among all study subjects, we restricted that subjects in the study sample had to work for 12 months in order for full-time status.

Analytic Sample

To be included in the analytic sample, participants had to be 18 through 64 years old age at the time of the survey (n = 80,080). In addition, individuals age 18 through 64 years old who did not work full-time were not included in the analytic sample (n = 40,675). Also, individuals who did not respond or their response were not ascertained to questions regarding functional limitation (n = 41) or questions regarding lost workdays due to illness (n = 148) were also excluded from the sample. Fourteen individuals did not answer both questions. This resulted in an analytic sample of 39,230 individuals for the study.

Functional Limitations Due to Chronic Diseases

In the NHIS Sample Adult core portion, participants were asked if they have had any difficulties in performing certain activities. Those who indicated any difficulty were considered to be functionally limited. The activities that were asked to each individuals included: (1) walking a quarter of a mile without special equipment, (2) walking up ten steps without resting, (3) standing for two hours, (4) sitting for two hours, (5) stooping, bending, or kneeling, (6) reaching above the head, (7) grasping or handling small objects, (8) lifting or carrying items as heavy as ten pounds, (9) pushing or pulling an object, (10) going out to shop, to the movies, or similar events, (11) participating in social events, or (12) participating in activities for leisure, such as reading, watching TV, and listening to music.

Individuals who responded to have functional limitation were then asked a follow-up question to determine if certain health conditions caused their limitation. For each identified health condition that had caused the interviewee's functional limitation, follow-up questions were asked to determine if it is either chronic or non-chronic condition. The seven *chronic* conditions of interest for the study includes arthritis/rheumatism, cancer, diabetes, heart disease, hypertension, lung disease, and stroke. These seven diseases were selected because these are either the most common physical chronic diseases or the most common cause of disability in the US adults.[1,7] The number of chronic diseases attributed to an individual's functional limitation was grouped into three classifications in this study: none of the seven studied chronic diseases attributed to functional limitation, one of the seven studied chronic diseases attributed to functional limitation, and two or more of the seven studied chronic diseases attributed to functional limitation.

Data Analysis

All statistical data analyses for this study were generated using SAS® software (SAS Institute Inc., Cary, NC), Version 9.3 of the SAS System for Windows. The NHIS data were collected using a stratified, multistage, cluster sampling design, oversampling for minorities (blacks, Hispanics, and Asians). Analyses were weighted for the probability of selection and accounted for the complex sample design of NHIS.[32]

The PROC SURVEYREG was used for linear regression, which assessed any significant association between functional limitation attributed to a chronic disease and the number of lost workdays. Seven models were run for each of the studied chronic diseases of interest. In addition, regression models were used to determine association between the number of studied chronic diseases that caused functional limitation and lost workdays. A p-value of < 0.05 is considered statistically significant for the study.

The total number of excess workdays lost per year due to a specific chronic disease that attributed to an individual's functional limitation was calculated by the following formula,

$$\mathrm{EWD}=\frac{(\overline{y}_1-\overline{y}_2)*n_1}{3\ \mathrm{years}}. \quad (1)$$

where EWD is the number of excess workdays lost per year; $\overline{y}_1$ is the mean workday lost of individuals with limitation caused by a specific studied chronic disease; $\overline{y}_2$ is the mean workday lost for individuals without limitation caused by that specific chronic disease; and n_1 is the weighted frequency for individuals with limitations caused by that specific chronic disease.

In addition, the total number of excess workdays lost per year for the total number of studied chronic diseases that attributed to an individual's functional limitation was calculated for the same three year period,

$$\mathrm{EWD}=\frac{(\overline{y}_3-\overline{y}_4)*n_3}{3\ \mathrm{years}} \quad (2)$$

where $\overline{y}_3$ is the mean workday lost for individuals with total x-number of studied chronic diseases that caused functional limitation; $\overline{y}_4$ is the mean workday lost for individuals with no functional limitation caused by any of the studied chronic diseases; and n_3 is the weighted frequency of individuals with total x-number of studied chronic diseases that caused an individual's limitation.

Economic impact was then determined through income lost per year. The average income by those with functional limitation due to each specific chronic diseases were calculated from the person's total earnings during the previous calendar year, as well as the average income by the number of chronic conditions causing functional limitation. The person's total earnings from the previous year was top-coded at the 95th percentile for each NHIS year, with the top five percent of values set at the top-coded value.[33] The top-coded income value was $115,000 for 2011 and $120,000 for both 2012 and 2013. The economic impact for both specific chronic disease causing an individual's functional limitation and the number of chronic diseases causing an individual's functional limitation was calculated by multiplying the number of excess workdays lost per year by the income information divided by the typical number of workdays. The typical number of workdays in a year was estimated based on an 8-hour workday, working 260 days in a year.

