INTEGRATED BENEFITS INSTITUTE

Health and Productivity Impact of Chronic Conditions

DIABETES

March 2018

Contents

Executive Summary: Health and Productivity Impact of Diabetes

- Of a nationally representative sample of employed U.S. adults, 6.3% had treatments for diabetes (ICD-9 diagnosis code 250.xx).

- Excess medical and pharmacy treatment costs for employees with diabetes averaged about $3,600 per year.

- Employees with diabetes had an average of 1.5 excess sick days per year, at a cost of about $400 in wages and benefits.

- Each year, employers' short-term disability (STD) insurance policies experience an average of 2.4 new claims for diabetes per 10,000 covered lives. STD claims for diabetes incur an average of 43 lost workdays, at an average cost of about $8,700 in wage replacements and paid employee benefits.

- Each year, employers' long-term disability (LTD) insurance policies manage an average of 1.6 active claims for diabetes per 10,000 covered lives. Of LTD claims for diabetes, 45% remain open two years after they begin. LTD claims for diabetes incur an average of 186 lost workdays per year that they remain open, at an average cost of about $39,000 in wage replacements and paid employee benefits per year.

- Overall, for every 1,000 U.S. employees, diabetes in the workforce costs about $260,000 in excess healthcare treatments and lost work time. This does not include the value of returns to lost labor inputs, early exits from the labor force, excess turnover costs and presenteeism (underperformance on the job due to diabetes).

- Considerable cost differences are observed across industries, ranging from about $227,000 per 1,000 employees in the manufacturing industry to about $330,000 per 1,000 employees in the "other services" industry (primarily repair and maintenance, personal services, and non-profit organizations).

Introduction to This Series

Helping employees manage chronic illnesses remains one of the most viable strategies for reducing employers' healthcare and disability costs. IBI's *Health and Productivity Impact of Chronic Conditions* series uses high-quality data to model healthcare, illness absence (i.e., sick days) and disability costs for populations of employees across different industries. The results provide a scalable cost benchmark that employers and their supplier partners can use to assess the potential savings from reductions in the prevalence of a condition, costs of treatments, and illness-related absences and disability leaves.

Data

The series uses data primarily from two sources.

Data from the Agency for Healthcare Research and Quality's (AHRQ's) *Medical Expenditure Panel Survey* (MEPS) are used for healthcare costs and illness absences.[1] MEPS collects annual, nationally representative information about health status, care utilization and treatment costs from components: (1) a survey of U.S. households, with information supplemented by data from household members' medical providers (the household component); and (2) a separate survey of employers about their employment-based health insurance plans (the insurance component). This report uses person-level data from the 2011–2015 household component files for information about health conditions, healthcare costs, illness absences, and demographic and occupational/industrial characteristics.

Data from IBI's *Health and Productivity Benchmarking System* (referred to simply as *Benchmarking*)[2] are used for short-term disability (STD) and long-term disability (LTD) outcomes. Each year, *Benchmarking* collects millions of STD and LTD claims from the books of business of 14 of the largest U.S. disability insurance carriers and third-party administrators. This report uses claims data for calendar years 2011–2015 for information on diagnoses, claims rates, durations and industry.

This report also incorporates information about wages and benefits from the U.S. Bureau of Labor Statistics (BLS) and healthcare cost growth estimates from the Centers for Medicare & Medicaid Services. Detailed information about the data and analytic methods is included in the appendix.

Methods

Attributing healthcare costs and illness absences to specific conditions poses well-known challenges. This is primarily due to the presence of comorbidities that can impact the severity of illness symptoms and the efficacy or intensity of care management.[3] For this reason, we control for the presence of other chronic conditions for analyses of healthcare costs and illness absences in a way that permits us to compare the excess burdens for persons with a specific condition, over and above the burdens associated with their other conditions. See the appendix for details on the models. Lost work time and costs associated with disability claims are more straightforward—no detail on comorbidities is provided, so only average outcomes are reported. All outcomes are reported on an annual basis.

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[1] AHRQ. *Medical Expenditure Panel Survey*. https://meps.ahrq.gov/mepsweb/about_meps/survey_back.jsp

[2] Integrated Benefits Institute. *Health and Productivity Benchmarking*. https://ibiweb.org/tools/benchmarking

[3] Alonso J, Vilagut G, Chatterji S et al. Including information about comorbidity in estimates of disease burden: Results from the WHO World Mental Health Surveys. *Psychological Medicine*. 2011;41(4):873-86.

Definitions of Conditions and Industries

CONDITIONS

Conditions are defined using the *International Classification of Diseases,* 9th revision (ICD-9),[4] based on the three-digit diagnosis categories available in the MEPS data. *Benchmarking* data contain full ICD-9 diagnosis information, which is truncated to conform to the MEPS three-digit reporting. Individuals in the MEPS data are determined to have a condition based on records in the medical conditions files of the household component. *Benchmarking* disability claims record only the primary claim diagnosis.

INDUSTRIES

MEPS data record the industry of an employee's current (or past) employer. These include the following civilian categories:

- Natural resources
- Mining
- Construction
- Manufacturing
- Wholesale and retail trade
- Transportation and utilities
- Information
- Financial activities
- Professional and business services
- Education, health and social services
- Leisure and hospitality
- Other services
- Public administration

Given the small sample sizes in the MEPS data, mining is combined with natural resources. *Benchmarking* claims contain North American Industrial Classification System (NAICS) codes, in many cases to the six-digit coding level. To conform to MEPS, NAICS sectors are combined to create major industries, as described in the following table.

HIPCC industry	NAICS sectors
Natural resources	• Agriculture, forestry, fishing and hunting • Mining, quarrying, and oil and gas extraction
Construction	• Construction
Manufacturing	• Manufacturing
Wholesale and retail trade	• Wholesale trade • Retail trade
Transportation and utilities	• Transportation and warehousing • Utilities
Information	• Information
Financial activities	• Finance and insurance • Real estate and rental and leasing

[4] World Health Organization. *International Classification of Diseases* (*ICD*), 9th revision. http://www.who.int/classifications/icd/en

HIPCC industry	NAICS sectors
Professional and business services	• Professional, scientific and technical services • Management of companies and enterprises • Administrative and support and waste Management and remediation services
Education, health and social services	• Educational services • Healthcare and social assistance
Leisure and hospitality	• Arts, entertainment and recreation • Accommodation and food services
Other services	• Other services (except public administration)
Public administration	• Public administration

Diabetes

Introduction

Diabetes is a metabolic condition that results in high levels of blood glucose. The most common form—type 2 diabetes—occurs as a result of impaired production of insulin. Diabetes occurs most often among older adults, particularly if they are overweight, obese, have high blood pressure or engage in little physical activity.[5] If unmanaged, diabetes can lead to more serious health problems such as heart attack, stroke, and kidney disease.

For the purpose of this report, diabetes is indicated as diagnoses for treatment or disability benefits with ICD-9 code 250.xx.

