Indirect Costs and Workplace Productivity Loss Associated with Non-Hodgkin's Lymphoma

Justin Yu

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Committee:

Joshua J. Carlson, Chair

Ryan Hansen

Adriana Valderrama

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Abstract

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Justin S. Yu

Chair of the Supervisory Committee:
Assistant Professor Joshua J. Carlson
Department of Pharmacy

Background

Non-Hodgkin's lymphoma (NHL) is the 7th most common type of cancer in the United States (U.S.) based on incidence.[1] Despite this, there is an absence of published literature on the indirect costs and workplace productivity loss associated with NHL.

Objective

The objective of this study was to examine the indirect costs and workplace productivity loss (defined as an aggregate measure of absenteeism, short-term disability (STD), and long-term disability (LTD) days) associated with NHL from a societal perspective in the commercially insured U.S. population.

Methods

The MarketScan® Commercial Claims and Encounters (CCAE) and Health and Productivity Management (HPM) Databases (2007-2013) were used for this study. The NHL cohort consisted of patients aged 18-64 years on the date of first diagnosis of NHL (index date), continuously enrolled for ≥6 months before and ≥12 months after the index date, with no diagnoses of other cancers prior to the index date, with non-missing data on absenteeism, STD, and LTD for ≥12 months after the index date, with ≥2 additional diagnoses of NHL on different days in the 60-day post-index period, and with no diagnoses of Hodgkin's lymphoma in the 12-month post-index period. Afterwards, controls without NHL and satisfying all except the last two inclusion/exclusion criteria were matched 3:1 based on index year, 5-year age group, and region. Multiple regression analyses adjusting for covariates were then used to estimate the differences in mean days of workplace productivity loss and associated indirect costs for NHL patients versus controls.

Results

In comparison to controls, NHL patients incurred significantly more workplace productivity loss (31.99 days; 95% CI: 25.24 days, 38.73 days; $p < 0.001$) in the 12-month post-index period when adjusting for covariates. Consequently, NHL patients incurred significantly more indirect costs ($6,302.34; 95% CI: $4,973.40, $7,631.28; $p < 0.001$) compared to controls when adjusting for the same covariates.

Conclusions

NHL can have a significant impact on workplace productivity loss, which translates to higher indirect costs to society. As the first study to address major gaps in evidence regarding NHL, these findings contribute substantially to understanding the disease's burden of illness.

TABLE OF CONTENTS

Chapter 1. INTRODUCTION

Non-Hodgkin's lymphoma (NHL) is a lymphoproliferative disorder originating in B-lymphocytes, T-lymphocytes, and rarely in natural killer cells. B-lymphocyte disorders account for approximately 80-85% of all new cases, while T-lymphocyte disorders account for approximately 15-20% of all new cases. Depending on the type of NHL, the disease can be either aggressive (fast-growing) or indolent (slow-growing)[2]. An affected individual's prognosis and treatment (e.g. watchful waiting, chemotherapy, radiation therapy, targeted therapy) are thus heavily influenced by the specific type of NHL[3].

NHL is the 7th most common cancer type in the United States (U.S.) based on incidence[1]. With an estimated 71,850 new cases and 19,790 deaths in 2015, NHL is expected to comprise approximately 4.3% of all new cancer cases and 3.4% of all cancer deaths. As a disease that primarily affects older individuals, the median age of diagnosis is 66 years and the median age of death is 76 years. Men and individuals of Caucasian descent are also at higher risk compared to women and other races. According to the most recent statistics from the National Cancer Institute (NCI), the age-adjusted incidence rate is 19.7 per 100,000 individuals and 5-year survival is 70%[1].

The economic burden of NHL consists of both direct and indirect costs, with the former being studied more often based on a review of the published literature. Nonetheless, relatively few studies have examined the direct costs of NHL in the U.S. and even fewer studies have examined them within the past decade[4 5]. Kutikova et al. (2006) estimated that overall costs "from diagnosis or death or up to two years…were $53,537 and $31,839 for aggressive and indolent NHL patients, respectively."[4] Mariotto et al. (2011) also estimated that the national cost of lymphoma in 2010 was $12.14 billion, making it the 3rd most costly type of cancer in the U.S.[5] Using the results of the study by Mariotto et al., the NCI subsequently estimated that annual per patient costs associated with lymphoma were $196,807 for women and $213,834 for men (2010 dollars)[6]. One limitation to these abovementioned findings was that no NHL-specific estimates were provided. Despite this, NHL accounts for approximately 89% of all incident cases of lymphoma and subsequently the majority of the costs[1].

In comparison to studies on the direct costs of NHL, there is little to no published research on the indirect costs associated with NHL in the U.S. A 2009 review of the economic burden of follicular NHL (the 2nd most common type of NHL in the U.S.[7]), for example, found no studies of national or per patient indirect costs[8]. This lack of evidence on the indirect costs of NHL in the U.S. stands in contrast to other commonly observed cancer types such as breast, lung, prostate, and colorectal cancer[9 10 11 12]. Consequently, there is a knowledge gap with regards to the costs of lost productivity in the U.S. due to NHL.

Given that an estimated 44% of subjects with NHL are diagnosed between the working ages of 18 to 64[1], NHL can have a substantial impact on workplace productivity by causing absenteeism, short-term disability (STD), and/or long-term disability (LTD) – all of which translate to indirect costs. The objective of this study was to examine the indirect costs and workplace productivity loss (defined as an aggregate measure of absenteeism, STD, and LTD days) associated with NHL from a societal perspective in a commercially insured U.S. population.

Chapter 2. METHODS

2.1 DATA SOURCE

Data for this study were obtained from the Truven Health Analytics MarketScan® Commercial Claims and Encounters (CCAE) and Health and Productivity Management (HPM) Databases. The CCAE Database encompasses approximately 110 million unique individuals with employer-sponsored private health insurance. It allows users to obtain patient information throughout the full continuum of care and to track patient utilization of healthcare resources over time. With data obtained from approximately 150 employers, the CCAE Database provides a representative sample of the national, commercially insured American population[9 13 14]. As a subset of the CCAE Database, the HPM Database covers approximately 3 million individuals and contains information on absenteeism, STD, LTD, and worker's compensation. It can be linked to medical, pharmacy, and enrollment data in the CCAE database, which allows assessment of both direct and indirect costs associated with various medical conditions[15]. Both databases are devoid of

patient identifiers and are in compliance with the Health Insurance Portability and Accountability Act (HIPAA) of 1996[13].

2.2 SAMPLE SELECTION

The NHL cohort consisted of patients with a first diagnosis of NHL from July 1, 2007 to December 31, 2012. The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes 200.00 to 200.88, 202.00 to 202.98, and 204.10 to 204.12 were used to identify NHL patients, and the date of first diagnosis was designated as the index date. July 1, 2007 was chosen as the first eligible date of diagnosis for NHL because the Food and Drug Administration (FDA) approved rituximab for combination therapy in December 2006, which would allow time for uptake of new treatment regimens[16]. Given that rituximab is now a mainstay of many NHL treatments[2], its approval for combination therapy signified a shift in the treatment paradigm of NHL and would have likely influenced the resulting workplace productivity loss and associated indirect costs.

NHL patients must have also had no diagnoses of cancer prior to the index date, and have had continuous enrollment for at least 6 months before (defined as the pre-index period) and at least 12 months after the index date (defined as the post-index period). Additionally, patients must have been at least 18 years old and no older than 64 years old on the index date. This was to ensure that the sample would be representative of the working-age population. Furthermore, all NHL patients must have had at least 2 additional NHL ICD-9-CM codes on different dates in the 60-day post-index period and no ICD-9-CM codes for Hodgkin's lymphoma (HL) (201.xx) in the 12-month post-index period based on outpatient or inpatient claims data. This was to ensure that a patient had an actual diagnosis of NHL instead of a diagnosis code related to screening for the disease or a potentially incorrect diagnosis. Finally, NHL patients were included if they had non-missing data on absenteeism, STD, and LTD for at least 12 months after the index date.

To generate the control cohort, all patients not diagnosed with NHL in a certain year (2007-2012) were first assigned a random index date during that year. Since some individuals were enrolled for multiple years, their index dates were randomly chosen based on all years enrolled. All potential controls were screened to meet the same inclusion and exclusion criteria as the NHL patients with the exception of no diagnoses of other cancers in the pre-index period and no

diagnoses of HL in the post-index period. Controls were allowed to have diagnoses of cancer before the index date and diagnoses of HL after the index date in order to provide a more accurate representation of the typical commercially insured U.S. population, assuming that such patients would not be overrepresented. Lastly, the control cohort was generated by 3:1 matching based on index year, gender, 5-year age group, and geographic region of residence.