RESULTS

Out of the 39,230 full-time workers in the analytic sample, 6,055 individuals indicated that they had a functional limitation due to chronic diseases. Forty-two percent (n = 2,563) of them had functional limitation caused by one of the seven chronic diseases of interest in the study.

Our study showed that there was a significant association between workdays lost and functional limitation attributed to chronic disease for all seven conditions. Table 1 displays the frequency, mean workdays lost, and *p*-values for each of the seven chronic diseases of interest in the study. The average workdays lost per year is approximately three days for individuals without functional limitation attributed to the seven chronic diseases of interest. Among those with limitations due to one of the seven chronic diseases of interest, individuals with limitations due to arthritis/rheumatism had the lowest average number of workdays lost at 6.65 days; however, arthritis/rheumatism was also the most prevalent chronic disease causing functional limitation. The next two lowest average numbers of workdays lost were chronic lung disease and chronic diabetes at 9.84 days and 10.43 days, respectively. Cancer accounted for the highest average number of workday loss of the seven studied conditions at 37.32 days.

In addition, analysis was done for the total number of studied chronic diseases attributed to functional limitation on workdays lost as displayed in Table 2. The majority of individuals with functional limitation caused by one of the seven studied chronic diseases attributed their limitation to only one chronic disease. The mean number of workdays lost increases as the number of studied conditions that caused an individual's limitation increase.

The number of excess workdays lost per year and the economic impact are displayed in Table 3. There were a total of 6.2 million full-time employees suffering functional limitations attributed to one of the seven studied chronic diseases. Arthritis/rheumatism accounts for an additional 19,411,385 workdays lost per year, or $3.54 billion per year. Although only 1.8% of individuals with functional limitation attributed to cancer, it was the second highest in number of excess workday lost and lost income based on 2013 averages. In 2011–2013, the seven chronic diseases accounted for 28.2 million workdays lost per year, totaling $4.95 billion dollars in lost income per year.

DISCUSSION

There have been various studies looking at chronic disease and absenteeism;[34–36] however, there are few studies looking at the relationship between individuals with functional limitation attributed to chronic disease and absenteeism. Our study examined the relationship between functional limitation due to chronic diseases and absenteeism among full-time workers. We detailed that functional limitation attributed to one of the seven studied chronic diseases caused significant absenteeism and that providing mechanisms to help workers to better self-manage their chronic diseases could be an avenue for employers to focus on when coming up with ways to reduce lost productivity.

Those previous studies have shown an increase in absenteeism in those with chronic diseases. In our study, we observed a significant increase in workdays lost in those with functional limitation due to chronic diseases, with approximately 6.2 million full-time employees in the civilian US population who suffer from at least one studied functional limitation chronic disease. The largest contributor to the number of workdays lost is the 5.1 million full-time employees who had functional limitation due to arthritis/rheumatism. They account for approximately 68.7% of the total excess workdays lost and income lost among all full-time workers suffering functional limitation attributed to one of seven studied chronic diseases. The next largest contributor is those with functional limitation attributed to cancer, accounting for approximately 13.8% of the total excess workdays lost. We also found that those with functional limitation attributed to multiple studied comorbid chronic diseases had a 2.5-fold increase in the number of workdays lost from those with functional limitation attributed to only one studied chronic disease. Compared with those without any functional limitation attributed to one of the seven studied condition, it represents a 5.9-fold increase in absenteeism.

The total amount that arthritis/rheumatism related functional limitation attributes to absenteeism was expected because it is the most common cause of disability in the US adults.[1] Chronic diabetes and hypertension are highly prevalent diseases that can cause disability, and they frequently occur together.[37] Chronic heart and lung diseases have also been shown to increase the risk for disability.[38,39]

Stroke and cancer are less prevalent compared to the other five chronic conditions; however, the severity of these two chronic diseases produces much higher number of absenteeism days per person. A study in New Zealand found that stroke victims who are in the workforce, approximately half return to full-time status within a few months of their stroke.[40] For cancer, a study found that half of individuals with cancer-related disability stopped working altogether.[41] In addition, the after effects of cancer treatment can linger after the end of treatment with a significant amount of survivors reporting fatigue symptoms.[42]