Prevalence

How many employees have diabetes?

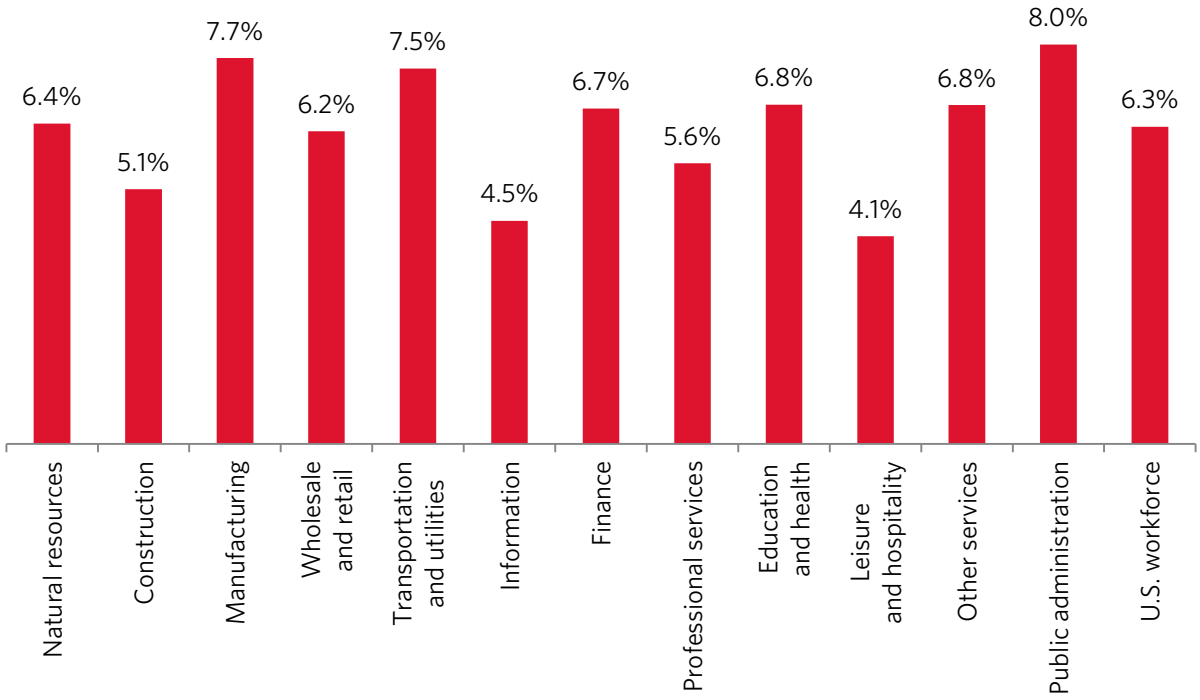

Figure 1

Source: Agency for Healthcare Research and Quality, Medical Expenditure Panel Study, 2011–2015.

[5] U.S. Department of Health and Human Services, The National Institute of Diabetes and Digestive and Kidney Diseases, < https://www.https://www.niddk.nih.gov/health-information/diabetes/overview/what-is-diabetes/type-2-diabetes>, accessed January 23, 2018.

WHAT OTHER CONDITIONS (COMORBIDITIES) AFFLICT EMPLOYEES WITH DIABETES?

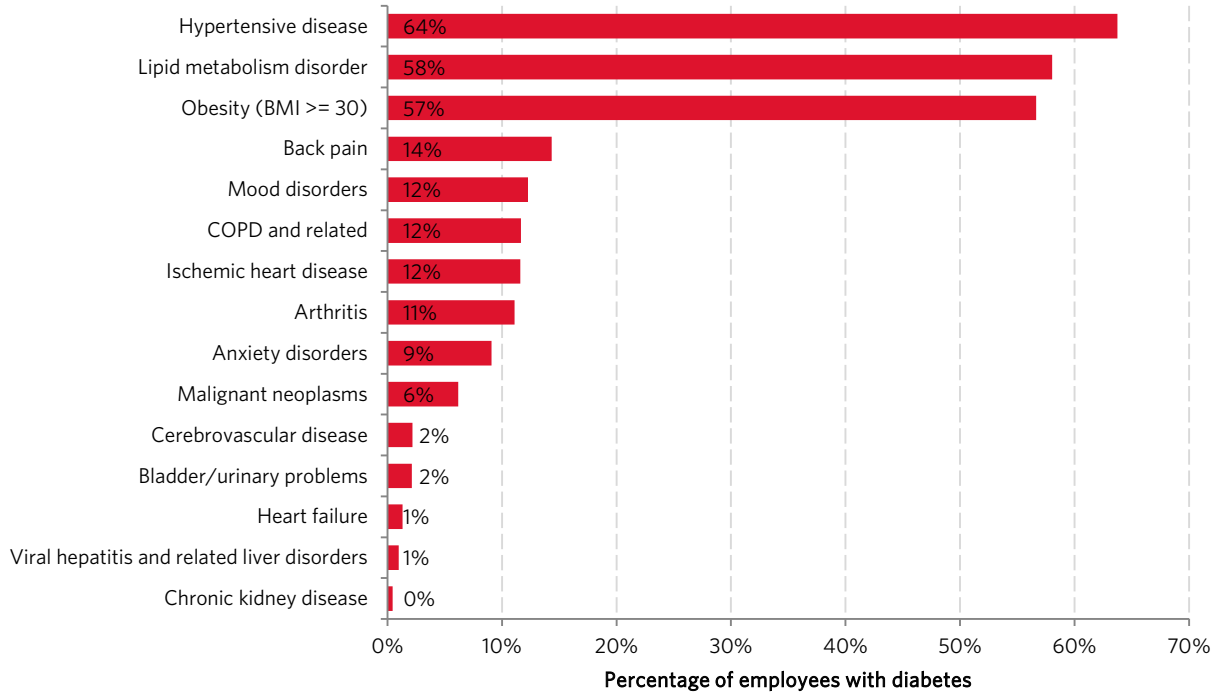

Figure 2

Source: Agency for Healthcare Research and Quality, Medical Expenditure Panel Study, 2011–2015. BMI = body mass index. COPD = chronic obstructive pulmonary disease.

Treatment Costs

HOW MUCH ARE MEDICAL/RX TREATMENT COSTS FOR EMPLOYEES WITH DIABETES?