2.3 VARIABLES

The primary outcomes of interest in this study were the differences in mean days of workplace productivity loss and the associated indirect costs between NHL patients and controls during the 12-month post-index period. The percentage of patients with non-zero days of workplace productivity loss in the post-index period was also measured, along with the mean number of absenteeism days, STD days, LTD days, and the associated mean indirect costs. Absenteeism was defined as all days absent from work (i.e. "sick," "leave," "recreational," "other," "Family Medical Leave Act"[15]) except for those due to "disability" (to avoid double-counting STD and LTD days). Short-term disability was defined as an extended period of absence, excluding weekend days, due to a particular diagnosis and is "typically capped by employers at 6 months." Long-term disability was subsequently defined as an extended period of absence, excluding weekend days, due to a particular diagnosis and typically occurs after STD benefits have ended[10]. Workplace productivity loss was defined as an aggregate measure of absenteeism, STD, and LTD days. To calculate indirect costs, we assumed 8-hour work days[15] and multiplied the number of days of workplace productivity loss during the post-index period by the 2014 average daily wage rate ($197.04) for all occupations, as reported by the Bureau of Labor Statistics[17].

Patient characteristics on the index date were also measured (defined as baseline characteristics), including age, age group, sex, index year, geographic region of residence, benefit plan type, fulltime status, union status, employer industry, and NHL subtype. Additionally, Charlson Comorbidity Index (CCI) score and direct cost were measured in the 6-month pre-index period. With regards to the CCI score, it is the most commonly used measure of illness severity and was originally developed to estimate 1-year mortality in patients based on their clinical diagnoses. In this study, CCI scores were calculated using an adaptation of the original CCI that encompasses 17 comorbid conditions given a weight of 1, 2, or 6[18]. With

regards to direct costs, they were estimated by summing total payments by insurers and health plans, patient coinsurance, and patient deductibles in relation to inpatient services, outpatient services, and pharmaceutical claims. All costs were adjusted to 2014 dollars using the medical care component of the Consumer Price Index[19].

2.4 STATISTICAL ANALYSES

Continuous variables (e.g. age, pre-index cost) were summarized using means and standard deviations, and comparisons between NHL patients and controls were made using t-tests. Categorical variables (e.g. geographic region of residence, employer industry, benefit plan type) were summarized using proportions, and comparisons between the NHL patients and controls were made using Chi squared tests.

To estimate the differences in mean days of workplace productivity loss and associated indirect costs for NHL patients versus controls, multiple regression analyses were performed. To control for potential confounders and precision variables, all regression analyses were adjusted for baseline age, benefit plan type, employer industry, fulltime status, and union status, as well as pre-index CCI score category. Differences in the means of the outcomes were subsequently assessed using t-tests.

With regards to clinical variables, pre-index CCI score was considered a potential confounder because pre-index comorbidities may be associated with a higher risk of developing cancer[20] and may also affect the number of days missed from work due to greater risk of illness (thus higher indirect costs). Janssen-Heijnen et al. (2005), for example, found a trend towards higher risk of death for patients with high impact comorbidities versus no comorbidities 3 years after diagnosis of NHL[21]. In the time period leading up to mortality, NHL patients may thus potentially have more absenteeism, STD, and LTD days – especially for those with aggressive NHL.

In relation to demographic variables, age was considered a potential confounder because older individuals are at higher risk for NHL[1] and may take longer to recover from illness. Sex was considered a potential confounder because males are at higher risk of NHL[1] and typically work more hours than females[22], which may affect the amount of days missed when ill. Plan type was also considered a potential confounder because certain benefit plans may be associated with

more NHL patients. Depending on the coverage for medical care, which varies between health plans and may influence choice of treatments, plan type may affect patient recovery time from sickness. Additionally, employer industry was considered a potential confounder because certain industries may be associated with a higher risk of NHL[23]. Depending on workplace policy (e.g. ability to work from home), employer industry may also influence the amount of days missed from work due to illness. Furthermore, fulltime status was considered a potential precision variable since it may affect the number of days missed from work due to medical conditions. An individual that works part time, for example, may have fewer workdays missed due to illness compared to a fulltime employee. Lastly, union status was considered a potential precision variable because workplace absence policies (e.g. for sick leave, disability) negotiated by unions on behalf of their members may affect the number of days missed from work due to illness.

All analyses were conducted using SAS, version 9.4, (SAS Institute, Cary, North Carolina) and STATA, version 13.1 (StataCorp, College Station, Texas). P-values less than or equal to 0.05 were considered statistically significant. Due to the use of de-identified patient data, this study was deemed not to be human subjects research by the University of Washington Human Subjects Division through self-determination.

Chapter 3. RESULTS

168 NHL patients and 504 matched controls were identified in this study. The mean age of NHL patients was 50.10 years, while the mean age of controls was 49.00 years ($p = 0.148$). The majority of NHL patients and controls were also male (80.36%), in the Western region (39.29%) and Southern region (32.14%), enrolled in preferred provider organizations (60.71% vs. 62.50%, $p = 0.464$), fulltime (97.02% vs. 99.01%, $p = 0.132$), non-union (58.33% vs. 56.15%, $p = 0.858$), and in the manufacturing, durable goods industry (51.79% vs. 47.62%, $p = 0.143$). Additionally, pre-index CCI scores were similar for NHL patients and controls, with the majority having a score of 0 (69.64% vs. 76.19%, $p = 0.055$). In relation to incident cases of NHL, follicular lymphoma (FL) and chronic lymphocytic leukemia/small lymphocytic lymphoma (CLL/SLL) were most common (17.26% and 16.67%, respectively). Note, however, that 54.17% of NHL patients had diagnoses of unspecified NHL subtypes – of which 10.71% appeared concurrently

with diagnoses of FL, diffuse large B-cell lymphoma (DLBCL), mantle cell lymphoma (MCL), marginal zone lymphoma (MZL), peripheral T-cell lymphoma (PTCL), CLL/SLL, or other specified NHL (e.g. Burkitt's lymphoma, etc.) (Table 1).

In relation to 6-month pre-index variables, mean pre-index cost was significantly higher for NHL patients versus controls ($5,864.31 vs. $2,612.52, $p = 0.001$). In relation to 12-month post-index variables, mean workplace productivity loss was significantly higher for NHL patients versus controls (64.66 days vs. 31.79 days, $p < 0.001$) despite the proportion of non-zero days of workplace productivity loss being similar between the cohorts (89.88% vs. 86.51%, $p = 0.255$). This is supported by a larger number of absenteeism days (39.44 vs. 28.74, $p < 0.001$), STD days (21.89 vs. 2.32 $p < 0.001$), and LTD days (3.34 vs. 0.72, $p = 0.074$). Consequently, mean indirect costs in the post-index period were significantly higher for NHL patients versus controls ($12,741.37 vs. $6,263.27, $p < 0.001$) (Table 1).

In comparison to controls, NHL patients incurred significantly more estimated mean days of workplace productivity loss (31.99 days; 95% CI: 25.24 days, 38.73 days; $p < 0.001$) in the post-index period when adjusting for baseline age, benefit plan type, employer industry, fulltime status, and union status, as well as pre-index CCI score. Consequently, NHL patients incurred significantly more estimated mean indirect costs ($6,302.34; 95% CI: $4,973.40, $7,631.28; $p < 0.001$) compared to controls when adjusting for the same aforementioned variables (Tables 2, 3).

Chapter 4. DISCUSSION

This retrospective cohort study revealed that NHL patients, on average, incurred approximately 32 more days (6.4 weeks, assuming 5 working days per week) of workplace productivity loss and approximately $6,500 more in associated indirect costs compared to controls in the 12-months after diagnosis of the disease. These results contribute substantially to the literature on NHL, given the lack of publications on such outcomes in relation to a commercially insured U.S. population. Reis et al. (2006) estimated the number of productive years lost in Germany in 2000 due to sick leave, early retirement, and mortality[24], but the results are likely not comparable to those in the U.S. due to changes in treatment paradigms since 2000, potential differences in

employer policies for workplace absence, and the differences between the health care systems in Germany and the U.S. This study, the first such analysis in the U.S. setting, indicates that there is a significant loss of workplace productivity due to NHL in the 12-month period after diagnosis of the disease.

The results of this study are notable given the magnitude of the differences in mean days of workplace productivity loss and associated indirect costs between NHL patients and controls. This study does not identify the specific causes of absenteeism, STD, and LTD, but possible explanations include more frequent doctors' office visits, receipt of chemotherapy, side effects of treatment, and morbidity due to NHL. Given that the majority of studies on indirect costs have focused on the economic consequences of premature mortality[25], this study provides an analysis of a relatively common[1] and costly[5] cancer type in which more evidence is needed in relation to workplace productivity loss and the associated indirect costs.