Due to the huge contribution of these seven studied chronic conditions have on absenteeism, the study would suggest that preventing functional limitation due to these chronic diseases and improving the quality of life for people with one or more of these seven chronic conditions is vital in reducing absenteeism. One avenue in which employers can partake in reducing absenteeism includes implementing or partnering with local agencies that offer some type of intervention/prevention programs, such as the Stanford CDSMP,[43] to empower individuals with chronic diseases so that they can be responsible for their health and manage their condition. The Stanford CDSMP is a low-cost evidence-based program that has been shown to improve the quality of life for individuals with chronic diseases and reduce hospitalization.[43] There have been studies on health-promotion programs at worksites on productivity, but no published studies have been completed regarding the impact of these programs on employment.[44–46] It will thus be interesting to see the impact of these interventions has on work productivity and absenteeism on those with functional limiting chronic diseases.

There are several limitations that are important to keep in mind while interpreting the results of the study. The first limitation is due to the cross-sectional nature of the NHIS. The design of the NHIS does not allow one to draw a causal relationship. Second, the NHIS required individuals to self-respond retrospectively to questions regarding work status and absenteeism, and in some cases it was proxy-reported. This could affect the accuracy of the data due to recall bias. Social desirability can also bias respondents to underreport limitations and chronic diseases.[47,48] Third, due to limitations from the 2011–2013 NHIS questionnaire, we were unable to distinguish those with chronic disease but without functional limitation from those without any chronic diseases at all. Last, the NHIS data does not allow us to study productivity losses due to presenteeism.

Our study found that full-time workers with functional limitation due to chronic diseases often miss significantly more workdays than those without limitations. This information provides the incentives needed for employers to offer mechanism to help workers better self-manage their chronic diseases. The interventions, such as Stanford's CDSMP, have been extensively demonstrated as cost-effectiveness in elderly population but not yet tested at workplaces. As employers are becoming increasingly aware of the rising costs of chronic diseases, studies on effectives of these interventions in reducing absenteeism at workplaces are needed. In addition, there is substantial evidence that self-management of chronic disease can help reduce the financial burden of the overall health care system, as well as increasing work productivity in employees with chronic diseases. Studies of these self-management programs on functional limiting chronic diseases at workplaces will thus be useful for not only employers, but also for health-care professionals and policymakers.

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Conflicts of Interest and Source of Funding:

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References

1. Centers for Disease Control and Prevention. Chronic diseases: the power to prevent, the call to control: at a glance 2009. [PDF]. 2009; http://www.cdc.gov/chronicdisease/resources/publications/aag/pdf/chronic.pdf. Accessed November 24, 2014
2. Centers for Disease Control and Prevention. Chronic Disease Prevention and Health Promotion. [Online]. 2015; http://www.cdc.gov/chronicdisease/index.htm. Accessed January 15, 2015
3. Martin AB, Lassman D, Washington B, Catlin A, National Health Expenditure Accounts Team. Growth in US health spending remained slow in 2010: Health share of gross domestic product unchanged from 2009. Health Aff (Millwood). 2012; 31(1):208–219. [PubMed: 22232112]
4. Vijan S, Hayward RA, Langa KM. The impact of diabetes on workforce participation: results from a national household sample. Health Serv Res. 2004; 39(6 Pt 1):1653–1670. [PubMed: 15533180]
5. Schofield DJ, Shrestha RN, Percival R, Passey ME, Kelly SJ, Callander EJ. Economic impacts of illness in older workers: quantifying the impact of illness on income, tax revenue and government spending. BMC Public Health. 2011; 11(418):1–7. [PubMed: 21199570]
6. Merikangas KR, Ames M, Cui L, et al. The impact of comorbidity of mental and physical conditions on role disability in the US adult household population. Arch Gen Psychiatry. 2007; 64(10):1180–1188. [PubMed: 17909130]