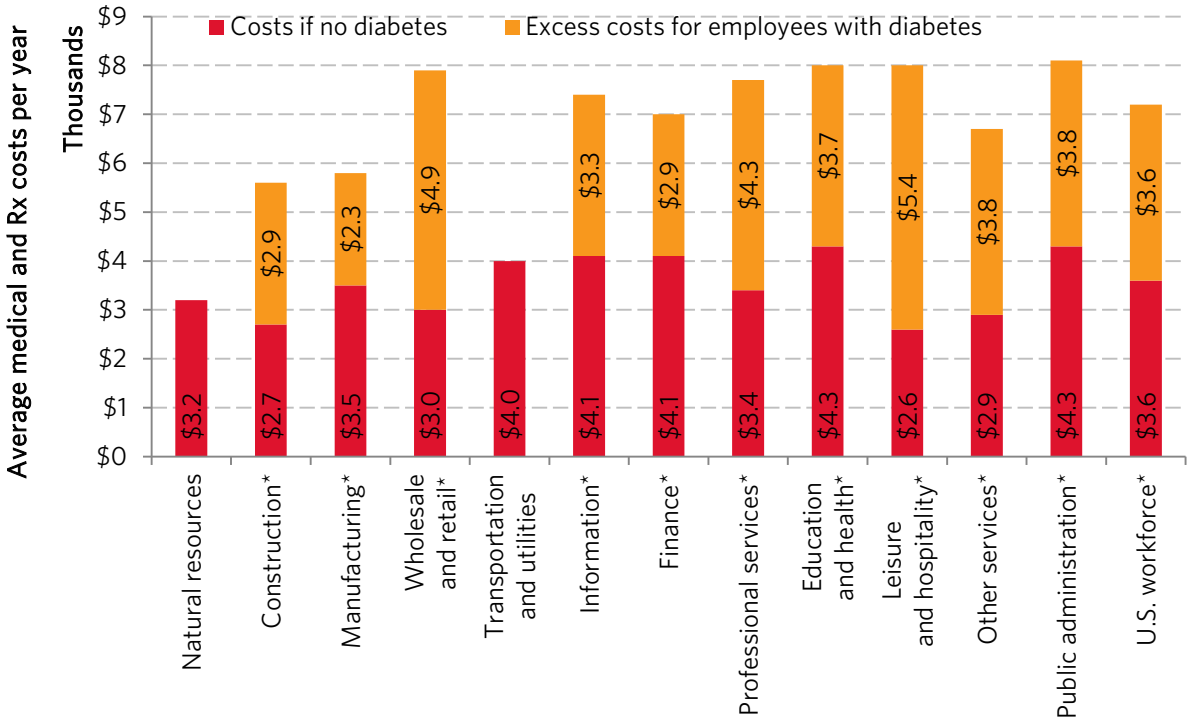

Figure 3

Source: Agency for Healthcare Research and Quality, Medical Expenditure Panel Study, 2011–2015. Costs include expenses for all medical and pharmacy treatment, regardless of reason. Costs are estimated from multivariate regression models controlling for other comorbid chronic conditions, age, sex, race and ethnicity. An asterisk (*) next to an industry label indicates that the estimated *excess costs* for employees with diabetes are statistically significant below the 0.05 level. For industries without an asterisk, a combination of a small sample of employees and wide variation in costs prevent us from confidently estimating that the excess costs are significantly different from $0 and are therefore not reported. See the appendix for details on the model.

Illness Absences

HOW OFTEN ARE EMPLOYEES WITH DIABETES ABSENT FROM WORK DUE TO ILLNESS?

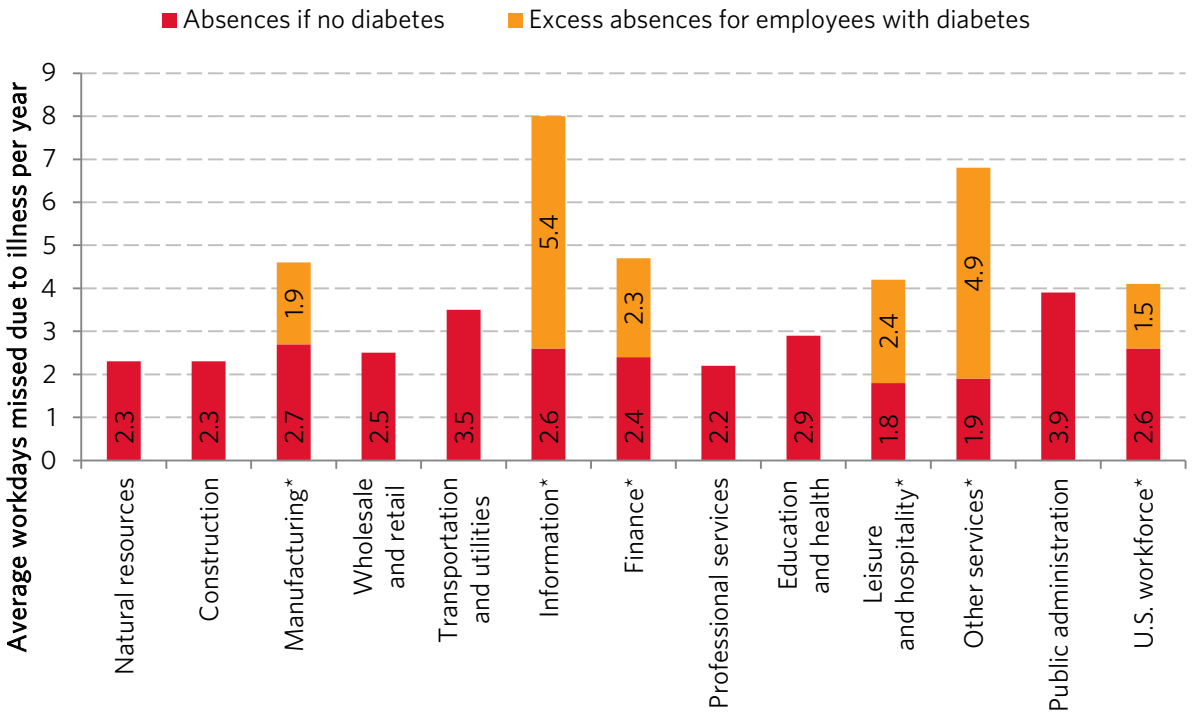

Figure 4

Source: Agency for Healthcare Research and Quality, Medical Expenditure Panel Study, 2011–2015. Illness absences are estimated from multivariate, negative binomial regression models controlling for other comorbid chronic conditions, age, sex, race and ethnicity. An asterisk (*) next to an industry label indicates that the estimated *excess absences* for employees with diabetes are statistically significant below the 0.05 level. For industries without an asterisk, a combination of a small sample of employees and wide variation in absences prevent us from confidently estimating that the excess absences are significantly different from 0 days and are therefore not reported. See the appendix for details on the model.

WHAT ARE THE COSTS OF ILLNESS ABSENCES FOR EMPLOYEES WITH DIABETES?