Providing an estimate of the mean indirect costs of an NHL diagnosis can also inform burden of disease estimates. The overall annual cost of cancer in 2010, for example, was estimated to be $263.8 billion – $140.1 billion due to indirect costs attributed to premature mortality, $102.8 billion due to direct medical costs, and $20.9 billion due to morbidity costs attributed to loss productivity[26]. Indirect costs of NHL due to workplace productivity loss, especially for aggressive subtypes and during terminal phases of the disease, can thus contribute greatly to its economic burden.

With regards to policy implications, it is important to note that the indirect costs of cancer-related premature mortality in 2007 were estimated to be as much as 1% of the U.S. gross domestic product (GDP)[27]. Despite the fact that indirect costs due to workplace productivity loss are estimated to be a fraction of the indirect costs due to premature mortality[26], the former can lead to the latter if treatments are unsuccessful at curing a patient's NHL. Although NHL appears to be neither underfunded nor overfunded based on years of life lost (YLL) due to premature mortality when compared to 20 other relatively common cancer types[28], the findings of this study can nevertheless be used to better inform research funding allocation when compared to estimates of the indirect costs of other cancer types.

In relation to patient characteristics, the findings that the majority of NHL patients were male and at least 45 years old were consistent with the fact that older age and male sex are

associated with an increased risk of the disease[1]. The Southern U.S. census region[29] also accounted for a large proportion of NHL cases, which is consistent with estimates from the American Cancer Society[30]. Interestingly, DLBCL was not the most common NHL subtype based on incidence (3.57%). Given than an estimated 32.5% of new NHL cases in the U.S. are DLBCL[31], the less than 5% incidence observed was unexpected. This is supported by the findings from a study using data from the National Cancer Data Base (n = 596,476), which showed that the incidence of DLBCL relative to all NHL cases from 1998-2011 was at least 30% regardless of race, sex, and age groups[31]. In comparison to DLBCL, incident cases of FL (17.26%) and CLL/SLL (16.67%) were much more common. Note that the estimated incident cases of FL and CLL/SLL in the U.S. are 17.1% and 18.6%, respectively[31], which are more consistent with the findings of this study. Furthermore, results of 10.71% of NHL patients having concurrent diagnoses of an unspecified NHL subtype in addition to FL, DLBCL, MCL, MZL, PTCL, CLL/SLL, or "other" NHL subtype indicate the potential occurrence of inaccurately entered diagnoses codes or a lack of certainty on the part of the provider on the index date.

Several limitations should be considered when interpreting this study. First, the relatively small NHL cohort size may affect the precision and magnitude of the study findings. This limitation was expected, however, due to the relative size of the HPM Database compared to the CCAE Database (approximately 3 million and 110 million unique individuals, respectively). To address this potential issue, exploratory analyses were performed using multiple regression analyses adjusting for the same aforementioned covariates. When comparing the estimated mean absenteeism days for NHL patients versus controls for the study group (n = 168 NHL patients, 504 controls) versus an exploratory group that was only required to have non-zero absenteeism days (n = 335 NHL patients, 1,005 controls), the former (9.70 days; 95% CI: 6.27 days, 13.14 days; $p < 0.001$) (Appendix Table 14) was less than the latter (13.63 days; 95% CI: 10.57 days, 16.69 days; $p < 0.001$) (Appendix Table 8). When comparing the estimated mean STD days for NHL patients versus controls for the study group versus an exploratory group that was only required to have non-zero STD days (n = 1,315 NHL patients, 3,945 controls), the former (19.70 days; 95% CI: 15.49 days, 23.90 days; $p < 0.001$) (Appendix Table 16) was also less than the latter (24.18 days; 95% CI: 22.31 days, 26.05 days; $p < 0.001$) (Appendix Table 10). In contrast, when comparing the estimated mean LTD days for NHL patients versus controls for the study

group versus an exploratory group that was only required to have non-zero LTD days (n = 1,056 NHL patients, 3,168 controls), the former (2.59 days; 95% CI: -0.32 days, 5.49 days; p = 0.081) (Appendix Table 18) was slightly more than the latter (2.01 days; 95% CI: 1.31 days, 2.72 days; p < 0.001) (Appendix Table 12). When considered together, the aforementioned findings indicate that absenteeism and STD may potentially be underestimated in the study group due to the smaller sample size – thus potentially underestimating indirect costs. Given the overall lack of LTD days compared to absenteeism and STD days, LTD is not expected to have a substantial impact on the study outcomes during the first 12 months after diagnosis of NHL. Note, however, that between-group differences in patient characteristics limit interpretations of these findings.

Second, due to the low apparent incidence of DLBCL (an aggressive NHL subtype) in the NHL cohort, the primary outcomes of interest may be underestimated compared to the actual commercially insured U.S. population. Third, only a 12-month post-index period was examined, despite some patients having continuous enrollment and non-missing absenteeism, STD, and LTD data for longer periods of time. The original rationale for use of the 12-month time frame, specified a priori, was due to concerns about obtaining adequate sample size of the NHL cohort. In post-hoc analyses, we found that among the NHL patients continuously enrolled for at least 24 months after the index date and satisfying all other criteria, cohort size decreased by 32.74% (n = 113). For NHL patients continuously enrolled for at least 36 months after the index date and satisfying all other criteria, cohort size decreased by 60.12% (n = 67). Taking this into account, larger sample sizes should be considered before undertaking further analyses in order to increase precision of the results.

Fourth, overall indirect costs were underestimated in this study. Productivity loss due to informal caregiving, for example, was not taken into account. This is supported by research from Bradley et al. (2008), who estimated that caregiving costs accounted for 42% ($58.5 billion) and 64% ($78.3 billion) of total costs for men ($139.7 billion) and women ($122 billion), respectively, in 2010[27]. Family members, in particular, have also been shown to incur economic burden (e.g. due to providing economic support), occupational burden (e.g. due to missed work, especially during patients' terminal phases), and psychosocial burden (e.g. anxiety, sadness, distress)[32 33] – all of which directly contribute or have the potential to contribute to indirect costs. Given that 18.2% of Americans reported being unpaid caregivers in 2014[34], the indirect costs of

cancer are expected to be much greater than those directly related to absenteeism, STD, and LTD. Additionally, this study did not take into account indirect costs of NHL due to presenteeism. Defined as "days at work but limited in performing job tasks because of health,"[35] presenteeism would not be captured by any of the primary outcomes of interest in this study but nonetheless play a vital role in the estimation of indirect costs. In order to estimate the effects of presenteeism, surveys such as the Work Limitations Questionnaire (WLQ), Health Limitations Questionnaire (HLQ), and Work Productivity and Activity Impairment (WPAI) Questionnaire are typically employed[36 37].

Fifth, since only the working-age commercially insured population is represented in this study, there is the potential for differences in results if examining other populations such as the Medicare population. The absenteeism, STD, and LTD days may be less for elderly patients such as those covered by Medicare due to the presence of more retirees, but may also be offset by indirect costs due to informal caregiving, informal housekeeping services, or other sources.

In conclusion, NHL contributes significantly to losses in productivity, as indicated by the greater number of days of workplace productivity loss compared to controls, along with higher associated indirect costs. Furthermore, this study fills a gap in the literature on the aforementioned outcomes of interest regarding NHL, particularly in relation to the working-age commercially insured U.S. population. Given that indolent NHL (approximately 50% of all NHL[38]) is unlikely to result in acute mortality, longer follow-up times (e.g. 24 months, 36 months after the index date) should be considered in future studies. In doing so, such analyses will provide more comprehensive descriptions of the outcomes over time associated with NHL. Studies of indirect costs due to premature mortality from NHL should also be considered using databases with available data on patient deaths (e.g. IMS LifeLink PharMetrics Plus Database). This will provide a more complete picture of indirect costs due to NHL. Additionally, subgroup analyses should be considered for NHL subtypes once larger sample sizes can be obtained. Such analyses would enable greater understanding of the NHL subtypes most commonly affecting working-age individuals in the commercially insured U.S. population. Lastly, although NHL is the 7th most common cancer type by incidence, it can result in a substantial disease burden for affected individuals and requires further research to better understand its economic implications.