7. DeVol, R.; Bedroussain, A.; Charuworn, A., et al. An unhealthy America: the economic burden of chronic disease–charting a new course to save lives and increase productivity and economic growth. Santa Monica: Milken Institute; 2007.
8. Partnership to Fight Chronic Disease. The burden of chronic disease on business and U.S. competiveness: excerpt from the 2009 Almanac of Chronic Disease. [PDF]. 2009; http://www.prevent.org/data/files/News/pfcdalmanac_excerpt.pdf. Accessed September 17, 2014
9. Gignac MAM. Arthritis and employment: an examination of behavioral coping efforts to manage workplace activity limitations. Arthritis Rheum. 2005; 53(3):328–336. [PubMed: 15934119]
10. Lerner D, Allaire SH, Reisine ST. Work disability resulting from chronic health conditions. J Occup Environ Med. 2005; 47(3):253–264. [PubMed: 15761321]
11. McKnight-Eily LR, Elam-Evans LD, Strine TW, et al. Activity limitation, chronic disease, and comorbid serious psychological distress in U.S. adults – BRFSS 2007. Int J Public Health. 2009; 54(1 Suppl):111–119. [PubMed: 19421709]
12. Paterson DH, Warburton DER. Physical activity and functional limitations in older adults: a systematic review related to Canada's Physical Activity Guidelines. Int J Behav Nutr Phys Act. 2010; 7:38. [PubMed: 20459782]
13. Ramage-Morin PL, Gilmour H. Chronic pain at ages 12 to 44. Health Rep. 2010; 21(4):53–61. [PubMed: 21269012]
14. The Lewin Group. Individuals living in the community with chronic conditions and functional limitations: a closer look. [PDF]. 2010; http://www.aspe.hhs.gov/daltcp/reports/2010/closerlook.pdf. Accessed November 1, 2014
15. Hoffman C, Rice D, Sung H-Y. Persons with chronic conditions: their prevalence and costs. JAMA. 1996; 276(18):1473–1479. [PubMed: 8903258]
16. Boult C, Kane RL, Louis TA, Boult L, McCaffrey D. Chronic conditions that lead to functional limitation in the elderly. J Gerontol. 1994; 49(1):M28–M36. [PubMed: 8282978]
17. Ralph NL, Mielenz TJ, Parton H, Flatley A-M, Thorpe LE. Multiple chronic conditions and limitations in activities of daily living in a community-based sample of older adults in New York City, 2009. Prev Chronic Dis. 2013; 10:E199. [PubMed: 24286273]
18. Wolff J, Starfield B, Anderson G. Prevalence, expenditures, and complications of multiple chronic conditions in the elderly. Arch Intern Med. 2002; 162(20):2269–2276. [PubMed: 12418941]
19. Anderson G, Horvath J. The growing burden of chronic disease in America. Public Health Rep. 2004; 119(3):263–270. [PubMed: 15158105]
20. Partnership to Fight Chronic Disease. Almanac of Chronic Disease. 2009. [PDF]. 2009; http://www.fightchronicdisease.org/sites/fightchronicdisease.org/files/docs/2009AlmanacofChronicDisease_updated81009.pdf. Accessed November 9, 2014
21. Stanford University School of Medicine. Chronic Disease Self-Management Program (Better Choices, Better Health® Workshop). [Online]. http://patienteducation.stanford.edu/programs/cdsmp.html. Accessed January 15, 2015
22. Brady TJ, Murphy L, O'Colmain BJ, et al. A meta-analysis of health status, health behaviors, and healthcare utilization outcomes of the Chronic Disease Self-Management Program. Prev Chronic Dis. 2013
23. Lorig KR, Ritter P, Stewart AL, et al. Chronic disease self-management program: 2-year health status and health care utilization outcomes. Med Care. 2001; 39(11):1217–1223. [PubMed: 11606875]
24. Ward BW, Schiller JS. Prevalence of multiple chronic conditions among US adults: estimates from the National Health Interview Survey, 2010. Prev Chronic Dis. 2013; (10):E65. [PubMed: 23618545]
25. Minnesota Population Center and State Health Access Data Assistance Center. Integrated Health Interview Series: Version 5.0. Minneapolis: University of Minnesota; 2012.
26. Kovar MG, Poe GS. The National Health Interview Survey design, 1973–84 and procedures, 1975–83. Vital Health Stat 1. 1985; (18):1–127.
27. United States Census Bureau. National Health Interview Survey: CAPI manual for NHIS field representatives. [PDF]. 2013; ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Survey_Questionnaires/NHIS/2013/frmanual.pdf. Accessed November 1, 2014