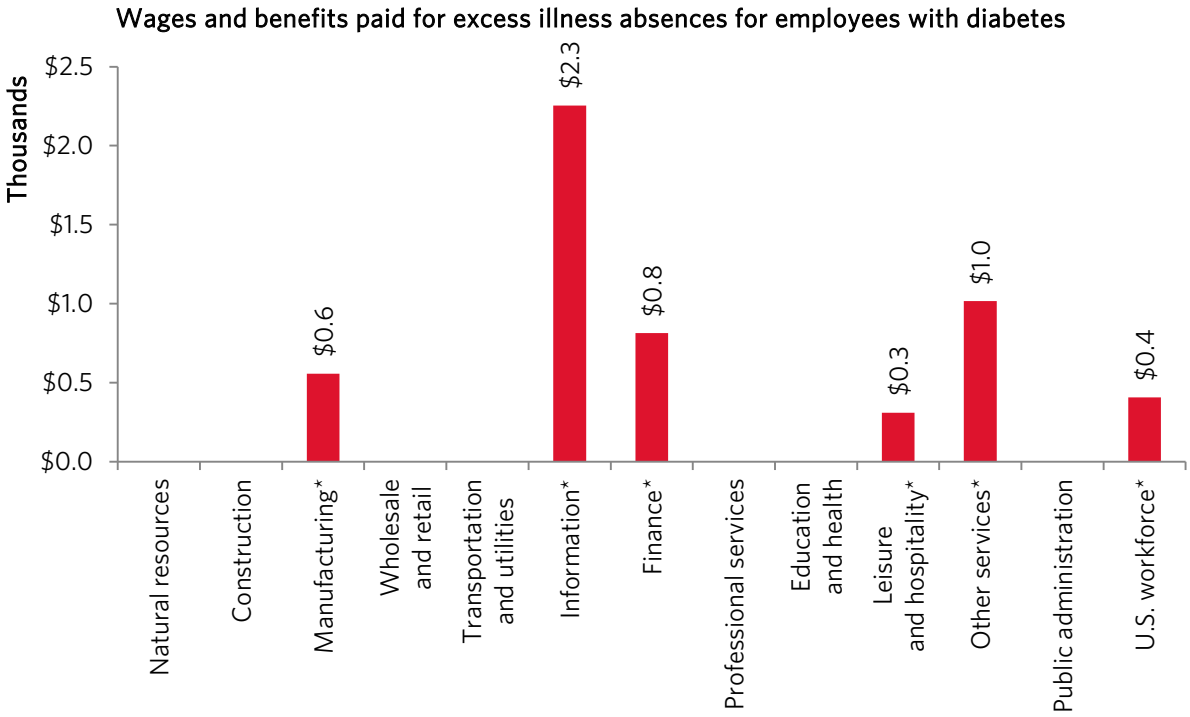

Figure 5

See Figure 4 for sources and interpretation of starred industries. Estimates assume that all employees are eligible for paid sick days.

STD Outcomes

HOW OFTEN DO EMPLOYEES TAKE STD LEAVE FOR DIABETES?

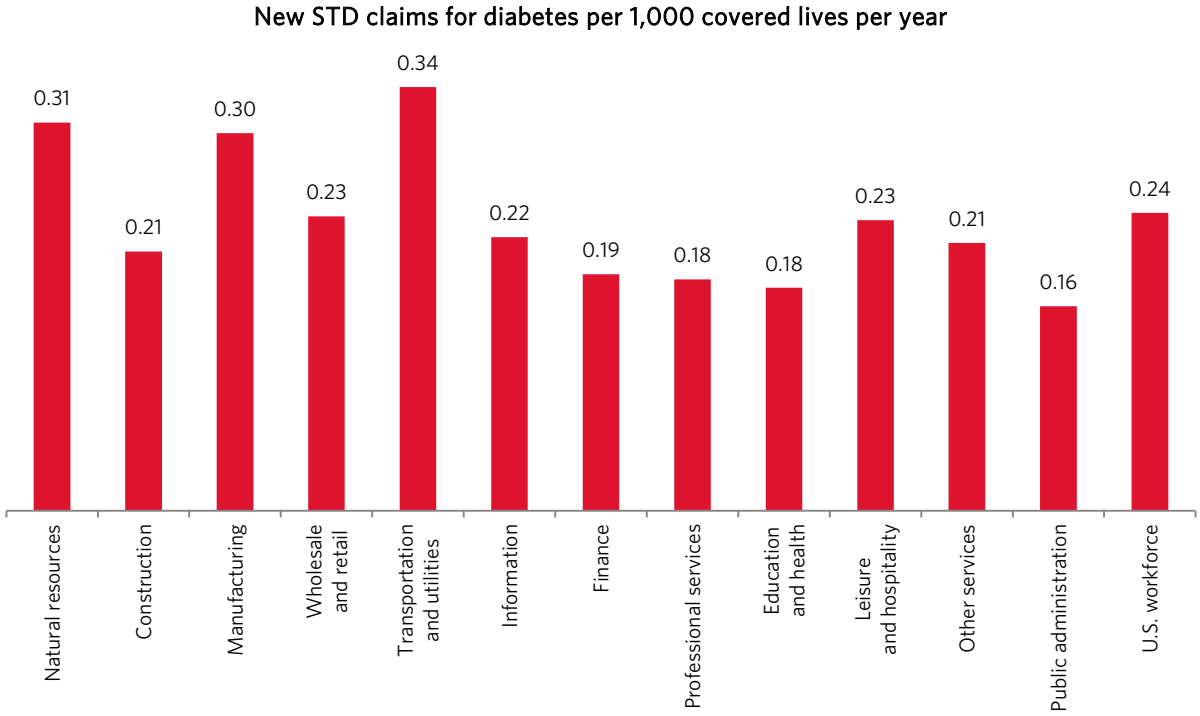

Figure 6

Source: Integrated Benefits Institute, Health and Productivity Benchmarking database, 2011–2015.

How long is the average STD claimant for diabetes away from work?