Chapter 5. LIST OF TABLES

5.1 TABLE 1. PATIENT CHARACTERISTICS (WORKPLACE PRODUCTIVITY LOSS – AGGREGATE MEASURE OF ABSENTEEISM, SHORT-TERM DISABILITY, AND LONG-TERM DISABILITY DAYS)

		NHL Patients (n = 168)		Controls (n = 504)		
		***n* or Mean**	**% or SD**	***n* or Mean**	**% or SD**	***P-value***
Age (years)		50.10	8.47	49.00	8.46	0.148
Age group (years)						0.684
	18-34	7	4.17%	30	5.95%	
	35-54	29	17.26%	84	16.67%	
	45-54	82	48.81%	258	51.19%	
	55+	50	29.76%	132	26.19%	
Sex						
	Male	135	80.36%	405	80.36%	1.000
	Female	33	19.64%	99	19.64%	
Index year						1.000
	2008	33	19.64%	99	19.64%	
	2009	30	17.86%	90	17.86%	
	2010	29	17.26%	87	17.26%	
	2011	40	23.81%	120	23.81%	
	2012	36	21.43%	108	21.43%	
Region						1.000
	Northeast	22	13.10%	66	13.10%	
	North Central	26	15.48%	78	15.48%	
	South	54	32.14%	162	32.14%	
	West	66	39.29%	198	39.29%	
Plan type						0.464*
	Unknown	0	0.00%	1	0.20%	
	Comprehensive	1	0.60%	4	0.79%	
	Exclusive provider organization	4	2.38%	7	1.39%	
	Health maintenance organization	13	7.74%	24	4.76%	
	Point-of-service	48	28.57%	146	28.97%	
	Preferred provider organization	102	60.71%	315	62.50%	
	Consumer-driven health plan	0	0.00%	7	1.39%	
Fulltime status						0.132*
	Non-fulltime	5	2.98%	5	0.99%	
	Fulltime	163	97.02%	499	99.01%	
Union status						0.858
	Union	37	22.02%	113	22.42%	
	Non-union	98	58.33%	283	56.15%	
	Other/unknown	33	19.64%	108	21.43%	

*Fisher's exact test; NHL - Non-Hodgkin's lymphoma

Table 1 cont.	NHL Patients (n = 168)		Controls (n = 504)		*P-value*
	***n* or Mean**	**% or SD**	***n* or Mean**	**% or SD**	
Industry					0.143
Manufacturing, durable goods	87	51.79%	240	47.62%	
Manufacturing, nondurable goods	9	5.36%	52	10.32%	
Transportation, communications, utilities	72	42.86%	212	42.06%	
CCI score (pre-index period)					0.055
0	117	69.64%	384	76.19%	
1	37	22.02%	67	13.29%	
2	8	4.76%	28	5.56%	
3+	6	3.57%	25	4.96%	
Pre-index cost	$5,864.31	$12,253.12	$2,612.52	$6,230.67	0.001
Days of all workplace absence (post-index period)					0.255
Zero all workplace absence days	17	10.12%	68	13.49%	
Non-zero all workplace absence days	151	89.88%	436	86.51%	
Days of workplace productivity loss (post-index period)	64.66	62.02	31.79	27.57	<0.001
Days of absenteeism (post-index period)	39.44	2.35	28.74	0.85	<0.001
Days of STD (post-index period)	21.89	3.34	2.32	0.50	<0.001
Days of LTD (post-index period)	3.34	1.98	0.72	0.52	0.074
Indirect costs due to workplace productivity loss (post-index period)	$12,741.37	$12,221.22	$6,263.27	$5,432.54	<0.001
NHL subtype (non-mutually exclusive)					
Diffuse large B-cell lymphoma	6	3.57%			
Follicular lymphoma	29	17.26%			
Marginal zone lymphoma	3	1.79%			
Mantle cell lymphoma	2	1.19%			
CLL/SLL	28	16.67%			
Peripheral T-cell lymphoma	0	0.00%			
Other	32	19.05%			
Unspecified	91	54.17%			
Unspecified and any of the above	18	10.71%			

CCI - Charlson comorbidity index; CLL/SLL - Chronic lymphocytic leukemia/small lymphocytic lymphoma; LTD - Long-term disability; NHL - Non-Hodgkin's lymphoma; STD - Short-term disability

5.2 TABLE 2. REGRESSION MODEL FOR COST OF WORKPLACE PRODUCTIVITY LOSS (AGGREGATE MEASURE OF ABSENTEEISM, SHORT-TERM DISABILITY, AND LONG-TERM DISABILITY DAYS) DUE TO NHL

	Coefficient	95% CI		*P-value*
NHL patient (vs. control)	$6,302.34	$4,973.40	$7,631.28	<0.001
Age (years)	-$23.04	-$92.07	$45.99	0.512
Plan type				
Comprehensive	$2,346.02	$13,832.05	$18,524.09	0.776
Exclusive provider organization	-$49.24	$15,426.51	$15,328.03	0.995
Health maintenance organization	$1,018.74	$15,925.03	$13,887.55	0.893
Point-of-service	$594.29	$14,232.48	$15,421.06	0.937
Preferred provider organization	-$135.99	$14,876.93	$14,604.96	0.986
Consumer-driven health plan	$412.01	$15,350.68	$16,174.70	0.959
Unknown (reference)	-	-	-	-
Industry				
Manufacturing, nondurable goods	$4,482.13	-$6,884.43	-$2,079.83	<0.001
Transportation, communications, utilities	$2,389.36	-$3,930.45	-$848.27	0.002
Manufacturing, durable goods (reference)	-	-	-	-
CCI score (pre-index period)				
1	$1,751.21	$127.70	$3,374.71	0.035
2	$1,823.80	-$770.74	$4,418.34	0.168
3+	$2,150.58	-$634.40	$4,935.56	0.130
0 (reference)	-	-	-	-
Fulltime (vs. non-fulltime)	$3,828.56	-$889.72	$8,546.83	0.112
Union status				
Non-union	$1,819.48	-$3,394.17	-$244.79	0.024
Other/unknown	$2,567.19	-$4,835.85	-$298.52	0.027
Union (reference)	-	-	-	-
Constant	$6,137.83	-$9,772.94	$22,048.60	0.449

CCI - Charlson Comorbidity Index; NHL - Non-Hodgkin's lymphoma

5.3 TABLE 3. REGRESSION MODEL FOR DAYS OF WORKPLACE PRODUCTIVITY LOSS (AGGREGATE MEASURE OF ABSENTEEISM, SHORT-TERM DISABILITY, AND LONG-TERM DISABILITY DAYS) DUE TO NHL

	Coefficient	95% CI		*P-value*
NHL patient (vs. control)	31.99	25.24	38.73	<0.001
Age (years)	-0.12	-0.47	0.23	0.512
Plan type				
Comprehensive	11.91	-70.20	94.01	0.776
Exclusive provider organization	-0.25	-78.29	77.79	0.995
Health maintenance organization	-5.17	-80.82	70.48	0.893
Point-of-service	3.02	-72.23	78.26	0.937
Preferred provider organization	-0.69	-75.50	74.12	0.986
Consumer-driven health plan	2.09	-77.91	82.09	0.959
Unknown (reference)	-	-	-	-
Industry				
Manufacturing, nondurable goods	-22.75	-34.94	-10.56	<0.001
Transportation, communications, utilities	-12.13	-19.95	-4.31	0.002
Manufacturing, durable goods (reference)	-	-	-	-
CCI score (pre-index period)				
1	8.89	0.65	17.13	0.035
2	9.26	-3.91	22.42	0.168
3+	10.91	-3.22	25.05	0.130
0 (reference)	-	-	-	-
Fulltime (vs. non-fulltime)	19.43	-4.52	43.38	0.112
Union status				
Non-union	-9.23	-17.23	-1.24	0.024
Other/unknown	-13.03	-24.54	-1.52	0.027
Union (reference)	-	-	-	-
Constant	31.15	-49.60	111.90	0.449

CCI - Charlson Comorbidity Index; NHL - Non-Hodgkin's lymphoma

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DEDICATION

This thesis is dedicated to my parents Allen Yu and Jane Dong-Yu. Thank you both for your loving, generous, and unconditional support throughout undergraduate and graduate school. Without you both, I would not be where I am today.