28. Centers for Disease Control and Prevention. National Health Interview Survey (NHIS) survey description. 2011. [PDF]. 2012; ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2011/srvydesc.pdf. Accessed October 28, 2014
29. Centers for Disease Control and Prevention. National Health Interview Survey (NHIS) survey description. 2012. [PDF]. 2013; ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2012/srvydesc.pdf. Accessed October 28, 2014
30. Centers for Disease Control and Prevention. National Health Interview Survey (NHIS) survey description. 2013. [PDF]. 2014; ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2013/srvydesc.pdf. Accessed October 10, 2014
31. Parsons VL, Moriarity C, Jonas K, Moore TF, Davis KE, Tompkins L. Design and estimation for the National Health Interview Survey, 2006–2015. Vital Health Stat 2. 2014; (165):1–53. [PubMed: 24775908]
32. Centers for Disease Control and Prevention. Variance Estimation Guidance, NHIS 2006–2013 (Adapted from the 2006–2013 NHIS Survey Description Documents). [PDF]. 2014; http://www.cdc.gov/nchs/data/nhis/2006var.pdf. Accessed January 15, 2015
33. Centers for Disease Control and Prevention. Multiple Imputation of Family Income and Personal Earnings in the National Health Interview Survey: Methods and Examples. [PDF]. 2014; http://www.cdc.gov/nchs/data/nhis/tecdoc13.pdf. Accessed January 9, 2015
34. American Diabetes Association. Economic costs of diabetes in the U.S. in 2012. Diabetes Care. 2013; 36(4):1033–1046. [PubMed: 23468086]
35. Burton WN, Chen C-Y, Schultz AB, Conti DJ, Pransky G, Edington DW. Worker productivity loss associated with arthritis. Dis Manag. 2006; 9(3):131–143. [PubMed: 16764531]
36. Collins JJ, Baase CM, Sharda CE, et al. The assessment of chronic health conditions on work performance, absence, and total economic impact for employers. J Occup Environ Med. 2005; 47(6):547–557. [PubMed: 15951714]
37. Cheung BMY, Li C. Diabetes and hypertension: is there a common metabolic pathway? Curr Atheroscler Rep. 2012; 14(2):160–166. [PubMed: 22281657]
38. Hakola R, Kauppi P, Leino T, et al. Persistent asthma, co-morbid conditions and the risk of work disability: a prospective cohort study. Allergy. 2011; 66(12):1598–1603. [PubMed: 21958351]
39. Lee, GA. Stone, J.; Blouin, M., editors. Coronary artery disease and quality of life. International Encyclopedia of Rehabilitation: Center for International Rehabilitation Research Information and Exchange. 2010. http://cirrie.buffalo.edu/encyclopedia/en/pdf/coronary_artery_disease_and_quality_of_life.pdf
40. Glozier N, Hackett ML, Parag V, Anderson CS. The influence of psychiatric morbidity on return to paid work after stroke in younger adults: the Auckland Regional Community Stroke (ARCOS) Study, 2002 to 2003. Stroke. 2008; 39(5):1526–1532. [PubMed: 18369172]
41. Short PF, Vasey JJ, Tunceli K. Employment pathways in a large cohort of adult cancer survivors. Cancer. 2005; 103(6):1292–1301. [PubMed: 15700265]
42. Wagner L, Cella D. Fatigue and cancer: causes, prevalence and treatment approaches. Br J Cancer. 2004; 91(5):822–828. [PubMed: 15238987]
43. National Asian Pacific Center on Aging. Chronic disease self-management program for AAPI elders. [PDF]. 2012; http://napca.org/wp-content/uploads/2012/11/NAPCA-CDSMP-Report.pdf. Accessed November 10, 2014
44. Aldana SG. Financial impact of health promotion programs: a comprehensive review of the literature. Am J Health Promot. 2001; 15(5):296–320. [PubMed: 11502012]
45. Bertera RL. Behavioral risk factor and illness day changes with workplace health promotion: two-year results. Am J Health Promot. 1993; 7(5):365–373. [PubMed: 10148712]
46. Pelletier KR. A review and analysis of the clinical- and cost-effectiveness studies of comprehensive health promotion and disease management programs at the worksite: 1998–2000 update. Am J Health Promot. 2001; 16(2):107–116. [PubMed: 11727590]
47. Deshields TL, Tait RC, Gfeller JD, Chibnall JT. Relationship between social desirability and self-report in chronic pain patients. Clin J Pain. 1995; 11(3):189–193. [PubMed: 8535037]

48. Podsakoff PM, MacKenzie SB, Lee J-Y, Podsakoff NP. Common method biases in behavioral research: a critical review of the literature and recommended remedies. J Appl Psychol. 2003; 88(5):879–903. [PubMed: 14516251]