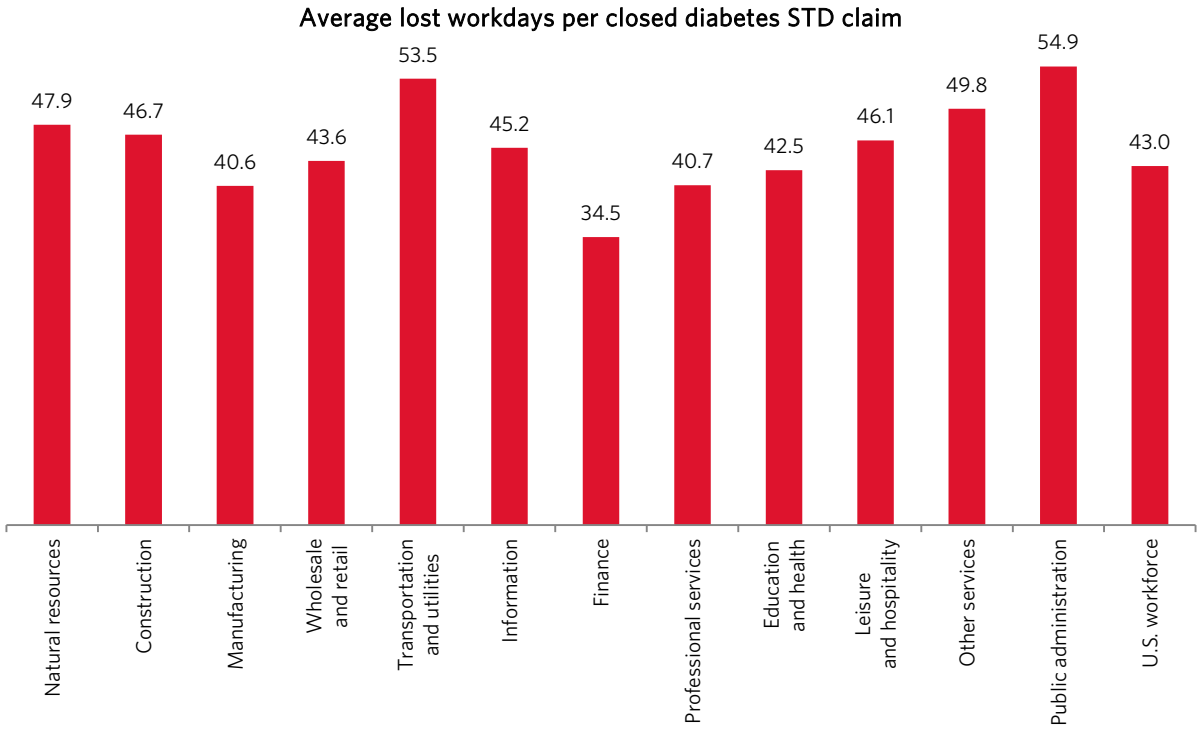

Figure 7

Source: Integrated Benefits Institute, Health and Productivity Benchmarking database, 2011–2015. Lost workdays do not include any elimination period that precedes the claim.

How much does the average STD claim for diabetes cost?

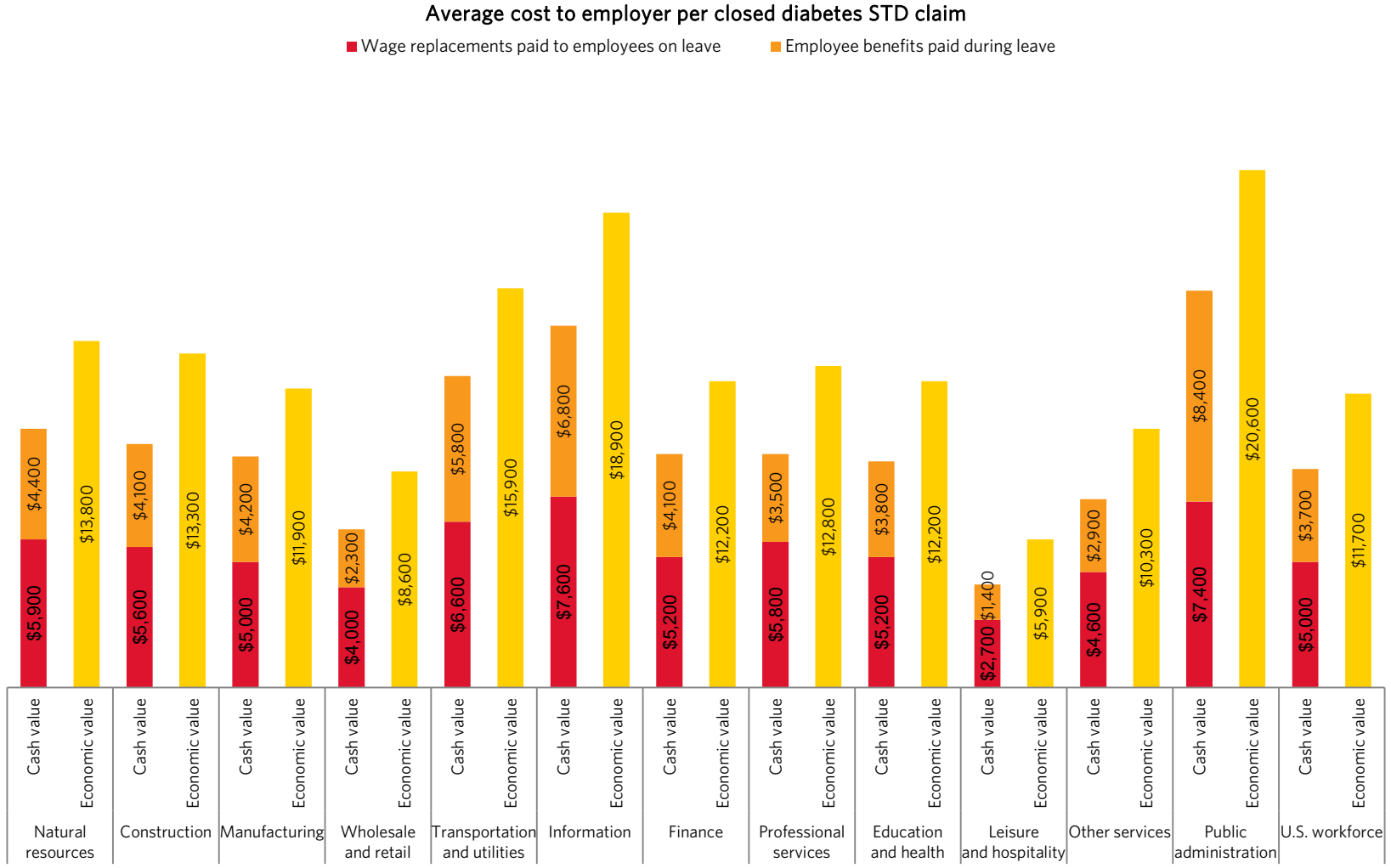

Figure 8

See Figure 7 for source and the appendix for cost estimation method. *Cash value* refers to compensation to employees on STD leave, including benefits continuation. *Economic value* refers to the marginal product of lost labor inputs and is estimated by average daily wages and benefits. Cash and economic value represent distinct ways of valuing lost productivity and should not be combined. See the appendix for more information.

LTD Outcomes

How many employees are on LTD leave for diabetes over a given year?