Lux sit
Palmam qui meruit ferat

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Chapter 7. APPENDIX

7.1 TABLE 4. PATIENT CHARACTERISTICS (EXPLORATORY GROUP WITH NON-ZERO ABSENTEEISM DAYS)

	NHL Patients (n = 335)		Controls (n = 1005)		
	***n* or Mean**	**% or SD**	***n* or Mean**	**% or SD**	***P-value***
Age (years)	49.81	8.93	48.71	9.04	0.053
Age group (years)					0.529
18-34	22	6.57%	78	7.76%	
35-54	54	16.12%	168	16.72%	
45-54	156	46.57%	490	48.76%	
55+	103	30.75%	269	26.77%	
Sex					1.000
Male	262	78.21%	786	78.21%	
Female	73	21.79%	219	21.79%	
Index year					1.000
2007	40	11.94%	120	11.94%	
2008	59	17.61%	177	17.61%	
2009	61	18.21%	183	18.21%	
2010	52	15.52%	156	15.52%	
2011	60	17.91%	180	17.91%	
2012	63	18.81%	189	18.81%	
Region					1.000
Northeast	51	15.22%	153	15.22%	
North Central	64	19.10%	192	19.10%	
South	119	35.52%	357	35.52%	
West	101	30.15%	303	30.15%	
Plan type					0.543*
Unknown	2	0.60%	11	1.09%	
Comprehensive	4	1.19%	12	1.19%	
Exclusive provider organization	9	2.69%	21	2.09%	
Health maintenance organization	39	11.64%	115	11.44%	
Point-of-service	91	27.16%	228	22.69%	
Preferred provider organization	187	55.82%	604	60.10%	
Consumer-driven health plan	0	0.00%	6	0.60%	
High deductible health plan	3	0.90%	8	0.80%	
Fulltime status					0.007
Non-fulltime	38	11.34%	68	6.77%	
Fulltime	297	88.66%	937	93.23%	
Union status					0.566
Union	64	19.10%	205	20.40%	
Non-union	218	65.07%	622	61.89%	
Other/unknown	53	15.82%	178	17.71%	

*Fisher's exact test; NHL - Non-Hodgkin's lymphoma

Table 4 cont.	NHL Patients (n = 335)		Controls (n = 1005)		*P-value*
	***n* or Mean**	**% or SD**	***n* or Mean**	**% or SD**	
Industry					0.054
Oil & gas extraction, mining	16	4.78%	64	6.37%	
Manufacturing, durable goods	170	50.75%	452	44.98%	
Manufacturing, nondurable goods	27	8.06%	134	13.33%	
Transportation, communications, utilities	112	33.43%	318	31.64%	
Services	10	2.99%	37	3.68%	
CCI score (pre-index period)					0.028
0	235	70.15%	782	77.81%	
1	70	20.90%	144	14.33%	
2	18	5.37%	47	4.68%	
3+	12	3.58%	32	3.18%	
Pre-index cost	$6,395.25	$11,401.77	$2,835.84	$10,598.15	<0.001
Absenteeism indicator (post-index period)					0.182
Zero absenteeism days	50	14.93%	182	18.11%	
Non-zero absenteeism days	285	85.07%	823	81.89%	
Days of absenteeism (post-index period)	40.13	38.27	25.75	21.70	<0.001
Absenteeism cost (post-index period)	$7,907.89	$7,539.95	$5,074.41	$4,275.70	<0.001
NHL subtype (non-mutually exclusive)					
Diffuse large B-cell lymphoma	11	3.28%			
Follicular lymphoma	53	15.82%			
Marginal zone lymphoma	12	3.58%			
Mantle cell lymphoma	4	1.19%			
CLL/SLL	46	13.73%			
Peripheral T-cell lymphoma	1	0.30%			
Other	63	18.81%			
Unspecified	193	57.61%			
Unspecified and any of the above	37	11.04%			

CCI - Charlson Comorbidity Index; CLL/SLL - Chronic lymphocytic leukemia/small lymphocytic lymphoma; NHL - Non-Hodgkin's lymphoma

7.2 TABLE 5. PATIENT CHARACTERISTICS (EXPLORATORY GROUP WITH NON-ZERO SHORT-TERM DISABILITY DAYS)

		NHL Patients (n = 1315)		Controls (n = 3945)		
		***n* or Mean**	**% or SD**	***n* or Mean**	**% or SD**	***P-value***
Age (years)		49.24	9.16	48.17	9.21	<0.001
Age group (years)						0.038
	18-34	110	8.37%	372	9.43%	
	35-54	233	17.72%	777	19.70%	
	45-54	545	41.44%	1668	42.28%	
	55+	427	32.47%	1128	28.59%	
Sex						1.000
	Male	915	69.58%	2745	69.58%	
	Female	400	30.42%	1200	30.42%	
Index year						1.000
	2007	120	9.13%	360	9.13%	
	2008	158	12.02%	474	12.02%	
	2009	214	16.27%	642	16.27%	
	2010	223	16.96%	669	16.96%	
	2011	277	21.06%	831	21.06%	
	2012	323	24.56%	969	24.56%	
Region						1.000
	Northeast	232	17.64%	696	17.64%	
	North Central	326	24.79%	978	24.79%	
	South	496	37.72%	1488	37.72%	
	West	260	19.77%	780	19.77%	
	Unknown	1	0.08%	3	0.08%	
Plan type						0.206
	Unknown	5	0.38%	23	0.58%	
	Comprehensive	35	2.66%	71	1.80%	
	Exclusive provider organization	37	2.81%	100	2.53%	
	Health maintenance organization	137	10.42%	492	12.47%	
	Point-of-service	109	8.29%	360	9.13%	
	Preferred provider organization	863	65.63%	2557	64.82%	
	Point-of-service with capitation	1	0.08%	4	0.10%	
	Consumer-driven health plan	97	7.38%	264	6.69%	
	High deductible health plan	31	2.36%	74	1.88%	
Fulltime status						<0.001
	Non-fulltime	61	4.64%	47	1.19%	
	Fulltime	1254	95.36%	3898	98.81%	
Union status						0.014
	Union	222	16.88%	797	20.20%	
	Non-union	809	61.52%	2270	57.54%	
	Other/unknown	284	21.60%	878	22.26%	

NHL - Non-Hodgkin's lymphoma

Table 5 cont.	NHL Patients (n = 1315)		Controls (n = 3945)		*P-value*
	***n* or Mean**	**% or SD**	***n* or Mean**	**% or SD**	
Industry					0.007*
Oil & gas extraction, mining	7	0.53%	41	1.04%	
Manufacturing, durable goods	466	35.44%	1344	34.07%	
Manufacturing, nondurable goods	190	14.45%	536	13.59%	
Transportation, communications, utilities	225	17.11%	770	19.52%	
Retail trade	31	2.36%	56	1.42%	
Finance, insurance, real estate	302	22.97%	819	20.76%	
Services	93	7.07%	373	9.46%	
Construction	1	0.08%	5	0.13%	
Wholesale	0	0.00%	1	0.03%	
CCI score (pre-index period)					<0.001
0	922	70.11%	3013	76.38%	
1	268	20.38%	573	14.52%	
2	78	5.93%	205	5.20%	
3+	47	3.57%	154	3.90%	
Pre-index cost	$8,056.61	$23,881.18	$2,615.96	$7,068.24	<0.001
STD indicator (post-index period)					<0.001
Zero STD days	855	65.02%	3634	92.12%	
Non-zero STD days	460	34.98%	311	7.88%	
Days of STD (post-index period)	28.14	51.55	3.59	17.41	<0.001
STD cost (post-index period)	$5,545.14	$10,156.85	$707.20	$3,430.52	<0.001
NHL subtype (non-mutually exclusive)					
Diffuse large B-cell lymphoma	40	3.04%			
Follicular lymphoma	186	14.14%			
Marginal zone lymphoma	48	3.65%			
Mantle cell lymphoma	19	1.44%			
CLL/SLL	180	13.69%			
Peripheral T-cell lymphoma	5	0.38%			
Other	258	19.62%			
Unspecified	739	56.20%			
Unspecified and any of the above	131	9.96%			

*Fisher's exact test; CCI - Charlson comorbidity index;
CLL/SLL - Chronic lymphocytic leukemia/small lymphocytic lymphoma; NHL - Non-Hodgkin's lymphoma;
STD - Short-term disability

7.3 TABLE 6. PATIENT CHARACTERISTICS (EXPLORATORY GROUP WITH NON-ZERO LONG-TERM DISABILITY DAYS)

	NHL Patients (n = 1056)		Controls (n = 3168)		
	***n* or Mean**	**% or SD**	***n* or Mean**	**% or SD**	***P-value***
Age (years)	49.41	9.05	48.32	9.09	0.001
Age group (years)					0.071
18-34	80	7.58%	279	8.81%	
35-54	185	17.52%	624	19.70%	
45-54	447	42.33%	1350	42.61%	
55+	344	32.58%	915	28.88%	
Sex					1.000
Male	705	66.76%	2115	66.76%	
Female	351	33.24%	1053	33.24%	
Index year					1.000
2008	117	11.08%	351	11.08%	
2009	204	19.32%	612	19.32%	
2010	195	18.47%	585	18.47%	
2011	248	23.48%	744	23.48%	
2012	292	27.65%	876	27.65%	
Region					1.000
Northeast	179	16.95%	537	16.95%	
North Central	280	26.52%	840	26.52%	
South	377	35.70%	1131	35.70%	
West	219	20.74%	657	20.74%	
Unknown	1	0.09%	3	0.09%	
Plan type					0.251
Unknown	3	0.28%	19	0.60%	
Comprehensive	29	2.75%	68	2.15%	
Exclusive provider organization	18	1.70%	56	1.77%	
Health maintenance organization	147	13.92%	533	16.82%	
Point-of-service	113	10.70%	302	9.53%	
Preferred provider organization	638	60.42%	1900	59.97%	
Consumer-driven health plan	88	8.33%	237	7.48%	
High deductible health plan	20	1.89%	53	1.67%	
Fulltime status					<0.001
Non-fulltime	65	6.16%	75	2.37%	
Fulltime	991	93.84%	3093	97.63%	
Union status					0.021
Union	186	17.61%	633	19.98%	
Non-union	646	61.17%	1783	56.28%	
Other/unknown	224	21.21%	752	23.74%	