Table 1

Workdays lost by functional limitation caused by a chronic disease among the 39,230 US full-time workers of age 18–64 years old in the 2011–2013 National Health Interview Survey.[a]

	Has Limitation Attributed to Specific Chronic Disease				
	No		Yes		
Chronic Disease	**Unweighted n (%)**	**Mean Workdays Lost ± S.E.**	**Unweighted n (%)**	**Mean Workdays Lost ± S.E.**	***p*-value**
Arthritis/Rheumatism..	37,127 (94.6)	2.86 ± 0.07	2,103 (5.4)	6.65 ± 0.54	<0.0001
Cancer.....	39,185 (99.9)	3.02 ± 0.07	45 (0.1)	37.32 ± 8.91	0.0001
Diabetes.....	39,069 (99.6)	3.04 ± 0.07	161 (0.4)	10.43 ± 2.10	0.0005
Heart Disease.....	39,107 (99.7)	3.04 ± 0.07	123 (0.3)	12.66 ± 2.17	<0.0001
Hypertension.....	39,052 (99.6)	3.03 ± 0.07	178 (0.5)	12.13 ± 2.52	0.0004
Lung Disease.....	39,001 (99.4)	3.03 ± 0.07	229 (0.6)	9.84 ± 1.68	<0.0001
Stroke.....	39,203 (99.9)	3.05 ± 0.07	27 (0.1)	20.06 ± 8.64	0.0498

[a] Individuals were classified as full-time if they reported to have worked at least 35 hours in a week and worked for 12 months in the year prior to the survey.

Table 2

Workdays lost by functional limitation caused by number of studied chronic diseases among the 39,230 US full-time workers age 18–64 years old in the 2011–2013 National Health Interview Survey.[a,b]

No. of Chronic Diseases	Unweighted n (%)[c]	Mean ± S.E.	*p*-value
None.....	36,667 (93.5)	2.77 ± 0.07	<0.0001
One.....	2,339 (6.0)	6.62 ± 0.53	
Two or more.....	224 (0.6)	16.26 ± 2.34	

[a]The chronic diseases studied in the study are: arthritis/rheumatism, cancer, diabetes, heart disease (including angina, myocardial infarction, heart murmur, and heart failure), hypertension, lung disease (including asthma, chronic bronchitis, chronic obstructive pulmonary disease, emphysema, pneumonia, respiratory allergies, and shortness of breath), and stroke.

[b]Individuals were classified as full-time if they reported to have worked at least 35 hours in a week and worked for 12 months in the year prior to the survey.

[c]Percentages do not equal to 100% due to rounding.

Table 3

Economic impact of workday lost due to functional limitation caused by chronic diseases among US full-time workers age 18–64 years old per year from the 2011–2013 National Health Interview Survey.[a]

	Weighted n Per Year (in thousands)	Extra Workdays Lost Per Year (in thousands)	Average Annual Income[b]	Lost Income Per Year[b] (in thousands)
Type of chronic disease:[c]				
Arthritis/rheumatism.....	5,117.6	19,411.4	$47,384.6	$3,537,969.5
Cancer.....	113.6	3,895.7	55,274.5	828,197.0
Diabetes.....	338.9	2,505.4	38,868.5	374,544.7
Heart disease.....	276.8	2,662.2	42,368.1	433,810.7
Hypertension.....	349.4	3,178.2	38,745.2	473,609.5
Lung disease.....	520.9	3,549.6	42,936.0	586,169.3
Stroke.....	72.8	1,239.0	43,917.1	209,284.0
No. of chronic diseases:[d]				
One.....	5,695.7	21,947.1	$47,226.8	$3,986,495.6
Two or more.....	466.0	6,288.3	39,935.2	965,859.9

[a] Individuals were classified as full-time if they reported to have worked at least 35 hours in a week and worked for 12 months in the year prior to the survey.

[b] Based on person's total earnings during previous calendar year.

[c] Extra workday lost per year = [(mean difference on workday lost between workers with and without functional limitation caused by the stated chronic disease) * (no. of worker with the functional limitations caused by the stated chronic disease per year)]

[d] Extra workday lost per year = [(mean difference on workday lost between workers with functional limitations which were caused by *x*-number of studied chronic diseases and those without any functional limitation which was caused by one of the seven studied chronic diseases) * (no. of worker with functional limitations which were caused by *x*-number of studied chronic diseases per year)]