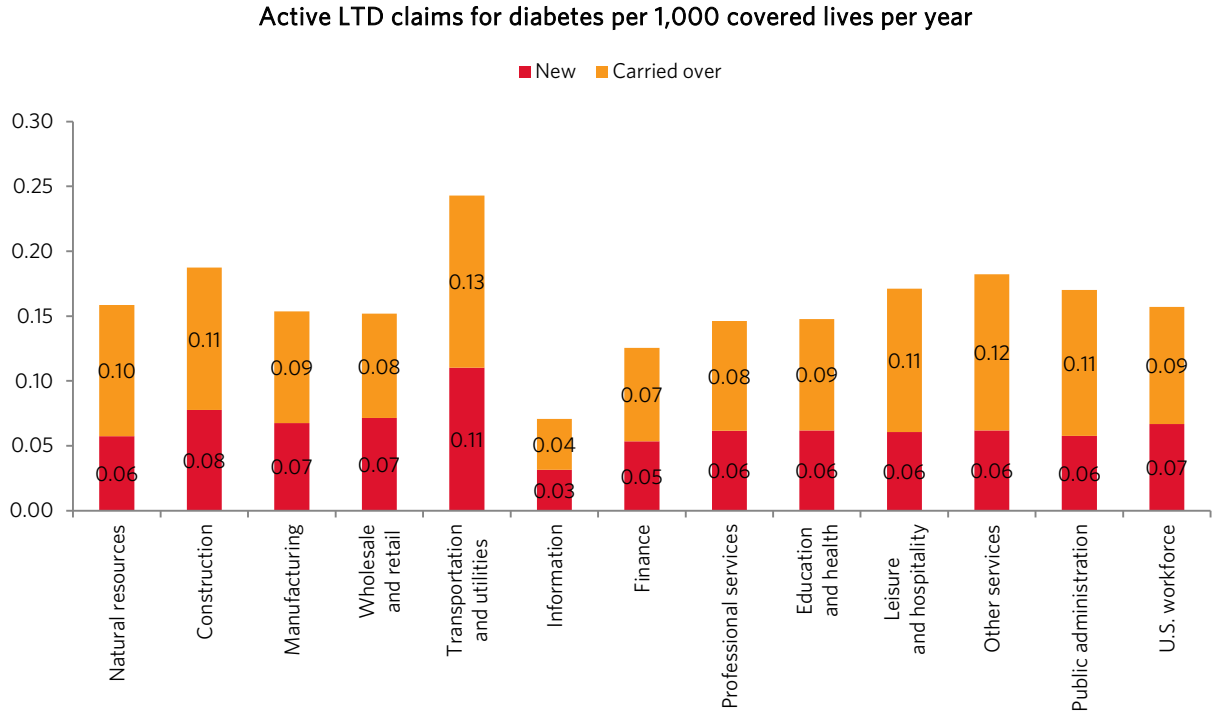

Figure 9

Source: Integrated Benefits Institute, Health and Productivity Benchmarking database, 2011–2015. New claims began within an observed data year. Carried-over claims began prior to an observed data year.

How many LTD claims for diabetes close within two years?

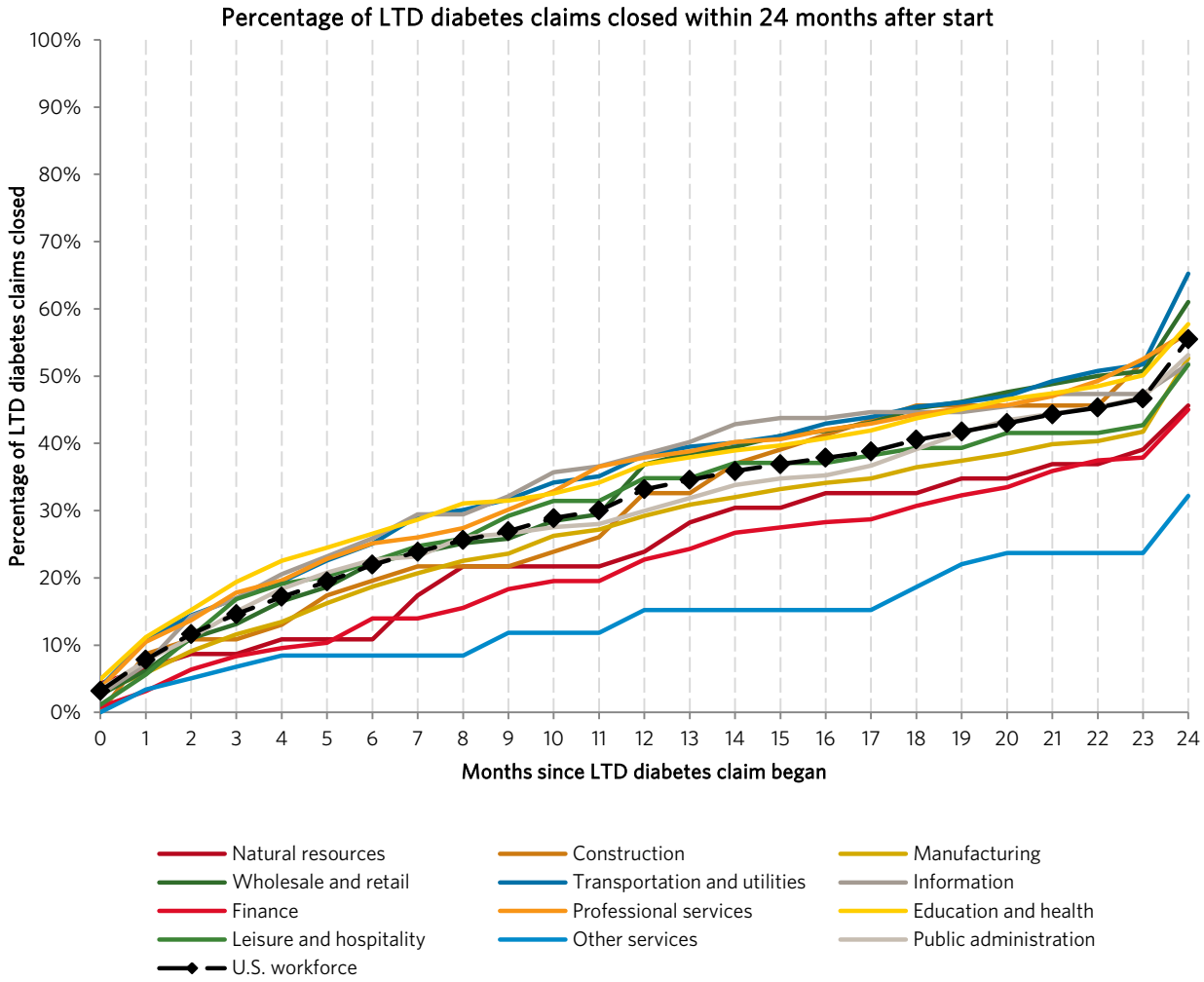

Figure 10

Source: Integrated Benefits Institute, Health and Productivity Benchmarking database, 2011–2015. Analysis is limited to claims with a start date from 2011 to 2013 to provide adequate observation time.

How much of each work year is lost by the average LTD claimant for diabetes?