NHL - Non-Hodgkin's lymphoma

Table 6 cont.	NHL Patients (n = 1056)		Controls (n = 3168)		*P-value*
	***n* or Mean**	**% or SD**	***n* or Mean**	**% or SD**	
Industry					0.050
Oil & gas extraction, mining	4	0.38%	11	0.35%	
Manufacturing, durable goods	258	24.43%	776	24.49%	
Manufacturing, nondurable goods	156	14.77%	492	15.53%	
Transportation, communications, utilities	241	22.82%	690	21.78%	
Retail trade	23	2.18%	27	0.85%	
Finance, insurance, real estate	223	21.12%	668	21.09%	
Services	150	14.20%	498	15.72%	
Construction	1	0.09%	6	0.19%	
CCI score (pre-index period)					0.001
0	730	69.13%	2376	75.00%	
1	217	20.55%	499	15.75%	
2	64	6.06%	173	5.46%	
3+	45	4.26%	120	3.79%	
Pre-index cost	$8,017.96	$25,492.25	$2,696.75	$9,676.77	<0.001
LTD indicator (post-index period)					<0.001
Zero LTD days	1028	97.35%	3161	99.78%	
Non-zero LTD days	28	2.65%	7	0.22%	
Days of LTD (post-index period)	2.25	17.65	0.19	5.55	<0.001
LTD cost (post-index period)	$443.53	$3,476.98	$37.07	$1,094.08	<0.001
NHL subtype (non-mutually exclusive)					
Diffuse large B-cell lymphoma	33	3.12%			
Follicular lymphoma	164	15.53%			
Marginal zone lymphoma	43	4.07%			
Mantle cell lymphoma	18	1.70%			
CLL/SLL	156	14.77%			
Peripheral T-cell lymphoma	4	0.38%			
Other	213	20.17%			
Unspecified	562	53.22%			
Unspecified and any of the above	114	10.80%			

CCI - Charlson comorbidity index; CLL/SLL - Chronic lymphocytic leukemia/small lymphocytic lymphoma; NHL - Non-Hodgkin's lymphoma; LTD - Long-term disability

7.4 TABLE 7. REGRESSION MODEL FOR ABSENTEEISM COST OF NHL (EXPLORATORY GROUP WITH NON-ZERO ABSENTEEISM DAYS)

	Coefficient	95% CI		*P-value*
NHL patient (vs. control)	$2,685.77	$2,082.14	$3,289.40	<0.001
Age (years)	$25.18	-$4.37	$54.73	0.095
Plan type				
Comprehensive	$1,541.65	-$2,076.41	$5,159.72	0.403
Exclusive provider organization	$1,777.67	-$1,413.02	$4,968.36	0.275
Health maintenance organization	$2,054.16	-$738.18	$4,846.49	0.149
Point-of-service	$1,597.51	-$1,211.77	$4,406.79	0.265
Preferred provider organization	$1,602.05	-$1,076.03	$4,280.13	0.241
Consumer-driven health plan	$379.58	-$4,320.24	$5,079.40	0.874
High deductible health plan	-$2,247.95	-$6,163.80	$1,667.90	0.260
Unknown (reference)	-	-	-	-
Industry				
Manufacturing, durable goods	-$186.63	-$1,323.03	$949.77	0.747
Manufacturing, nondurable goods	-$3,061.12	-$4,434.35	-$1,687.89	<0.001
Transportation, communications, utilities	-$2,568.97	-$3,826.23	-$1,311.72	<0.001
Services	-$1,990.10	-$3,780.33	-$199.87	0.029
Oil & gas extraction, mining (reference)	-	-	-	-
CCI score (pre-index period)				
1	$784.82	$63.45	$1,506.19	0.033
2	$1,632.62	$411.49	$2,853.74	0.009
3+	$1,763.51	$295.84	$3,231.19	0.019
0 (reference)	-	-	-	-
Fulltime (vs. non-fulltime)	$1,479.87	$443.75	$2,515.98	0.005
Union status				
Non-union	-$2,308.65	-$2,997.93	-$1,619.36	<0.001
Other/unknown	-$3,160.03	-$4,211.44	-$2,108.62	<0.001
Union (reference)	-	-	-	-
Constant	$3,989.72	$562.20	$7,417.24	0.023

CCI - Charlson Comorbidity Index; NHL - Non-Hodgkin's lymphoma

7.5 TABLE 8. REGRESSION MODEL FOR DAYS OF ABENTEEISM DUE TO NHL (EXPLORATORY GROUP WITH NON-ZERO ABSENTEEISM DAYS)

	Coefficient	95% CI		*P-value*
NHL patient (vs. control)	13.63	10.57	16.69	<0.001
Age (years)	0.13	-0.02	0.28	0.095
Plan type				
Comprehensive	7.82	-10.54	26.19	0.403
Exclusive provider organization	9.02	-7.17	25.22	0.275
Health maintenance organization	10.43	-3.75	24.60	0.149
Point-of-service	8.11	-6.15	22.36	0.265
Preferred provider organization	8.13	-5.46	21.72	0.241
Consumer-driven health plan	1.93	-21.93	25.78	0.874
High deductible health plan	-11.41	-31.28	8.46	0.260
Unknown (reference)	-	-	-	-
Industry				
Manufacturing, durable goods	-0.95	-6.71	4.82	0.747
Manufacturing, nondurable goods	-15.54	-22.50	-8.57	<0.001
Transportation, communications, utilities	-13.04	-19.42	-6.66	<0.001
Services	-10.10	-19.19	-1.01	0.029
Oil & gas extraction, mining (reference)	-	-	-	-
CCI score (pre-index period)				
1	3.98	0.32	7.64	0.033
2	8.29	2.09	14.48	0.009
3+	8.95	1.50	16.40	0.019
0 (reference)	-	-	-	-
Fulltime (vs. non-fulltime)	7.51	2.25	12.77	0.005
Union status				
Non-union	-11.72	-15.21	-8.22	<0.001
Other/unknown	-16.04	-21.37	-10.70	<0.001
Union (reference)	-	-	-	-
Constant	20.25	2.85	37.64	0.023

CCI - Charlson Comorbidity Index; NHL - Non-Hodgkin's lymphoma

7.6 TABLE 9. REGRESSION MODEL FOR SHORT-TERM DISABILITY COST OF NHL (EXPLORATORY GROUP WITH NON-ZERO SHORT-TERM DISABILITY DAYS)

	Coefficient	95% CI		*P-value*
NHL patient (vs. control)	$4,765.23	$4,396.81	$5,133.66	<0.001
Age (years)	-$5.21	-$22.93	$12.52	0.565
Plan type				
Comprehensive	-$584.63	-$3,028.71	$1,859.45	0.639
Exclusive provider organization	-$1,762.46	-$4,153.16	$628.24	0.148
Health maintenance organization	-$1,147.40	-$3,360.03	$1,065.24	0.309
Point-of-service	-$2,039.87	-$4,281.34	$201.60	0.074
Preferred provider organization	-$1,682.85	-$3,860.70	$494.99	0.13
Point-of-service with capitation	-$5,112.41	-$10,681.33	$456.52	0.072
Consumer-driven health plan	-$2,197.26	-$4,454.57	$60.04	0.056
High deductible health plan	-$1,675.57	-$4,119.25	$768.11	0.179
Unknown (reference)	-	-	-	-
Industry				
Manufacturing, durable goods	$1,336.42	-$341.77	$3,014.62	0.119
Manufacturing, nondurable goods	$1,168.28	-$539.08	$2,875.65	0.18
Transportation, communications, utilities	$1,220.07	-$478.02	$2,918.17	0.159
Retail trade	$616.64	-$1,450.86	$2,684.13	0.559
Finance, insurance, real estate	$1,185.35	-$522.50	$2,893.20	0.174
Services	$363.74	-$1,375.08	$2,102.57	0.682
Construction	$433.01	-$4,531.69	$5,397.70	0.864
Wholesale	$779.90	-$10,766.63	$12,326.43	0.895
Oil & gas extraction, mining (reference)	-	-	-	-
CCI score (pre-index period)				
1	$356.37	-$82.54	$795.29	0.112
2	$971.09	$261.37	$1,680.82	0.007
3+	$2,039.58	$1,204.28	$2,874.87	<0.001
0 (reference)	-	-	-	-
Fulltime (vs. non-fulltime)	-$2,054.76	-$3,176.79	-$932.73	<0.001
Union status				
Non-union	-$1,052.10	-$1,493.64	-$610.55	<0.001
Other/unknown	-$1,675.28	-$2,246.76	-$1,103.81	<0.001
Union (reference)	-	-	-	-
Constant	$4,301.32	$1,196.99	$7,405.65	0.007