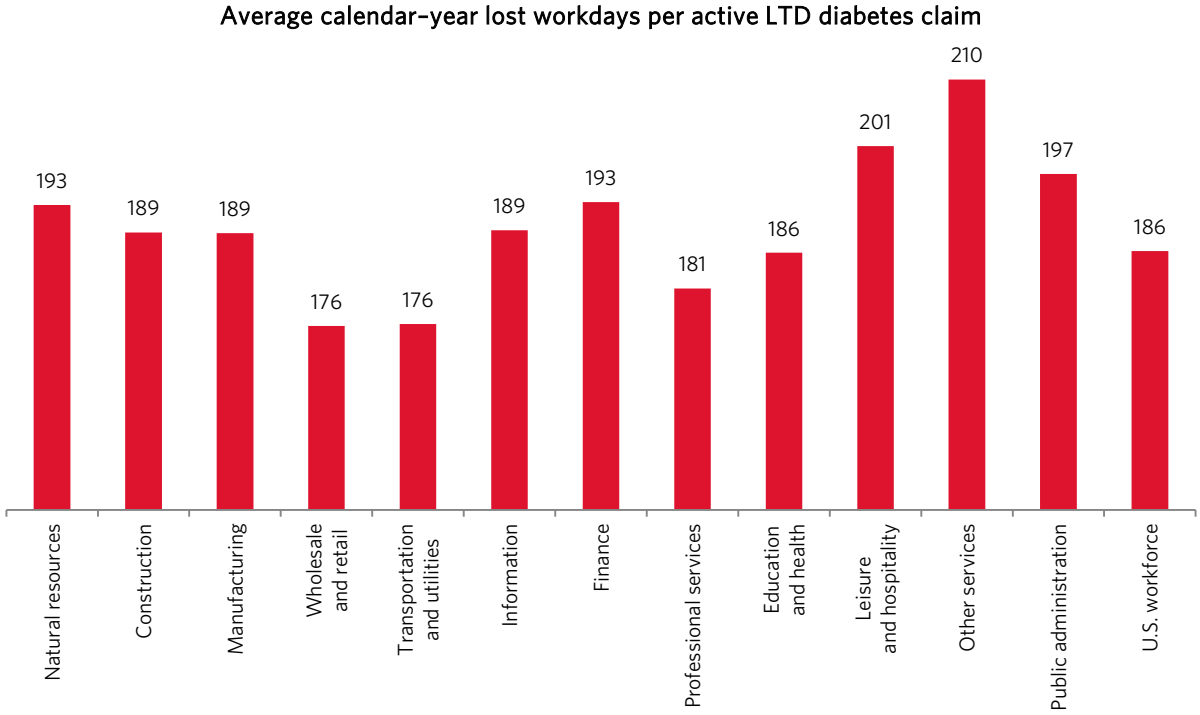

Figure 11

Source: Integrated Benefits Institute, Health and Productivity Benchmarking database, 2011–2015. Days for LTD claims represent wage replacements for lost workdays occurring within a calendar year. This includes claims that began within a calendar year and claims that carried over from previous calendar years.

How much does the average LTD claim for diabetes cost each year?

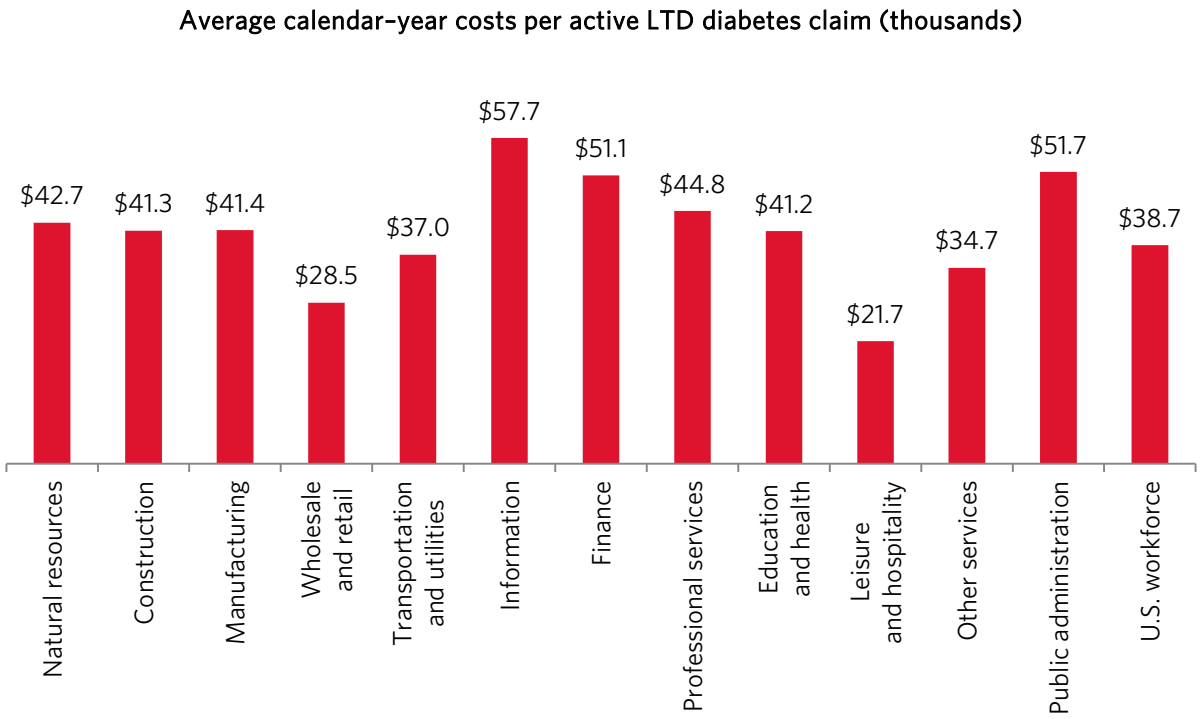

Figure 12

See Figure 11 for source and the appendix for cost estimation method.

Total Costs of Diabetes in a Workforce

WHAT ARE THE ESTIMATED ANNUAL COSTS ASSOCIATED WITH DIABETES IN A 1,000-PERSON WORKFORCE?

Table 1: Estimates of annual costs associated with diabetes in a 1,000-person workforce (thousands)

	Excess medical and Rx treatments	Excess illness absences	STD claims	LTD claims	Total*
Natural resources	n.s.	n.s.	$4.3	$3.7	
Construction	$147.3	n.s.	$2.7	$4.6	
Manufacturing	$177.1	$42.9	$3.6	$3.7	$227.3
Wholesale and retail	$305.8	n.s.	$2.0	$3.4	
Transportation and utilities	n.s.	n.s.	$5.4	$4.0	
Information	$146.9	$100.3	$4.1	$1.6	$252.9
Finance	$194.0	$54.5	$2.3	$4.3	$255.1
Professional services	$240.8	n.s.	$2.4	$4.0	
Education and health	$250.5	n.s.	$2.2	$4.0	
Leisure and hospitality	$223.6	$12.8	$1.4	$4.5	$242.2
Other services	$256.9	$68.7	$2.2	$2.5	$330.3
Public administration	$302.9	n.s.	$3.4	$3.3	
U.S. workforce	$227.9	$25.7	$2.8	$3.5	$259.9

Sources: Agency for Healthcare Research and Quality, Medical Expenditure Panel Study, 2011–2015; Integrated Benefits Institute, Health and Productivity Benchmarking database, 2011–2015; Bureau of Labor Statistics.

n.s. = Not significant in Figures 3, 4, and 5. * Totals not calculated for industries with non-significant excess treatment or illness costs.