CCI - Charlson Comorbidity Index; NHL - Non-Hodgkin's lymphoma

7.7 TABLE 10. REGRESSION MODEL FOR DAYS OF SHORT-TERM DISABILITY DUE TO NHL (EXPLORATORY GROUP WITH NON-ZERO SHORT-TERM DISABILITY DAYS)

	Coefficient	95% CI		*P-value*
NHL patient (vs. control)	24.18	22.31	26.05	<0.001
Age (years)	-0.03	-0.12	0.06	0.565
Plan type				
Comprehensive	-2.97	-15.37	9.44	0.639
Exclusive provider organization	-8.94	-21.08	3.19	0.148
Health maintenance organization	-5.82	-17.05	5.41	0.309
Point-of-service	-10.35	-21.73	1.02	0.074
Preferred provider organization	-8.54	-19.59	2.51	0.13
Point-of-service with capitation	-25.95	-54.21	2.32	0.072
Consumer-driven health plan	-11.15	-22.61	0.30	0.056
High deductible health plan	-8.50	-20.91	3.90	0.179
Unknown (reference)	-	-	-	-
Industry				
Manufacturing, durable goods	6.78	-1.73	15.30	0.119
Manufacturing, nondurable goods	5.93	-2.74	14.59	0.18
Transportation, communications, utilities	6.19	-2.43	14.81	0.159
Retail trade	3.13	-7.36	13.62	0.559
Finance, insurance, real estate	6.02	-2.65	14.68	0.174
Services	1.85	-6.98	10.67	0.682
Construction	2.20	-23.00	27.39	0.864
Wholesale	3.96	-54.64	62.56	0.895
Oil & gas extraction, mining (reference)	-	-	-	-
CCI score (pre-index period)				
1	1.81	-0.42	4.04	0.112
2	4.93	1.33	8.53	0.007
3+	10.35	6.11	14.59	<0.001
0 (reference)	-	-	-	-
Fulltime (vs. non-fulltime)	-10.43	-16.12	-4.73	<0.001
Union status				
Non-union	-5.34	-7.58	-3.10	<0.001
Other/unknown	-8.50	-11.40	-5.60	<0.001
Union (reference)	-	-	-	-
Constant	21.83	6.07	37.58	0.007

CCI - Charlson Comorbidity Index; NHL - Non-Hodgkin's lymphoma

7.8 TABLE 11. REGRESSION MODEL FOR LONG-TERM DISABILITY COST OF NHL (EXPLORATORY GROUP WITH NON-ZERO LONG-TERM DISABILITY DAYS)

	Coefficient	95% CI		*P-value*
NHL patient (vs. control)	$396.88	$257.55	$536.21	<0.001
Age (years)	$6.72	-$0.05	$13.50	0.052
Plan type				
Comprehensive	$127.12	-$792.27	$1,046.51	0.786
Exclusive provider organization	$16.00	-$930.26	$962.27	0.974
Health maintenance organization	-$71.66	-$915.76	$772.45	0.868
Point-of-service	$261.08	-$599.20	$1,121.36	0.552
Preferred provider organization	$77.92	-$754.64	$910.48	0.854
Consumer-driven health plan	$102.76	-$753.54	$959.05	0.814
High deductible health plan	-$49.81	-$995.70	$896.07	0.918
Unknown (reference)	-	-	-	-
Industry				
Manufacturing, durable goods	$18.88	-$992.97	$1,030.72	0.971
Manufacturing, nondurable goods	$80.67	-$933.85	$1,095.19	0.876
Transportation, communications, utilities	$89.16	-$922.97	$1,101.28	0.863
Retail trade	-$172.58	-$1,324.65	$979.50	0.769
Finance, insurance, real estate	$17.36	-$997.35	$1,032.06	0.973
Services	$159.19	-$855.43	$1,173.82	0.758
Construction	$4.56	-$1,775.36	$1,784.48	0.996
Oil & gas extraction, mining (reference)	-	-	-	-
CCI score (pre-index period)				
1	-$38.61	-$201.29	$124.07	0.642
2	$157.26	-$107.25	$421.77	0.244
3+	$209.96	-$102.89	$522.80	0.188
0 (reference)	-	-	-	-
Fulltime (vs. non-fulltime)	-$135.77	-$478.04	$206.49	0.437
Union status				
Non-union	-$137.39	-$306.36	$31.58	0.111
Other/unknown	-$46.71	-$257.04	$163.62	0.663
Union (reference)	-	-	-	-
Constant	-$210.58	-$1,607.45	$1,186.29	0.768

CCI - Charlson Comorbidity Index; NHL - Non-Hodgkin's lymphoma

7.9 TABLE 12. REGRESSION MODEL FOR DAYS OF LONG-TERM DISABILITY DUE TO NHL (EXPLORATORY GROUP WITH NON-ZERO LONG-TERM DISABILITY DAYS)

	Coefficient	**95% CI**		***P-value***
NHL patient (vs. control)	2.01	1.31	2.72	<0.001
Age (years)	0.03	0.00	0.07	0.052
Plan type				
Comprehensive	0.65	-4.02	5.31	0.786
Exclusive provider organization	0.08	-4.72	4.88	0.974
Health maintenance organization	-0.36	-4.65	3.92	0.868
Point-of-service	1.33	-3.04	5.69	0.552
Preferred provider organization	0.40	-3.83	4.62	0.854
Consumer-driven health plan	0.52	-3.82	4.87	0.814
High deductible health plan	-0.25	-5.05	4.55	0.918
Unknown (reference)	-	-	-	-
Industry				
Manufacturing, durable goods	0.10	-5.04	5.23	0.971
Manufacturing, nondurable goods	0.41	-4.74	5.56	0.876
Transportation, communications, utilities	0.45	-4.68	5.59	0.863
Retail trade	-0.88	-6.72	4.97	0.769
Finance, insurance, real estate	0.09	-5.06	5.24	0.973
Services	0.81	-4.34	5.96	0.758
Construction	0.02	-9.01	9.06	0.996
Oil & gas extraction, mining (reference)	-	-	-	-
CCI score (pre-index period)				
1	-0.20	-1.02	0.63	0.642
2	0.80	-0.54	2.14	0.244
3+	1.07	-0.52	2.65	0.188
0 (reference)	-	-	-	-
Fulltime (vs. non-fulltime)	-0.69	-2.43	1.05	0.437
Union status				
Non-union	-0.70	-1.55	0.16	0.111
Other/unknown	-0.24	-1.30	0.83	0.663
Union (reference)	-	-	-	-
Constant	-1.07	-8.16	6.02	0.768

CCI - Charlson Comorbidity Index; NHL - Non-Hodgkin's lymphoma

7.10 TABLE 13. REGRESSION MODEL FOR ABSENTEEISM COST OF NHL (PRIMARY STUDY GROUP)

	Coefficient	95% CI		*P-value*
NHL patient (vs. control)	$1,912.16	$1,235.01	$2,589.31	<0.001
Age (years)	-$3.09	-$38.27	$32.08	0.863
Plan type				
Comprehensive	$3,358.56	$4,884.84	$11,601.96	0.424
Exclusive provider organization	-$452.01	$8,287.37	$7,383.35	0.910
Health maintenance organization	-$648.83	$8,244.21	$6,946.54	0.867
Point-of-service	-$219.84	$7,774.69	$7,335.02	0.954
Preferred provider organization	-$385.74	$7,896.87	$7,125.39	0.920
Consumer-driven health plan	$297.32	$7,734.43	$8,329.07	0.942
Unknown (reference)	-	-	-	-
Industry				
Manufacturing, nondurable goods	$4,028.27	$5,252.34	-$2,804.20	<0.001
Transportation, communications, utilities	$2,207.30	$2,992.56	-$1,422.05	<0.001
Manufacturing, durable goods (reference)	-	-	-	-
CCI score (pre-index period)				
1	$880.01	$52.77	$1,707.26	0.037
2	$1,451.35	$129.32	$2,773.38	0.031
3+	$517.46	-$901.60	$1,936.53	0.474
0 (reference)	-	-	-	-
Fulltime (vs. non-fulltime)	$1,888.70	-$515.46	$4,292.85	0.123
Union status				
Non-union	$2,178.09	$2,980.46	-$1,375.72	<0.001
Other/unknown	$3,914.59	$5,070.57	-$2,758.61	<0.001
Union (reference)	-	-	-	-
Constant	$7,439.00	-$668.20	$15,546.20	0.072

CCI - Charlson Comorbidity Index; NHL - Non-Hodgkin's lymphoma

7.11 TABLE 14. REGRESSION MODEL FOR DAYS OF ABSENTEEISM DUE TO NHL (PRIMARY STUDY GROUP)

	Coefficient	95% CI		*P-value*
NHL patient (vs. control)	9.70	6.27	13.14	<0.001
Age (years)	-0.02	-0.19	0.16	0.863
Plan type				
Comprehensive	17.05	-24.79	58.88	0.424
Exclusive provider organization	-2.29	-42.06	37.47	0.910
Health maintenance organization	-3.29	-41.84	35.25	0.867
Point-of-service	-1.12	-39.46	37.23	0.954
Preferred provider organization	-1.96	-40.08	36.16	0.920
Consumer-driven health plan	1.51	-39.25	42.27	0.942
Unknown (reference)	-	-	-	-
Industry				
Manufacturing, nondurable goods	-20.44	-26.66	-14.23	<0.001
Transportation, communications, utilities	-11.20	-15.19	-7.22	<0.001
Manufacturing, durable goods (reference)	-	-	-	-
CCI score (pre-index period)				
1	4.47	0.27	8.66	0.037
2	7.37	0.66	14.08	0.031
3+	2.63	-4.58	9.83	0.474
0 (reference)	-	-	-	-
Fulltime (vs. non-fulltime)	9.59	-2.62	21.79	0.123
Union status				
Non-union	-11.05	-15.13	-6.98	<0.001
Other/unknown	-19.87	-25.73	-14.00	<0.001
Union (reference)	-	-	-	-
Constant	37.75	-3.39	78.90	0.072

CCI - Charlson Comorbidity Index; NHL - Non-Hodgkin's lymphoma

7.12 TABLE 15. REGRESSION MODEL FOR SHORT-TERM DISABILITY COST OF NHL (PRIMARY STUDY GROUP)

	Coefficient	95% CI		*P-value*
NHL patient (vs. control)	$3,880.83	$3,051.99	$4,709.67	<0.001
Age (years)	-$47.17	-$90.22	-$4.12	0.032
Plan type				
Comprehensive	-$532.98	$10,622.98	$9,557.03	0.917
Exclusive provider organization	$598.89	-$8,991.67	$10,189.45	0.902
Health maintenance organization	-$226.02	-$9,522.83	$9,070.80	0.962
Point-of-service	$918.84	-$8,328.38	$10,166.05	0.845
Preferred provider organization	$330.88	-$8,862.81	$9,524.57	0.944
Consumer-driven health plan	$74.15	-$9,756.79	$9,905.09	0.988
Unknown (reference)	-	-	-	-
Industry				
Manufacturing, nondurable goods	-$84.39	-$1,582.66	$1,413.89	0.912
Transportation, communications, utilities	-$606.36	-$1,567.52	$354.79	0.216
Manufacturing, durable goods (reference)	-	-	-	-
CCI score (pre-index period)				
1	$1,096.61	$84.05	$2,109.16	0.034
2	$194.81	-$1,423.36	$1,812.99	0.813
3+	$2,222.19	$485.25	$3,959.14	0.012
0 (reference)	-	-	-	-
Fulltime (vs. non-fulltime)	$1,261.86	-$1,680.85	$4,204.57	0.400
Union status				
Non-union	$341.96	-$640.15	$1,324.07	0.494
Other/unknown	$476.11	-$938.82	$1,891.04	0.509
Union (reference)	-	-	-	-
Constant	$754.62	-$9,168.67	$10,677.91	0.881

CCI - Charlson Comorbidity Index; NHL - Non-Hodgkin's lymphoma

7.13 TABLE 16. REGRESSION MODEL FOR DAYS OF SHORT-TERM DISABILITY DUE TO NHL (PRIMARY STUDY GROUP)

	Coefficient	95% CI		*P-value*
NHL patient (vs. control)	19.70	15.49	23.90	<0.001
Age (years)	-0.24	-0.46	-0.02	0.032
Plan type				
Comprehensive	-2.70	-53.91	48.50	0.917
Exclusive provider organization	3.04	-45.63	51.71	0.902
Health maintenance organization	-1.15	-48.33	46.04	0.962
Point-of-service	4.66	-42.27	51.59	0.845
Preferred provider organization	1.68	-44.98	48.34	0.944
Consumer-driven health plan	0.38	-49.52	50.27	0.988
Unknown (reference)	-	-	-	-
Industry				
Manufacturing, nondurable goods	-0.43	-8.03	7.18	0.912
Transportation, communications, utilities	-3.08	-7.96	1.80	0.216
Manufacturing, durable goods (reference)	-	-	-	-
CCI score (pre-index period)				
1	5.57	0.43	10.70	0.034
2	0.99	-7.22	9.20	0.813
3+	11.28	2.46	20.09	0.012
0 (reference)	-	-	-	-
Fulltime (vs. non-fulltime)	6.40	-8.53	21.34	0.400
Union status				
Non-union	1.74	-3.25	6.72	0.494
Other/unknown	2.42	-4.76	9.60	0.509
Union (reference)	-	-	-	-
Constant	3.83	-46.53	54.19	0.881

CCI - Charlson Comorbidity Index; NHL - Non-Hodgkin's lymphoma

7.14 TABLE 17. REGRESSION MODEL FOR LONG-TERM DISABILITY COST OF NHL (PRIMARY STUDY GROUP)

	Coefficient	95% CI		*P-value*
NHL patient (vs. control)	$509.35	-$63.40	$1,082.10	0.081
Age (years)	$27.22	-$2.53	$56.97	0.073
Plan type				
Comprehensive	-$479.57	-$7,452.09	$6,492.96	0.893
Exclusive provider organization	-$196.12	-$6,823.51	$6,431.28	0.954
Health maintenance organization	-$143.89	-$6,568.29	$6,280.52	0.965
Point-of-service	-$104.71	-$6,494.84	$6,285.43	0.974
Preferred provider organization	-$81.13	-$6,434.27	$6,272.02	0.980
Consumer-driven health plan	$40.53	-$6,752.97	$6,834.04	0.991
Unknown (reference)	-	-	-	-
Industry				
Manufacturing, nondurable goods	-$369.47	-$1,404.83	$665.89	0.484
Transportation, communications, utilities	$424.31	-$239.88	$1,088.50	0.210
Manufacturing, durable goods (reference)	-	-	-	-
CCI score (pre-index period)				
1	-$225.41	-$925.12	$474.29	0.527
2	$177.64	-$940.58	$1,295.85	0.755
3+	-$589.08	-$1,789.36	$611.21	0.336
0 (reference)	-	-	-	-
Fulltime (vs. non-fulltime)	$678.00	-$1,355.51	$2,711.51	0.513
Union status				
Non-union	$16.65	-$662.02	$695.32	0.962
Other/unknown	$871.29	-$106.47	$1,849.06	0.081
Union (reference)	-	-	-	-
Constant	$2,055.78	-$8,913.11	$4,801.54	0.556

CCI - Charlson Comorbidity Index; NHL - Non-Hodgkin's lymphoma

7.15 TABLE 18. REGRESSION MODEL FOR DAYS OF LONG-TERM DISABILITY DUE TO NHL (PRIMARY STUDY GROUP)

	Coefficient	95% CI		*P-value*
NHL patient (vs. control)	2.59	-0.32	5.49	0.081
Age (years)	0.14	-0.01	0.29	0.073
Plan type				
Comprehensive	-2.43	-37.82	32.95	0.893
Exclusive provider organization	-1.00	-34.63	32.64	0.954
Health maintenance organization	-0.73	-33.33	31.87	0.965
Point-of-service	-0.53	-32.96	31.90	0.974
Preferred provider organization	-0.41	-32.65	31.83	0.980
Consumer-driven health plan	0.21	-34.27	34.68	0.991
Unknown (reference)	-	-	-	-
Industry				
Manufacturing, nondurable goods	-1.88	-7.13	3.38	0.484
Transportation, communications, utilities	2.15	-1.22	5.52	0.210
Manufacturing, durable goods (reference)	-	-	-	-
CCI score (pre-index period)				
1	-1.14	-4.70	2.41	0.527
2	0.90	-4.77	6.58	0.755
3+	-2.99	-9.08	3.10	0.336
0 (reference)	-	-	-	-
Fulltime (vs. non-fulltime)	3.44	-6.88	13.76	0.513
Union status				
Non-union	0.08	-3.36	3.53	0.962
Other/unknown	4.42	-0.54	9.38	0.081
Union (reference)	-	-	-	-
Constant	-10.43	-45.24	24.37	0.556

CCI - Charlson Comorbidity Index; NHL - Non-Hodgkin's lymphoma