Treatment costs and illness absence days are calculated by the product of the prevalence of diabetes and the average excess outcomes for employees with diabetes (see previous charts in this section). Costs for illness absences and STD claims represent the economic value of lost labor inputs from absences. They are calculated by applying industry-average 2015 daily wage and benefits estimates from BLS to the total number of estimated lost workdays. See the appendix for more information. Costs for LTD claims represent wage replacements for lost workdays occurring within a calendar year. Costs assume that all employees are eligible for illness absence, STD benefits and LTD benefits or for other benefits that allow them to take time off from work due to diabetes. Analysis of STD is limited to claims with a start date from 2011 to 2014 to provide adequate time to observe a claim closure. Analysis of LTD is limited to claims from data years 2012 to 2015 to observe lost workdays from both new and carried-over claims.

Evidence for Workplace Interventions

Several sources offer good starting points for crafting strategies to manage the health and productivity impact of diabetes. Examples include:

- Generally, better glycemic control has been linked to diabetic patients' improved quality of life[6] and their capacity to engage in productive activities.[7]
- Diabetic workers who are adherent with insulin, oral hypoglycemic agents and other antidiabetic medications tend to have fewer sick day and STD absences.[8]
- Adherence with insulin, oral hypoglycemic or metformin medication guidelines has been linked to better job performance among diabetic employees.[9]
- Work accommodations such as modified schedules, work-at-home arrangements, and special equipment have been shown to improve on-the-job performance among employees with metabolic conditions such as diabetes.[10]

Additional Information about Diabetes

More information about the causes, treatment and prevention of diabetes can be found at the following sources:

National Institute of Health's (NIH) diabetes pages

Centers for Disease Control and Prevention's (CDC) diabetes pages

[6] Diabetes Control and Complications Trial Research Group. Influence of intensive diabetes treatment on quality-of-life outcomes in the diabetes control and complications trial. *Diabetes care*. 1996 Mar 1;19(3):195-203.

[7] Testa MA, Simonson DC. Health economic benefits and quality of life during improved glycemic control in patients with type 2 diabetes mellitus: a randomized, controlled, double-blind trial. *JAMA*. 1998 Nov 4;280(17):1490-6.

[8] Carls GS, Roebuck MC, Brennan TA, Slezak JA, Matlin OS, Gibson TB. Impact of Medication Adherence on Absenteeism and Short-Term Disability for Five Chronic Diseases. *Journal of Occupational and Environmental Medicine*. 2012;54:792-805; Hagen SE, Wright DW, Finch R, Talamonti WJ, Edington DW. Impact of Compliance to Oral Hypoglycemic Agents on Short-Term Disability Costs in an Employer Population. *Population Health Management*. 2014;17:35-41; Testa and Simonson *op cit*. 1998

[9] Loeppke R, Haufle V, Jinnett K, et al. Medication Adherence, Comorbidities, and Health Risk Impacts on Workforce Absence and Job Performance. *Journal of Occupational and Environmental Medicine*. 2011;53:595-604.

[10] Gifford B, Zong Y. On-the-Job Productivity Losses among Employees with Health Problems: The Role of Work Accommodations. *Journal of Occupational and Environmental Medicine*. 2017;59(9):885-93.

Appendix

SUPPLEMENTAL DATA

To estimate the costs for each lost workday, we apply industry-average daily wages in 2015 from the BLS's Occupational Employment Statistics (OES) program.[11] We also include an estimate of payments for employee benefits such as healthcare, retirement, and mandatory programs from the BLS's National Compensation Survey.[12]

Our estimates assume a population of employees that is 100% eligible for paid sick days and for STD and LTD benefits. The economic value of each lost workday is the sum of average daily wages and benefits. For the cash value of disability absences, we assume that employees are paid 100% of their daily benefits, but only a portion of their wages based on their industry's average wage replacement rate as a fixed percent of annual earnings reported in the BLS's Employee Benefits Survey.[13] The STD wage replacement rate was 63% for the U.S. workforce, ranging from 59% to 65% across industries. For LTD, the average replacement rate was 58%, ranging from 57% to 61%.

Healthcare treatment costs in the MEPS data are reported in current dollars. We inflate all costs to 2015 dollars using the chain-weighted national health expenditures deflator reported in 2016 by the Centers for Medicare and Medicaid Services (CMS), Office of the Actuary.[14]

REGRESSION MODELS

Our analyses of healthcare costs and illness absences using the MEPS data employ multivariate regression methods to isolate marginal results on average of employees' demographics and other comorbidities. The basic form of the model is:

$$\hat{Y} = \alpha + \beta_1 \text{Chronic} + \beta_2 \text{Any other chronic} + \beta_3 \text{Chronic} \times \text{Any other chronic} + \sum \beta_k \, Demographics + \varepsilon$$

Equation 1

Where $\hat{Y}$ is the predicted value of the outcome, α is the constant intercept if all variables in the model equal zero, and ε is the error term. β_1 is the marginal increase or decrease in the outcome for employees with the focal chronic condition (in this case, diabetes) compared to employees without the focal condition. β_2 is the marginal change for employees with any conditions besides the focal condition, and β_3 captures the marginal changes for the interactions between the focal and other conditions. $\sum \beta_k$ represents the marginal changes for the demographic variables included in the models. These demographics include sex, age, race (white, black, or any other), and Hispanic ethnicity. The models are run separately for each industry. For the estimates of the U.S. workforce, indicator variables for each industry are included.

The estimator is ordinary least squares regression for healthcare treatment costs and negative binomial regression for illness absences. To estimate either costs or absences for the baseline case (that is, for employees

[11] BLS, Occupational Employment Statistics (OES), 2015; https://www.bls.gov/oes/home.htm

[12] BLS, National Compensation Survey, Employer Costs of Employee Compensation, 2015; https://www.bls.gov/ncs/

[13] BLS, Employee Benefits Survey, 2015; https://www.bls.gov/ncs/ebs/benefits/2015/benefits_life.htm

[14] Martin AB, Hartman M, Washington B, Catlin A, National Health Expenditure Accounts Team. National health spending: faster growth in 2015 as coverage expands and utilization increases. Health Affairs. 2016; Dec 2:10-377.

without the focal condition), the equation is solved at the mean of all variables in the model, with the values of focal condition and the interaction with the focal conditions set to zero. Excess costs or absences are calculated as β_1 plus the product of β_3 and the proportion of the population with any other chronic conditions (converted to the predicted number of events in the case of absences). All results are weighted to reflect the U.S. workforce.

About IBI

Founded in 1995, the Integrated Benefits Institute (IBI) is a national, nonprofit research and educational organization focused on workforce health and productivity. IBI provides data, research, tools and engagement opportunities to help business leaders make sound investments in their employees' health. IBI is supported by more than 1,200 member companies representing over 20 million workers.

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